



ROHDE & SCHWARZ

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Meßtechnik

Servicehandbuch

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Inhaltsübersicht für die SMH-Beschreibung

Betriebshandbuch

1. Datenblatt
2. Betriebsvorbereitung und Bedienung
3. Wartung

Servicehandbuch

4. Serviceanleitung für das Gesamtgerät

| 5. Serviceanleitung Baugruppen | Ident-Nr. | Register |
|---|-------------------|----------|
| Tastatur/Anzeige | 801.1366.02 | 1 |
| FRN-Loop | 801.3917.02 | 2 |
| HF-Oszillator | 801.5110.02 | 3 |
| Ausgangsstufe | 843.4805.02 | 4 |
| Rechner | 801.2410.04 | 5 |
| NF-Generator | 801.7312.02 | 6 |
| Netzteil | 801.1614.02 | 7 |
| HF-Eichleitung | 801.1108.02 | 8 |
| Frequenzerweiterung | 843.3273.02 | 9 |
| Reference Oscillator, OCXO (Option SMG-B1) | 802.0005.02 | 10 |
| AF Synthesizer (Option SMG-B2) | 802.0405.02 | 10 |
| X-Ausgang (Option SMG-B3) | 801.9609.02 | 10 |

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| | Schaltteilliste |
| | Funktionsstromlauf |
| | Stromlauf |
| | Bestückungspläne |

4.1 Funktionsbeschreibung

(Hierzu Funktionsstromlauf 845.4002 FS)

Der Signalgenerator SMH benützt die indirekte Synthese zur Erzeugung der Ausgangsfrequenz. Bei dieser Art der Synthese wird ein freilaufender Oszillator (VCO) über eine Phasenregelschleife (PLL) an eine Referenzfrequenz angebunden. Ist die Referenzfrequenz von einem Quarz abgeleitet, so erhält das Ausgangssignal die gleiche Stabilität. Der SMH enthält vier solcher Phasenregelschleifen, wobei zur HF-Synthese im unmodulierten Betrieb (CW) nur zwei Phasenregelschleifen (N,F-Loop und Hauptoszillator-Loop) benützt werden. Die weiteren Phasenregelschleifen werden zur Synchronisation des FM-Oszillators (FM-Loop) und des 50-MHz-Quarzoszillators (Referenz-Loop) bei externer Referenzfrequenz verwendet.

4.1.1 HF-Synthese

Die Grundoktave (500...1000 MHz) wird direkt durch 2 Oszillatoren in der Baugruppe "HF-Oszillator" erzeugt. Die Frequenzen von 31,25 bis 500 MHz werden durch Frequenzteilung, die Frequenzen von 1000...2000 MHz durch Verdoppeln und die Frequenzen von 0,1 bis 31,25 MHz durch Mischen in der Baugruppe "Ausgangsstufe" erzeugt. Die HF-Oszillatoren werden in einer Phasenregelschleife (Hauptoszillator-Loop) auf die 19. bis 38. Oberwelle einer 26-MHz-Referenz synchronisiert, die soweit variabel ist, daß bei der tiefsten benutzten Oberwelle der Anschluß an die nächsthöhere lückenlos möglich ist. Die Referenzfrequenz enthält die gesamte Feinauflösung des Synthesizers. Sie wird durch Teilung (1/8) der Ausgangsfrequenz (208...218,9 MHz) der Baugruppe "FRN-Loop" gewonnen.

In der Baugruppe "FRN-Loop" wird ein sogenannter Fractional-N-Teiler zur Erzeugung der Feinauflösung verwendet. Bei diesem Teiler erreicht man durch zeitweiliges Umschalten des Teilungsfaktors von N auf N+1, daß die VCO-Frequenz ein gebrochenes Vielfaches der Referenzfrequenz ist. Durch dieses Verfahren wird eine hohe Auflösung, schnelles Einschwingen und ein geringes Rauschen erreicht.

Als Referenzquelle für die HF-Synthese wird ein 50-MHz-Quarzoszillator verwendet. Von diesem Oszillator werden durch Vervielfachen bzw. Teilen die Festfrequenzen für den SMH abgeleitet. Um eine noch größere Stabilität zu erreichen, kann der 50-MHz-Quarzoszillator auf einen ofengeregelten 10-MHz-Quarzoszillator (Option SMG-B1) oder auf eine externe Referenzfrequenz (10 MHz) synchronisiert werden.

4.1.2 Pegelaufbereitung und AM

Die Soll-Hüllkurve des Ausgangssignals wird mit einer einstellbaren Gleichspannung erzeugt. Bei AM wird dieser Gleichspannung die NF überlagert. Dieser Führungswert und die gleichgerichtete Ausgangsspannung des Geräts werden einem Regelverstärker zugeführt, der das elektronische HF-Stellglied (Pinmodulator) so ansteuert, daß Soll- und Istwert übereinstimmen. Mit dieser Pegelregelschleife wird auch die Pegelfeineinstellung in 0,1-dB-Stufen erzeugt. Eine mechanische Eichleitung dämpft den Pegel in 5-dB-Stufen von 5 dB bis 135 dB.

4.1.3 Frequenzmodulation

In der Betriebsart FM wird anstatt der 50-MHz-Quarzfrequenz eine modulierte Frequenz von 50 MHz auf der Baugruppe "FRN-Loop" zuge-mischt. Die modulierte 50-MHz-Frequenz wird auf der Baugruppe "HF-Oszillator" mit der Phasenregelschleife (FM-Loop) erzeugt. Die Grenzfrequenz dieser Phasenregelschleife liegt weit unter der niedrigsten Modulationsfrequenz, damit die Modulation nicht von der Regelschleife verfälscht wird. Für den FM-DC-Betrieb wird die Phasenregelschleife aufgetrennt und eine durch einen D/A-Wandler erzeugte Abstimmspannung, die dem Wert im synchronisierten Be-trieb entspricht, auf den FM-Oszillator gegeben. Damit wird der Frequenzversatz beim Umschalten auf FM-DC gering gehalten.

4.1.4 Modulationsgenerator

Der Modulationsgenerator ist in der Baugruppe "NF-Generator" bzw. "AF Synthesizer" bei Ausrüstung mit der Option enthalten. In der Standardausführung (NF-Generator) wird zur Frequenzerzeugung ein Wien-Robinson-Oszillator verwendet. Es stehen 8 verschiedene Frequenzen zur Verfügung. In der Baugruppe "AF Synthesizer" (Option SMG-B2) ist ein digitaler Synthesizer eingebaut, dessen Frequenz von 10 Hz...100 kHz einstellbar ist.

Das Ausgangssignal des Modulationsgenerators steht auch ohne Modulation an der Gerätefrontseite zur Verfügung. Bei der Stan-dardausrüstung (NF-Generator) ist der Ausgangspegel 1 V. Bei der Option "AF Synthesizer" ist der Ausgangspegel von 1 mV...1 V ein-stellbar.

4.1.5 Steuerung

Sämtliche Einstellungen des SMH werden vom Mikroprozessor auf der Baugruppe "Rechner gesteuert. Der Mikroprozessor wartet auf eine Eingabe von der Tastatur oder von IEC-Bus. Aus den Eingaben be-rechnet er die notwendigen Einstellungen und gibt sie über den geräteinternen Datenbus an die entsprechenden Baugruppen aus.

4.2 Mechanischer Aufbau

(Hierzu die Bilder 4-1 und 4-2 im Anhang)

Das Gerät besteht aus einem Chassis, der Frontplatte und der Rückwanne. In das Chassis ist ein schwenkbarer Rahmen eingehängt, in dem die drei Baugruppen "FRN-Loop", "HF-Oszillator" und "Ausgangsstufe" steckbar eingesetzt sind. Ein Motherboard stellt alle unkritischen Verbindungen wie Stromversorgung und Datenleitungen her. Die HF-Verbindungen werden über Koax-Kabel hergestellt.

Zwischen der Frontplatte und dem Schwenkrahmen sind die Baugruppen "Rechner" und "NF-Generator" eingesteckt. Auf der rechten Seite sind die Baugruppen "Steuerplatte", "Filtermodul", "Ausgangsverstärker" und die mechanische Eichleitung befestigt. An die Frontplatte ist die Baugruppe "Tastatur/Anzeige" angeschraubt, die alle Bedien- und Anzeigeelemente enthält. Das Netzteil und der Lüfter sind an der Rückwanne befestigt.

Der Service-Kit SMH-Z1 enthält alle Teile, um die Baugruppen für Servicezwecke zugänglich zu machen.

Tabelle 4-1 Baugruppenverzeichnis

| Nr. | Bezeichnung | Ident-Nr. |
|------|-----------------------------|-------------|
| A1 | Tastatur/Anzeige | 801.1366.02 |
| A2 | FRN-Loop | 801.3917.02 |
| A3 | HF-Oszillator | 801.5110.02 |
| A4 | Ausgangsstufe | 843.4805.02 |
| A5 | Rechner | 801.2410.04 |
| A6 | NF-Generator | 801.7312.02 |
| A8 | Netzteil | 801.1614.02 |
| A9 | Eichleitung | 801.1108.02 |
| A10 | Reference Oscillator SMG-B1 | 802.0005.02 |
| A60 | AF Synthesizer SMG-B2 | 802.0405.02 |
| | X-Ausgang SMG-B3 | 801.9609.02 |
| A100 | NF-Motherboard | 801.1043.02 |
| A200 | HF-Motherboard | 801.1066.02 |
| A221 | Steuerplatte | 843.3309.02 |
| A230 | Filtermodul | 843.3550.02 |
| A240 | Ausgangsverstärker | 843.3450.02 |

4.3 Prüfen und Abgleichen

4.3.1 Übersicht der Abgleiche am Gesamtgerät

| Abgleich | Abgleichelement | Baugruppe | Abschnitt |
|--|--------------------|---|-----------|
| Ausgangspegel Offset RF > 8 MHz | R30 | Ausgangsverstärker Ausgangsstufe Ausgangsstufe Ausgangsstufe | 4.3.3 |
| Pegel RF > 8 MHz | R514 | | |
| Offset RF < 8 MHz | R663 | | |
| Pegel RF < 8 MHz | R641 | | |
| Amplitudenmodulation | R503 | Ausgangsstufe | 4.3.4 |
| Frequenzmodulation | R202 | HF-Oszillator | 4.3.5 |
| Referenzoszillator (Standard) (Option) | R542 REF. FREQ. | FRN-Loop SMG-B1 | 4.3.6 |
| Überspannungsschutz | R30 | Eichleitung | 4.3.7 |

4.3.2 Übersicht der Abgleiche bei Baugruppenwechsel

| Bei Wechsel der Baugruppe | Abgleich | Abschnitt |
|---------------------------|-------------------------------|-----------|
| FRN-Loop | Referenzoszillator (Standard) | 4.3.6 |
| HF-Oszillator | Frequenzmodulation | 4.3.5 |
| Ausgangsstufe | Ausgangspegel | 4.3.3 |
| | Amplitudenmodulation | 4.3.4 |
| Ausgangsverstärker | Ausgangspegel | 4.3.3 |
| | Amplitudenmodulation | 4.3.4 |
| Eichleitung | Überspannungsschutz | 4.3.7 |

4.3.3 Ausgangspegel

a) Offsetabgleich für RF > 8 MHz

- Einstellung am Gerät: RF = 100 MHz, Pegel = 13 dBm
- Kalibrierten Leistungsmesser an den HF-Ausgang anschließen
- Spezialfunktion 53 einschalten und den Pegel notieren.
- Spezialfunktion 54 einschalten und mit dem Trimmer R30 auf der Baugruppe Ausgangsverstärker eine Dämpfung von 25 dB $\pm 0,2$ dB einstellen.

b) Pegelabgleich für RF > 8 MHz

- Einstellung am Gerät: RF = 100 MHz, Pegel = 0 dBm
- Mit Trimmer R514 auf der Baugruppe Ausgangsstufe den Pegel auf 0 dBm $\pm 0,1$ dB einstellen.

c) Offsetabgleich für RF < 8 MHz

- Einstellung am Gerät: RF = 7,9 MHz, Pegel = 13 dBm
- Spezialfunktion 53 einschalten und den Pegel notieren.
- Spezialfunktion 54 einschalten und mit dem Trimmer R663 auf der Baugruppe Ausgangsstufe eine Dämpfung von 25 dB $\pm 0,2$ dB einstellen.

d) Pegelabgleich für RF < 8 MHz

- Einstellung am Gerät: Pegel = 0 dBm
- Pegel bei RF = 8 MHz messen und bei 7,999 MHz mit R641 auf der Baugruppe Ausgangsstufe den gleichen Wert ($\pm 0,1$ dB) einstellen.

4.3.4 Amplitudenmodulation

- Am SMH 100 MHz, 0 dBm und 80 % AM ($f_{\text{mod}} = 1$ kHz) einstellen.
- Modulationsanalysator an den HF-Ausgang anschließen.
- Mit dem Trimmer R503 auf der Ausgangsstufe den Modulationsgrad auf 80 % ± 1 % einstellen.

4.3.5 Frequenzmodulation

- Baugruppe "Ausgangsstufe" herausziehen.
- Am SMH 800 MHz und eine Frequenzmodulation von 400 kHz Hub ($f_{\text{mod}} = 1$ kHz) einstellen.
- Modulationsanalysator an X308 der Baugruppe "HF-Oszillator" anschließen.
- Mit dem Trimmer R202 auf der Baugruppe "HF-Oszillator" den Hub auf 400 kHz ± 2 kHz einstellen.
- Baugruppe "Ausgangsstufe" wieder einbauen.

4.3.6 Referenzoszillator

a) Standardausführung

- Gerät eine Stunde warmlaufen lassen.
- Kalibrierten Frequenzzähler an Buchse "REF.FREQ." (Rückwanne) anschließen.
- Mit Trimmer R542 auf der Baugruppe "FRN-Loop" die Frequenz auf 10 MHz ± 5 Hz abgleichen.

b) mit Option SMG-B1 Referenzoszillator OCXO

- Gerät 15 Minuten warmlaufen lassen.
- Kalibrierten Frequenzzähler an Buchse "REF.FREQ." (Rückwanne) anschließen.
- Mit Trimmer REF.FREQ. (Rückwanne) die Frequenz auf 10 MHz $\pm 0,5$ Hz einstellen.

4.3.7 Ansprechschwelle Überspannungsschutz

- Am SMH einen Pegel von -122 dBm einstellen.
- Mit einem Leistungsmeßsender eine Frequenz von 25 MHz in den HF-Ausgang des SMH einspeisen.
- Trimmer R30 auf der Eichleitungsansteuerung so einstellen, daß der Überspannungsschutz bei einer eingespeisten HF-Leistung von +27 dBm gerade anspricht.

4.4 Fehlersuche

4.4.1 Selbsttest

Während des Betriebs werden die wichtigsten Gerätefunktionen wie Frequenzerzeugung und Pegelregelung automatisch überwacht. Wird ein Fehler festgestellt, erfolgt eine Anzeige durch das Blinken der Status-LED und durch eine Service-Request-Meldung. Der Statuscode zur Identifizierung des Fehlers wird durch Drücken der STATUS-Taste im Modulations-Display zur Anzeige gebracht.

Die Fehlermeldungen bedeuten:

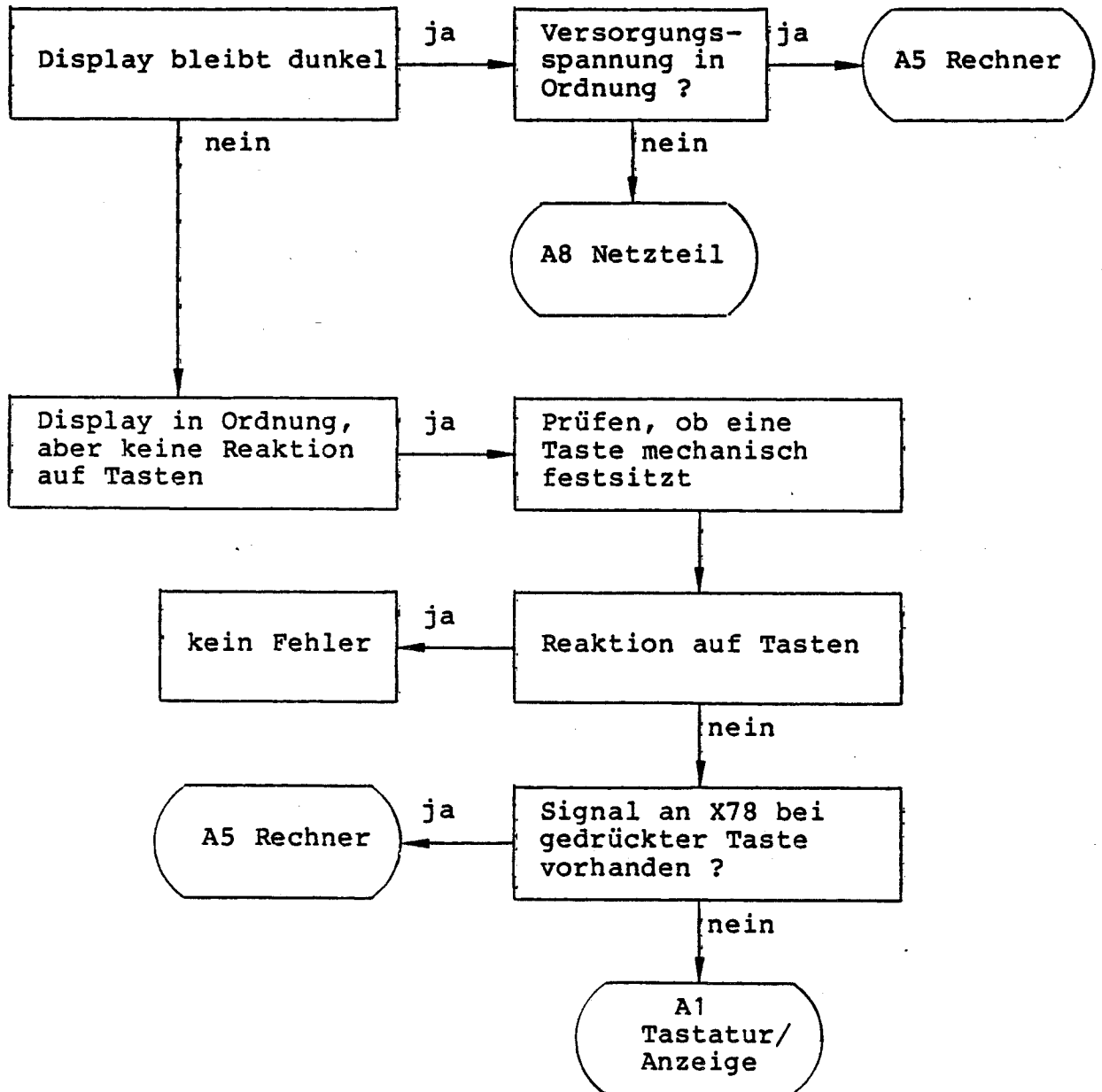
- Err 0: kein Fehler
- Err 1: Referenzloop außer Synchronisation
- Err 2: Summenloop außer Synchronisation
- Err 3: FM-Loop außer Synchronisation
- Err 4: Hauptoszillatorloop außer Synchronisation
- Err 5: Pegelregelung außer Funktion
- Err 6: Batteriespannung zu gering
- Err 7: ROM-Datenfehler
- Err 8: RAM-Datenfehler
- Err 9: Externe Überspannung am RF-Ausgang

Weitere Fehlermeldungen siehe Tabelle "Statuscodes von Fehlern" im Bedienhandbuch.

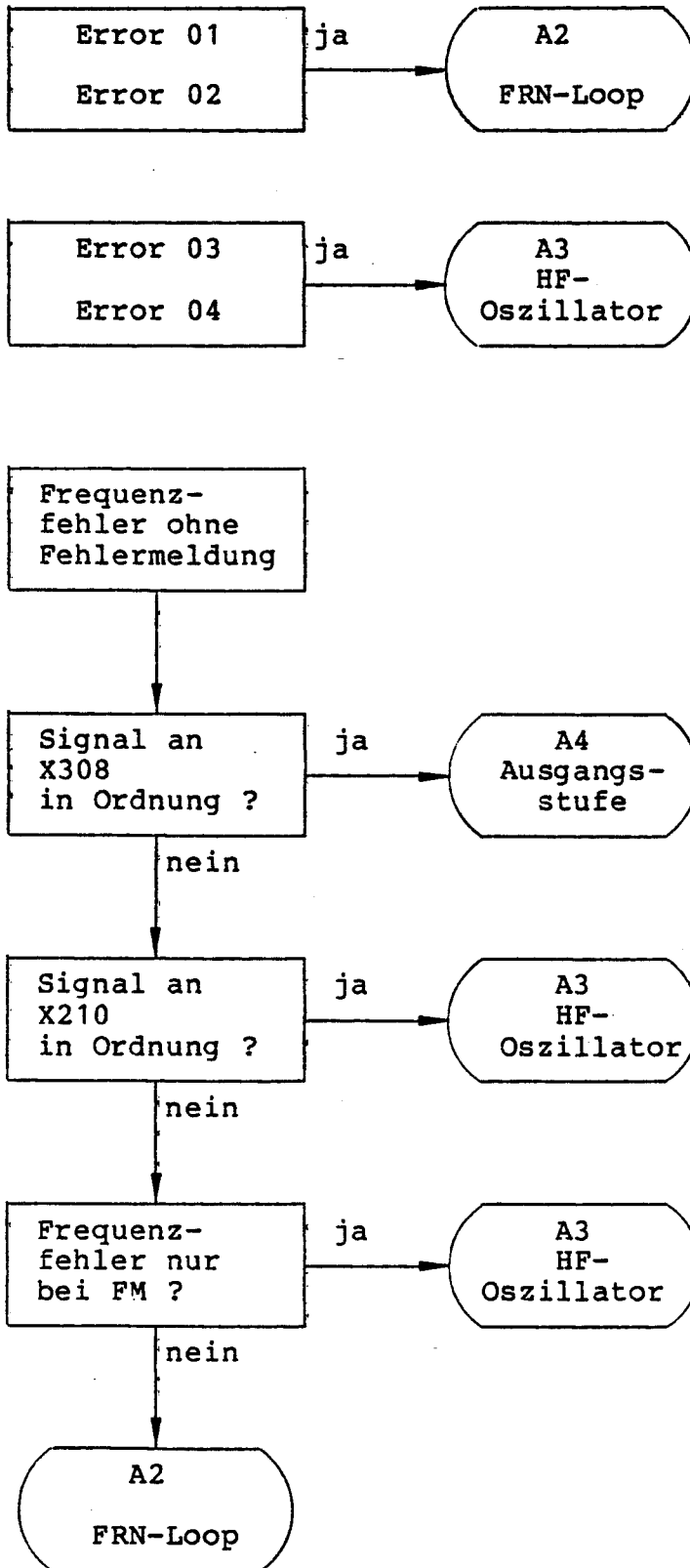
4.4.2 Fehlersuchdiagramme

Die folgenden Flußdiagramme sollen die Fehlersuche bis zur einzelnen Baugruppe erleichtern, wenn der Fehler nicht mit dem Selbsttest oder der internen Diagnose festgestellt werden kann. Zur Fehlersuche in den einzelnen Baugruppen siehe Teil 5, Baugruppenbeschreibungen. Es wird vorausgesetzt, daß alle Versorgungsspannungen den richtigen Wert aufweisen.

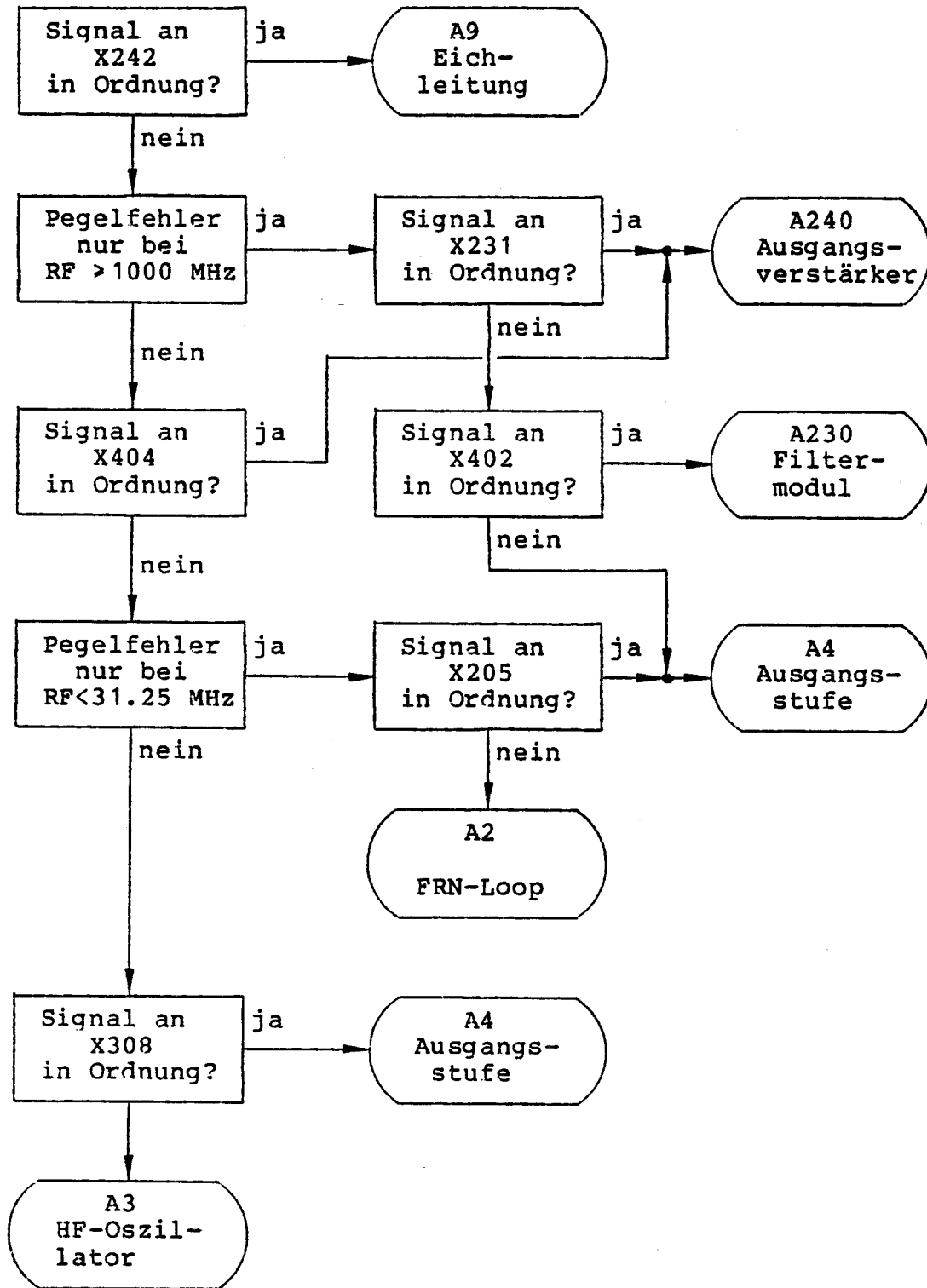
4.4.3 Tastatur/Anzeige-Fehler



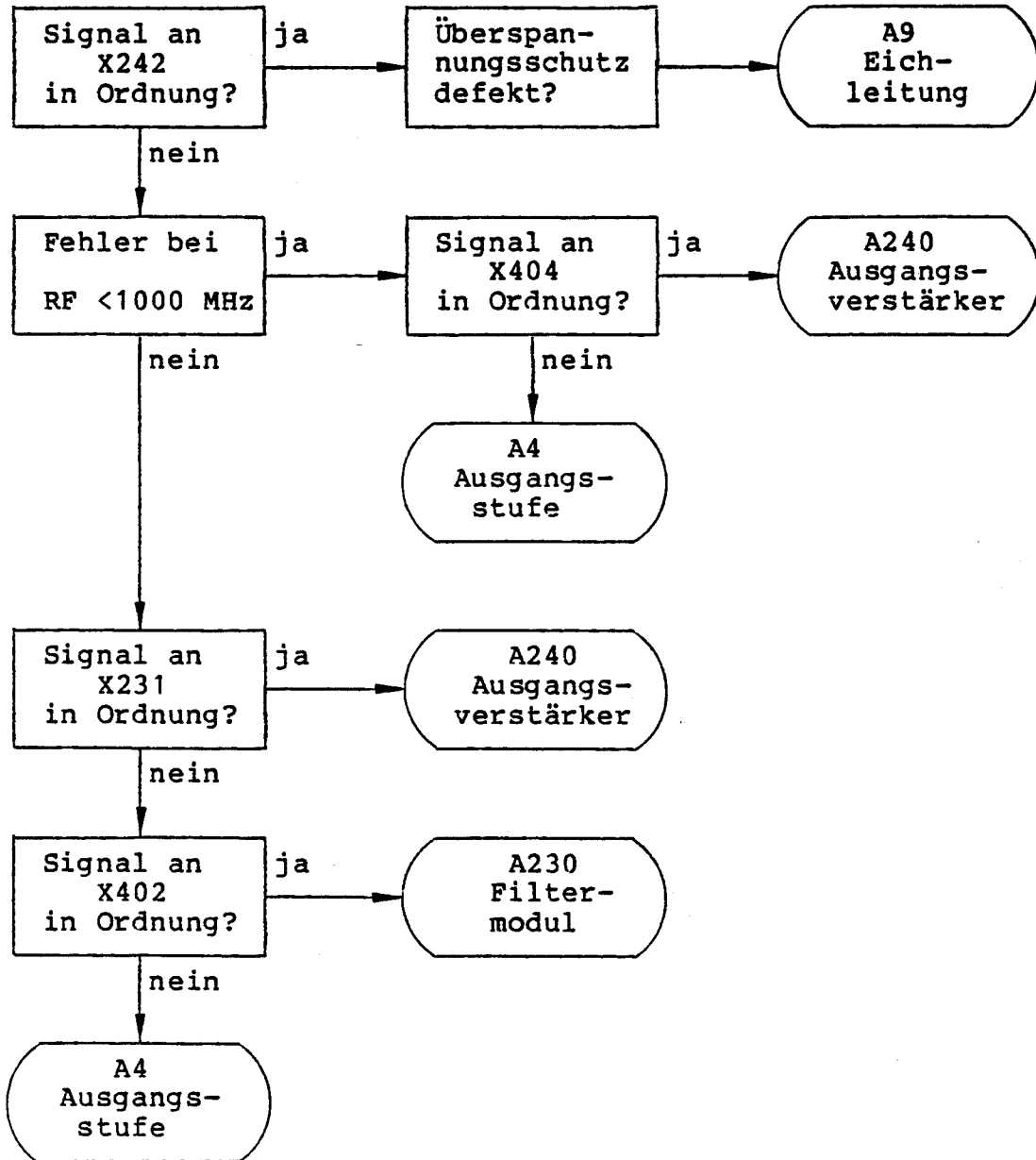
4.4.4 Frequenzfehler



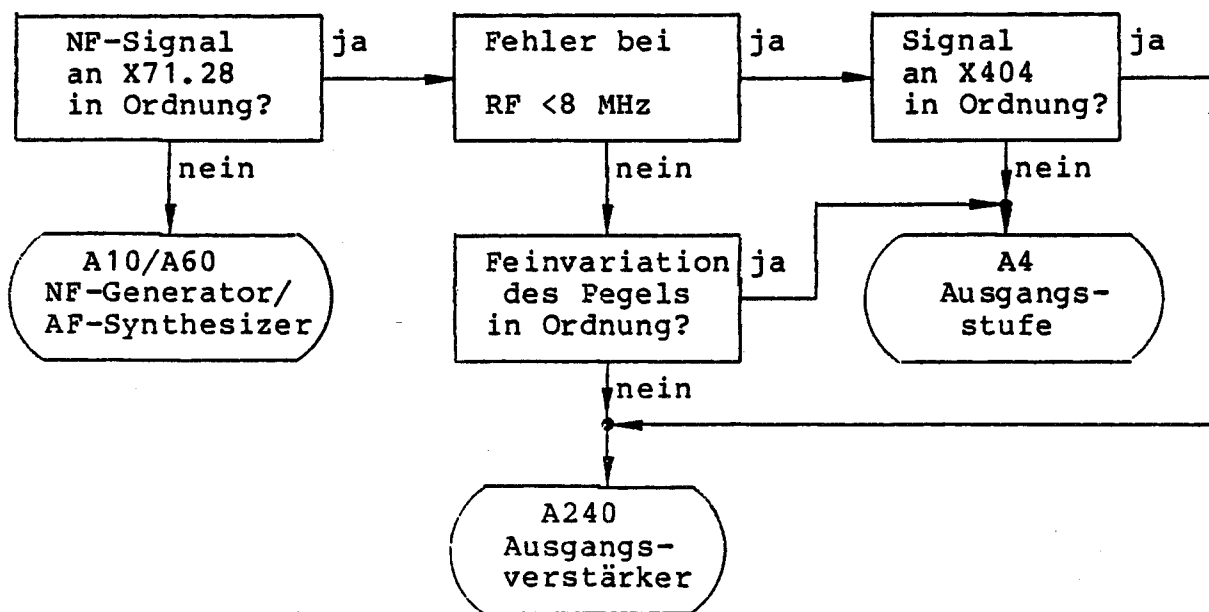
4.4.5 Pegelfehler



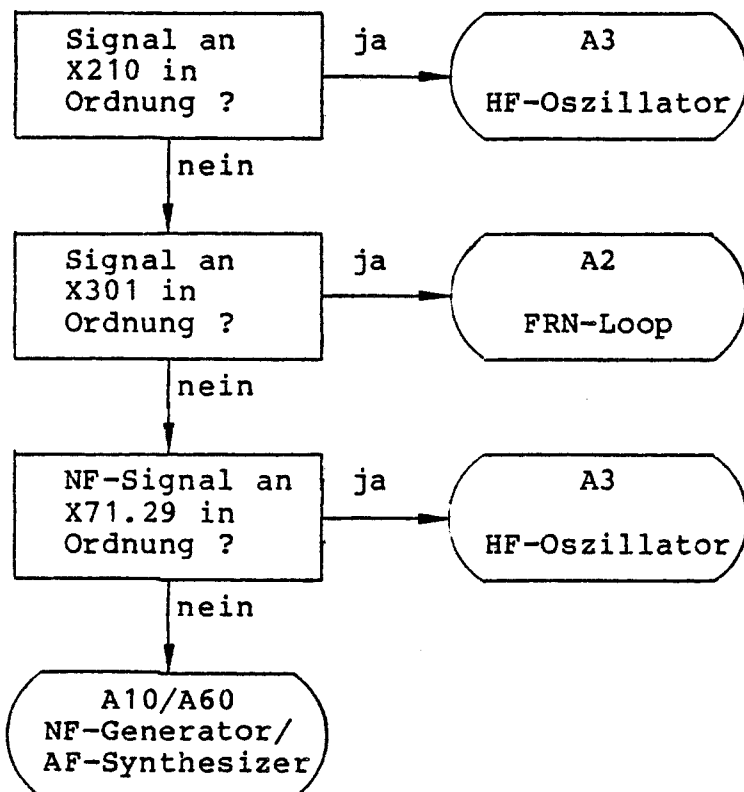
4.4.6 Oberwellen- bzw. Subharmonischenpegel zu groß



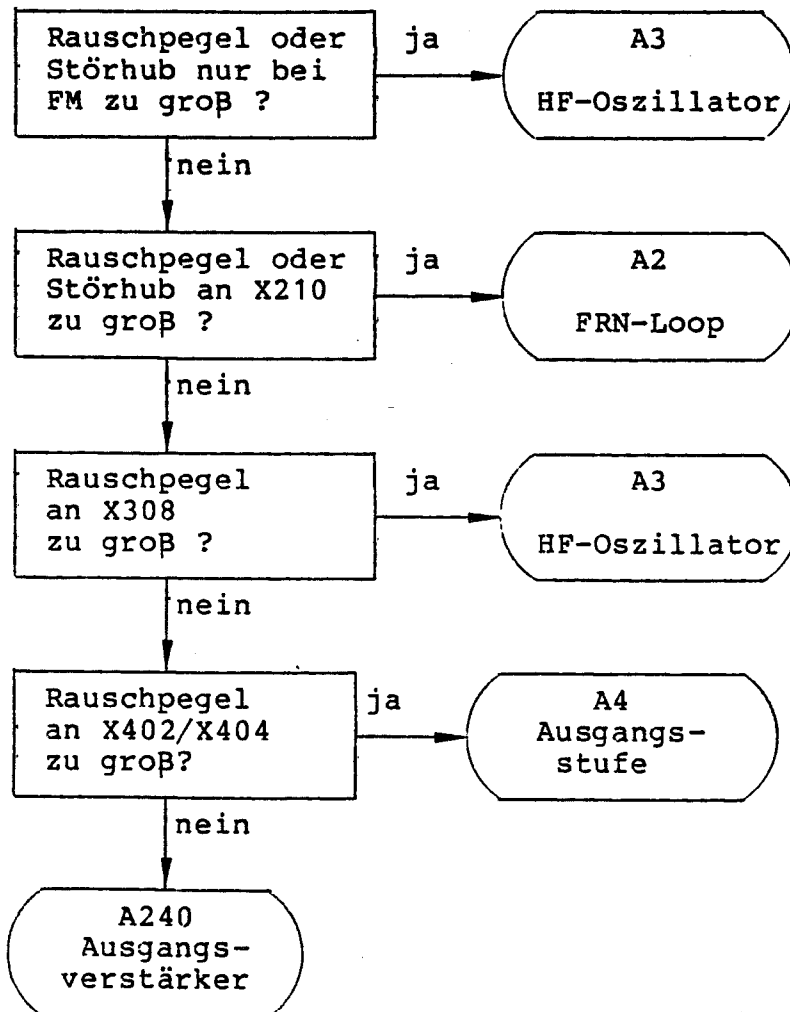
4.4.7 AM-Fehler



4.4.8 FM-Fehler



4.4.9 Rauschpegel oder Störhub zu groß



4.4.10 Diagnose

Neben dem Selbsttest, der permanent die wichtigsten Gerätefunktionen überwacht, können vom Benutzer ohne Öffnen des Gerätes und ohne externe Meßmittel die Spannungswerte von 34 internen Meßstellen abgefragt werden. Die Spannungswerte werden im Amplituden-Display angezeigt oder können über den IEC-Bus ausgelesen werden. Dieser Test, der alle wesentlichen internen Signalpegel, Abstimm- und Regelspannungen beinhaltet, liefert eine umfassende Information über den Gerätezustand.

Die Testpunkte werden mit den Spezialfunktionen Code 101 bis 137 eingeschaltet und mit dem allen Testpunkten gemeinsamen Code 100 ausgeschaltet (siehe Tabelle 4-2).

| Beispiele | | a) Einschalten des Meßpunkts 23 | | | | |
|-----------|-------------------------------|----------------------------------|--------------------------------|--------------------------------|--------------------------------|----------------------|
| | | b) Ausschalten des Meßpunkts | | | | |
| | | PARAMETER | DATA | | | ENTER/UNITS |
| a) | SHIFT <input type="text"/> | <input type="checkbox"/> SPECIAL | <input type="text" value="1"/> | <input type="text" value="2"/> | <input type="text" value="3"/> | <input type="text"/> |
| b) | SHIFT <input type="text"/> | <input type="checkbox"/> SPECIAL | <input type="text" value="1"/> | <input type="text" value="0"/> | <input type="text" value="0"/> | <input type="text"/> |

Anzeige: Im linken Teil des Amplituden-Displays wird der Spannungswert der Meßstelle und im rechten Teil die Nummer des Meßpunktes angezeigt.

Tabelle 4-2 Diagnosetestpunkte

| Testpunkt Nr. | Einschaltcode der Spezialfunktion "Testspannung" | Baugruppe | Bezeichnung | Sollwert |
|---------------|--|---------------------------------|--|-------------------|
| - | 100 | - | Ausschalten der Meßpunkte | - |
| 1 | 101 | Rechner | Versorgungsspannung +24 V | 24 V \pm 0,5 V |
| 2 | 102 | Rechner | Versorgungsspannung +15 V | 15 V \pm 0,5 V |
| 3 | 103 | Rechner | Versorgungsspannung -15 V | -15 V \pm 0,5 V |
| 4 | 104 | Rechner | Batteriespannung | 3...4 V |
| 5 | 105 | HF-Oszillator | Regelschleifenüberwachung Loop OK | <1 V |
| 6 | 106 | NF-Generator/ AF-Synthesizer | Pegelüberwachung des Modulations- eingangs AM EXT | 2,57...2,68 V |
| 7 | 107 | NF-Generator/ AF-Synthesizer | Pegelüberwachung des Modulations- eingangs FM/QM EXT | 2,57...2,68 V |
| 8 | 108 | Eichleitung | Eichleitungstestpunkt | 0...2 V |
| 9 | 109 | FRN-Loop | Regelschleifenüberwachung der Baugruppe | >3 V |
| 10 | 110 | FRN-Loop | Abstimmspannung der Referenz-Loop | 1...16,7 V |
| 11 | 111 | FRN-Loop | Versorgungsspannung +4,9 V | 4,9 V \pm 0,2 V |
| 12 | 112 | FRN-Loop | Ausgangspegel (X210) 208...219 MHz | 0,2...0,5 V |
| 13 | 113 | Ref. Osz. OCXO | Überwachung des Thermostats | ca. 6 V |
| 14 | 114 | FRN-Loop | Oszillatorpegel (VCO 158...169 MHz) | 0,2...0,6 V |
| 15 | 115 | FRN-Loop | Pegel des 50-MHz-Quarzoszillators | 6,5...8,2 V |
| 16 | 116 | FRN-Loop | Abstimmspannung der N,F-Loop Ausgangsfrequenz (520...545,9 MHz) | 1...20 V |
| 17 | 117 | HF-Oszillator | Ausgangspegel (X308) (500...1000 MHz) | >0,2 V |
| 18 | 118 | HF-Oszillator | 50-MHz-Signal (X11) | >0,8 V |
| 19 | 119 | HF-Oszillator | Pegel der 50-kHz-Referenz (X303) | >1 V |
| 20 | 120 | HF-Oszillator | Abstimmspannung der HF-Oszillatoren | 1...20 V |
| 21 | 121 | HF-Oszillator | Abstimmspannung der FM-Loop | 2...13 V |
| 22 | 122 | HF-Oszillator | Out of Lock (Hauptoszillator-Loop) | <1 V |
| 23 | 123 | HF-Oszillator | Versorgungsspannung +15 V | 15 V \pm 0,5 V |
| 24 | 124 | HF-Oszillator | Regelschleifenüberwachung der Baugruppe | >3 V |
| 28 | 128 | Ausgangsstufe | Regelspannung der Pegelregelung (X24) | 0...-6 V |
| 29 | 129 | Ausgangsstufe | HF-Gleichrichter $f \geq 8$ MHz | 0...4 V |
| 30 | 130 | Ausgangsstufe | HF-Gleichrichter $f < 8$ MHz (P35) | 0...4 V |
| 31 | 131 | Ausgangsstufe | HF-Pegel an Meßpunkt P24 | 0,1...0,5 V |
| 32 | 132 | Ausgangsstufe | Führungswert der Pegelregelung (P28) | 0...-4 V |
| 33 | 133 | AF-Generator | Pegel des NF-Generators | 0,4...0,5 V |
| 34 | 134 | AF-Synthesizer | Pegel des Quarzoszillators | 1 V \pm 0,3 V |
| 35 | 135 | AF-Synthesizer | Pegel des NF-Synthesizers | 1 V \pm 0,3 V |
| 36 | 136 | AF-Synthesizer | Versorgungsspannung +5 V | 4,8...5,3 V |
| 37 | 137 | X-Ausgang | Spannung am Ausgang "X-Axis" | 0...10 V |

4.4.11 Spezialfunktionen für Testzwecke

Diese Spezialfunktionen sind für Servicearbeiten am Gerät vorgesehen. Sie werden über Codes (Dateneingabe) ein- und ausgeschaltet (siehe auch Kapitel 2 im Bedienhandbuch).

Tabelle 4-3

| Spezialfunktion | Code |
|---|------|
| Diagnosespannung des Meßpunktes 108 mit 0,1 mV Auflösung messen | 35 |
| Diagnosespannung mit 1 mV Auflösung messen | 36 |
| Überwachungsschaltung der PLL's abschalten | 37 |
| Überwachungsschaltung der PLL's aktivieren | 38 |
| Phasenkontinuierlichen Einstellmodus für die RF abschalten | 45 |
| Phasenkontinuierlichen Einstellmodus für die RF einschalten | 46 |
| Anzeige der Ausgangsfrequenz "FRN-Loop" *) | 51 |
| Anzeige der Ausgangsfrequenz "HF-Oszillator" *) | 52 |
| Unterbrechungsfreie Pegeleinstellung auf 0 dB setzen | 53 |
| Unterbrechungsfreie Pegeleinstellung auf 25 dB setzen | 54 |
| Display-Test *) | 55 |
| PROM-Test | 56 |
| RAM-Test | 57 |

*) Anzeige erscheint so lange, wie eine der vier Einheitentasten gedrückt wird.

4.5 Erforderliche Meßgeräte und Hilfsmittel

| Pos. Nr. | Gerät | erforderliche Eigenschaften | R&S-Gerät Bestellnr. | Anwendung Abschnitt |
|----------|-------------------------|--|--|---------------------|
| 1 | Frequenz-zähler | Bereich 10 Hz...2000 MHz Auflösung 1 Hz | | 4.3.6 |
| 2 | Leistungs-messer | Bereich 0,1...2000 MHz Leistung bis 20 mW, Z = 50 Ω , Fehler <0,1 dB, Auflösung <0,02 dB | | 4.3.3 |
| 3 | Modula-tions-analysator | Frequenzbereich bis 1360 MHz, AM, FM, ϕ M, Fehler <1 % | FAM 334.2015.53 FAM-B2 334.4918.02 FAM-B8 334.5714.02 | 4.3.4 4.3.5 |
| 4 | Leistungs-meßsender | Pegel 30 dBm bis 1 GHz | SMLU 200.1009.03 | 4.3.7 |
| 5 | Oszillo-skop | DC...30 MHz | BOP 374.0020.02 | 5 |



ROHDE & SCHWARZ

Measuring Instruments
and Systems Division

Service Manual

SIGNAL GENERATOR

SMH

845.4002.52

Printed in the Federal
Republic of Germany

Contents of SMH Manual

Operating Manual

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2. Preparation for Use and Operating Instructions
3. Maintenance

Service Manual

4. Service Manual for Complete Instrument
5. Service Instructions for the Individual PC Boards

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| RF Oscillator | 801.5110.02 | 3 |
| Output Stage | 843.4805.02 | 4 |
| Processor | 801.2410.04 | 5 |
| AF Generator | 801.7312.02 | 6 |
| Power Pack | 801.1614.02 | 7 |
| RF Attenuation Set | 801.1108.02 | 8 |
| Frequency Extension | 843.3273.02 | 9 |
| Reference Oscillator, OCXO (Option SMG-B1) | 802.0005.02 | 10 |
| AF Synthesizer (Option SMG-B2) | 802.0405.02 | 10 |
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4.1 Function Description

(See complete circuit diagram 845.4002 FS)

The Signal Generator SMH uses indirect synthesis to generate the output frequency. With this type of synthesis, a voltage controlled oscillator is linked to a reference frequency via a phase locked loop. If the reference frequency is derived from a crystal, the output signal has the same stability. The SMH contains four such phase locked loops, and only two loops (fractional-N control loop and main oscillator loop) are used for RF synthesis in unmodulated mode (CW). The other phase locked loops are used to synchronize the FM oscillator (FM loop) and the 50-MHz crystal oscillator (reference loop) with an external reference frequency.

4.1.1 RF Synthesis

The fundamental octave (500 to 1000 MHz) is generated by two oscillators in the RF oscillator module. The frequencies from 31.25 to 500 MHz are generated by frequency division, the frequencies from 1000 to 2000 MHz by doubling and the frequencies from 0.1 to 31.25 MHz by mixing in the output stage module. The RF oscillators are synchronized in the phase controlled loop (main oscillator loop) with the 19th to 38th harmonics of a 26-MHz reference which can be adjusted such that the changeover from the lowest harmonic used to the next higher harmonic is continuous. The reference frequency contains the complete fine resolution of the synthesizer. This is obtained by dividing (1:8) the output frequency (208 to 218.9 MHz) on the FRN loop module.

A so-called fractional-N divider is used in the FRN loop module to generate the fine resolution. Occasional switching of the division factor from N to N+1 means that the VCO frequency is a fractional multiple of the reference frequency. This method results in high resolution, fast settling and low noise.

A 50-MHz crystal oscillator is used as the reference for the RF synthesis. The fixed frequencies for the SMH are derived from this oscillator by multiplication or division. In order to achieve an even greater stability, the 50-MHz crystal oscillator can be synchronized to a thermostat-controlled 10-MHz crystal oscillator (option SMG-B1) or an external reference frequency (10 MHz).

4.1.2 Level Conditioning and AM

The reference envelope curve of the output signal is generated using an adjustable DC voltage. In the case of AM, the AF is superimposed on this DC voltage. This command value and the rectified output voltage of the instrument are connected to a control amplifier which drives the electronic RF control element (pin modulator) until the reference value and the actual value agree. Fine level adjustment in steps of 0.1 dB is also enabled using this level control loop. A mechanical attenuation set is used to attenuate the level in 5-dB steps from 5 dB up to 135 dB.

4.1.3 Frequency Modulation

In FM mode, a modulated frequency of 50 MHz is mixed in on the FRN loop module instead of the 50-MHz crystal frequency. The modulated 50-MHz frequency is generated on the RF oscillator module using the phased locked loop (FM loop). The cut-off frequency of this PLL is much lower than the lowest modulation frequency so that the modulation is not falsified by the loop. The PLL is opened for FM DC mode and a tuning voltage generated by a D/A converter corresponding to the value in synchronized mode is applied to the FM oscillator. This results in a low frequency offset when switching to FM DC.

4.1.4 Modulation Generator

The modulation generator is included if the AF generator module or AF synthesizer module is fitted. A Wien-Robinson oscillator is used in the standard design (AF generator) for frequency generation. Eight different frequencies are produced. A digital synthesizer is fitted in the AF synthesizer module (option SMG-B2) whose frequency is adjustable from 10 Hz to 100 kHz.

The output signal of the modulation generator is also available on the front panel without modulation. The output level is 1 V with the standard equipment (AF generator). The output level is adjustable from 1 mV to 1 V with the AF synthesizer option.

4.1.5 Controller

All SMH settings are controlled by the microprocessor on the controller module. The microprocessor waits for inputs from the keyboard or IEC bus. It calculates the required settings from the inputs and outputs them to the corresponding modules via the internal data bus.

4.2 Mechanical Design

(See Figs. 4-1 and 4-2 in the Appendix)

The instrument consists of a chassis, the front panel and the rear panel. A pivotable frame is fitted into the chassis into which the three modules "FRN loop", "RF oscillator" and "output stage" are plugged in. All non-critical connections such as the power supply and data lines are made by a motherboard. The RF connections are made using coaxial cables.

The controller and AF generator modules are inserted between the front panel and the pivotable frame. The modules "control board", "filter module", "output amplifier" and the mechanical attenuation set are fixed on the right. The keyboard/display module containing all controls and displays is screwed onto the front panel. The power pack and the ventilator are mounted on the rear panel.

The Service Kit SMH-Z1 contains all parts required to access the modules for servicing.

Table 4-1 List of modules

| No. | Designation | Identification No. |
|------|-----------------------------|--------------------|
| A1 | Keyboard/display | 801.1366.02 |
| A2 | FRN loop | 801.3917.02 |
| A3 | RF oscillator | 801.5110.02 |
| A4 | Output stage | 843.4805.02 |
| A5 | Controller | 801.2410.04 |
| A6 | AF generator | 801.7312.02 |
| A8 | Power pack | 801.1614.02 |
| A9 | Attenuation set | 801.1108.02 |
| A10 | Reference oscillator SMG-B1 | 802.0005.02 |
| A60 | AF synthesizer SMG-B2 | 802.0405.02 |
| | X output SMG-B3 | 801.9609.02 |
| A100 | AF motherboard | 801.1043.02 |
| A200 | RF motherboard | 801.1066.02 |
| A221 | Control board | 843.3309.02 |
| A230 | Filter module | 843.3550.02 |
| A240 | Output amplifier | 843.3450.02 |

4.3 Checking and Adjustments

4.3.1 Summary of Adjustments on Complete Instrument

| Adjustment | Trimmer | Module | Section |
|--|---------------------------------|--|---------|
| Output level Offset RF >8 MHz Level RF >8 MHz Offset RF <8 MHz Level RF <8 MHz | R30 R514 R663 R641 | Output amplifier Output stage Output stage Output stage | 4.3.3 |
| Amplitude modulation | R503 | Output stage | 4.3.4 |
| Frequency modulation | R202 | RF oscillator | 4.3.5 |
| Reference oscillator (Standard) (Option) | R542 REF. FREQ. | FRN loop SMG-B1 | 4.3.6 |
| Overvoltage protection | R30 | Attenuation set | 4.3.7 |

4.3.2 Summary of Adjustments Following Module Replacement

| Following replacement of module | Adjustment | Section |
|---------------------------------|--------------------------------------|----------------|
| FRN loop | Reference oscillator (standard) | 4.3.6 |
| RF oscillator | Frequency modulation | 4.3.5 |
| Output stage | Output level Amplitude modulation | 4.3.3 4.3.4 |
| Output amplifier | Output level Amplitude modulation | 4.3.3 4.3.4 |
| Attenuation set | Overvoltage protection | 4.3.7 |

4.3.3 Output Level

a) Offset adjustment for RF >8 MHz

- SMH setting: RF = 100 MHz, level = 13 dBm
- Connect calibrated power meter to RF output.
- Switch on special function 53 and note the level
- Switch on special function 54 and set an attenuation of 25 dB \pm 0.2 dB using trimmer R30 on the output amplifier.

b) Level adjustment for RF >8 MHz

- SMH setting: RF = 100 MHz, level = 0 dBm
- Set the level to 0 dBm \pm 0.1 dB using trimmer R115 on the output stage.

c) Offset adjustment for RF <8 MHz

- SMH setting: RF = 7.9 MHz, level = 13 dBm
- Switch on special function 53 and note the level.
- Switch on special function 54 and set an attenuation of 25 dB \pm 0.2 dB using trimmer R663 on the output stage.

d) Level adjustment for RF <8 MHz

- SMH setting: Level = 0 dBm
- Measure level at RF = 8 MHz and adjust to the same value (\pm 0.1 dB) at 7.999 MHz using R64 on the output stage.

4.3.4 Amplitude Modulation

- Set 100 MHz, 0 dBm and 80 % AM ($f_{\text{mod}} = 1$ kHz) on the SMH.
- Connect modulation analyzer to RF output.
- Adjust the modulation depth to 80 % \pm 1 % using trimmer R503 on the output stage.

4.3.5 Frequency Modulation

- Remove output stage module.
- Set 800 MHz and a frequency modulation of 400 kHz deviation ($f_{\text{mod}} = 1$ kHz) on the SMH.
- Connect modulation analyzer to X308 of RF oscillator module.
- Adjust the deviation to 400 kHz \pm 2 kHz using trimmer R202 on the RF oscillator module.
- Insert the output stage module again.

4.3.6 Reference Oscillator

a) Standard design

- Allow instrument to warm up for one hour.
- Connect calibrated frequency meter to connector "REF.FREQ." (rear panel).
- Adjust the frequency to 10 MHz \pm 5 Hz using trimmer R542 on the FRN loop module.

b) With reference oscillator option OCXO, SMG-B1

- Allow instrument to warm up for 15 minutes.
- Connect calibrated frequency meter to connector "REF.FREQ." (rear panel).
- Adjust the frequency to 10 MHz \pm 0.5 Hz using trimmer REF.FREQ. (rear panel).

4.3.7 Response Threshold of Overvoltage Protection

- Set a level of -122 dBm on the SMH.
- Apply a frequency of 25 MHz to the RF output of the SMH using a power signal generator.
- Adjust trimmer R30 on the attenuation set such that the overvoltage protection just responds when an RF power of +27 dBm is applied.

4.4 Troubleshooting

4.4.1 Self-test

The most important instrument functions such as frequency generation and level control are automatically monitored during operation. Errors are indicated by flashing of the status LED and by a Service Request message. The status code identifying the error can be output on the modulation display by pressing the STATUS key.

The error messages are defined as follows:

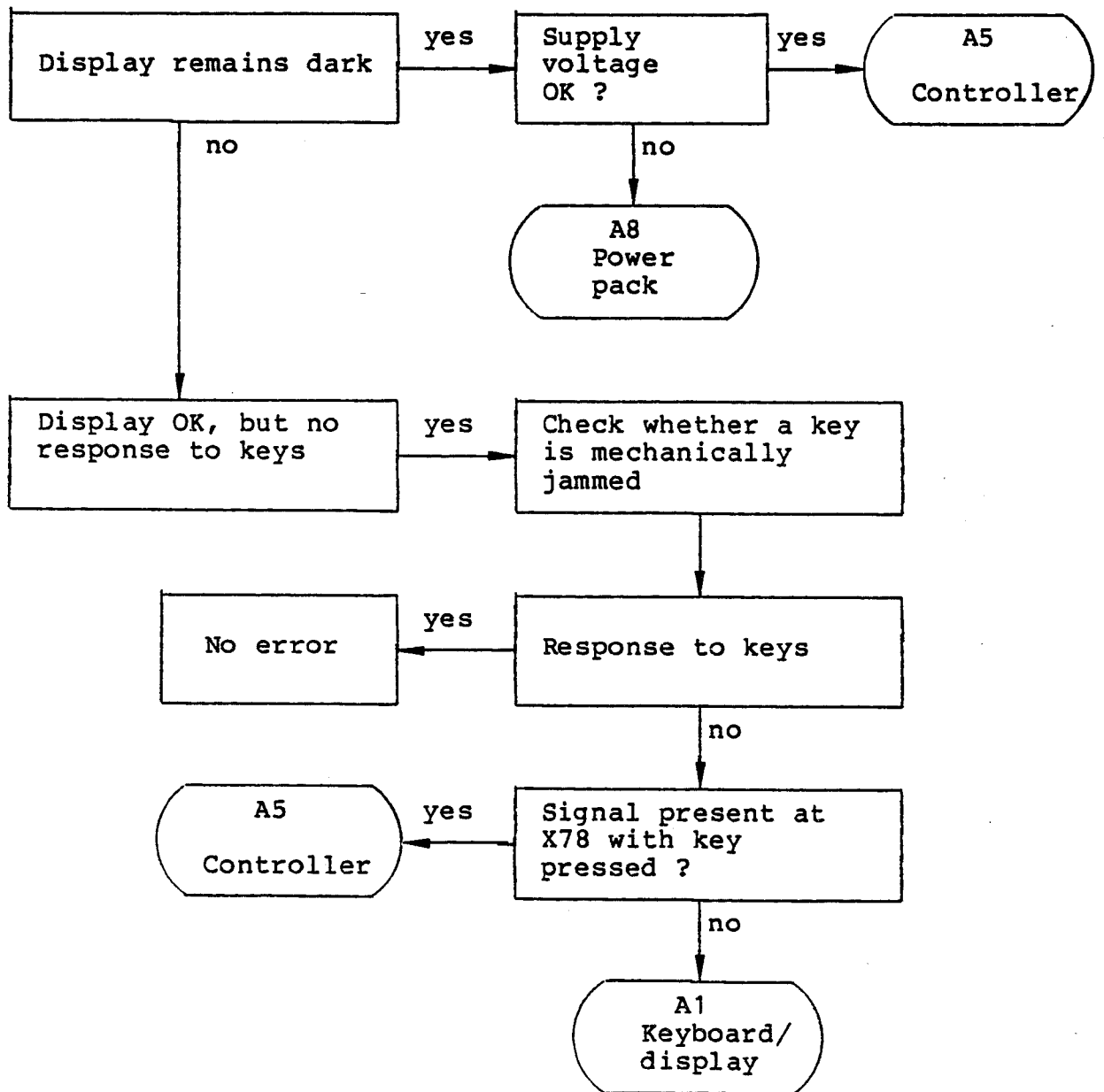
Err 0: no error
Err 1: reference loop not in synchronization
Err 2: sum loop not in synchronization
Err 3: FM loop not in synchronization
Err 4: main oscillator loop not in synchronization
Err 5: Level control not in function
Err 6: Battery voltage too low
Err 7: ROM data error
Err 8: RAM data error
Err 9: External overvoltage at RF output

For further error messages, see Table "Status codes of errors" in the operating manual.

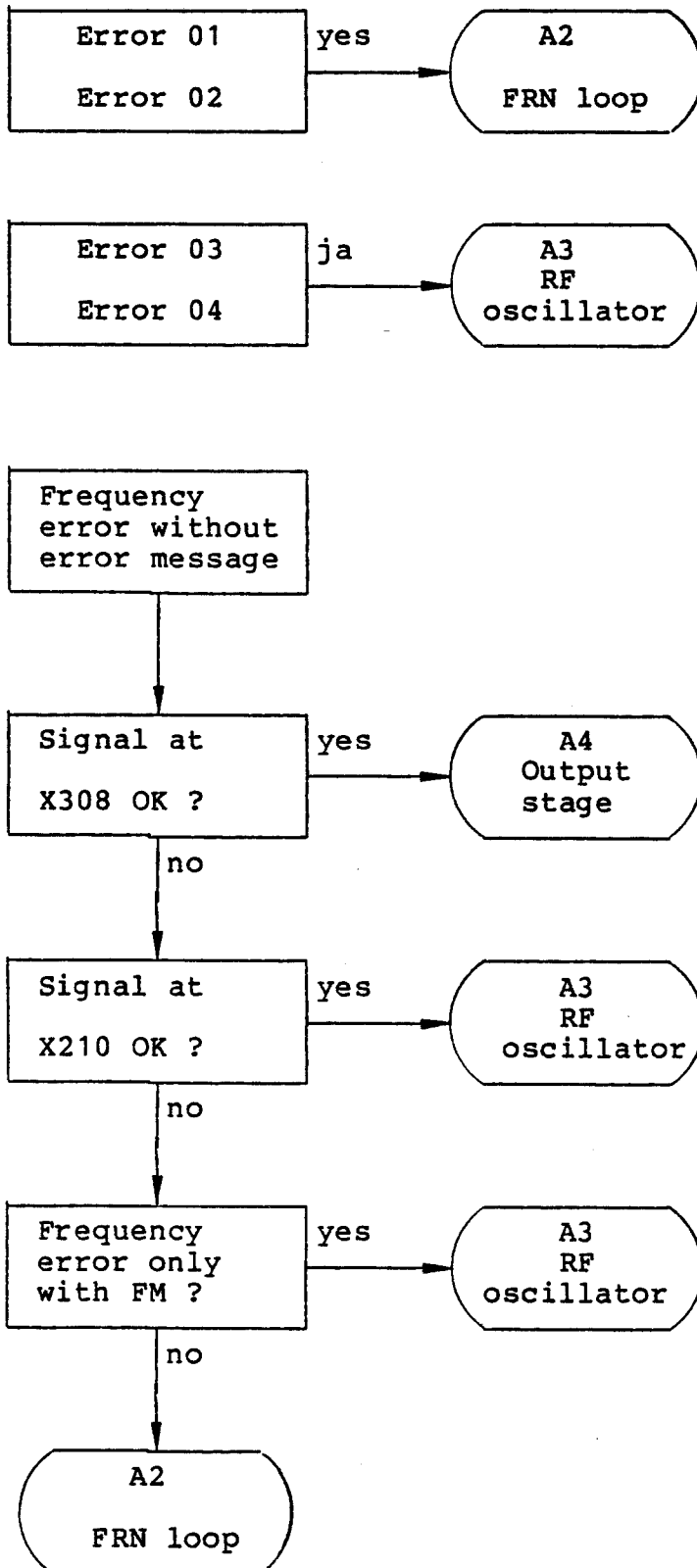
4.4.2 Troubleshooting Diagrams

The following flowcharts serve to locate the faulty module if the error cannot be determined by the self-test or the internal diagnostic routines. See Section 5, Module Descriptions, for troubleshooting in the individual modules. It is assumed that all supply voltage have the correct value.

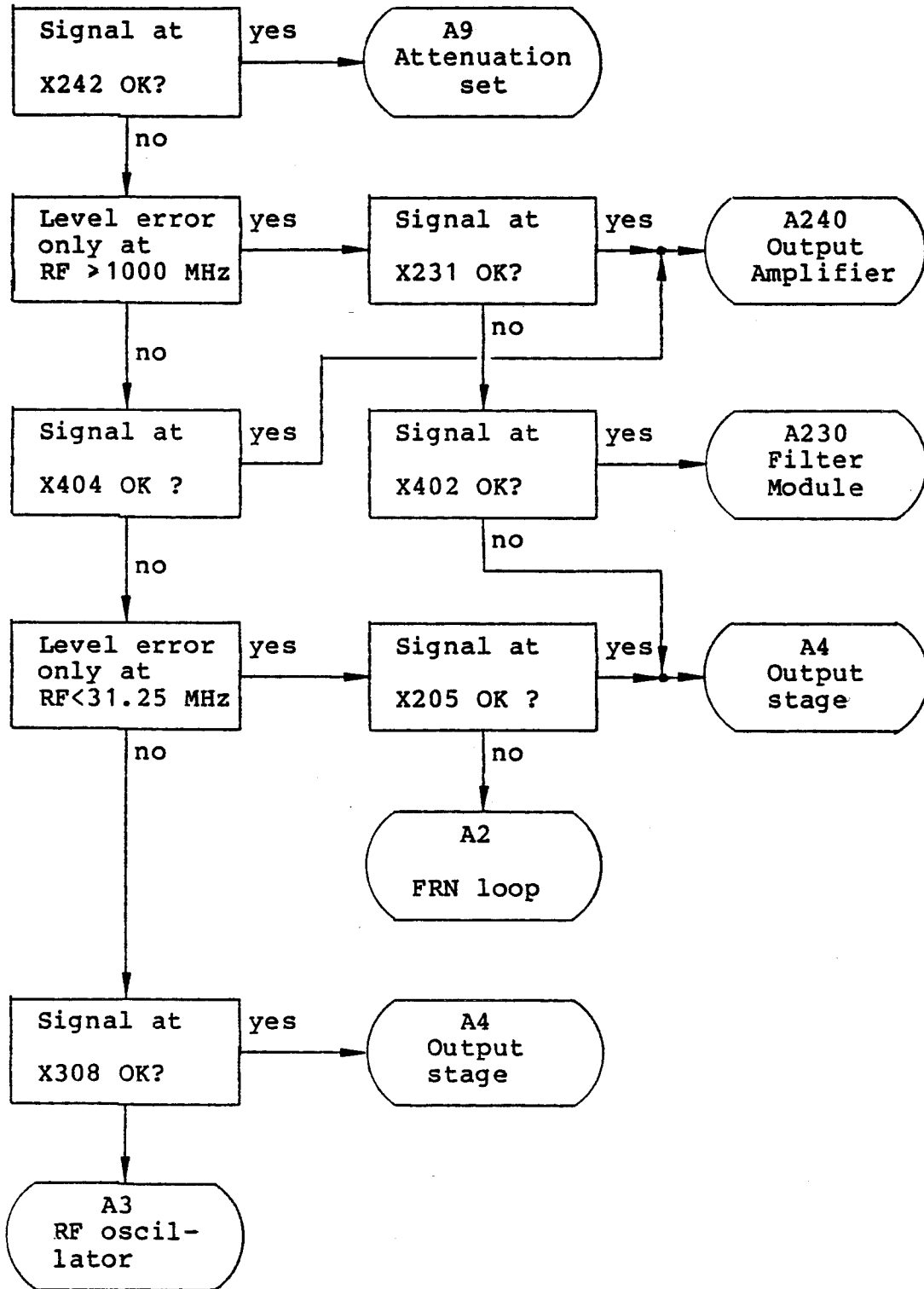
4.4.3 Keyboard/Display Errors



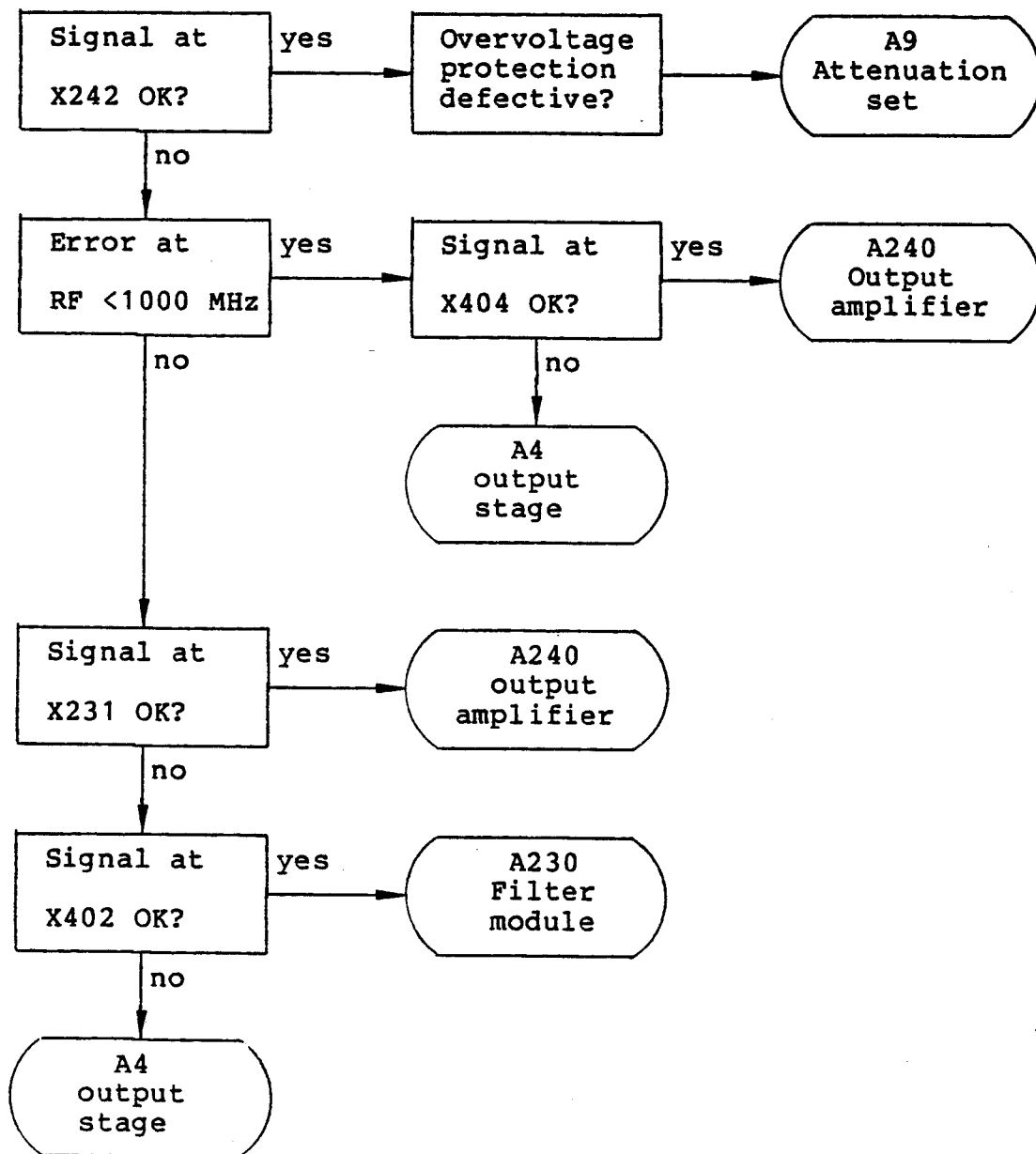
4.4.4 Frequency Errors



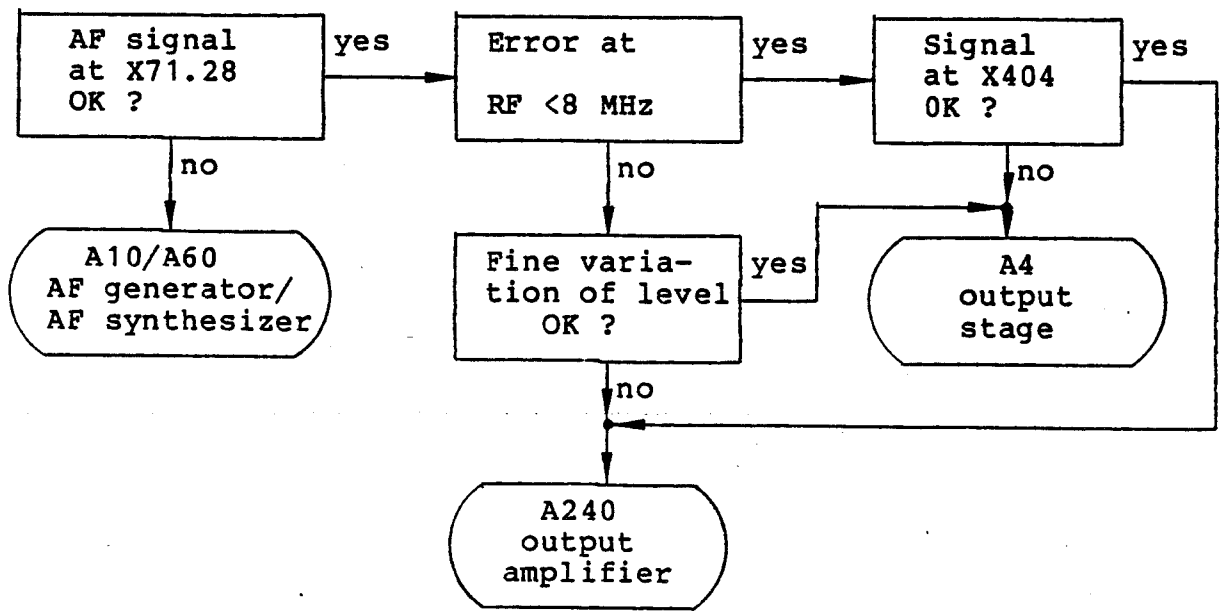
4.4.5 Level Errors



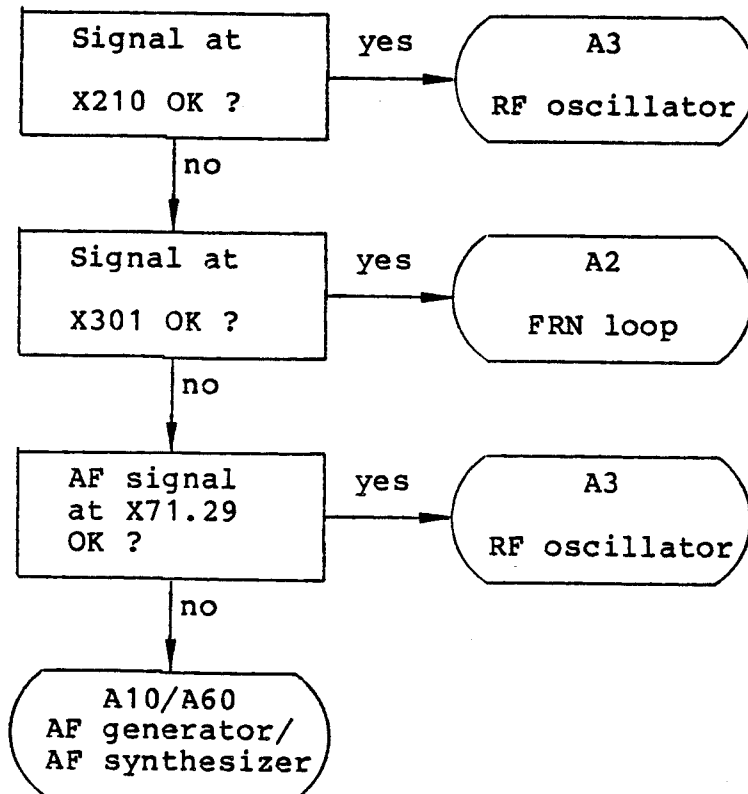
4.4.6 Harmonics or Subharmonics Level Too Large



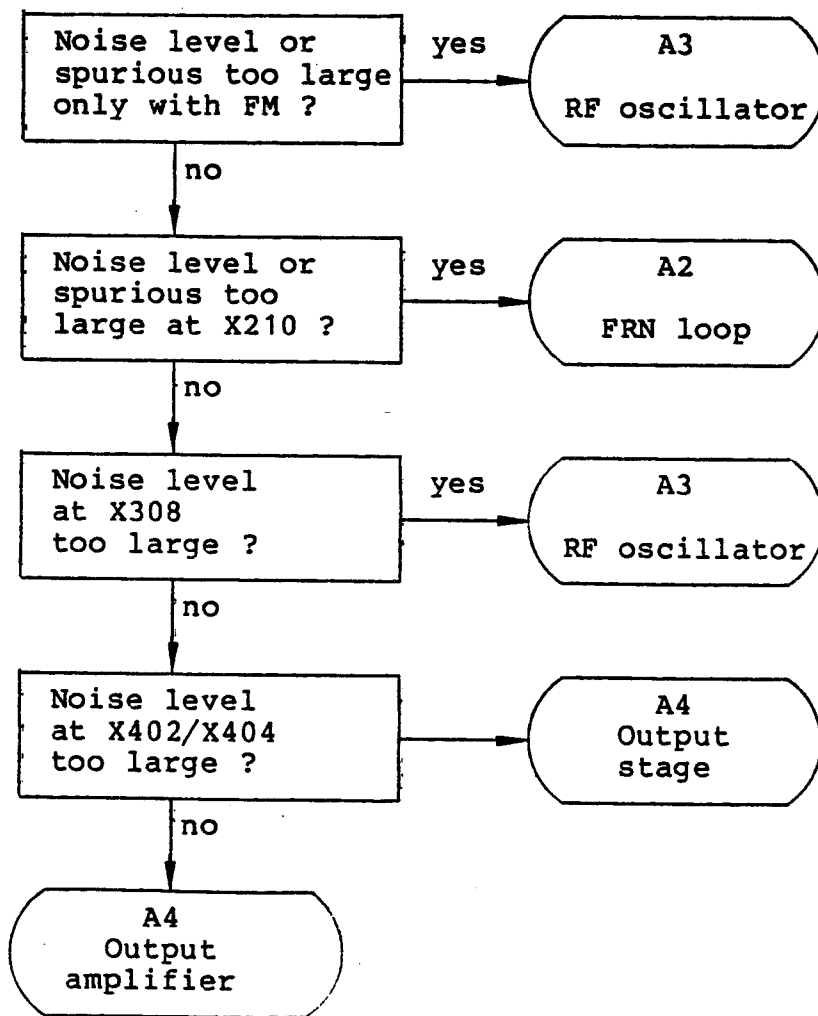
4.4.7 AM Errors



4.4.8 FM Errors



4.4.9 Noise Level or Spurious FM Too Large



4.4.10 Diagnostic Test

In addition to the self-test permanently monitoring the most important instrument functions, the user can call up the voltage values of 34 internal test points without opening the instrument and without using external measuring devices. The voltage values are output in the amplitude display or can be read out via the IEC bus. This test, which includes all essential internal signal levels, tuning voltages and control voltages, provides comprehensive information on the state of the instrument.

The test points are switched on using the special functions code 101 to 137 and switched off with code 100 common to all test points (see Table 4-2).

| Examples | | a) Switching on the test point 23 | | b) Switching off the test point | | |
|----------|-------------------------------|-----------------------------------|--------------------------------|---------------------------------|--------------------------------|----------------------|
| | | PARAMETER | DATA | | | ENTER/UNITS |
| a) | SHIFT <input type="text"/> | <input type="checkbox"/> SPECIAL | <input type="text" value="1"/> | <input type="text" value="2"/> | <input type="text" value="3"/> | <input type="text"/> |
| b) | SHIFT <input type="text"/> | <input type="checkbox"/> SPECIAL | <input type="text" value="1"/> | <input type="text" value="0"/> | <input type="text" value="0"/> | <input type="text"/> |

Display: The voltage value of the test point is output in the left-hand section of the amplitude display, the number of the test point is output in the right-hand section.

Table 4-2 Diagnostic test points

| Test point No. | Switch-on code of special function "Test voltage" | Module | Designation | Rated value |
|----------------|---|---------------------------------|--|-------------------|
| - | 100 | - | Switching off the test points | - |
| 1 | 101 | Processor | Supply voltage +24 V | 24 V \pm 0.5 V |
| 2 | 102 | Processor | Supply voltage +15 V | 15 V \pm 0.5 V |
| 3 | 103 | Processor | Supply voltage -15 V | -15 V \pm 0.5 V |
| 4 | 104 | Processor | Battery voltage | 3 to 4 V |
| 5 | 105 | RF oscillator | Monitoring of control loop Loop OK | <1 V |
| 6 | 106 | AF generator/ AF synthesizer | Level monitoring of modulation input AM EXT | 2.57 to 2.68 V |
| 7 | 107 | AF generator/ AF synthesizer | Level monitoring of modulation input FM/AM EXT | 2.57 to 2.68 V |
| 8 | 108 | Attenuation set | Attenuation set test point | 0 to 2 V |
| 9 | 109 | FRN loop | Monitoring of control loop of module | >3 V |
| 10 | 110 | FRN loop | Tuning voltage of reference loop | 1 to 16.7 V |
| 11 | 111 | FRN loop | Supply voltage +4.9 V | 4.9 V \pm 0.2 V |
| 12 | 112 | FRN loop | Output level (X210) 208 to 219 MHz | 0.2 to 0.5 V |
| 13 | 113 | Ref. Osc. OCXO | Monitoring of thermostat | approx. 6 V |
| 14 | 114 | FRN loop | Oscillator level (VCO 158 to 169 MHz) | 0.2 to 0.6 V |
| 15 | 115 | FRN loop | Level of 50-MHz crystal oscillator | 6.5 to 8.2 V |
| 16 | 116 | FRN loop | Tuning voltage of fractional-N control loop | 1 to 20 V |
| 17 | 117 | RF oscillator | Output frequency (520 to 545.9 MHz) | |
| 18 | 118 | RF oscillator | Output level (X308) (500 to 1000 MHz) | >0.2 V |
| 19 | 119 | RF oscillator | 50-MHz signal (X11) | >0.8 V |
| 20 | 120 | RF oscillator | Level of 50-kHz reference (X303) | >1 V |
| 21 | 121 | RF oscillator | Tuning voltage of RF oscillators | 1 to 20 V |
| 22 | 122 | RF oscillator | Tuning voltage of FM loop | 2 to 13 V |
| 23 | 123 | RF oscillator | Out of Lock (main oscillator loop) | <1 V |
| 24 | 124 | RF oscillator | Supply voltage +15 V | 15 V \pm 0.5 V |
| | | | Monitoring of control loop of module | >3 V |
| 28 | 128 | Output stage | Control voltage of level control (X24) | 0 to -6 V |
| 29 | 129 | Output stage | RF rectifier f >8 MHz | 0 to 4 V |
| 30 | 130 | Output stage | RF rectifier f <8 MHz (P35) | 0 to 4 V |
| 31 | 131 | Output stage | RF level at test point P24 | 0.1 to 0.5 V |
| 32 | 132 | Output stage | Command value of level control (P28) | 0 to -4 V |
| 33 | 133 | AF generator | Level of AF generator | 0.4 to 0.5 V |
| 34 | 134 | AF synthesizer | Level of crystal oscillator | 1 V \pm 0.3 V |
| 35 | 135 | AF synthesizer | Level of AF synthesizer | 1 V \pm 0.3 V |
| 36 | 136 | AF synthesizer | Supply voltage +5 V | 4.8 to 5.3 V |
| 37 | 137 | X output | Voltage at output "X-Axis" | 0 to 10 V |

4.4.11 Special Functions for Testing

These special functions are intended to be used for servicing of the instrument. They are switched on and off using codes (data entry) (see also Section 2 in the operating manual).

Table 4-3

| Special function | Code |
|--|------|
| Measure diagnostic voltage of test point 108 with a resolution of 0.1 mV | 35 |
| Measure diagnostic voltage with a resolution of 1 mV | 36 |
| Switch off monitoring circuit of PLLs | 37 |
| Activate monitoring circuit of PLLs | 38 |
| Switch off phase-continuous setting mode for the RF | 45 |
| Activate phase-continuous setting mode for the RF | 46 |
| Display of output frequency "FRN loop" *) | 51 |
| Display of output frequency "RF oscillator" *) | 52 |
| Set non-interrupting level setting to 0 dB | 53 |
| Set non-interrupting level setting to 25 dB | 54 |
| Display test *) | 55 |
| PROM test | 56 |
| RAM test | 57 |

*) is displayed as long as one of the four unit keys is pressed.

4.5 Measuring Instruments and Aids Required

| Item | Instrument | Required specifications | R&S inst. Order No. | Use described in section |
|------|------------------------|--|--|--------------------------|
| 1 | Frequency meter | Range 10 Hz to 2000 MHz Resolution 1 Hz | | 4.3.6 |
| 2 | Power meter | Range 0.1 to 2000 MHz Power up to 20 mW, Z = 50 Ω , error <0.1 dB, Resolution <0.02 dB | | 4.3.3 |
| 3 | Modulation analyzer | Frequency range up to 1360 MHz, AM, FM, ϕ M, error <1 % | FAM 334.2015.53 FAM-B2 334.4918.02 FAM-B8 334.5714.02 | 4.3.4 4.3.5 |
| 4 | Power signal generator | Level 30 dBm to 1 GHz | SMLU 200.1009.03 | 4.3.7 |
| 5 | Oscilloscope | DC up to 30 MHz | BOP 374.0020.02 | 5 |



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Liste mechanischer Teile

List of mechanical parts

Bilder zur Liste mechanischer Teile

Figures pertaining to list of mechanical parts

Liste zu den Bildern 4-1 und 4-2

List for Figs 4-1 and 4-2

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|--------|--|----------------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 1 | | 1 | MZ Haube oben 3E 1/1 T460 Panelling, top | 396.3473 |
| | | 60 mm | WW Klebeband Adhesive strip | 290.5115 |
| 2 | | 1 | MZ Haube unten 3E 1/1 T460 Panelling, bottom | 396.3780 |
| 3 | | 1 | ZM Frontrahmen 3E 1/1 Front frame | 396.2119 |
| 4 | | 2 | MF Seitenleiste T460 Side strip | 396.3080 |
| | | 4 | VS M3x6 DIN 965 A4 | VS 081.9378 |
| 5 | | 1 | MF Führungsschiene, rechts Guide rail, right | 396.4757 |
| 6 | | 1 | MF Führungsschiene, links Guide rail, left | 396.4763 |
| 7 | | 2 | MF Bedienhinweiskarte User's guide | 845.4219 845.4225 |
| 8 | | 4,56 m | WG HF-Dichtprofil RF seal | 396.1035 |
| 9 | | 1 | Führungskragen Guide frame | 396.0897 |
| 10 | | 1 | KB Beschriftungsplatte R&S für VAR 52 Identification plate R&S for model 52 | 843.3980 |
| | | 2 | VS M1,6x3 DIN 965 A4 | VS 078.3795 |
| | | 4 | VS Scheibe Washer | 396.5518 |
| | | 4 | VS M3x8 DIN 965 A4 | VS 081.9384 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|----------------|-------|--|-------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 11 | | 1 | MZ Frontplatte Front panel | 801.1343 |
| | | 6 | VS M2x16 DIN 965 A4 | VS 081.9290 |
| 12 | A1 | 1 | ED Tastatur/Anzeige Keyboard/display | 801.1366.02 |
| 13 | | 1 | ZM Frontwinkel Mounting bracket | 801.1295 |
| | | 4 | VS M3x8 DIN 965 A4 | VS 081.9384 |
| 14 | X2 X3 X4 | 3 | FJ Einbaubuchse Syst. BNC Panel mounting socket BNC | FJ 017.6607 |
| | W9 | 1 | DX Kabel W9 Cable | 801.7593 |
| 15 | | 3 | VL Lötöse Solder tag | VL 035.0813 |
| 16 | W1 | 1 | DX HF-Kabel W1 RF cable | 801.7635 |
| 17 | | 1 | ZM Schirmwand Screening panel | 801.0499 |
| | | 5 | EK Federstreifen Contact spring strip | 032.5120 |
| | | 5 | VS M2,5x6 DIN 965 A4 | VS 088.0101 |
| 20 | | 2 | MF Gerätefuß, vorne Foot, front | 396.4534 |
| 21 | | 2 | MF Aufstellfuß, unten Swinging foot, bottom | 396.4540 |
| 22 | | 2 | ZM Gerätefuß, hinten Foot, rear | 396.4586 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|--|-------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 24 | | 2 | MF Abdeckung, Leerseite Cover piece | 396.3344 |
| 25 | | 2 | MF Abdeckung, Griffseite Cover piece | 396.3338 |
| 26 | | 1 | ZM Tragegriff T460 Carrying handle | 396.3221 |
| 27 | | 2 | MR Griffbuchse Handle fixings | 396.3321 |
| | | 2 | VS M4x10 DIN 965 A4 | VS 081.9478 |
| 30 | | 1 | OK Drehknopf m. Mulde Rotary knob | 078.1192 |
| 33 | | 4 | MF Seitenfuß Foot, side | 396.4692 |
| 34 | | 2 | MF Stapelnutabdeckung Stacking-slot cover | 396.4728 |
| 40 | | 1 | ZM Schaltstange Power-switch push rod | 801.0647 |
| 42 | S1 | 1 | SB Schaltnetz 2a o. Knopf Power switch | SB 020.5495 |
| | | 1 | SB Haube Protective cover | SB 250.3692 |
| | | 2 | VS M2,5x4 DIN 7985 A4 | VS 088.0024 |
| 43 | | 4 | MG Rahmenschiene T460 Frame guide | 396.2377 |
| | | 2 | VS Einpreßmutter M2,5 Nut | VS 542.4073 |
| | | 2 | KZ Schiebemutter M3 Nut | KZ 079.0525 |
| | | 16 | VS M3x8 DIN 965 A4 | VS 081.9384 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|--|-------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 44 | | 1 | ZM Rückrahmen 3E 1/1 Rear frame | 396.2254 |
| 45 | | 1 | MZ Schwenkrahmenriegel Locking device | 801.0753 |
| | | 2 | VS M2,5x8 DIN 7985 A4 | VS 088.0047 |
| 46 | | 2 | MB Angel Pivot | 801.0660 |
| 47 | | 1 | VS M2,5x5 DIN 7985 A4 | VS 088.1543 |
| | | 1 | VS 2,7 DIN 433 A4 | VS 088.8890 |
| 48 | | 1 | VS M2,5x4 DIN 7985 A4 | VS 088.0024 |
| | | 1 | VS 2,7 DIN 9021 A4 | VS 031.5179 |
| 49 | | 1 | ZM Wand Panel | 801.0547 |
| | | 6 | VS M3x8 DIN 965 A4 | VS 081.9384 |
| | | 90 mm | WT Kantenschutz Edge protector | WT 001.9499 |
| 50 | A9 | 1 | ZE Eichleitung Attenuator | 801.1108 |
| 51 | | 1 | ZM Bügel Frame | 801.0601 |
| 52 | | 4 | VS M2,5x5 DIN 7985 A4 | VS 088.1543 |
| | | 4 | VS 2,6 DIN 137 A2 | VS 005.0280 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|--------------------------------------|-------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 53 | | 3 | VN 4x6 DIN 7340 | VN 031.2805 |
| | | 3 | VS 4,3 DIN 125 A4 | VS 082.4686 |
| | | 3 | VS M3x10 DIN 7985 A4 | VS 081.9084 |
| 54 | W15 | 1 | DX HF-Kabel RF cable | 843.3409 |
| 56 | | 1 | ZM Rechnerwinkel Bracket | 801.0676 |
| | | 2 | VS M2,5x5 DIN 7985 A4 | VS 088.1543 |
| 57 | | 2 | VS M2,5x12 DIN 7985 A4 | VS 088.0060 |
| | | 2 | VS 2,7 DIN 433 A4 | VS 088.8890 |
| 60 | A100 | 1 | ED NF-Motherboard AF motherboard | 801.1043.02 |
| | | 6 | VS M2,5x5 DIN 7985 A4 | VS 088.1543 |
| | | 6 | VS 2,6 DIN 137 A2 | VS 005.0280 |
| 61 | | 1 | MZ Isolierplatte Insulating plate | 801.1037 |
| | | 2 | DZ Kabelbinder Cable clamp | DZ 015.9038 |
| 63 | A5 | 1 | ED Rechner Processor | 801.2410.04 |
| 64 | A6 | 1 | ED NF-Generator AF generator | 801.7312.02 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|---|-------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 65 | | 1 | ZM Schwenkrahmen Swinging frame | 801.0724 |
| | | 14 | VS Setzmutter M3 Nut | VS 088.6680 |
| 66 | | 4 | VS Einpreßmutter M2,5 Nut | VS 249.9961 |
| | | 4 | MH Abstandsrohr Spacer | MH 290.8189 |
| 67 | | 6 | KM Führungsleiste, grau Guide rail, grey | 396.7427 |
| | | 6 | MZ Massefeder 4E Ground contact | 396.7233 |
| | | 12 | VS M3x6 DIN 965 A4 | VS 081.9378 |
| 68 | | 1 | MZ Bügel Frame | 801.0730 |
| | | 4 | VS Setzmutter M3 Nut | VS 088.6680 |
| 69 | A200 | 1 | ED HF-Motherboard RF motherboard | 801.1066.02 |
| | | 4 | VS M2,5x12 DIN 7985 A4 | VS 088.0060 |
| | | 4 | VS 2,6 DIN 137 A2 | VS 005.0280 |
| 70 | A2 | 1 | ED FRN-Loop FRN loop | 801.3917.02 |
| 71 | A3 | 1 | ED HF-Oszillator RF oscillator | 801.5110.02 |
| 72 | A4 | 1 | ED Ausgangsstufe Output stage | 843.3015.02 |
| | | 1 | OS Klebeschild Adhesive label | 801.7664 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|---------------------------------------|-------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 74 | | 2 | MZ Leiterplattenhalter PCB holder | 801.0760 |
| | | 4 | VS M3x8 DIN 7985 A4 | VS 081.9078 |
| | | 4 | VS 3 DIN 137 A2 | VS 005.0296 |
| | | 4 | VS 3,2 DIN 125 A4 | VS 082.4670 |
| 76 | | 1 | MZ Winkel Bracket | 801.0747 |
| | | 2 | VS M3x6 DIN 7985 A4 | VS 081.9061 |
| 77 | | 4 | VS M3x6 DIN 965 A4 | VS 081.9378 |
| 80 | | 1 | ZM Buchsenhalter Connector support | 801.1643 |
| | | 1 | MP Verschlußstopfen Plug | 483.1490 |
| | | 3 | MP Abdeckkappe Plug | 570.5187 |
| 81 | W10 | 1 | DX Kabel W10 Cable | 801.7606 |
| | | 1 | DZ Kabelbinder Cable clamp | DZ 015.9038 |
| 82 | W11 | 1 | DX Kabel W11 Cable | 801.7612 |
| 83 | | 4 | VS M3x8 DIN 965 A4 | VS 081.9384 |
| 85 | | 2 | MF Mutter für Rückrahmen Nut | 396.3167 |
| | | 2 | VS M3x10 DIN 965 A4 | VS 081.9390 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|---|-------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 87 | | 1 | ZM Rückwandfuß rechts 3E Rear-panel foot, right | 396.4128 |
| | | 1 | ZM Rückwandfuß links 3E Rear-panel foot, left | 396.4334 |
| 88 | | 1 | ZM Rückwand Rear panel | 801.1620 |
| | | 5 | VS M3x8 DIN 7985 A4 | VS 081.9078 |
| | | 1 | VS M3x12 DIN 7985 A4 | VS 081.9090 |
| | | 6 | VS 3 DIN 137 A2 | VS 005.0296 |
| | | 6 | VS 3,2 DIN 125 A4 | VS 082.4670 |
| | | 1 | OS Schild Made in Germany Label | OS 042.4985 |
| | | 1 | OS FNR.-Schild für VAR 52 FNR label for model 52 | 801.0218 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|--|----------------------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 90 | Z1 | 1 | FN Netzfilter m. Spannungsw. Chassis power plug with filter and voltage selector | FN 099.3313 |
| | F1 | 1 | SS Schmelz. T1,6D DIN 41571 Fuse für/for 220 V/240 V | SS 020.7500 |
| | | 1 | SS Schmelz. T2,0D DIN 41571 Fuse für/for 100 V/120 V | SS 020.7546 |
| | | 2 | VS M3x10 DIN 965 A4 | VS 081.9390 |
| | | 2 | VS 3 DIN 137 A2 | VS 005.0296 |
| | | 2 | VS M3 DIN 934 A4 | VS 016.4398 |
| | 91 | | 1 | MF Kühlprofil Heat sink |
| 1 | | | VS M3x10 DIN 7985 A4 | VS 081.9084 |
| 93 | | 1 | LT Ringkerntrafo Torroidal transformer | 801.1920 |
| | | 1 | MF Topf Pot | 801.1943 |
| | | 1 | MB Säule Pillar | 801.1966 |
| | | 1 | MB Gewindestange Threaded rod | 801.1972 |
| | | 1 | VS 5,3 DIN 125 A4 | VS 082.4692 |
| | | 2 | VS 5 DIN 137 A2 | VS 005.0321 |
| | | 2 | VS M5 DIN 934 A4 | VS 016.4417 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|--|---------------------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 93 | | 4 | FV Flachsteckhülse 2,8 Flat connector, recepticle | FV 279.2165 |
| | | 4 | FV Schutztülle Cover | FV 279.1681 |
| | | 1 | FV Flachsteckhülse 6,3 Flat connector, recepticle | FV 518.2280 |
| | | 9 | FP Buchsenkontakt Insert contact, female | 343.4946 |
| | | 3 | FP Kupplungsgehäuse Shell | 520.5831 |
| | S2 | 1 | ST Öffner Thermostat | 377.3994 |
| | | 100 g | WH Harz Resin | WH 453.3466 |
| | | 10 g | WH Härter Hardener | WH 453.3472 |
| | 95 | | 1 | MZ Schirmdeckel Screen |
| 1 | | | MB Isoliertülle Insulator | 801.1995 |
| 97 | E1 | 1 | ZM Lüftereinheit Blower | 801.1708 |
| 98 | | 4 | VS M2,5x10 DIN 7985 A4 | VS 088.0053 |
| | | 4 | VS 2,7 DIN 125 A4 | VS 082.4663 |
| | | 4 | VS 2,8 DIN 6797 A2 | VS 016.2814 |

| Lfd. Nr. | Kennzeichen | Menge | Benennung/Beschreibung | Sachnummer |
|----------|--------------|-------|--|-------------|
| No. | Unit/Comp.No | Qty | Designation | Stock No. |
| 99 | | 1 | FV Flachstecker 6,3 Flat connector, blade | FV 543.6705 |
| | | 1 | VS M4x8 DIN 7985 A4 | VS 081.9178 |
| | | 1 | VS 4,3 DIN 6797 A2 | VS 016.2837 |
| | | 1 | VS M4 DIN 934 A4 | VS 016.4400 |
| | | 1 | OS Schild Schutzzeichen Safety label | OS 042.5330 |
| 100 | | 1 | ED Netzteil Power supply | 801.1666.02 |
| | | 2 | VS M2,5x10 DIN 7985 A4 | VS 088.0053 |
| | | 4 | VS M2,5x6 DIN 7985 A4 | VS 088.0030 |
| | | 6 | VS 2,6 DIN 137 A2 | VS 005.0280 |
| 101 | | 1 | Versteifungsplatte Reinforcing plate | 801.0599 |
| 102 | | 1 | Versteifungswinkel Reinforcing angle | 801.0582 |
| 110 | | 1 | 2GHz-Erweiterung 2-GHz extension | 843.3273.02 |



ROHDE & SCHWARZ

Schalteillisten

Stromläufe

Bestückungspläne

Part lists

Circuit diagrams

Components plans

Listes des pièces détachées

Schémas de Circuit

Plans des composants

R&S-Schlüsselliste

R&S key list

Liste des symboles de référence R&S

Die R&S-Schaltteillisten nennen in der Spalte "Benennung/Beschreibung" die technischen Daten der Bauelemente in Kurzform. Die Art des Bauelements (z.B. Schicht-, Draht-Widerstand usw.) beschreiben die 2 Kennbuchstaben vor der "Benennung" (evtl. auch vor der "Sachnummer"), die nachfolgend erklärt werden. In Ersatzteil-Bestellungen an R&S ist stets die Angabe der vollständigen Sachnummer erforderlich.

The R&S Parts Lists give the technical data of the components in short form in the column "Benennung/Beschreibung" (designation). The type of component (e.g. depos.-carbon resistor, wire-wound resistor etc.) is indicated by 2 identification letters before the designation, possibly also before the "Sachnummer" (order number), which are explained below. When ordering spare parts from R&S, the complete order number must always be specified.

La colonne «Désignation/description» des listes de pièces de R&S indique les caractéristiques des éléments sous forme abrégée. Le type d'élément (p.ex. résistance à couche, résistance bobinée etc. ...) est décrit par les deux lettres précédant la désignation (et éventuellement le numéro de référence), dont voici l'explication. Prière d'indiquer le numéro de référence («Sachnummer») complet dans toute commande de pièces de rechange.

| Teilefamilie | Art des Bauelementes | Parts family | Type of component | Familie | Type d'élément |
|--------------|--|--------------|---|----------|---|
| A | Aktive Bauelemente, Halbleiter | A | Active components, semiconductors | A | Composants actifs, semiconducteurs |
| AD | Universaldiode, z.B. Gleichrichter, Sperrdiode | AD | General-purpose diode, e.g. rectifier, high-resistance diode | AD | Diode d'usage général, p.ex. redresseur, diode à haute résistance |
| AE | Spezialdiode, z.B. Tunnel-, Kapazitäts-, Zener-Diode | AE | Diode (special), e.g. tunnel diode, varactor, Zener diode | AE | Diode spéciale, p.ex. diode tunnel, varactor, diode Zener |
| AF | Fotohalbleiter, z.B. Foto-Diode, -Transistor, -Widerstand, Leuchtdiode | AF | Photo-semiconductor, e.g. resistor, diode, transistor, LED | AF | Semiconducteur photoélectrique, p.ex. diode, transistor, résistance photoél., DEL |
| AG | Leistungs-Gleichrichter, z.B. Thyristor, Triac, Selengleichrichter | AG | Power rectifier, e.g. thyristor, triac, selenium rectifier | AG | Redresseur de puissance, p.ex. thyristor, triac, redresseur, au sélénium |
| AK | Kleinsignal-Transistor | AK | Small-signal transistor | AK | Transistor faible puissance |
| AL | Leistungs-Transistor | AL | High-power transistor | AL | Transistor grande puissance |
| AM | Spezial-Transistor, z.B. FET, MOSFET | AM | Transistor (special), e.g. FET, MOS-FET | AM | Transistor spécial, p.ex. TEC, MOSTEC |
| AP | Peltier-, Hall-Element | AP | Peltier element, Hall element | AP | Element Peltier, élément Hall |
| AR | Röhre für Empfänger, Verstärker, Gleichrichter | AR | Valve for receiver, amplifier, rectifier | AR | Tube pour récepteur, amplificateur, redresseur |
| AS | Spezialröhre, z.B. Senderöhre, EW-Widerstand, Stabilisator | AS | Valve (special), e.g. for transmitter, barretter, ballast valve | AS | Tube (spécial), p.ex. pour émetteur, résistance fer-hydrogène, ballast |
| AT | Katodenstrahlröhre, z.B. Bildröhre, Ziffern-Anzeigeröhre | AT | Cathode ray tube, e.g. picture tube, digital indicator tube | AT | Tube à rayon cathodique, p.ex. tube à image, tube à affichage numérique |
| AZ | Zubehör für Halbleiter u. Röhren | AZ | Accessories for semiconductors and valves | AZ | Accessoires pour semiconducteurs et tubes |
| B | Bausteine | B | PC boards, chips | B | Cartes imprimées, puces |
| BC | Integr. Schaltkreis (Microcomp.) | BC | Integrated circuit (interface, A/D) | BC | Circuit intégré (microprocesseur) |
| BD | R&S-Dünnschicht- und Dickschichtschaltung | BD | R&S thinfilm or thickfilm circuit | BD | Circuit R&S à couche mince ou épaisse |
| BG | R&S-spezifische Gate-Arrays | BG | R&S gate arrays | BG | Circuits intégrés prédiffusés R&S |
| BJ | Integrierter Schaltkreis (Interface, A/D-Wandler) | BJ | Integrated circuit (interface, A/D converter) | BJ | Circuit intégré (interface, convertisseur A/N) |
| BL | Log. Schaltkreis z.B. DTL, TTL, HTL, ECL, C-MOS | BL | Logic circuit, e.g. DTL, TTL, HTL, ECL, C-MOS | BL | Circuit logique, p.ex. DTL, TTL, HTL, ECL, C-MOS |
| BM | Hybridbaustein, z.B. Mischer, Tuner, Modulator | BM | Hybrid chip, e.g. mixer, tuner, modulator | BM | Puce hybride, p.ex. mélangeur, tuner, modulateur |
| BO | Analogschaltkreis, z.B. Operationsverstärker | BO | Analog circuit, e.g. operational amplifier | BO | Circuit analogique, p.ex. amplificateur opérationnel |
| BP | Optoelektronischer Baustein, z.B. Anzeigeeinheit, Koppler | BP | Optoelectronic component, e.g. display, coupler | BP | Composant optoélectronique, p.ex. afficheur, coupleur |
| BS | Schalt- und Steuerbaustein, elektronischer Sensor | BS | Switching and control modul, electronic sensor | BS | Modul de commutation et de commande, sonde électronique |
| BV | Stromversorgung, Übersp.-Schutz | BV | Power pack, protective circuit | BV | Alimentation, protection surcharge |
| BZ | Zubehör | BZ | Accessories | BZ | Accessoires |

| Teile- familie | Art des Bauelementes | Parts family | Type of component | Familie | Type d'élément |
|-------------------|---|-----------------|---|----------|---|
| C | Kondensatoren | C | Capacitors | C | Condensateurs |
| CB | Bypass-, Durchf.-Kondensator | CB | Bypass capacitor, feed-through capacitor | CB | Condensateur bypass, condensateur de traversée |
| CC | Keramischer Kondensator | CC | Ceramic capacitor | CC | Condensateur céramique |
| CD | Drehkondensator | CD | Variable capacitor | CD | Condensateur variable |
| CE | Elektrolytkondensator | CE | Electrolytic capacitor | CE | Condensateur électrolytique |
| CG | Glimmerkondensator | CG | Mica capacitor | CG | Condensateur au mica |
| CH | Sperrschichtkondensator | CH | Semiconductor capacitor | CH | Condensateur semiconducteur |
| CK | Kunststoffkondensator | CK | Synthetic-foil capacitor | CK | Condensateur à feuille synthétique |
| CL | Ker. Hochsp.-Kondensator | CL | HV capacitor (ceramic) | CL | Condensateur HT céramique, |
| CM | Metallpapier-Kondensator | CM | MP capacitor | CM | Condensateur à papier métallisé |
| CN | Kondensatornetzwerk | CN | Capacitor network | CN | Réseau capacitif |
| CP | Papierkondensator | CP | Paper capacitor | CP | Condensateur au papier |
| CS | Störschutzkondensator | CS | Interference-suppression capacitor | CS | Condensateur anti-parasite |
| CT | Trimmkondensator | CT | Trimmer capacitor | CT | Condensateur ajustable |
| CV | Vakuum-Kondensator | CV | Vacuum capacitor | CV | Condensateur à vide |
| D | Drähte, Leitungen | D | Wires, lines | D | Fils, lignes |
| DD | Schalt- und Wickeldraht | DD | Hook-up or winding wire | DD | Fil de câblage, fil de bobinage |
| DF | Flachleitung, Litze | DF | Flat multiple line, stranded wire | DF | Ligne plate, ligne torsadée |
| DG | Abgeschirmte Leitung | DG | Shielded line | DG | Ligne blindé |
| DH | Koaxialkabel | DH | Coaxial line | DH | Ligne coaxiale |
| DJ | Isolierschläuche, Schrumpfschläuche, Wellrohre, Schutzschläuche | DJ | Insulating sheaths, shrink-on sleeves, corrugated tubes, protective tubes | DJ | Gaines isolantes, gaines thermorétractables tubes ondulés, gaines protectrices |
| DL | HF-Litzen | DL | RF stranded wires | DL | Lignes torsadées RF |
| DM | Schaltlitzen (mehrdrähtige Leiter) | DM | Multi-conductor wires | DM | Lignes torsadées (multiconducteurs) |
| DN | Antenne | DN | Antenna | DN | Antenne |
| DO | Lichtleiter (optisch) | DO | Optical waveguides | DO | Guides d'onde optiques |
| DP | Leiterplatten (unbestückt) | DP | Printed circuit boards (bare) | DP | Cartes imprimées (non équipées) |
| DQ | Multilayer (unbestückt) | DQ | Multilayer boards (bare) | DQ | Cartes multicouche (non équipées) |
| DS | Anschlußkabel (mehradrig) | DS | Connecting cable, multicore | DS | Câble de connexion (multiconducteur) |
| DU | Substratplatten für Dickschichtschaltungen | DU | Substrate boards for thickfilm circuits | DU | Cartes à substrat pour circuits à couche épaisse |
| DW | Festmantelkabel | DW | Rigid cables | DW | Câbles rigides |
| E | Elektrische Teile | E | Electric parts | E | Organes électriques |
| EB | Blei-, NC-Akku, Batterie | EB | Lead or alkaline accumulator, battery | EB | Accumulateur Pb/NC, batterie |
| ED | Gedruckte Schaltung (bestückte Leiterplatte), nicht steckbar | ED | Printed circuits (assembled), non-pluggable | ED | Circuits imprimés (équipés) non enfichables |
| EE | Gedruckte Schaltung (bestückte Leiterplatte), steckbar | EE | Printed circuits (assembled), pluggable | EE | Circuits imprimés (équipés) enfichables |
| EF | Glühlampe, Leuchte | EF | Incandescent lamp, pilot lamp | EF | Lampe à incandescence, voyant |
| EG | Glimmlampe, Entladungslampe | EG | Glow lamp, discharge lamp | EG | Lampe à luminescence lampe à décharge |
| EK | Kontakt-Streifen, -Feder | EK | Contact clip, contact spring | EK | Lampe de contact, ressort de contact |
| EL | Lautsprecher, Kopfhörer, Mikrofon | EL | Loudspeaker, headphones, microphone | EL | Haut-parleur, casque, microphone |
| EM | Motor, Hubmagnet, Drehfeldsystem | EM | Motor, lifting magnet, synchro system | EM | Moteur, électro-aimant de levage, système synchro |
| EO | Oszillator, z.B. Quarzoszillator | EO | Oscillator, e.g. crystal oscillator | EO | Oscillateur p.ex. oscillateur à quartz |
| EP | Tief-, Band-, Hochpaß, Bandsperre, Diskriminator | EP | Lowpass, bandpass, highpass filter, band-stop filter, discriminator | EP | Filtre passe-bas, passe-bande, passe-haut, suppression de bande, discriminateur |
| EQ | Schwing-, Filter-Quarz | EQ | Oscillator or filter crystal | EQ | Quartz oscillateur, quartz de filtre |
| ER | Resonator, piezoelekt./magnetostruktiv | ER | Resonator, piezoelectric/magnetostrictive | ER | Résonateur piézo-électrique/magneto-strictif |
| ES | Passive SHF-Bauteile | ES | Passive SHF-components | ES | Composant SHF passif |
| ET | Thermostat | ET | Thermostat | ET | Thermostat |
| EV | Lüfter, Gebläse | EV | Ventilator, blower | EV | Ventilateur, soufflerie |

| Teilefamilie | Art des Bauelementes | Parts family | Type of component | Familie | Type d'élément |
|--------------|---|--------------|---|----------|---|
| F | Fassungen, Steckverbindungen | F | Sockets, connectors | F | Douilles, connecteurs |
| FG | Koax-Umrüstsatz | FG | Coaxial screw-in assembly | FG | Ensemble vissable coaxial |
| FH | Koax-Übergang auf Fremdsystem | FH | Coaxial adapter | FH | Adaptateur coaxial |
| FJ | BNC-Systemteil | FJ | BNC screw-in assembly | FJ | Ensemble vissable BNC |
| FK | Koaxial-UHF-Systemteil | FK | Coaxial UHF screw-in assembly | FK | Ensemble vissable coaxial UHF |
| FM | Mehrfachstecker, Buchsenleiste | FM | Multipoint connector | FM | Connecteur multiple |
| FN | Netz-Steckverbindung | FN | AC-supply connector | FN | Connecteur secteur |
| FO | Runde Mehrfach-Steckverbindung | FO | Round multipoint connector | FO | Connecteur multipoles rond |
| FP | Druckschalt-Steckverbindung | FP | Multipoint connector for PC boards | FP | Connecteur multipoles pour cartes imprimées |
| FR | Fassung für Lampe, Sicherung, usw. | FR | Socket for lamp, fuse, etc. | FR | Douille pour lampe, fusible etc. . . . |
| FT | Schwachstrom-Steckverbindung | FT | LV plug and socket | FT | Connecteur pour faible courant |
| FU | Hochspannungs-Steckverbindung | FU | HV plug and socket | FU | Connecteur pour haute tension |
| FV | Verbinder (z.B. AMP) | FV | Push-on connector | FV | Connecteur à enfichage |
| FZ | Zubehör für koax. Bauelemente | FZ | Accessories for coax. components | FZ | Accessoires pour composants coax. |
| H | Software | H | Software | H | Logiciel |
| HP | Software-Komponenten und Software-Module | HP | Rights to software components and software modules | HP | Droits d'utilisation de composants et modules logiciel |
| HS | Auf Informationsträger geladene Software | HS | Software data media | HS | Logiciel sur support d'information |
| J | Meßinstrumente | J | Indicators | J | Indicateurs |
| JD | Drehspul-Anzeiginstrument | JD | Moving-coil meter | JD | Galvanomètre à cadre mobile |
| JE | Dreheisen-Anzeiginstrument | JE | Moving-iron meter | JE | Galvanomètre à fer mobile |
| JF | Frequenzmesser | JF | Frequency meter | JF | Fréquencemètre |
| JG | Drehspulinstrument mit Gleichrichter | JG | Moving-coil meter with rectifier | JG | Galvanomètre à cadre mobile avec redresseur |
| JH | Betriebsstundenzähler | JH | Operating-hours counter | JH | Compteur d'heures de fonctionnement |
| JJ | Impulszähler | JJ | Pulse counter | JJ | Compteur d'impulsions |
| JK | Kleinst-Instrument, z.B. Abstimmanzeiger | JK | Mini-instrument, e.g. tuning indicator | JK | Petit indicateur, p.ex. indicateur d'accord |
| JM | Mechanisches Zählwerk | JM | Mechanical counter | JM | Compteur mécanique |
| JP | Projektions-Instrument (Leuchtziffer) | JP | Digital display | JP | Afficheur numérique |
| JQ | Quotientenmesser (Kreuzspulinstrum.) | JQ | Ratiometer (cross coul) | JQ | Quotientmètre (à cadres croisés) |
| JU | Uhrwerk | JU | Clockwork | JU | Mouvement d'horlogerie |
| JW | Elektrodyn. Anzeiginstrument | JW | Electrodynamic meter | JW | Instrument électrodynamique |
| L | Induktivitäten, Magnetik | L | Inductors, magnetic components | L | Composants inductifs et magnétiques |
| LB | Blech- und Schnittbandkern mit Zubehör | LB | Laminated and C-cores with accessories | LB | Noyaux feuilletés et noyaux de type C, avec accessoires |
| LC | Keramische Spule | LC | Ceramic coil | LC | Bobine céramique |
| LD | Netz-, HF-Drossel, Df-Filter | LD | Choke, lead-through filter | LD | Self de choc, filtre dé traversée |
| LE | Einzelkreis, Bandfilter | LE | Single tuned circuit, bandpass filter | LE | Circuit accordé, filtre passe-bande |
| LF | Ferritkern mit Zubehör | LF | Ferrite cores with accessories | LF | Noyaux en ferrite avec accessoires |
| LK | Karboneisenkern und elektrischer Kupferkern mit Zubehör | LK | Iron carbonyl slugs and copper slugs with accessories | LK | Noyaux en fer carbonyle et en cuivre, avec accessoires |
| LL | Luftspule | LL | Air-core coils | LL | Bobines à air |
| LM | Magnetband und -platte | LM | Magnetic tapes and disks | LM | Bandes et disques magnétiques |
| LS | Schirmbecher | LS | Screening cans | LS | Bîtiers de blindage |
| LT | Netztransformator | LT | Power transformer | LT | Transformateur secteur |
| LU | NF-Übertrager | LU | AF transformer | LU | Transformateur BF |
| LV | Variometer | LV | Variometer | LV | Variomètre |
| LW | Wickelkörper, allgemein | LW | Coil formers, general | LW | Carcasses de bobine, en général |

| Teile-familie | Art des Bauelementes | Parts family | Type of component | Familie | Type d'élément |
|---------------|--------------------------------------|--------------|--|----------|---|
| R | Widerstände | R | Resistors | R | Résistances |
| RD | Drahtwiderstand | RD | Wire-wound resistor | RD | Résistance bobinée |
| RF | Kohleschicht-Widerstand | RF | Carbon-film resistor | RF | Résistance à couche de carbone |
| RG | Metallglasur-Widerstand | RG | Metal-coated resistor | RG | Résistance à couche métallique |
| RJ | Metalloxid-Widerstand | RJ | Metal-oxide resistor | RJ | Résistance à oxyde métallique |
| RK | Kaltleiter, Heißeiter, Varistor | RK | PTC, NTC resistors, varistors | RK | Résistances CPT, CNT, varistors |
| RL | Metallfilm-Widerstand | RL | Metal-film resistor | RL | Résistance à film métallique |
| RN | Widerstandsnetzwerk | RN | Resistor network | RN | Réseau de résistance |
| RR | Draht-Potentiometer | RR | Wire-wound potentiometer | RR | Potentiomètre bobiné |
| RS | Schicht-Potentiometer | RS | Carbon-film potentiometer | RS | Potentiomètre à couche |
| RT | Dämpfungsglied, Abschlußwiderstand | RT | Attenuator, termination | RT | Atténuateur, charge |
| RV | Drahtwiderstand mit Abgriff | RV | Wire-wound resistor, tapped | RV | Résistance bobinée à prise |
| RW | Wendelpotentiometer | RW | Helical potentiometer | RW | Potentiomètre hélicoïdal |
| S | Schalter, Relais, Sicherungen | S | Switches, relays, fuses | S | Commutateurs, relais, fusibles |
| SB | Drucktastenschalter | SB | Pushbutton switch | SB | Commutateur à touche |
| SD | Drehschalter | SD | Rotary switch | SD | Commutateur rotatif |
| SF | Kontaktfedersatz | SF | Spring contact assembly | SF | Jeu de ressorts de contact |
| SH | HF-Koaxialschalter, -Relais, -Teiler | SH | Coaxial RF switch, RF relay, RF attenuator | SH | Commutateur RF coaxial, relais RF, atténuateur RF |
| SK | Kipp-, Wipp- und Schiebeschalter | SK | Toggle switch, slide switch | SK | Commutateur à bascule, à glissière |
| SL | Leistungsschalter Netz/HF | SL | AC supply switch, high-power RF switch | SL | Commutateur secteur, de puissance RF |
| SM | Mikroschalter | SM | Microswitch | SM | Microrupteur |
| SN | Elektromagnet, Relais | SN | Electromagnetic relay | SN | Relais électromagnétique |
| SP | Leistungsrelais, Luftschütz | SP | Power relay, air-type contactor | SP | Relais de puissance, contacteur à air |
| SR | Reedrelais | SR | Reed relay | SR | Relais reed |
| SS | Sicherung, Schutzschalter | SS | Fuse, automatic cut-out | SS | Fusible, coupe-circuit automatique |
| ST | Thermoschalter | ST | Thermal circuit breaker | ST | Disjoncteur thermique |
| SU | Überspannungs-Ableiter | SU | Arrester | SU | Eclateur |
| SW | Wechselrichter, Näherungsschalter | SW | Inverter (DC-AC), proximity switch | SW | Inverseur (DC-AC), commutateur de proximité |
| SZ | Zeitschalter | SZ | Time switch | SZ | Interrupteur horaire |
| V | Verbindungselemente | V | Connecting elements | V | Éléments de raccordement |
| VK | Klemme, Klemmleiste | VK | Clamp, terminal strip | VK | Pince, réglette à bornes |
| VL | Lötöse, Stützpunkt | VL | Soldering lug | VL | Cosse à souder |
| VS | Schraube, Mutter, Scheibe | VS | Screw, nut, washer | VS | Vis, écrou, disque |

Farbcode für Widerstände und Kondensatoren

Anmerkung:
Die Wertangabe der weitgehend miniaturisierten Bauelemente erfolgt überwiegend durch Farbkennzeichnungen, deren Bedeutung der nachfolgenden Tabelle entnommen werden kann.

Hinweis:

Im Zuge des technischen Fortschrittes setzt R&S zunehmend Metallschichtwiderstände mit 1% Toleranz anstelle von Kohleschichtwiderständen mit 5% Toleranz ein. Metallschichtwiderstände können sich dabei an Stellen befinden, an denen gemäß Schaltteilliste Kohleschichtwiderstände vorgesehen sind. Etwaige geringfügige Differenzen der Nennwerte zwischen Stromlaufplan, Schaltteilliste und Gerät liegen im zulässigen Toleranzbereich.

Colour code for resistors and capacitors

Note:
The electrical values of the largely miniaturized components are mainly identified by a colour code, the meaning of which can be taken from the table below.

N. B.:

Following the state of the art R&S makes increasing use of metal-film resistors (1% tolerance) instead of carbon-film resistors (5% tolerance). Metal-film resistors may have been employed where carbon-film resistors are specified in the parts list. Any slight differences of nominal values between circuit diagram, parts list and equipment are within tolerance.

Code couleur pour résistances et condensateurs

Remarque:
Les valeurs électriques des composants fort miniaturisés sont indiquées dans la plupart des cas par un code couleur dont voici l'explication.

N. B.:

Suivant le progrès technique R&S utilise de plus en plus des résistances à film métallique (tolérance 1%) au lieu des résistances à couche de carbone (tolérance 5%). Des résistances à film métallique peuvent se trouver en des points où des types à couche de carbone figurent dans la liste des composants. Les différences minimales des valeurs nominales existant éventuellement entre le schéma de circuit, la liste des composants et l'appareil sont dans la marge de tolérance.

| Farbe/Colour/Couleur | A | B | C | D | Anordnungsbeispiele für Examples for / Exemple pour | Definition* / Définition* |
|---|---|---|--------|--------|--|--|
| Schwarz/Black/Noir | — | 0 | | | Widerstände (R) Kondensat. (C) | Kennzeichen A (Bauteilfarbe/1. Farbring) = 1. Zahl Kennzeichen B (Bauteilende/2. Farbring) = 2. Zahl Kennzeichen C (Punkt/3. Farbring) - 3. Zahl = Zahl der Nullen Kennzeichen D (Punkt/4. Farbring) = Toleranz des Nennwerts in % (Fehlendes Kennzeichen für D bedeutet ±20%) Das Fehlen eines Kennzeichens bedeutet, daß die Farbe des Bauteilkörpers die Wertangabe darstellt. Marking A (body colour or first coloured ring) = 1st digit Marking B (body end or second coloured ring) = 2nd digit Marking C (dot or third coloured ring) = number of zeroes Marking D (dot or fourth coloured ring) = tolerance on nominal value in % (with no D marking tolerance ± 20%) The absence of a marking signifies that the body colour gives the corresponding information. Repérage A (couleur du corps ou 1er anneau) = 1er chiffre Repérage B (bout du corps ou 2e anneau) = 2e chiffre Repérage C (point ou 3e anneau) = nombre de zéros. Repérage D (point ou 4e anneau) = tolérance en % de la valeur nominale (L'absence du repérage D signifie ± 20%) L'absence de tout repérage signifie que la couleur du corps du composant représente la valeur correspondante. |
| Braun/Brown/Marron | 1 | 1 | 0 | ± 1% | Resistors (R) Capacitors (C) | |
| Rot/Red/Rouge | 2 | 2 | 00 | ± 2% | Resistance (R) Condensateur (C) | |
| Orange/Orangé | 3 | 3 | 000 | | | |
| Gelb/Yellow/Jaune | 4 | 4 | 0000 | | | |
| Grün/Green/Vert | 5 | 5 | 00000 | ± 0,5% | | |
| Blau/Blue/Bleu | 6 | 6 | 000000 | | | |
| Violett/Violet | 7 | 7 | — | ± 0,1% | | |
| Grau/Gray/Gris | 8 | 8 | — | | | |
| Weiß/White/Blanc | 9 | 9 | — | | | |
| Gold/Doré | — | — | — | ± 5% | | |
| Silber/Silver/Argenté | — | — | — | ± 10% | | |
| Ohne Farbe/No colour/ Pas de couleur | — | — | — | ± 20% | | |

1) Toleranzring, hier nicht spezifiziert. 1) Tolerance ring, here not specified.
1) Anneau de tolérance, ne pas spécifié ici.

* Siehe auch DIN 41 429 und DIN 40 825 * see also IEC publication 62-1952 and 62-1968
* Voir aussi DIN 41 429 et DIN 40 825

Cross-Reference List of Class Designation Letters

IEC Publication 113-2 (1971) Item Designations, Letter Codes
ANSI Y32.2-1975 (IEEE Std 315-1975), Section 22, Class Designation Letters

Note: The designation letters used in the R&S Manuals correspond to the letter codes of the IEC Standard identified in the first column!

| IEC Publication 113-2 Terminology | Letter Code | | IEC Publication 113-2 Terminology | Letter Code | |
|---|-------------|-----------|---|-------------|--------|
| | IEC | Y32.2 | | IEC | Y32.2 |
| Acoustical indicator | H | LS | Magnetic tape recorder | D | A |
| Adjustable resistor | R | R | Maser | A | A |
| Aerial | W | E | Measuring equipment | P | M |
| Amplifier | A | AR | Microphone | B | MK |
| Amplifier (with tubes) | A | AR | Miscellaneous | E | E |
| Arrester | F | E | Modulator | U | A |
| Assemblies | A | A,U | Monostable element | D | A,U |
| Auxiliary switch | S | S | Motor | M | B |
| Battery | G | BT | Optical indicator | H | DS |
| Adjustable element | D | U,A | Oscillator | G | Y,G |
| Brake | Y | MP | Overvoltage discharge device | F | F,E |
| Busbar | W | W | Parabolic aerial | W | E |
| Cable | W | W | Photoelectric cell | B | V |
| Cable balancing network | Z | Z | Pickup | B | PU |
| Capacitor | C | C | Plug | X | P |
| Changer | U | A,B,G,MT | Pneumatic valve | Y | MP |
| Circuit breaker | Q | CB | Potentiometer | R | R |
| Clutch | Y | MP | Power switchgear | Q | CB,S |
| Coder | U | U,A | Protective device | F | F |
| Compander | Z | A | Pushbutton | S | S |
| Connecting stage | S | S | Quartz-oscillator | G | Y |
| Contactors | K | K | Recording device | P | A,M |
| Control switch | S | S | Register | D | A,U,M |
| Converter | U | A,U,M,G | Relay | K | K |
| Core, storage | D | E | Resistor | R | R |
| Crystal filter | Z | FL | Resolver | B | B |
| Crystal transducer | B | Y | Rheostat | R | R |
| Current transformer | T | T | Rotating frequency generator | G | G,MG |
| Delay device | D | DL | Rotating generator | G | G |
| Delay line | D | DL | Selector | S | S |
| Demodulator | U | A | Selector switch | S | S |
| Dial contact | S | S | Semiconductor | V | D,CR,Q |
| Diode | V | D | Shunt (resistor) | R | R |
| Dipole | W | E | Signal generator | P | A |
| Disconnecting plug | X | P | Signaling device | H | DS |
| Disconnecting socket | X | X | Socket | X | X |
| Discriminator | U | A | Soldering terminal strip | X | E,TB |
| Disk recorder | D | A | Static frequency changer | U | A |
| Dynamotor | B | MG | Storage device | D | A,U |
| Electrically operated mechanical device | Y | MT | Subassembly | A | A |
| Electronic tube | V | V | Supply | G | A,PS |
| Equalizer | Z | EQ | Supply device | G | A,PS |
| Filter | Z | FL | Synchro | B | B |
| Frequency changer | U | A,B,G | Telegraph translator | U | A |
| Fuse | F | F | Terminal | X | E |
| Gas discharge tube | V | V | Terminal board | X | TB |
| Generator | G | G | Termination | Z | AT |
| Heating device | E | HR | Test jack | X | EJ |
| Hybrid | Z | Z | Testing equipment | P | A |
| Indicating device | P | DS | Thermistor | R | RT |
| Induction coil | L | L | Thermo cell | B | A,TC |
| Inductors | L | L | Thermoelectric sensor | B | A |
| Integrating measuring device | P | M,MT,Z | Thyristor | V | Q |
| Inverter | U | A,U,PS,MG | Transducer (nonelectrical quantity to electrical quantity) | B | A,BT |
| Isolator | Q | AT | Transformer | T | T |
| Jumper wire | W | W | Transmission path | W | W |
| Laser | A | MT,A | Transistor | V | Q |
| Lighting device | E | DS | Tube (electron) | V | V |
| Limit switch | S | S | Voltage transformer (potential) | T | T |
| Limiter | Z | MT,RE | Waveguide | W | W |
| Line trap | L | FL,MP,V | Waveguide directional coupler | W | DC |
| Loudspeaker | B | LS | | | |
| Magnetic amplifier | A | AR | | | |


Zusammenstellung der lieferbaren Netzkabel
 List of power cables available
 Liste des câbles d'alimentation disponibles

| Sach-Nr. Stock No. Référence | Schutzkontaktstecker nach: Earthed-contact connector: Fiche à contact de protection: | Vorzugsweise verwendet in: Preferably used in: Utilisé de préférence en: |
|------------------------------------|--|---|
| DS 006.7013 | BS 1363: 1967' 13A entspr. IEC 83: 1975 Standard B2 BS 1363: 1967' 13A complying with IEC 83: 1975 Standard B2 BS 1363: 1967' 13A suivant CEI 83: 1975 norme B2 | GB Great Britain Grande- Bretagne |
| DS 006.7020 | Typ 12 nach SEV-Vorschrift 1011.1059, Normblatt S24507 Type 12 complying with SEV re- gulation 1011.1059, standard sheet S24507 Type 12 suivant la norme SEV 1011.1059, feuille S24507 | Schweiz Switzerland Suisse |
| DS 006.7036 | Typ 498/13 nach USA-Vorschrift UL 498, bzw. IEC 83 Type 498/13 complying with US regulation UL 498 or with IEC 83 Type 498/13 suivant la norme E.U.A UL 498 ou la norme CEI 83 | USA/Kanada USA/Canada E.U.A./Canada |
| DS 006.7107 | Typ SAA3 10 A, 250 V, nach AS C112-1964 Ap. Type SAA3 10 A, 250 V, complying with AS C112-1964 Ap. Type SAA3 10 A, 250 V, suivant AS C112-1964 Ap. | Australien Australia Australie |
| DS 025.2365 | DIN 49441, 10 A, 250 V . | Europa (ohne Schweiz) Europe (Switzerland not included) Europe (Suisse non comprise) |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| A1 | ED TASTATUR ANZEIGE KEYBOARD DISPLAY | 0801.1366.02 | | | 0801.0047.01 |
| A2 | EE FRN LOOP FRN LOOP | 0801.3917.02 | | | 0801.0047.01 |
| A3 | EE HF-OSZILLATOR RF OSCILLATOR | 0801.5110.02 | | | 0801.0047.01 |
| A4 | ED AUSGANGSSTUFE 2GHZ OUTPUT-STAGE 2GHZ | 0843.4805.02 | | | 0845.4031.01 |
| A4 | NUR VAR/ONLY MOD: 44 ED AUSGANGSSTUFE 2GHZ OUTPUT-STAGE 2GHZ | 0843.4805.02 | | | 0845.4031.01 |
| A5 | NUR VAR/ONLY MOD: 52 53 ED RECHNER OHNE SOFTWARE PROCESSOR WITHOUT SOFTW. | 0801.2410.02 | | | 0845.4031.01 |
| A5 | NUR VAR/ONLY MOD: 44 52 ED RECHNER OHNE SOFTWARE PROCESSOR WITHOUT SOFTW. | 0843.4705.02 | | | 0845.4031.01 |
| A5 | NUR VAR/ONLY MOD: 53 ED RECHNER OHNE SOFTWARE PROCESSOR WITHOUT SOFTW. | 0801.2410.02 | | | 0845.4031.01 |
| A6 | ED NF-GENERATOR AF GENERATOR | 0801.7312.02 | | | 0845.4031.01 |
| A8 | ZJ NETZTEIL POWER SUPPLY | 0801.1614.02 | | | 0801.0047.01 |
| A9 | ZE EICHL. (SMG) ATTENUATOR (SMG/SMH) | 0801.1108.02 | | | 0801.0047.01 |
| A100 | ED NF-MOTHERBOARD AF MOTHERBOARD | 0801.1172.02 | | | 0801.0047.01 |
| A200 | ED HF-MOTHERBOARD RF MOTHERBOARD | 0801.1066.02 | | | 0801.0047.01 |
| A220 | ZE ERWEITERUNG-2GHZ EXTENSION-2GHZ | 0843.3273.02 | | | 0845.4031.01 |
| W1 | DW HF-KABEL W1 RF CABLE W1 | 0801.7635.00 | | | 0843.3496.01 |
| W3 | DV HF-KABEL W3 RF CABLE W3 | 0801.7535.00 | | | 0843.3380.01 |
| W4 | DV HF-KABEL W4 RF CABLE W4 | 0801.7541.00 | | | 0843.3380.01 |
| W5 | DV HF-KABEL W5 RF CABLE W5 | 0801.7558.00 | | | 0843.3380.01 |
| W6 | DV HF-KABEL W6 RF CABLE W6 | 0801.7564.00 | | | 0843.3380.01 |
| W7 | DV HF-KABEL W7 RF CABLE W7 | 0801.7570.00 | | | 0843.3380.01 |
| W9 | DX KABEL W9 ANBIETEN: 801.8083.00 | 0801.7593.00 | | | 0843.3473.01 |
| W10 | DX KABEL W10 ANBIETEN: 801.8083.00 | 0801.7606.00 | | | 0843.3473.01 |
| W11 | NUR VAR/ONLY MOD: 52 DV KABEL W11 CABLE W11 | 0801.7612.00 | | | 0843.3380.01 |
| W12 | DV HF-KABEL W12 RF-CABLE | 0843.3421.00 | | | 0843.3380.01 |
| W13 | DV HF-KABEL W13 RF-CABLE | 0843.3438.00 | | | 0843.3380.01 |
| W14 | DV HF-KABEL W14 RF-CABLE | 0843.3444.00 | | | 0843.3380.01 |
| W15 | DX HF-KABEL W15 RF-CABLE | 0843.3409.00 | | | 0843.3496.01 |
| W17 | DV KABEL W17 CABLE | 0843.3480.00 | | | 0843.3380.01 |
| X2 | FJ EINBAUBUCHSE SYST.BNC BNC-CONNECTOR UG 625CIU | FJ 0099.9186.00 | ROSENBERGE | 51K-503-200-N4 | 0801.0047.01 |
| X3 | FJ EINBAUBUCHSE SYST.BNC BNC-CONNECTOR UG 625CIU | FJ 0099.9186.00 | ROSENBERGE | 51K-503-200-N4 | 0801.0047.01 |
| X4 | FJ EINBAUBUCHSE SYST.BNC BNC-CONNECTOR UG 625CIU | FJ 0099.9186.00 | ROSENBERGE | 51K-503-200-N4 | 0801.0047.01 |

095.0026-0693

| | | | | | | |
|---|----------|----|---------------|---------------------------------------|-------------------------|-------------------|
| MEZ15 | 790 3PLU | ÄI | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | | 28 | 03.05.99 | GG SMH SIGNAL GENERATOR | 0845.4002.01 SA | 1- |

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|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| . | XX VARIANTENERKLAERUNG IDENTIFICATION OF MODELS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL VAR 04 = SMGL MOD 04 = SMGL | | | | |
| X33 | DX BUCHSENEINHEIT CONNECTOR UNIT NUR VAR/ONLY MOD: 02 | 0801.7987.00 | | | 0801.8060.01 |
| X33 | DY BUCHSENEINHEIT CONNECTOR UNIT NUR VAR/ONLY MOD: 04 | 0801.7970.00 | | | 0801.8060.01 |
| X70 | DX BUCHSENEINHEIT CONNECTOR UNIT | 0801.8002.00 | | | 0801.8060.01 |
| X71 | FP BUCHSENLEISTE 32POL. CONNECTOR 32POL. | FP 0008.5676.00 | DEUT_ELCO | 26 8457 064 004 027 | |
| X72 | FP BUCHSENLEISTE 64P. CONNECTOR 64P | FP 0008.5699.00 | DEUT_ELCO | 26 8457 064 004 025 | |
| X73 | FP BUCHSENLEISTE 32P.KURZ M.CL CONNECTOR | FP 0008.5624.00 | DEUT_ELCO | 26 8457 048 004 026 | |
| X77 | DX BUCHSENEINHEIT CONNECTOR UNIT NUR VAR/ONLY MOD: 02 | 0801.7993.00 | | | 0801.8060.01 |
| X77 | DY BUCHSENEINHEIT CONNECTOR UNIT NUR VAR/ONLY MOD: 04 | 0801.7958.00 | | | 0801.8060.01 |
| X79 | FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 6 POLE/PINS | FP 0243.3578.00 | BERG_ELEKT | 75168-113-36 | |
| X221 | FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 12 POLE/PINS | FP 0243.3578.00 | BERG_ELEKT | 75168-113-36 | |
| X10A | FP STIFTL.WIN 36P.R2,54 PIN CONNECTOR 5 POLE/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | |
| X10B | FP STIFTL.WIN 36P.R2,54 PIN CONNECTOR 5 POLE/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | |
| X74A | FP STIFTL.WIN 36P.R2,54 PIN CONNECTOR 13 POLE/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | |
| X74B | FP STIFTL.WIN 36P.R2,54 PIN CONNECTOR 13 POLE/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | |
| X76A | FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 5 POLE/PINS | FP 0243.3578.00 | BERG_ELEKT | 75168-113-36 | |
| X76B | FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 5 POLE/PINS | FP 0087.9105.00 | AMP | 3-827 844-6 | |
| X78A | FP STIFTL.WIN 36P.R2,54 PIN CONNECTOR 17 POLE/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | |
| X78B | FP STIFTL.WIN 36P.R2,54 PIN CONNECTOR 17 POLE/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | |


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| MEZ15 | 790 3PLU | ÄI | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | ROHDE & SCHWARZ | 03 | 03.05.99 | ED NF-MOTHERBOARD | 0801.1172.01 SA | 1- |

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|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| . | XX VARIANTENERKLAERUNG IDENTIFICATION OF MODELS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL VAR 04 = SMGL MOD 04 = SMGL | | | | |
| X32 | DY BUCHSENEINHEIT CONNECTOR UNIT NUR VAR/ONLY MOD: 02 | 0801.7964.00 | | | |
| X32 | DY BUCHSENEINHEIT CONNECTOR UNIT NUR VAR/ONLY MOD: 04 | 0801.7941.00 | | | |
| X51 | FP BUCHSENLEISTE 32POL. | FP 0514.4120.00 | SIEMENS | V42254-B2201-B641 | |
| ..53 | FEMALE MULTIPOINT CONNECT | | | | |
| X70A | FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 10-POLIG/PINS | FP 0087.9105.00 | AMP | 3-827 844-6 | |
| X70B | FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 10-POLIG/PINS | FP 0243.3578.00 | BERG_ELEKT | 75168-113-36 | |

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| MEZ15 | 790 3PLU | ÄI | Datum Date | Schalttailliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | | 01 | 03.05.99 | ED HF-MOTHERBOARD RF MOTHERBOARD | 0801.1066.01 SA | 1- |



ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Baugruppe "Tastatur/Anzeige"

801.1366.02

Printed in West Germany

ENGLISH SERVICE MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5.1 Funktionsbeschreibung

(Hierzu Stromlauf 801.1366 S)

Die Schaltung der Baugruppe "Tastatur/Anzeige" gliedert sich in vier Funktionsblöcke:

- Tastaturmatrix mit den Eingabetasten S1...S45
- LED-Ansteuerung
- LCD-Ansteuerung
- Drehimpulsgeber

5.1.1 Tastaturmatrix

Die 45 Eingabetasten der Tastatur sind an den Kreuzungspunkten einer 8 x 7-Matrix angeordnet, deren 8 Zeilenleitungen und 7 Spaltenleitungen durch die Buchseneinheit X78 mit der Baugruppe "Rechner" verbunden sind. Beim Betätigen einer Eingabetaste wird die Zeile, in der die Taste angeordnet ist, mit der ihr zugeordneten Spalte verbunden.

Dadurch wird mittels einer auf der Baugruppe "Rechner" angeordneten Interface-Schaltung zunächst ein Interrupt erzeugt, der den Rechner veranlaßt, einen für diese Tastenstellung charakteristischen Tastencode über den Datenbus einzulesen.

5.1.2 LED-Ansteuerung

Zur Vereinfachung der Bedienung sind einigen Eingabetasten Leuchtdioden zugeordnet, die die jeweils zuletzt betätigte Taste anzeigen. Eine weitere LED dient als REMOTE-Anzeige.

Die Ansteuerung der LEDs erfolgt über drei in Serie geschaltete Schieberegister, die über eine Datenleitung (DIS.DATA) seriell geladen werden und über ein Strobe-Signal die eingelesenen Daten an ihren Ausgängen bereitstellen.

Neben der Ansteuerung der LEDs dient ein Ausgabebit der Ansteuerung der Beleuchtung der LCD-Anzeigen.

5.1.3 LCD-Ansteuerung

Das Gerät besitzt drei LCD-Anzeigen, das Frequenz-Display, das Modulations-Display und das Pegel-Display.

Die Ansteuerung der Segmente der drei Displays erfolgt im Multiplexverfahren durch je einen Ansteuerbaustein.

Der Datenverkehr zwischen der Baugruppe "Rechner" und den Ansteuerbausteinen erfolgt seriell über die bereits erwähnte DIS.DATA-Leitung. Zur Auswahl der Ansteuerbausteine stehen drei Chip-Select-Leitungen zur Verfügung.

5.1.4 Drehimpulsgeber

Der Drehimpulsgeber dient zur quasikontinuierlichen Variation von Geräteeinstellungen. Durch Links- bzw. Rechtsdrehung des Drehimpulsgebers wird der durch die Parameter-LED angezeigte Parameter in programmierbaren Schritten verringert bzw. erhöht.

Der Drehimpulsgeber besteht aus einem auf der Drehknopfachse angebrachten, radial abwechselnd in Nord- und Südrichtung magnetisierten Ferrit-Ring.

Die Information über Drehrichtung und -winkel wird über zwei am Umfang versetzt angeordnete Hall-Sensoren abgeleitet.

5.2 Prüfen und Abgleichen

Mit Hilfe des Potentiometers R18 läßt sich der optimale Kontrast zwischen den aktiven und inaktiven Segmenten der drei LCD-Anzeigen einstellen. Das Potentiometer R18 ist nach Entfernen der Beschriftungsplatte zum Abgleich zugänglich.

Die Einstellung des Kontrasts sollte aus frontaler Sicht auf die Displays erfolgen. Die Funktionsfähigkeit der Tastaturmatrix läßt sich durch Betätigen der Eingabetasten am Display kontrollieren.

Zum Prüfen der Anzeigen, deren Ansteuerung und Beleuchtung sowie der LEDs steht die Spezialfunktion "Display Test" zur Verfügung, nach deren Aufruf alle LCD-Segmente und LEDs angesteuert werden.

Die Funktionsfähigkeit des Drehimpulsgebers läßt sich ebenfalls direkt am Display kontrollieren.

5.3 Fehlersuche

Sollte eine Eingabe nicht im Display erscheinen, so ist nachzuprüfen, ob durch Betätigen der Taste ein Interrupt erzeugt wird (siehe Baugruppe "Rechner"). Ist dies der Fall, so sollte mit Hilfe der Spezialfunktion "Display Test" die Ansteuerung der Anzeigen überprüft werden, ansonsten die Eingabetasten.

Variiert der Drehimpulsgeber nicht oder in falscher Richtung, so sind die Ausgangssignale der Hall-Sensoren zu überprüfen (X1.A3, X1.B3).

Bei Betätigen des Drehimpulsgebers sollen an den Ausgängen TTL-Signale mit einem Tastverhältnis von etwa 1:1 und einer Phasenverschiebung von etwa 90° zueinander anliegen.

5.4 Schnittstellen

a) Tastaturmatrix

| Bezeichnung | Kürzel | Pegel | X1 |
|-------------|--------|-------|-----|
| Zeile 1 | ROW1 | TTL | B12 |
| Zeile 2 | ROW2 | TTL | A12 |
| Zeile 3 | ROW3 | TTL | B11 |
| Zeile 4 | ROW4 | TTL | A11 |
| Zeile 5 | ROW5 | TTL | B10 |
| Zeile 6 | ROW6 | TTL | A10 |
| Zeile 7 | ROW7 | TTL | B9 |
| Spalte 1 | COL1 | TTL | B8 |
| Spalte 2 | COL2 | TTL | A8 |
| Spalte 3 | COL3 | TTL | B7 |
| Spalte 4 | COL4 | TTL | A7 |
| Spalte 5 | COL5 | TTL | B6 |
| Spalte 6 | COL6 | TTL | A6 |
| Spalte 7 | COL7 | TTL | B5 |
| Spalte 8 | COL8 | TTL | A5 |

b) LED-Ansteuerung

| Bezeichnung | Kürzel | Pegel | X1 |
|----------------|----------|-------|-----|
| Taktsignal | DIS.CLK | TTL | A16 |
| Dateneingang | DIS.DATA | TTL | B15 |
| Strobe-Eingang | LED.STB | TTL | B16 |

c) LCD-Ansteuerung

| Bezeichnung | Kürzel | Pegel | X1 |
|--------------------------------|------------------|-------|-----|
| Taktsignal | DIS.CLK | TTL | A16 |
| Dateneingang | DIS.DATA | TTL | B15 |
| Chip-Select Frequenzdisplay | DIS.STB1 | TTL | A14 |
| Chip-Select Modulationsdisplay | DIS.STB2 | TTL | B13 |
| Chip-Select Pegeldisplay | DIS.STB3 | TTL | A13 |
| Display-Reset-Eingang | RES | TTL | A9 |
| Display-Steuereingang | DIS.C/ \bar{D} | TTL | A15 |
| Display-Handshake-Ausgang | BUSY | TTL | B14 |

d) Drehimpulsgeber

| Bezeichnung | Kürzel | Pegel | X1 |
|-----------------------------|---------|-------|----|
| Drehwinkel-Impulsausgang | DG.PULS | TTL | A3 |
| Drehrichtungs-Impulsausgang | DG.DIR | TTL | B3 |

e) Betriebsspannung

| Bezeichnung | Kürzel | Pegel | X1 |
|------------------|--------|---------------------|---------------|
| Betriebsspannung | VDD | 5,2 V _{DC} | A2,B2 |
| Masse | VSS | Ø V _{DC} | A1,B1,A17,B17 |

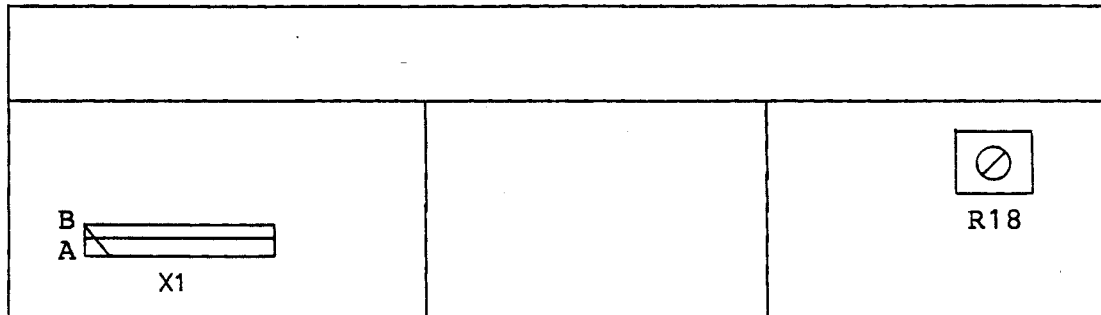


Bild 5-1 Lage der Prüf- und Trimpunkte



ROHDE & SCHWARZ

SERVICE DOCUMENTS

Keyboard/Display Module

801.1366.02

Contents

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| 5.1 | Function Description | 5.1 |
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| 5.1.4 | Spinwheel | 5.2 |
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| 5.3 | Troubleshooting .. | 5.3 |
| 5.4 | Interfaces | 5.4 |

Component lists
Circuit diagrams
Component layout diagrams

5.1 Function Description

(See circuit diagram 801.1366 S)

The circuit of the keyboard/display module is divided into four function blocks:

- Keyboard with input keys S1 to S45
- LED control
- LCD control
- Spinwheel

5.1.1 Keyboard

The 45 input keys on the keyboard are located at the points of intersection of an 8 x 7 matrix whose 8 row lines and 7 column lines are connected to the controller module via X78. When a key is pressed, the row in which it is located is connected to the associated column.

An interrupt is then generated by means of an interface circuit on the controller module which causes the controller to read in the code of the key pressed via the data bus.

5.1.2 LED Control

To simplify operation, LEDs are assigned to certain input keys and indicate the key last operated. A REMOTE LED is also present.

The LEDs are driven by three shift registers connected in series which are loaded sequentially via a data line (DIS.DATA). A strobe signal enables the read-in data of the shift registers to be output.

In addition to the control of the LEDs, one output bit of the shift registers controls the LCDs.

5.1.3 LCD Control

The instrument contains three LCDs, the frequency display, the modulation display and the level display.

The segments of the three displays are driven in multiplex mode by a control IC each.

Data transfer between the controller module and the control ICs takes place in the serial mode via the DIS.DATA line already mentioned. Three chip select lines are provided for selection of the control ICs.

5.1.4 Spinwheel

The spinwheel is used for quasi-continuous variation of instrument settings. The parameter indicated by the parameter LED is decreased or increased in programmable steps by spinwheel counterclockwise or clockwise.

The spinwheel consists of an axial ferrite ring which is radially magnetized North and South alternately.

The information on the direction and angle of rotation is derived from two Hall sensors displaced from one another on the circumference of the ring.

5.2 Checking and Adjustment

Potentiometer R18 can be used to set the optimum contrast between the active and inactive segments of the three LCD displays. Potentiometer R18 is accessible after removing the front-panel cover.

The adjustment of the contrast should be made when viewing the displays from the front. Correct functioning of the keyboard can be checked on the display by pressing the input keys.

Special function "Display Test" can be used to check the displays, their control and illumination as well as the LEDs. All LCD segments and the LEDs are driven when this function is called.

Correct functioning of the spinwheel can also be checked directly on the display.

5.3 Troubleshooting

In the event that an input does not appear in the display, check whether an interrupt is generated by pressing the key (see Processor module). If this is the case use the special function "Display Test" to test the display control, otherwise the input keys.

Check the output signals of the Hall sensors (X1.A3, X1.B3) if no variation is produced by the spinwheel or if the variation is in the wrong direction.

A duty factor of approx. 1:1 and a phase offset of approx. 90° should be present at the TTL signal outputs when the spinwheel is turned.

5.4 Interfaces

a) Keyboard

| Designation | Abbreviation | Level | X1 |
|-------------|--------------|-------|-----|
| Row 1 | ROW1 | TTL | B12 |
| Row 2 | ROW2 | TTL | A12 |
| Row 3 | ROW3 | TTL | B11 |
| Row 4 | ROW4 | TTL | A11 |
| Row 5 | ROW5 | TTL | B10 |
| Row 6 | ROW6 | TTL | A10 |
| Row 7 | ROW7 | TTL | B9 |
| Column 1 | COL1 | TTL | B8 |
| Column 2 | COL2 | TTL | A8 |
| Column 3 | COL3 | TTL | B7 |
| Column 4 | COL4 | TTL | A7 |
| Column 5 | COL5 | TTL | B6 |
| Column 6 | COL6 | TTL | A6 |
| Column 7 | COL7 | TTL | B5 |
| Column 8 | COL8 | TTL | A5 |

b) LED control

| Designation | Abbreviation | Level | X1 |
|--------------|--------------|-------|-----|
| Clock signal | DIS.CLK | TTL | A16 |
| Data input | DIS.DATA | TTL | B15 |
| Strobe input | LED.STB | TTL | B16 |

c) LCD control

| Designation | Abbreviation | Level | X1 |
|--------------------------------|------------------|-------|-----|
| Clock signal | DIS.CLK | TTL | A16 |
| Data input | DIS.DATA | TTL | B15 |
| Chip select frequency display | DIS.STB1 | TTL | A14 |
| Chip select modulation display | DIS.STB2 | TTL | B13 |
| Chip select level display | DIS.STB3 | TTL | A13 |
| Display reset input | RES | TTL | A9 |
| Display control input | DIS.C/ \bar{D} | TTL | A15 |
| Display handshake output | BUSY | TTL | B14 |

d) Spinwheel

| Designation | Abbreviation | Level | X1 |
|--------------------------------------|--------------|-------|----|
| Angle of rotation - pulse output | DG.PULS | TTL | A3 |
| Direction of rotation - pulse output | DG.DIR | TTL | B3 |

e) Operating voltage

| Designation | Abbreviation | Level | X1 |
|-------------------|--------------|---------|---------------|
| Operating voltage | VDD | 5.2 VDC | A2,B2 |
| Ground | VSS | 0 VDC | A1,B1,A17,B17 |

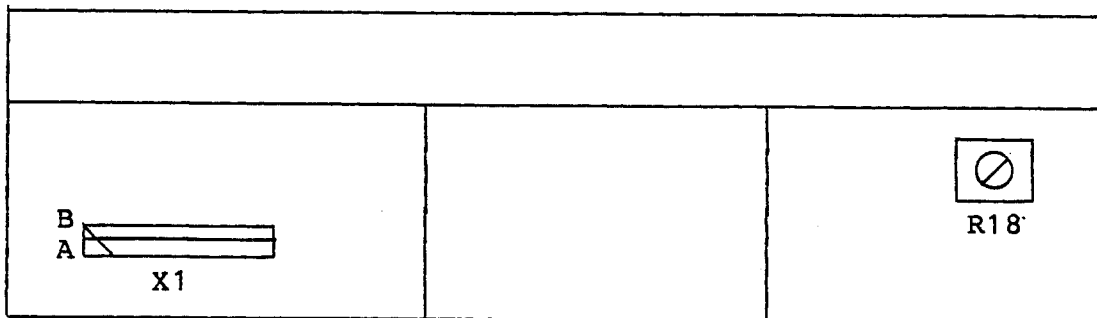



Fig. 5-1 Positions of the test points and trimmers

Schalteillisten
Stromläufe
Bestückungspläne
Part lists
Circuit diagrams
Components plans
Listes des pièces détachées
Schémas de Circuit
Plans des composants

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| B1 | BS UGN3120U HALL-EFF.SW. HALL-EFF.SWITCH | BJ 0336.4750.00 | ALLEGRO | UGN3120U | |
| B2 | BS UGN3120U HALL-EFF.SW. HALL-EFF.SWITCH | BJ 0336.4750.00 | ALLEGRO | UGN3120U | |
| C1 | CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR | CE 0022.8185.00 | KEMET | T340 A105M040 AS | |
| C2 | CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR | CE 0022.8185.00 | KEMET | T340 A105M040 AS | |
| C3 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C4 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C5 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C6 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C7 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C8 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C9 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C10 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C11 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C12 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C13 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| D1 | BJ UPD7225G00 LCD DRIV ALPHANUM.LCD CONTR/DRIVER | BJ 0392.5320.00 | NEC | D7225G (JG) | |
| D2 | BJ UPD7225G00 LCD DRIV ALPHANUM.LCD CONTR/DRIVER | BJ 0392.5320.00 | NEC | D7225G (JG) | |
| D3 | BJ UPD7225G00 LCD DRIV ALPHANUM.LCD CONTR/DRIVER | BJ 0392.5320.00 | NEC | D7225G (JG) | |
| D4 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D5 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D6 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| H1 ..17 | AF HLMP1700 LED3 RT626N LED FUER/FOR S1-S17 | 0099.9134.00 | QUALITY | HLMP-1700.L31S | |
| H18 | AF HLMP1700 LED3 RT626N LED | 0099.9134.00 | QUALITY | HLMP-1700.L31S | |
| H20 ..23 | EF 5V OHNE SOCKEL LAMP | EF 0063.6906.00 | OSHINO | OL 715 | |
| H26 | AF HLMP1700 LED3 RT626N LED FUER/FOR S26 | 0099.9134.00 | QUALITY | HLMP-1700.L31S | |
| J50 | EM DREHIMPULSGEBER ROTARY MAGNET | EM 0336.3348.00 | | | |
| L1 | LD 0,33UH10%,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| N1 | BO CA3240AE 2XMOSFETOPAMP DUAL MOSFET-INPUT OPAMP | 0302.7040.00 | RCA | CA3240AE | |
| P1 | BP AN 127 LCD-MODULE | 0826.8587.00 | VARITRONIX | R&S 0826.8587 | |
| P2 | BP AN 153 LC DISPLAY | 0801.1420.00 | DATA_MODUL | LC 01093 AN 153 | |
| P3 | BP AN 152 LC DISPLAY | 0801.1437.00 | DATA_MODUL | LC 01092 AN 152 | |
| P5 | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| R2 | RL 0,60W 182 KOHM+-1%TK50 RESISTOR | RL 0083.2193.00 | RESISTA | MK2 | |
| R3 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |

| | | | | | | |
|---|----------------------------|----|------------|---|------------------------|----------------|
| MEZ15 | 790 3PLU | Äi | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | ROHDE & SCHWARZ | 17 | 03.05.99 | ED TASTATUR ANZEIGE KEYBOARD DISPLAY | 0801.1366.01 SA | 1+ |

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|------------------|--|---|-------------------------|-------------------------|---------------------------|
| R4 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R5 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R6 | RL 0,60W 182 KOHM+-1%TK50 RESISTOR | RL 0083.2193.00 | RESISTA | MK2 | |
| R7 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R8 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R9 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R10 | RL 0,60W 182 KOHM+-1%TK50 RESISTOR | RL 0083.2193.00 | RESISTA | MK2 | |
| R11 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R12 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R13 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R14 | RL 0,60W 681 KOHM+-1%TK50 RESISTOR | RL 0083.2735.00 | PHILIPS_CO | MRS 25 | |
| R15 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R16 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R17 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R18 | RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T | RS 0247.7890.00 | BI_TECHNOL | 72PM | |
| R19 | RL 0,60W 5,62KOHM+-1%TK50 RESISTOR | RL 0082.2190.00 | PHILIPS_CO | MRS 25 | |
| R21 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| ..38 | R40 | RL 0,60W 56,2KOHM+-1%TK50 RESISTOR | RL 0082.2231.00 | RESISTA | MK2 |
| ..46 | R47 | RL 0,60W 56,2KOHM+-1%TK50 RESISTOR | RL 0082.2231.00 | RESISTA | MK2 |
| | R48 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 |
| | R49 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 |
| | R50 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 |
| | R51 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 |
| | R52 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 |
| | R56 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 |
| S1 | SB TASTER 1XA OHNE KNOFF PUSHBUTTON SWITCH | SB 0238.3850.00 | SIEMENS | V42 263-D32-M2 | |
| ..17 | S18 | SB TASTER 1XA OHNE KNOFF PUSHBUTTON SWITCH | SB 0238.3850.00 | SIEMENS | V42 263-D32-M2 |
| ..25 | S26 | SB TASTER 1XA OHNE KNOFF PUSHBUTTON SWITCH | SB 0238.3850.00 | SIEMENS | V42 263-D32-M2 |
| ..45 | S27 | SB TASTER 1XA OHNE KNOFF PUSHBUTTON SWITCH | SB 0238.3850.00 | SIEMENS | V42 263-D32-M2 |
| V20 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V21 | AL BD139 N 80V 1A0 TRANSISTOR | AL 0274.8994.00 | VALVO | BD139 | |
| X78 | DY STECKEREINHEIT CONNECTOR UNIT | 0801.1472.00 | | | |

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Parts list for

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ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Baugruppe "FRN-Loop"

801.3917.02

Printed in West Germany

ENGLISH SERVICE MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5.1 Funktionsbeschreibung

(Hierzu Stromlauf 801.3917 S und Bild 5-3)

Die Baugruppe "FRN-Loop" enthält die Referenzfrequenzaufbereitung sowie einen Oszillator, der in einer "Fractional-N-Regelschleife" die Feinauflösung des Geräts erzeugt. Außerdem befindet sich auf der Druckschaltung die Zumischung des FM-Oszillators.

5.1.1 Aufbereitung der Referenzfrequenz

Der 50-MHz-Quarzoszillator arbeitet mit einem FET V435 in Gate-Schaltung. Von diesem Oszillator werden durch Vervielfachen bzw. Teilen die für das Gerät benötigten Festfrequenzen abgeleitet.

Über den Emitterfolger V460 gelangt das Quarzsignal zum Vervielfacher V465 mit einem zweikreisigen Bandfilter, welches die dritte Oberwelle aussiebt. Die Ausgangsspannung des Filters wird auf die beiden Trennverstärker V485, V490 aufgeteilt. Das 150-MHz-Signal dient einmal als LO für den Mischbereich sowie zum Abmischen des VCO (E330).

Der ECL-Line-Receiver D24 entkoppelt den Oszillator von dem nachfolgenden Teiler D20, welcher die Quarzfrequenz auf 10 und 5 MHz herunterteilt. Dieses Signal steht nach Tiefpaßfilterung an X201 als Referenzfrequenz zur Verfügung. Durch weitere Teilung (D22) erhält man 100 kHz als Referenz für die Fractional-N-Regelschleife sowie 50 kHz (X203) für die FM-Oszillator-Regelung.

In der Betriebsart "REF EXT" wird das Signal an X201 von N550 auf TTL-Pegel verstärkt. Über den Frequenz-Phasendetektor D23 und den Regelverstärker N530 wird der Quarzoszillator auf diese Frequenz synchronisiert. In der Betriebsart "REF INT" wird die Regelspannung durch eine einstellbare Vorspannung ersetzt.

5.1.2 VCO- und FM-Zumischung

Der VCO in Clappschaltung mit einem FET (V275) als aktives Element schwingt von 158...168,9 MHz. Nach einer Trennstufe V290 wird das Signal auf die beiden Verstärker V315, V325 mit nachfolgendem Mischer aufgeteilt.

In E330 wird der VCO auf eine Zwischenfrequenz von 8...18,9 MHz abgemischt. Nach Tiefpaßfilterung und Verstärkung auf TTL-Pegel gelangt das Signal zur Fractional-N-Regelschleife.

Im Gegentaktmischer mit V360, V370 wird der VCO mit 50 MHz zur Ausgangsfrequenz 208...218,9 MHz hochgemischt. Mit dem Diodenschalter V500...V503 kann dabei zwischen dem 50-MHz-FM-Oszillator sowie der Quarzfrequenz umgeschaltet werden. Zwischen Mischer und nachfolgendem Verstärker befindet sich ein Mitlaufbandfilter, das von der VCO-Regelspannung gesteuert wird. Ein festes Bandfilter am Ausgang der Baugruppe verbessert die Selektion.

5.1.3 Fractional-N-Regelschleife

Funktionsprinzip

Bei einem Fractional-N-Teiler erreicht man durch zeitweiliges Umschalten des Teilungsfaktors von N auf N+1, daß die VCO-Frequenz ein gebrochenes Vielfaches der Referenzfrequenz ist, d.h. $f_{VCO} = N,F \cdot f_{REF}$. Durch dieses Verfahren erreicht man mit einer Regelschleife eine hohe Frequenzauflösung.

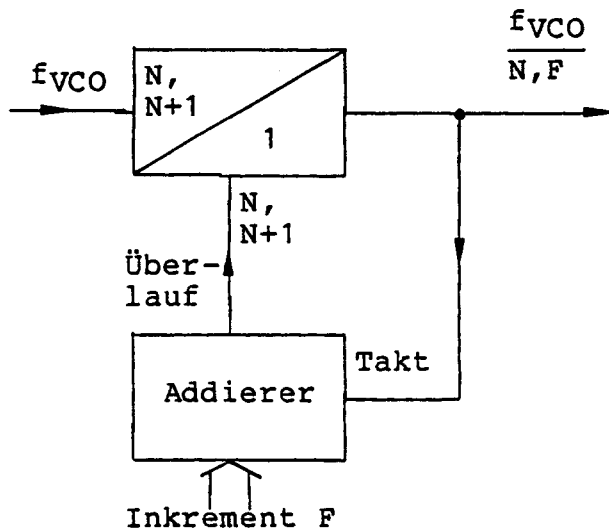


Bild 5-1 Blockschaltbild N,F-Teiler

In einem Addierer wird mit jedem Ausgangsimpuls des Teilers ein Inkrement F aufaddiert. Erreicht der Addierer eine bestimmte Grenze, so wird für eine Referenzfrequenzperiode der Teilungsfaktor auf N+1 umgeschaltet.

Beispiel:

$$F = 0,1 \Rightarrow \bar{N} = \frac{(9 \times N) + (N + 1)}{10} = N,1 = N,F$$

Durch das Umschalten des Teilungsfaktors entsteht eine Phasenstörung, die über die Regelschleife zu einer Störmodulation des Oszillators führt. Mit einer Kompensation läßt sich der Nebenwellenabstand um 60 bis 80 dB verbessern.

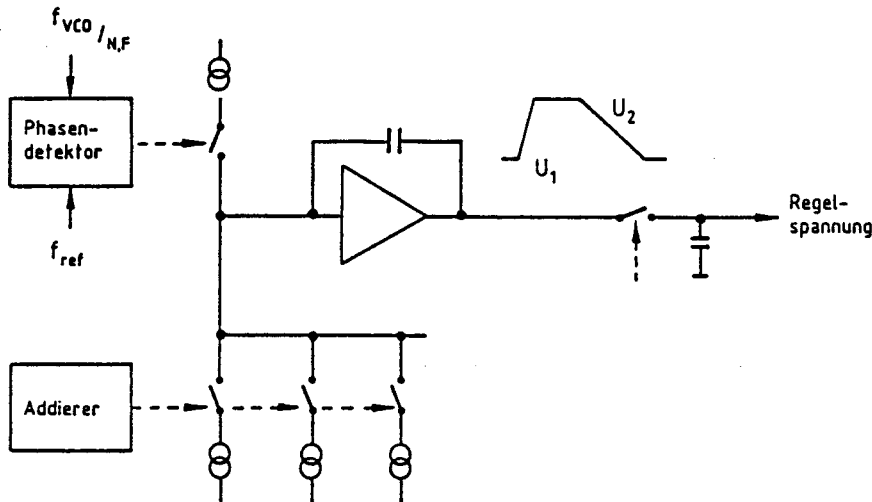


Bild 5-2 Blockschaltbild N,F-Regelschleife

Der Phasendetektor schaltet mit seinem Ausgangssignal eine Stromquelle, die den Integrationskondensator von U_1 auf U_2 auflädt. Diese Spannung wird von der Sample-and-Hold-Schaltung abgetastet. Danach entladen die Kompensationsstromquellen den Integrator auf U_1 . Die Einschaltdauer dieser Stromquellen wird von dem jeweiligen Stand im Addierer gesteuert, wobei jeder Stelle eine eigene Stromquelle zugeordnet ist. Zusätzlich sorgt eine Biasstromquelle für eine konstante Phasenverschiebung in der Regelschleife.

Schaltungsbeschreibung

Das Gate-Array D2 enthält eine Schnittstelle zur Datenübertragung, den N,F-Teiler mit 6stelligem Addierer sowie die Ansteuerung für die Kompensationsstromquellen der ersten vier Nachkommastellen.

D6 bis D11 steuern den Ablauf der Kompensation einschließlich der Biasstromquelle sowie die Sample-and-Hold-Schaltung. D12, D13 synchronisieren die Kompensationsimpulse auf den VCO-Takt. Das J-K-Flipflop D14 arbeitet als Frequenz-Phasendetektor.

Die Stromquellen bestehen aus FETs, deren Strom über einen Operationsverstärker geregelt wird. Zum Schalten der Ströme werden Diodenumschalter verwendet, die mit TTL-Pegel angesteuert werden. Um eine möglichst hohe Temperaturstabilität zu erreichen, befinden sich die wichtigsten strombestimmenden Widerstände in einem Array.

Eine zweifache Sample-and-Hold-Schaltung (V140, V141), die vom Pegelwandler V160, V165, N146 angesteuert wird, tastet die Ausgangsspannung des Integrators N130 im 100-kHz-Takt ab. Mit N180 wird in Abhängigkeit vom Teilungsfaktor die Regelverstärkung umgeschaltet sowie eine Voreinstellspannung addiert. Der Fensterkomparator N200 überwacht die Regelspannung der Fractional-N- sowie der Referenzfrequenz-Regelschleife.

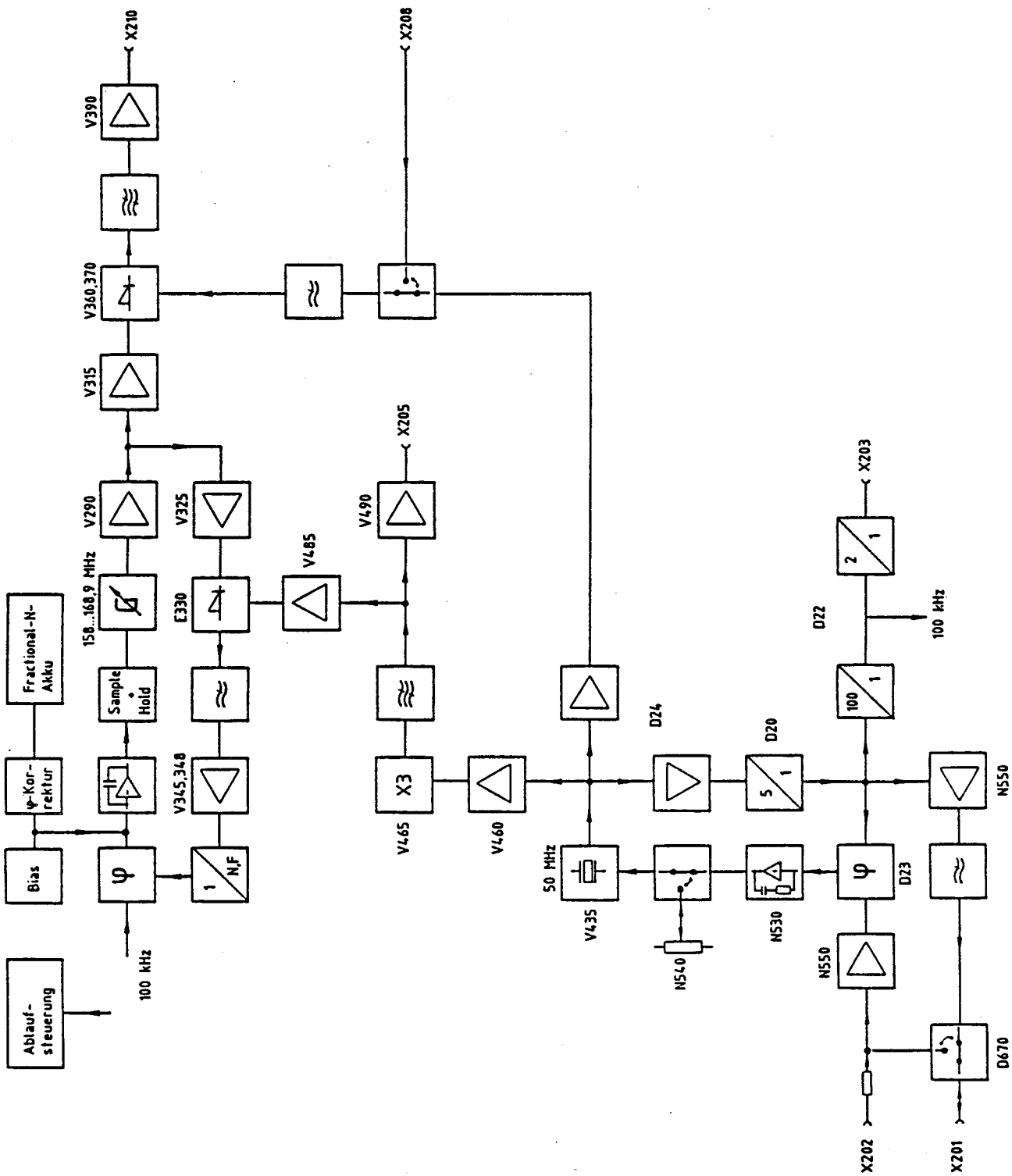


Bild 5-3 Blockschaltbild FRN-Loop

5.2 Prüfen und Abgleichen

5.2.1 50-MHz-Quarzoszillator (L432)

Einstellung am Gerät: REF INT

- Mit R542 Voreinstellspannung auf Maximum stellen (P23 ≈ 17 V)
- Mit L432 Spannung an R423 auf Minimum abgleichen (7,8...8,2 V bei schwingendem Oszillator).

5.2.2 Referenzfrequenz Ausgang (X202)

Einstellung am Gerät: REF INT

- Mit einem Leistungsmesser Signal an X202 messen.

Sollpegel: >-3 dBm bei 5 oder 10 MHz. (Brücke X13.AB: 5 MHz, X13.BC: 10 MHz).

5.2.3 Prüfen der Referenzfrequenz-Regelschleife

Einstellung am Gerät: REF EXT

- Einen Meßsender (Frequenzfehler $<10^{-6}$) an X202 anschließen: Pegel -7 dBm.
- Bei den folgenden Einstellungen die Regelspannung an P23 prüfen.

Tabelle 5-1

| $f_{REF EXT}/MHz$ | X11 | U_{P23}/V |
|-------------------|-----|-------------|
| 10,0000 | B-C | 9 ±2,5 |
| 10,0001 | B-C | 13 ±2,5 |
| 9,9999 | B-C | 5 ±2,5 |
| 5,0000 | A-B | 9 ±2,5 |

5.2.4 Abgleich des 150-MHz-Bandfilters

- Mit einem Spektrumanalysator das Signal an X205 messen.
- L467, L471, L498 auf Maximum bei 150 MHz abgleichen.
- Abgleich L467, L471 wiederholen.
Sollpegel an X205: 0 ±2 dBm.

5.2.5 Prüfen und Abgleichen des 158...168,9-MHz-VCOs

Zum Abgleich des VCOs muß unbedingt der untere Schirmdeckel aufgeschraubt sein. Ein Netzgerät (0...20 V) an die Brücke X3.BC (Kurzschlußbrücke entfernt, C→Masse) sowie einen Frequenzzähler an X5 (B→Masse) anschließen. Abgleich des VCOs mit C270 und C272 auf folgenden Frequenzbereich:

$$U_{X3} = +3 \text{ V, } f = 158 \pm 0,2 \text{ MHz}$$
$$U_{X3} = +18 \text{ V, } f = 168,9 \pm 0,2 \text{ MHz}$$

5.2.6 Abgleich der 208...219-MHz-Bandfilter

Zum Abgleich der Bandfilter muß unbedingt der untere Schirmdeckel aufgeschraubt sein.

Mitlaufbandfilter

- Abstimmspannung aus einem Netzgerät (0...20 V) an X3.BC (Kurzschlußbrücke entfernt, C→Masse) einspeisen.
- Mit einem Serviceadapterkabel Wobbelmeßsender an X6 (B→Masse) sowie Meßkopf mit 50- Ω -Abschluß an Brücke X8.A-B (Kurzschlußbrücke entfernt, A→Masse) anschließen.
- Potentiometer R380, R382 in Mittelstellung bringen.
- Bei $U = +3 \text{ V}$ Bandfilter mit L375, L386 auf $f_0 = 208 \text{ MHz}$, für $U = +18 \text{ V}$ Bandfilter mit R380, R382 auf $f_0 = 219 \text{ MHz}$ abgleichen.
- Abgleich nochmals wiederholen. Durchgangsdämpfung des Bandfilters: $1 \pm 3 \text{ dB}$.

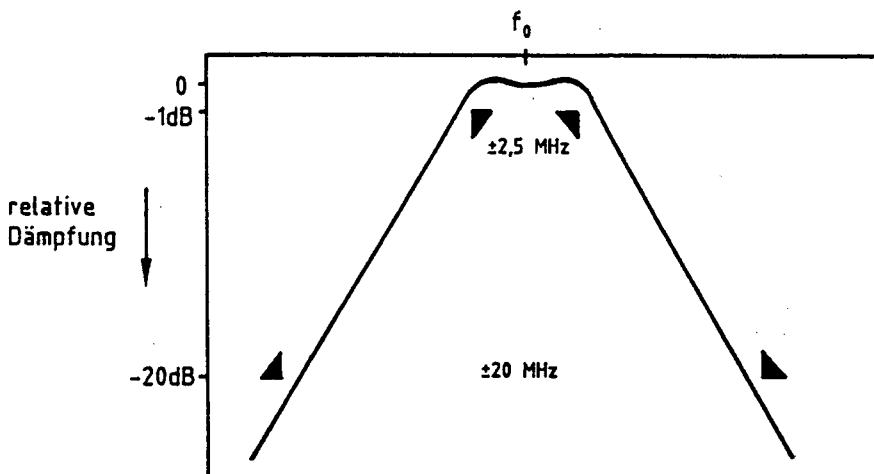


Bild 5-4 Filtersollkurve

208...219-MHz-Bandfilter

- Mit einem Serviceadapterkabel Wobbelmeßsender an Brücke X8.C-D sowie Meßkopf mit 50- Ω -Abschluß an X210 anschließen.
- Mit L411, L414 Filter auf Sollkurve abgleichen. Durchgangsdämpfung des Bandfilters: 6 ± 1 dB.

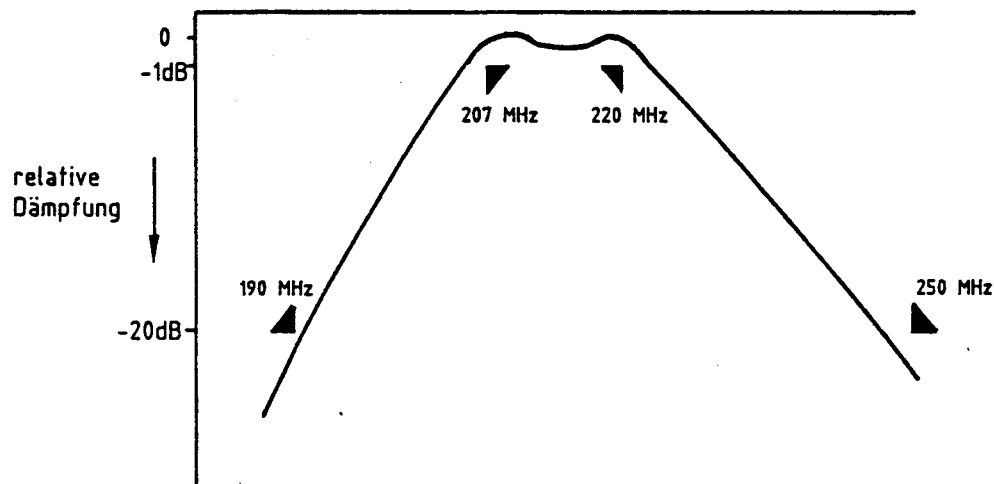


Bild 5-5 Filtersollkurve

5.2.7 Prüfen des Ausgangssignals (X210) sowie des Mischers E330

- Brücke X6 und X8.B-C einstecken.
- Einstellung am Gerät: FM aus.
- Mit einem Spektrumanalysator Signal an X210 messen.
- L351 auf maximalen Ausgangspegel abgleichen.
- Abstimmspannung am Netzgerät (siehe Kapitel 5.2.6) von 3...18 V variieren, Pegel im gesamten Bereich -2 ± 2 dBm (Raumtemperatur).
- Mit einem Oszilloskop Signal an X14.A messen.
- Spannung am Netzgerät wieder von 3...18 V variieren, Pegel im gesamten Bereich: 8...19 MHz, TTL.

5.2.8 Prüfen der Regelschleife

- Brücke X3 auf A-B stecken.
- Bei den folgenden Einstellungen Regelspannung an P20 messen.

Tabelle 5-2

| Frequenz/MHz | Spannung (U_p)/V |
|--------------|----------------------|
| 520 | 3 ±0,2 |
| 533 | 10,5 ±0,5 |
| 519,9 | 18 ±0,2 |

5.2.9 Einstellen und Prüfen der Kompensation (R91, R94)

- Die Baugruppe muß für diese Einstellung mit der Referenz des Spektrumanalysators extern synchronisiert werden (X201, $f = 10$ MHz, $P > -7$ dBm).
- Der untere Schirmdeckel muß aufgeschraubt sein.
- Brücke X15 auf A-B stecken.
- Einstellung am Gerät: FM aus, REF EXT
- Spektrumanalysator an X210 anschließen.
- Einstellung: Referenz -2 dBm,
RES BW 100 Hz,
Frequency Span 0 Hz,
Sweep Time 3 s
- Bei folgenden Einstellungen den Pegel der Nebenwelle auf <-83 dBm abgleichen.

Tabelle 5-3

| Frequenzeinstellung am Gerät/MHz | Frequenzeinstellung am Analysator/MHz | Abgleich |
|----------------------------------|---------------------------------------|----------|
| 520,0025 | 208,002 | R91 |
| 520,00025 | 208,0011 | R94 |

- Einstellung am Spektrumanalysator: RES BW 30 Hz,
Frequency Span 10 kHz
- Bei den in Tabelle 5-4 angegebenen Frequenzeinstellungen die Nebenwellen im Abstand $n \cdot 1$ kHz zum Träger kontrollieren.

Tabelle 5-4

| Frequenzeinstellung am Gerät/MHz | Frequenzeinstellung am Analysator/MHz | α /dBm |
|-------------------------------------|--|---------------|
| 520,000025 | 208 | <-80 |
| 624,000003 | 208 | <-80 |
| 545,0025 | 218 | <-76 |
| 545,00025 | 218 | <-76 |
| 545,000025 | 218 | <-76 |
| 648,000003 | 216 | <-76 |

5.2.10 Prüfen des Alarms

→ Voltmeter an X1.A3 anschließen.

N,F-Regelspannung

- Netzgerät (0...20 V) an Brücke X3.B-C (Kurzschlußbrücke entfernt, C→Masse) anschließen.
- Für $U = 10$ V Spannung am Voltmeter >4 V, für $U = 0,5$ V und $20,5$ V < 1 V.

Referenzfrequenz-Regelspannung

- Netzgerät an Brücke X12.A-B (Kurzschlußbrücke entfernt, A→Masse) anschließen.
- Prüfung wie bei N,F-Regelspannung durchführen.

5.2.11 Prüfen der Nebenwellen an X205 und X210

- Zu dieser Prüfung muß der obere und untere Schirmdeckel aufgeschraubt sein.
- Die Baugruppe wird mit der Referenz des Spektrumanalysators extern synchronisiert (X201, $f = 10$ MHz, $P > -7$ dBm).
- Einstellung am Gerät: FM aus, REF EXT
- Mit einem Spektrumanalysator das Signal an X205 bzw. X210 messen. Bei den in Tabelle 5-5 angegebenen Einstellungen den Nebenwellenabstand kontrollieren.

Tabelle 5-5

| Frequenzeinstellung am Gerät/MHz | Frequenzeinstellung Analysator/MHz | Ausgang | α /dBm |
|-------------------------------------|---------------------------------------|---------|---------------|
| 520 | 158 | X208 | <-84 |
| 520 | 216 | X208 | <-56 |
| 520 | 266 | X208 | <-64 |
| 532,5 | 189 | X208 | <-84 |
| 532,5 | 239 | X208 | <-84 |
| 545 | 188 | X208 | <-84 |
| 545 | 136 | X208 | <-84 |
| - | 100 | X205 | <-75 |
| - | 200 | X205 | <-80 |

5.2.12 Abgleich der Referenzfrequenz (R542)

- Zu diesem Abgleich muß der obere und untere Schirmdeckel aufgeschraubt sein.
- Das Gerät muß vorher 1 Stunde warmgelaufen sein.
- Einstellung am Gerät REF INT.
- Frequenzzähler mit genauer Referenz an X201 anschließen.
- Mit R542 Frequenz auf 10 MHz \pm 1 Hz abgleichen.

5.3 Fehlersuche

50-MHz-Quarzoszillator

V435.S : $\approx +2V$ (DC)
V460.E : 50 MHz, 5 V (U_{SS}) mit Oszilloskop
P21 : 50 MHz, TTL mit Oszilloskop

150-MHz-Trennverstärker

V485.C : $9,5 \pm 1 V$
V490.C : $9,5 \pm 1 V$
X9 : 150 MHz, -10 ± 2 dBm




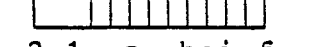
158...168,9-MHz-VCO und Trennverstärker

V275.S : $\approx +2 V$ (DC)
V290.C : $6,5 \pm 1,5 V$
V300.K : $0,4 \pm 0,2 V$
V315.C : $7,5 \pm 1,5 V$
V325.C : $9,5 \pm 1 V$
X4 : 158...168,9 MHz, $-7,5 \pm 2$ dBm
X5 : 158...168,9 MHz, -10 ± 2 dBm
X14 : 8...19 MHz, TTL

Gegentaktmischer und Ausgangsverstärker

V360,370.S: $3,5 \pm 1 V$
V390.C : $8 \pm 1,5 V$
X8 : -2 ± 1 dBm
X10 : 50 MHz, -21 ± 1 dBm
V400.K : $0,5 \pm 0,2 V$

Digitalteil N,F-Regelschleife

P1 : schmaler TTL-Puls, () , 100 kHz
P3 : TTL-Puls () , Länge 3,2 μs bei $f = 525$ MHz
P4 : TTL-Puls () , Länge ≈ 1 μs bei $f = 525$ MHz
P5 : TTL-Puls () ,
Länge 0,3...2,1 μs , bei $f = 525,025$ MHz
P6 : TTL-Puls wie bei P5, $f = 525,0025$ MHz
P7 : TTL-Puls wie bei P5, $f = 525,00025$ MHz
P8 : TTL-Puls wie bei P5, $f = 525,000025$ MHz


Bias-Stromquellen

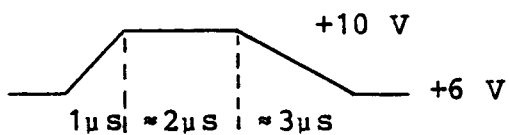
P9, P10, P11, P12: -9 ± 2 V

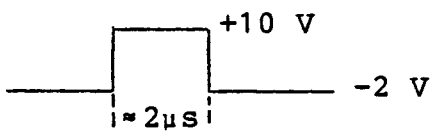
Analogteil N,F-Regelschleife

P13 : $+4,9 \pm 0,1$ V

P14 : $2,5 \pm 0,1$ V

P16 : TTL-Puls, (), Länge ≈ 2 μ s

P15 :  $f = 525$ MHz

P18 :  $f = 525$ MHz

P19, P20:

| f/MHz | U _{P19} | U _{P20} |
|-------|------------------|------------------|
| 520 | $\approx 4,9$ | 3 |
| 530 | ≈ 17 | ≈ 9 |
| 532,5 | $\approx 8,8$ | $\approx 10,4$ |
| 547 | $\approx 18,9$ | 18 |

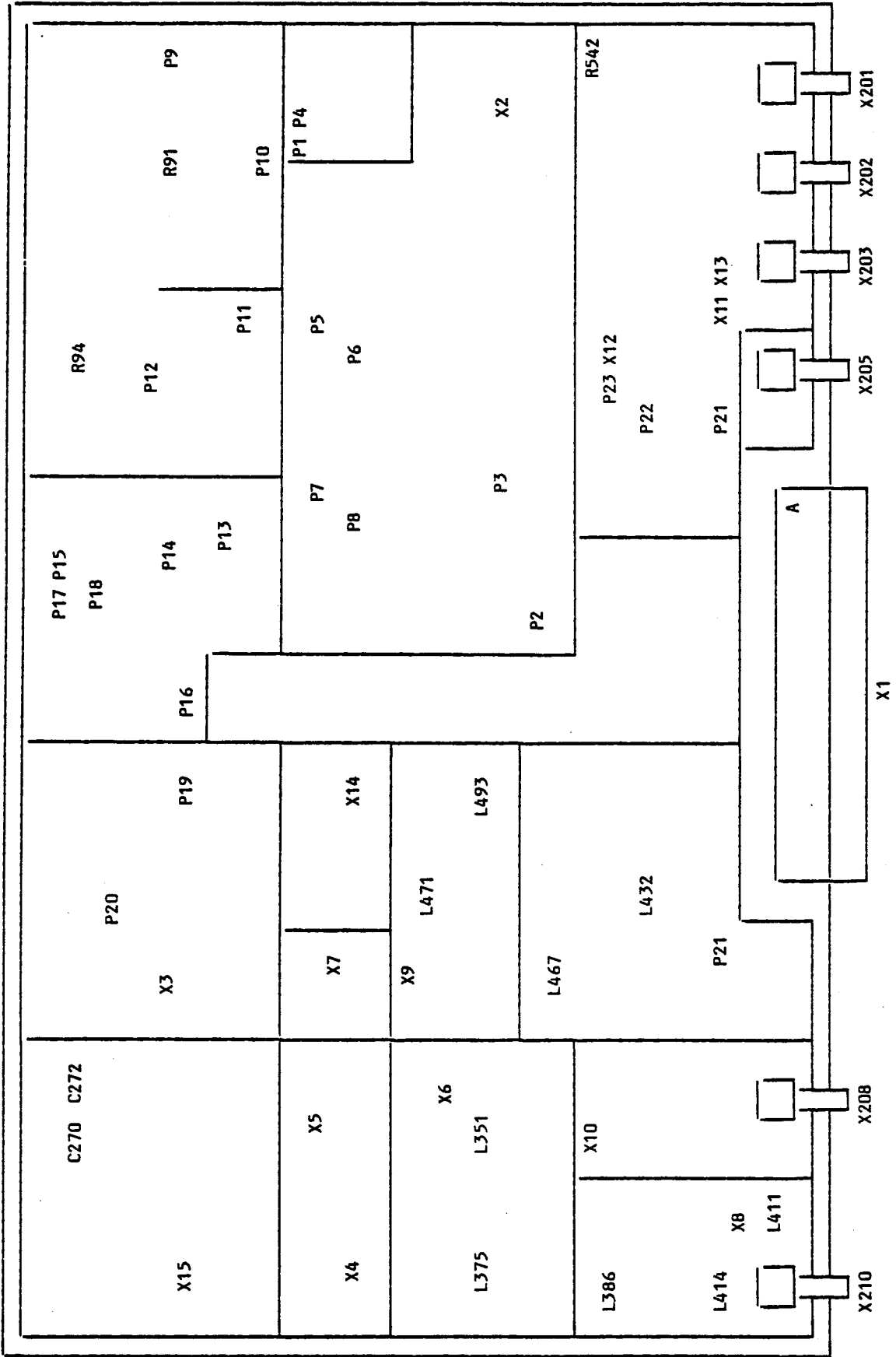


Bild 5-6 Lage der Prüf- und Trimpunkte

5.4 Schnittstellen

Analoge Schnittstellen

| Anschluß | Funktion | Frequenz | Pegel |
|----------|--|--------------------------------|-----------------------------------|
| X201 | HF-Ausgang bei REF INT HF-Eingang bei REF EXT | 5 oder 10 MHz 5 oder 10 MHz | >-3 dBm >100 mV _{eff} |
| X202 | HF-Eingang | 10 MHz | >500 mV _{SS} |
| X203 | HF-Ausgang | 50 kHz | TTL |
| X205 | HF-Ausgang | 150 MHz | 0 ±2 dBm |
| X208 | HF-Eingang | 50 MHz | ECL |
| X210 | HF-Ausgang | 208..218,9 MHz | -3 ±2 dBm |
| X1.A23 | Diagnose-Ausgang | DC | 0...5 V |
| X1.A27 | Diagnose-Eingang OCXO-Thermostat | DC | 4...6 V |

Digitale Schnittstellen

| Anschluß | Funktion | Bemerkung |
|----------|--------------|---|
| X1.A6 | Strobe | |
| X1.A8 | Dateneingang | |
| X1.A10 | Clock | |
| X1.A3 | Loop Control | FRN- und Referenzfrequenz-Regelschleife |



ROHDE & SCHWARZ

SERVICE DOCUMENTS

FRN Loop Module

801.3917.02

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5.1 Function Description

(See circuit diagram 801.3917 S and Fig. 5-3)

The FRN loop module conditions the reference frequency and contains an oscillator which generates the fine resolution of the instrument in a fractional-N control loop. Mixing of the FM oscillator also takes place on the circuit board.

5.1.1 Conditioning of the Reference Frequency

The 50-MHz crystal oscillator operates with an FET V435 in common gate configuration. The fixed frequencies required for the instrument are derived from this oscillator by multiplication or division.

The crystal signal is applied via the emitter follower V460 to the multiplier V465 with a double-tuned bandpass which filters out the third harmonic. The output voltage of the filter is divided between the two buffer amplifiers V485, V490. The 150-MHz signal is used as LO for the mixer range and to demix the VCO (E330).

The ECL line receiver D24 decouples the oscillator from the following divider D20 which divides the crystal frequency down to 10 MHz and 5 MHz. This signal is available at X201 as the reference frequency following lowpass filtering. Further division (D22) results in 100 kHz as the reference for the fractional-N control loop and 50 kHz (X203) for the FM oscillator control.

The signal at X201 is amplified to TTL level by N550 in REF EXT mode. The crystal oscillator is synchronized to this frequency via the frequency phase detector D23 and the control amplifier N530. The control voltage is replaced by an adjustable bias voltage in the REF INT mode.

5.1.2 VCO and FM Mixing

The VCO in a Clapp circuit with an FET (V275) as the active element oscillates from 158 to 168.9 MHz. Following a buffer V290, the signal is divided between the two amplifiers V315, V325 with a subsequent mixer.

The VCO is reduced in E330 to an intermediate frequency of 8 to 18.9 MHz. The signal is applied to the fractional-N control loop following lowpass filtering and amplification to TTL level.

The VCO is increased by 50 MHz to an output frequency of 208 to 218.9 MHz in the balanced mixer with V360, V370. The diode switch V500 to V503 can be used to switch between the 50-MHz FM oscillator and the crystal frequency. A tracking bandpass filter controlled by the VCO control voltage is located between the mixer and the subsequent amplifier. The selection is improved by a fixed bandpass filter at the module output.

5.1.3 Fractional-N Control Loop

Principle of operation

Occasional switching of the division factor from N to N+1 in a fractional-N divider sets the VCO frequency to a fractional multiple of the reference frequency, i.e. $f_{VCO} = N, F \cdot f_{REF}$. This method results in a high frequency resolution with a control loop.

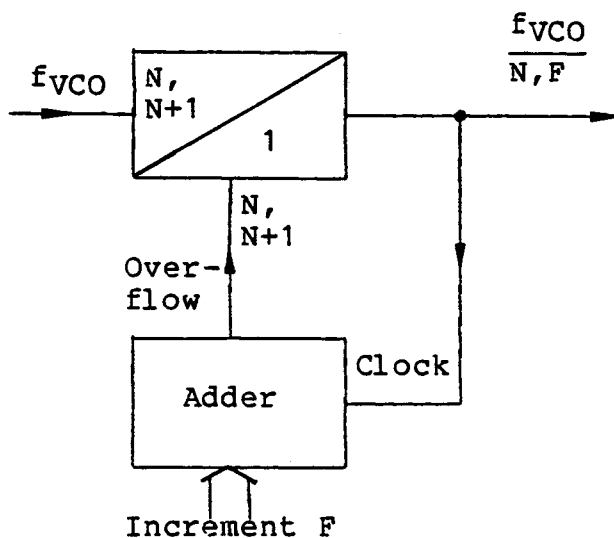


Fig. 5-1 Block diagram of N,F divider

An increment F is added upon each output pulse of the divider. Once the adder reaches a certain limit, the dividing factor is switched to N+1 for a reference frequency period.

Example:

$$F = 0.1 \Rightarrow \bar{N} = \frac{(9 \times N) + (N + 1)}{10} = N, 1 = N, F$$

A phase error is produced when the dividing factor is switched over which leads to a spurious modulation of the oscillator via the control loop. The suppression of nonharmonics can be improved by 60 to 80 dB using a compensation circuit.

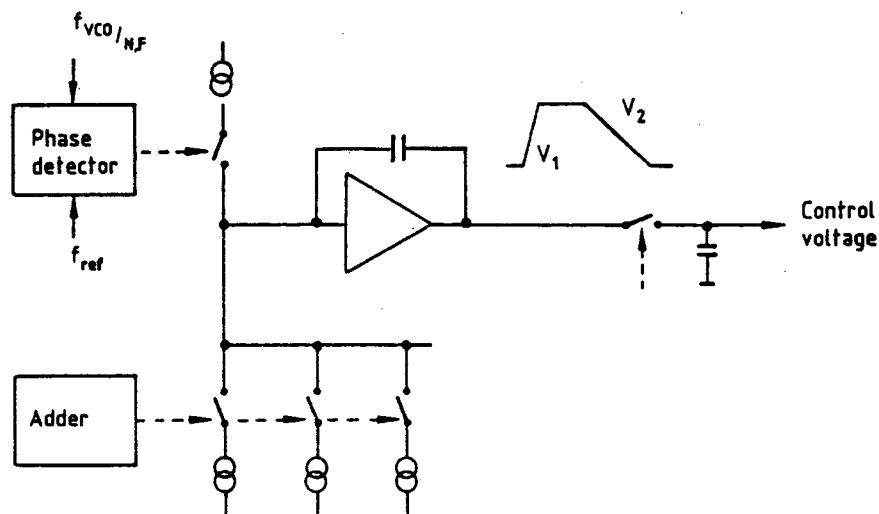


Fig. 5-2 Block diagram of N,F control loop

The output signal of the phase detector switches a current source which charges the integration capacitor from V_1 to V_2 . This voltage is sampled by the sample-and-hold circuit. The compensation current sources then discharge the integrator to V_1 . The switch-on duration of these current sources is controlled by the respective state in the adder where a current source is assigned to each position. In addition, a bias current source produces a constant phase offset in the control loop.

Circuit description

The gate array D2 contains an interface for data transmission, the N,F divider with a 6-digit adder and the control circuit for the compensation current sources of the first four digits following the decimal point.

D6 to D11 control the compensation sequence including the bias current source and the sample-and-hold circuit.

D12 and D13 synchronize the compensation pulses with the VCO pulse. The J-K flip-flop D14 operates as a frequency phase detector.

The current sources are FETs whose current is controlled via an operational amplifier. Diode switches controlled by TTL level are used to switch the currents. The most important resistors which determine the current are fitted in an array to achieve the best temperature stability.

A double sample-and-hold circuit (V140, V141) triggered by the level converter V160, V165, N146 scans the output voltage of the integrator N130 in a 100-kHz cycle. The control gain is switched over and a constant voltage added by N180 depending on the dividing factor. The window comparator N200 monitors the control voltage of the fractional-N control loop and the reference frequency control loop.

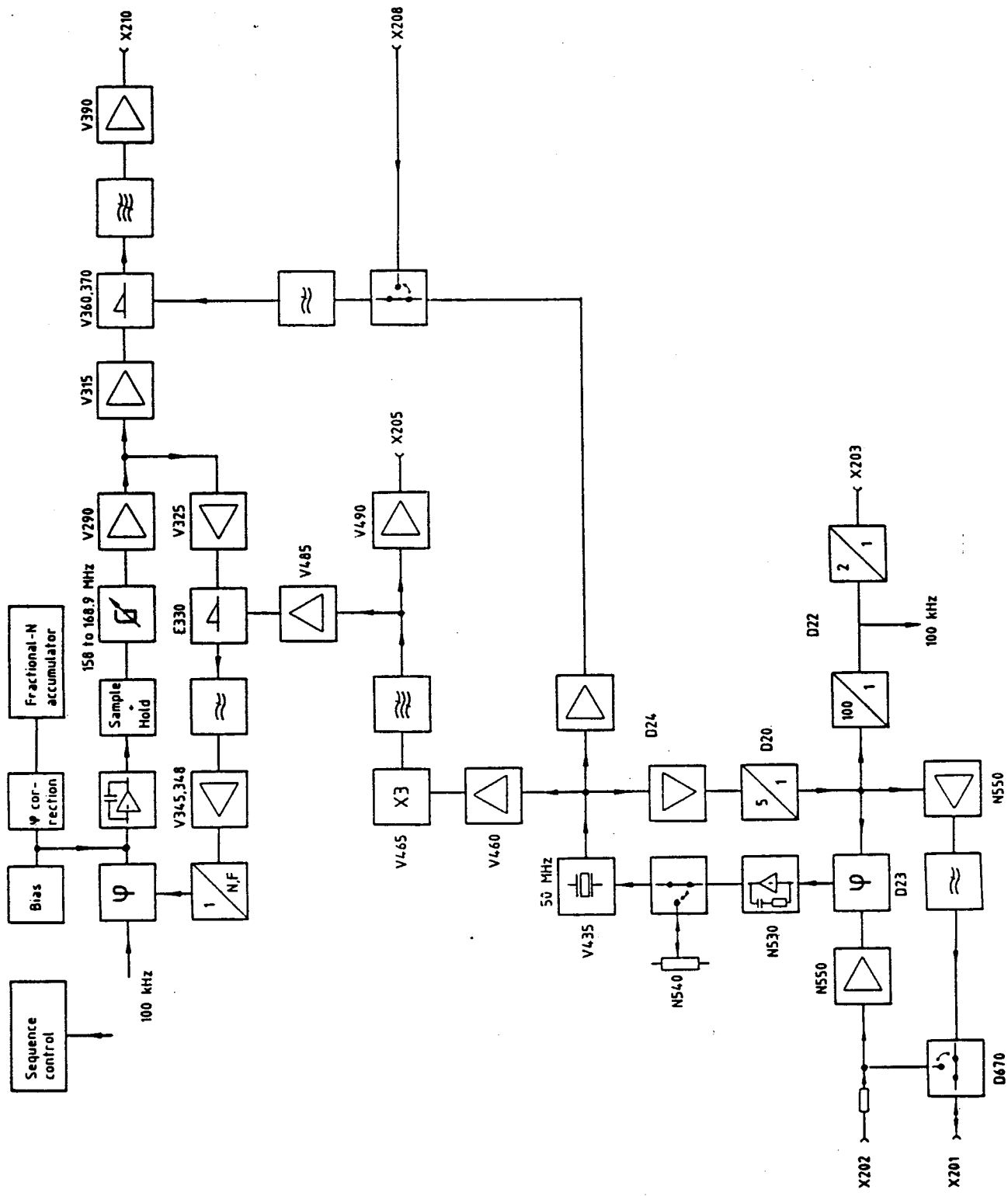


Fig. 5-3 Block diagram of FRN loop

5.2 Checking and Adjustments

5.2.1 50-MHz Crystal Oscillator (L432)

Instrument setting: REF INT

- Set the constant voltage to a maximum using R542 (P23 ≈17 V).
- Adjust the voltage at R423 to a minimum using L432 (7.8 to 8.2 V with a vibrating oscillator).

5.2.2 Reference Frequency Output (X202)

Instrument setting: REF INT

- Measure the signal at X202 using a power meter.

Correct level: >-3 dBm at 5 or 10 MHz. (Jumper X13.AB: 5 MHz, X13.BC: 10 MHz).

5.2.3 Checking the Reference Frequency Control Loop

Instrument setting: REF EXT

- Connect a signal generator (frequency error $<10^{-6}$) to X202: level -7 dBm.
- Check the control voltage at P23 at the following settings.

Table 5-1

| f _{REF EXT} /MHz | X11 | V _{p23} /V |
|---------------------------|-----|---------------------|
| 10.0000 | B-C | 9 ±2.5 |
| 10.0001 | B-C | 13 ±2.5 |
| 9.9999 | B-C | 5 ±2.5 |
| 5.0000 | A-B | 9 ±2.5 |

5.2.4 Adjustment of the 150-MHz Bandpass Filter

- Measure the signal at X205 using a spectrum analyzer.
- Adjust L467, L471, L498 to a maximum at 150 MHz.
- Repeat the adjustment of L467, L471.
Correct level at X205: 0 ±2 dBm.

5.2.5 Checking and Adjustment of the 158 to 168.9-MHz VCO

The bottom screen cover must always be screwed on when adjusting the VCO. Connect a power supply unit (0 to 20 V) to jumper X3.BC (short-circuit jumper removed, C→ground) and a frequency meter to X5 (B→ground). Adjust the VCO to the following frequency ranges using C270 and C272:

$$V_{X3} = +3 \text{ V, } f = 158 \pm 0.2 \text{ MHz}$$
$$V_{X3} = +18 \text{ V, } f = 168.9 \pm 0.2 \text{ MHz}$$

5.2.6 Adjustment of the 208 to 219-MHz Bandpass Filter

The bottom shield must always be screwed on when adjusting the bandpass filter.

Tracking bandpass filter

- Feed in a tuning voltage from a power supply unit (0 to 20 V) to X3.BC (short-circuit jumper removed, C→ground).
- Connect a sweep signal generator to X6 (B→ground) using a service adapter cable and a test probe with a 50-Ω terminator to jumper X8.A-B (short-circuit jumper removed, A→ground).
- Set potentiometer R380, R382 into centre position.
- Adjust bandpass filter to $f_0 = 208 \text{ MHz}$ at +3 V using L375, L386, and to $f_0 = 219 \text{ MHz}$ at +18 V using R380, R382.
- Repeat adjustment. Transmission loss of bandpass filter: $1 \pm 3 \text{ dB}$.

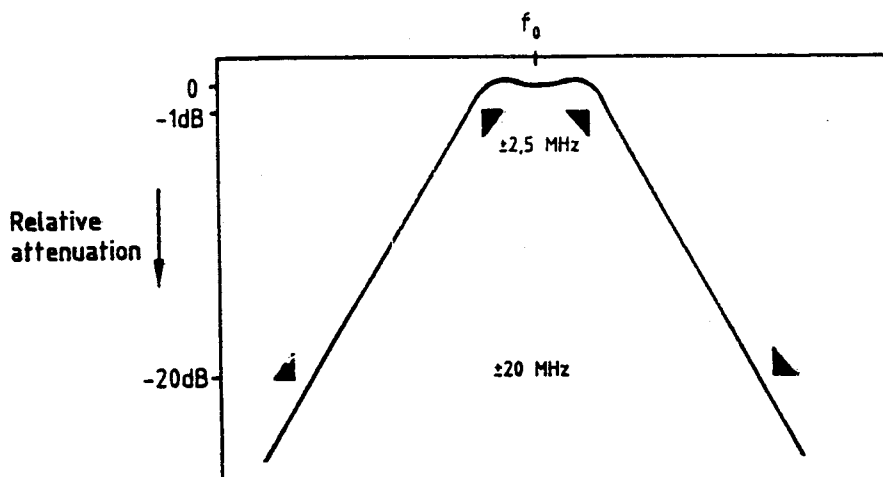


Fig. 5-4 Nominal filter response

208 to 219-MHz bandpass filter

- Connect a sweep signal generator to jumper X8.C-D using a service adapter cable and a test probe with a 50- Ω terminator to X210.
- Adjust the filter to the nominal filter response using L411, L414. Transmission loss of bandpass filter: 6 ± 1 dB.

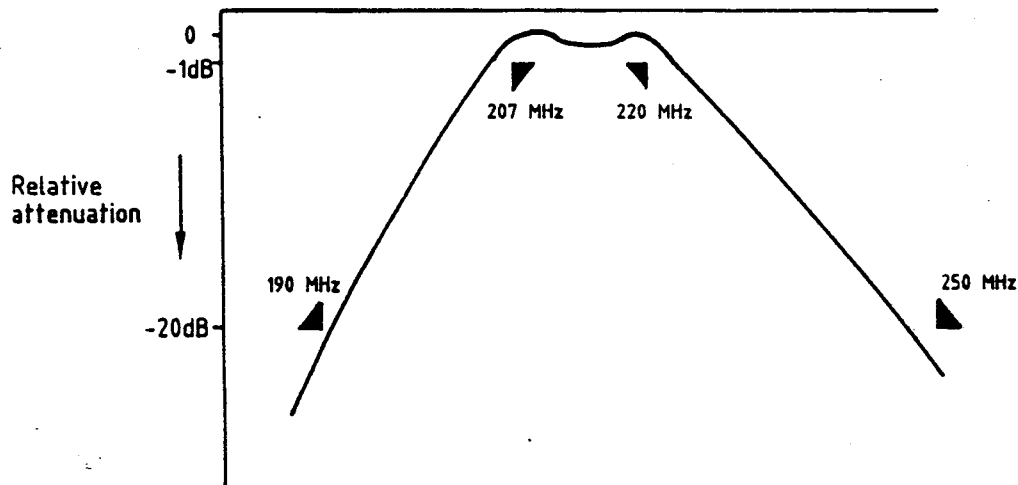


Fig. 5-5 Nominal filter response

5.2.7 Checking the Output Signal (X210) and the Mixer E330

- Insert jumpers X6 and X8.B-C.
- Instrument setting: FM off.
- Measure the signal at X210 using a spectrum analyzer.
- Adjust to maximum output level using L351.
- Vary the tuning voltage on the power supply unit (see Section 5.2.6) from 3 to 18 V; level in complete range: -2 ± 2 dBm (room temperature).
- Measure the signal at X14.A using an oscilloscope.
- Vary the voltage on the power supply unit again from 3 to 18 V; level in complete range: 8 to 19 MHz, TTL.

5.2.8 Checking the Control Loop

- Insert jumper X3 to A-B.
- Measure the control voltage at P20 at the following settings.

Table 5-2

| Frequency/MHz | Voltage V |
|---------------|-----------|
| 520 | 3 ±0.2 |
| 533 | 10.5 ±0.5 |
| 519.9 | 18 ±0.2 |

5.2.9 Adjusting and Checking the Compensation (R91, R94)

- The module must be externally synchronized for this setting with the reference of the spectrum analyzer (X201, $f = 10$ MHz, $P > -7$ dBm).
- The bottom shield must be screwed on.
- Insert jumper X15 to A-B.
- Instrument setting: FM off, REF EXT
- Connect spectrum analyzer to X210.
- Setting: reference -2 dBm,
RES BW 100 Hz,
frequency span 0 Hz,
sweep time 3 s
- Adjust the level of the nonharmonics to < -83 dBm with the following settings.

Table 5-3

| Frequency setting on instrument/MHz | Frequency setting on analyzer/MHz | Adjustment |
|-------------------------------------|-----------------------------------|------------|
| 520.0025 520.00025 | 208.002 208.0011 | R91 R94 |

- Setting on spectrum analyzer: RES BW 30 Hz,
frequency span 10 kHz
- Check the nonharmonics at $n \cdot 1$ kHz from the carrier at the frequency settings listed in Table 5-4.

Table 5-4

| Frequency setting on instrument/MHz | Frequency setting on analyzer/MHz | α /dBm |
|-------------------------------------|-----------------------------------|---------------|
| 520.000025 | 208 | <-80 |
| 624.000003 | 208 | <-80 |
| 545.0025 | 218 | <-76 |
| 545.00025 | 218 | <-76 |
| 545.000025 | 218 | <-76 |
| 648.000003 | 216 | <-76 |

5.2.10 Checking the FRN Loop Monitoring

→ Connect voltmeter to X1.A3.

N,F control voltage

→ Connect power supply unit (0 to 20 V) to jumper X3.B-C (short-circuit jumper removed, C → ground).

→ Voltage on voltmeter >4 V for 10 V applied, <1 V for 0.5 V and 20.5 V.

Reference frequency control voltage

→ Connect power supply unit to jumper X12.A-B (short-circuit jumper removed, A → ground).

→ Carry out test as for N,F control voltage.

5.2.11 Checking the Nonharmonics at X205 and X210

→ The top and bottom shields must be screwed on during this test.

→ The module is externally synchronized with the reference of the spectrum analyzer (X201, $f = 10$ MHz, $P > -7$ dBm).

→ Instrument setting: FM off, REF EXT

→ Measure the signal at X205 or X210 using a spectrum analyzer. Check the suppression of nonharmonics at the settings listed in Table 5-5.

Table 5-5

| Frequency setting on instrument/MHz | Frequency setting on analyzer/MHz | Output | α /dBm |
|-------------------------------------|-----------------------------------|--------|---------------|
| 520 | 158 | X208 | <-84 |
| 520 | 216 | X208 | <-56 |
| 520 | 266 | X208 | <-64 |
| 532.5 | 189 | X208 | <-84 |
| 532.5 | 239 | X208 | <-84 |
| 545 | 188 | X208 | <-84 |
| 545 | 136 | X208 | <-84 |
| - | 100 | X205 | <-75 |
| - | 200 | X205 | <-80 |

5.2.12 Adjustment of Reference Frequency (R542)

- The top and bottom shields must be screwed on during this adjustment.
- Allow the instrument 1 hour to warm up.
- Instrument setting: REF INT.
- Connect frequency meter with accurate reference to X201.
- Adjust frequency to 10 MHz \pm 1 Hz using R542.

5.3 Troubleshooting

50-MHz crystal oscillator

V435.S : $\approx +2V$ (DC)
V460.E : 50 MHz, 5 V (V_{pp}) with oscilloscope
P21 : 50 MHz, TTL with oscilloscope

150-MHz buffer amplifier

V485.C : 9.5 ± 1 V
V490.C : 9.5 ± 1 V
X9 : 150 MHz, -10 ± 2 dBm


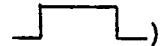


158 to 168.9-MHz VCO and buffer amplifier

V275.S : $\approx +2$ V (DC)
V290.C : 6.5 ± 1.5 V
V300.K : 0.4 ± 0.2 V
V315.C : 7.5 ± 1.5 V
V325.C : 9.5 ± 1 V
X4 : 158 to 168.9 MHz, -7.5 ± 2 dBm
X5 : 158 to 168.9 MHz, -10 ± 2 dBm
X14 : 8 to 19 MHz, TTL

Balanced mixer and output amplifier

V360,370.S: 3.5 ± 1 V
V390.C : 8 ± 1.5 V
X8 : -2 ± 1 dBm
X10 : 50 MHz, -21 ± 1 dBm
V400.K : 0.5 ± 0.2 V

Digital unit of N,F control loop

P1 : Narrow TTL pulse, () , 100 kHz
P3 : TTL pulse () , length 3.2 μs at $f = 525$ MHz
P4 : TTL pulse () , length ≈ 1 μs at $f = 525$ MHz
P5 : TTL pulse () ,
length 0.3 to 2.1 μs , at $f = 525.025$ MHz
P6 : TTL pulse as with P5, $f = 525.0025$ MHz
P7 : TTL pulse as with P5, $f = 525.00025$ MHz
P8 : TTL pulse as with P5, $f = 525.000025$ MHz


Bias current sources

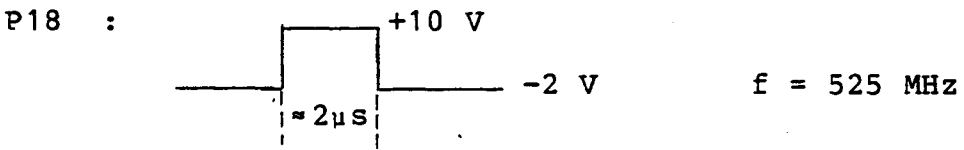
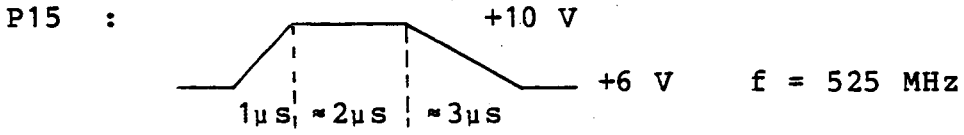
P9, P10, P11, P12: -9 ± 2 V

Analog unit of N,F control loop

P13 : $+4.9 \pm 0.1$ V

P14 : 2.5 ± 0.1 V

P16 : TTL pulse (, length $\approx 2 \mu\text{s}$



P19,P20:

| f/MHz | V _{P19} | V _{P20} |
|-------|------------------|------------------|
| 520 | ≈ 4.9 | 3 |
| 530 | ≈ 17 | ≈ 9 |
| 532.5 | ≈ 8.9 | ≈ 10.4 |
| 547 | ≈ 18.9 | 18 |

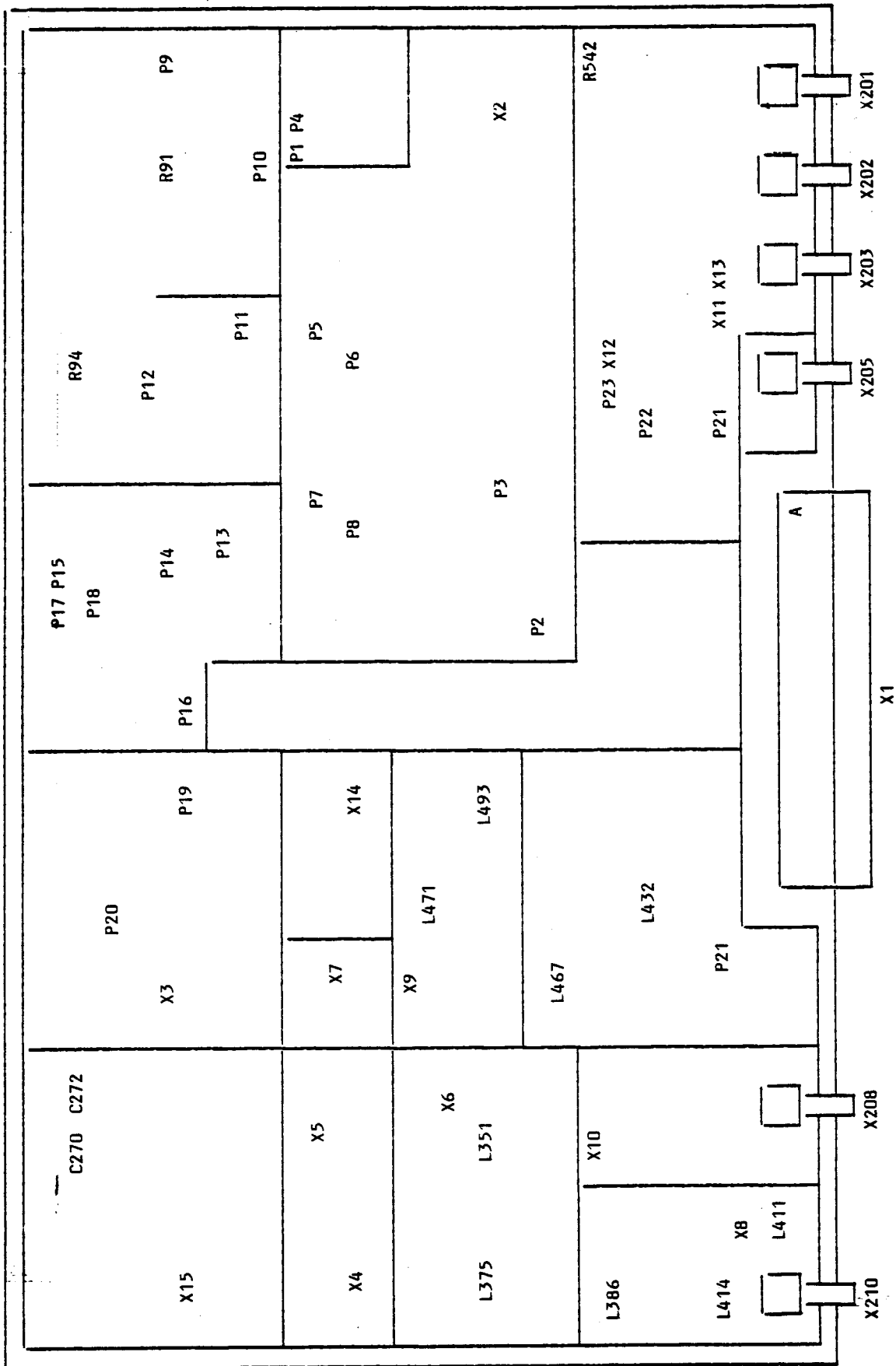


Fig. 5-6 Locations of the test points and trimmers

5.4 Interfaces

Analog interfaces

| Pin | Function | Frequency | Level |
|--------|---|----------------------------|-----------------------------------|
| X201 | RF output with REF INT RF input with REF EXT | 5 or 10 MHz 5 or 10 MHz | >-3 dBm >100 mV _{rms} |
| X202 | RF input | 10 MHz | >500 mV _{pp} |
| X203 | RF output | 50 kHz | TTL |
| X205 | RF output | 150 MHz | 0 ±2 dBm |
| X208 | RF input | 50 MHz | ECL |
| X210 | RF output | 208 to 218.9 MHz | -3 ±2 dBm |
| X1.A23 | Diagnosis output | DC | 0 to 5 V |
| X1.A27 | Diagnosis input OCXO thermostat | DC | 4 to 6 V |


Digital interfaces

| Pin | Function | Remarks |
|--------|--------------|--------------------------------|
| X1.A6 | Strobe | |
| X1.A8 | Data input | |
| X1.A10 | Clock | |
| X1.A3 | Loop control | FRN and reference control loop |

Schaltteillisten
Stromläufe
Bestückungspläne
Part lists
Circuit diagrams
Components plans
Listes des pièces détachées
Schémas de Circuit
Plans des composants

Für diese Unterlage behalten wir uns alle Rechte vor.

| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| B435 | BD QUARZ MIT THERMOSTAT CRYSTAL WITH THERMOSTAT | 0801.8402.00 | | | |
| C3 | CC 22PF+-2%4X5NPO CAPACITOR | CC 0087.6464.00 | PHILIPS_CO | 2222 678 | |
| C4 | CC 22PF+-2%4X5NPO CAPACITOR | CC 0087.6464.00 | PHILIPS_CO | 2222 678 | |
| C5 | CC 22PF+-2%4X5NPO CAPACITOR | CC 0087.6464.00 | PHILIPS_CO | 2222 678 | |
| C6 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |
| C7 | CC 47PF+-2%5X6NPO CAPACITOR | CC 0087.6506.00 | PHILIPS_CO | 2222 678 | |
| C8 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |
| C9 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |
| C10 | CC 180PF+-2%6X7N750 CAPACITOR | CC 0087.6935.00 | PHILIPS_CO | 2222 678 58181 | |
| C14 | CC 22PF+-2%4X5NPO CAPACITOR | CC 0087.6464.00 | PHILIPS_CO | 2222 678 | |
| C16 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C20 | CC 68PF+-2%6X7NPO CAPACITOR | CC 0087.6529.00 | PHILIPS_CO | 2222 678 | |
| C25 | CC 68PF+-2%6X7NPO CAPACITOR | CC 0087.6529.00 | PHILIPS_CO | 2222 678 | |
| C35 | CC 15PF+-2%3X4NPO CAPACITOR | CC 0087.6441.00 | PHILIPS_CO | 2222 678 | |
| C40 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C41 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C43 | CK 470NF+-5%63V RD5H10MKT CAPACITOR | CK 0099.2975.00 | SIEMENS | B 32 529-A474-J | |
| C44 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C51 | CK 470NF+-5%63V RD5H10MKT CAPACITOR | CK 0099.2975.00 | SIEMENS | B 32 529-A474-J | |
| C52 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C60 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C61 | CK 470NF+-5%63V RD5H10MKT CAPACITOR | CK 0099.2975.00 | SIEMENS | B 32 529-A474-J | |
| C62 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C66 | CK 47NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2917.00 | SIEMENS | B 32529-C473-J | |
| C67 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C70 | CE 2,2UF+-20%35V 7X 5X11 ELECTROLYTIC CAPACITOR | CE 0022.8191.00 | KEMET | T340 B225M040 AS | |
| C92 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C100 | CE 2,2UF+-20%35V 7X 5X11 ELECTROLYTIC CAPACITOR | CE 0022.8191.00 | KEMET | T340 B225M040 AS | |
| C120 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C121 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C123 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C124 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C130 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C131 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C132 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C136 | CK 1,0NF +-1% 100V RM5 KP POLYPROPYLENE CAPACITOR | CK 0007.7598.00 | ROEDERSTEI | KP1830-210 01 1 3 W | |
| C137 | CK 150NF+-5%63VRD3,5H9MKT CAPACITOR | CK 0099.2946.00 | SIEMENS | B 32 529-A154-J | |
| C140 | CK 1,0NF +-1% 100V RM5 KP POLYPROPYLENE CAPACITOR | CK 0007.7598.00 | ROEDERSTEI | KP1830-210 01 1 3 W | |


| | | | | | | |
|---|----------|----|------------|------------------------------------|------------------------|----------------|
| MEZ15 | 790 3PLU | Äi | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | | 66 | 03.05.99 | EE FRN LOOP | 0801.3917.01 SA | 1+ |

095.0026-0693

| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| C141 | CC 3,9PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6370.00 | PHILIPS_CO | 2222 678 | |
| C142 | TRIMMWERT/SELECTED CC 100PF+-2%4X5N750 CAPACITOR | CC 0087.6906.00 | PHILIPS_CO | 2222 678 58101 | |
| C163 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C170 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C171 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C172 | CK 2,2NF +-1% 100V RM5 KP POLYPROPYLENE CAPACITOR | CK 0007.7617.00 | ROEDERSTEI | KP1830-222 01 1 3 W | |
| C173 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C174 | CK 68NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2923.00 | SIEMENS | B 32 529-A683-J | |
| C176 | CC 330PF+-10%3X4R2000 CAPACITOR | CC 0087.6970.00 | PHILIPS_CO | 2222 630 51331 | |
| C181 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C202 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C205 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C212 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C214 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C215 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C216 | CE 220UF+-20%16V RM5 ELECTROLYTIC CAPACITOR | 0008.7562.00 | FROLYT | EKS00CC322DG | |
| C217 | CE 220UF+-20%16V RM5 ELECTROLYTIC CAPACITOR | 0008.7562.00 | FROLYT | EKS00CC322DG | |
| C218 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C219 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C220 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C221 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C222 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C223 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C231 | CE 47UF+-20%6,3V SAL ELECTR.CAPACITOR | CE 0007.3957.00 | VALVO | 2222 128 33479 | |
| C232 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C235 | CE 47UF+-20%6,3V SAL ELECTR.CAPACITOR | CE 0007.3957.00 | VALVO | 2222 128 33479 | |
| C236 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C238 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C239 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C241 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C242 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C243 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C244 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C245 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C247 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C260 | CK 68NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2923.00 | SIEMENS | B 32 529-A683-J | |
| C261 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C262 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| C265 | CK 1UF+-5%50V7, 5X5, 5X10, 5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C266 | CK 1UF+-5%50V7, 5X5, 5X10, 5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C267 | CK 1UF+-5%50V7, 5X5, 5X10, 5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C270 | CT 13PF TAUCHTR.RD7X12 AIR-TYPE TRIMMER | CT 0092.4266.00 | TEKELEC | TL 244 | |
| C272 | CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER | CT 0025.7373.00 | TEKELEC | TL 191 | |
| C274 | CC 7PF+-0,5PF N150/IB RD5 CERAMIC CAPACITOR | 0006.0231.00 | DRALORIC | SDPN 5 | |
| C275 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C276 | CC 22PF 2% N750/IA 3ROHR CERAMIC CAPACITOR | 0022.3402.00 | DRALORIC | RDLL 3X10 | |
| C277 | CC 15PF+-2%N750/IA3ROHR CERAMIC CAPACITOR | 0022.3383.00 | DRALORIC | RDLL 3X10 | |
| C278 | CC 1,5PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6193.00 | PHILIPS_CO | 2222 678 | |
| C279 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C280 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C281 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C285 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C286 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C290 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C293 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C300 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C302 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C310 | CC 330PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8873.00 | AVX | 1206 5A 331 F 3 | |
| C312 | CC 3,3PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6364.00 | PHILIPS_CO | 2222 678 | |
| C317 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C318 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C319 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C320 | CC 330PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8873.00 | AVX | 1206 5A 331 F 3 | |
| C322 | CC 1PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6170.00 | PHILIPS_CO | 2222 678 | |
| C323 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C327 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C328 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C340 | CC 100PF+-2%4X5N750 CAPACITOR | CC 0087.6906.00 | PHILIPS_CO | 2222 678 58101 | |
| C341 | CC 150PF+-2%5X6N750 CAPACITOR | CC 0087.6929.00 | PHILIPS_CO | 2222 678 58151 | |
| C342 | CC 150PF+-2%5X6N750 CAPACITOR | CC 0087.6929.00 | PHILIPS_CO | 2222 678 58151 | |
| C343 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C345 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C347 | CK 100NF+-5%63VRD2, 5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C348 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C350 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C351 | CC 68PF+-2%6X7NPO CAPACITOR | CC 0087.6529.00 | PHILIPS_CO | 2222 678 | |
| C352 | CC 68PF+-2%6X7NPO CAPACITOR | CC 0087.6529.00 | PHILIPS_CO | 2222 678 | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| C360 | CC 100PF+-2%4X5N750 CAPACITOR | CC 0087.6906.00 | PHILIPS_CO | 2222 678 58101 | |
| C361 | CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8444.00 | AVX | 1206 5 C 222 KA 3 | |
| C362 | CC 100PF+-2%4X5N750 CAPACITOR | CC 0087.6906.00 | PHILIPS_CO | 2222 678 58101 | |
| C363 | CC 1,2PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6187.00 | PHILIPS_CO | 2222 678 | |
| C364 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C365 | CC 5,6PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6393.00 | PHILIPS_CO | 2222 678 | |
| C366 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C367 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C370 | CC 100PF+-2%4X5N750 CAPACITOR | CC 0087.6906.00 | PHILIPS_CO | 2222 678 58101 | |
| C371 | CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8444.00 | AVX | 1206 5 C 222 KA 3 | |
| C372 | CC 100PF+-2%4X5N750 CAPACITOR | CC 0087.6906.00 | PHILIPS_CO | 2222 678 58101 | |
| C373 | CC 1,2PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6187.00 | PHILIPS_CO | 2222 678 | |
| C374 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C375 | CC 5,6PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6393.00 | PHILIPS_CO | 2222 678 | |
| C376 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C384 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C385 | CC 5,6PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6393.00 | PHILIPS_CO | 2222 678 | |
| C386 | CC 3,9PF/0,25PF63V3X5N750 CAPACITOR | CC 0099.5568.00 | PHILIPS_CO | 2222 678 57398 | |
| C387 | CC 1,5PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6193.00 | PHILIPS_CO | 2222 678 | |
| C390 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C391 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C392 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C395 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C396 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C400 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C401 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C410 | CC 10PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6429.00 | PHILIPS_CO | 2222 678 10109 | |
| C411 | CC 2,2PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6341.00 | PHILIPS_CO | 2222 678 | |
| C412 | CC 1,8PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6206.00 | VALVO | 2222 678 | |
| C413 | CC 6,8PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6406.00 | PHILIPS_CO | 2222 678 | |
| C414 | CC 2,2PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6341.00 | PHILIPS_CO | 2222 678 | |
| C422 | CC 2,2NF+-10%5X6R2000 CAPACITOR | CC 0087.7060.00 | PHILIPS_CO | 2222 630 51222 | |
| C424 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C430 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C431 | CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8444.00 | AVX | 1206 5 C 222 KA 3 | |
| C432 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C433 | CC 150PF+-2%6X9N150 CAPACITOR | CC 0087.6735.00 | PHILIPS_CO | 2222 678 34151 | |
| C434 | CC 82PF+-2%4X5N750 CAPACITOR | CC 0087.6893.00 | VALVO | 2222 678 58829 | |
| C436 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| C437 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C438 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C439 | CC 18PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8767.00 | MURATA | GRM42-6COG 180F50ZPT | |
| C440 | CC 18PF+-2%3X4NPO CAPACITOR | CC 0087.6458.00 | PHILIPS_CO | 2222 678 | |
| C441 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C442 | CE 47UF+-20%6,3V SAL ELECTR.CAPACITOR | CE 0007.3957.00 | VALVO | 2222 128 33479 | |
| C444 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C445 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C446 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C450 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C455 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C456 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C460 | CC 2,2NF+-10%5X6R2000 CAPACITOR | CC 0087.7060.00 | PHILIPS_CO | 2222 630 51222 | |
| C462 | CC 2,2NF+-10%5X6R2000 CAPACITOR | CC 0087.7060.00 | PHILIPS_CO | 2222 630 51222 | |
| C463 | CC 27PF+-2%4X5NPO CAPACITOR | CC 0087.6470.00 | PHILIPS_CO | 2222 678 | |
| C465 | CC 2,2NF+-10%5X6R2000 CAPACITOR | CC 0087.7060.00 | PHILIPS_CO | 2222 630 51222 | |
| C466 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C467 | CC 10PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6429.00 | PHILIPS_CO | 2222 678 10109 | |
| C468 | CC 1PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6170.00 | PHILIPS_CO | 2222 678 | |
| C470 | CC 1PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6170.00 | PHILIPS_CO | 2222 678 | |
| C471 | CC 1PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6170.00 | PHILIPS_CO | 2222 678 | |
| C472 | CC 12PF+-2%3X4NPO CAPACITOR | CC 0087.6435.00 | VALVO | 2222 678 | |
| C480 | CC 330PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8873.00 | AVX | 1206 5A 331 F 3 | |
| C483 | CC 1PF+-0,25PF3X4P100 CAPACITOR | CC 0087.6170.00 | PHILIPS_CO | 2222 678 | |
| C485 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C487 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C488 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C490 | CC 330PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8873.00 | AVX | 1206 5A 331 F 3 | |
| C492 | CC 2,7PF+-0,25PF3X4NPO CERAMIC CAPACITOR | CC 0087.6358.00 | PHILIPS_CO | 2222 678 | |
| C493 | CC 12PF+-2%3X4NPO CAPACITOR | CC 0087.6435.00 | VALVO | 2222 678 | |
| C498 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C500 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C501 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C502 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C503 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C504 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C510 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C511 | CC 56PF+-2%5X6NPO CAPACITOR | CC 0087.6512.00 | PHILIPS_CO | 2222 678 | |
| C512 | CC 120PF+-2%6X9NPO CAPACITOR | CC 0087.6558.00 | PHILIPS_CO | 2222 678 10121 | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| C513 | CC 68PF+-2%6X7NPO CAPACITOR | CC 0087.6529.00 | PHILIPS_CO | 2222 678 | |
| C514 | CC 18PF+-2%3X4NPO CAPACITOR | CC 0087.6458.00 | PHILIPS_CO | 2222 678 | |
| C520 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C521 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C522 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C523 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C524 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C525 | CC 330PF+-2%6X9N750 CERAMIC CAPACITOR | CC 0087.6964.00 | PHILIPS_CO | 2222 678 58331 | |
| C530 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C533 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C534 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C536 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C537 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C538 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C541 | CE 6,8UF+-20%35V 7X 5X11 ELECTROLYTIC CAPACITOR | CE 0087.9392.00 | KEMET | T340 C685M040 AS | |
| C550 | CC 270PF+-2%6X9N750 CAPACITOR | CC 0087.6958.00 | PHILIPS_CO | 2222 631 58271 | |
| C551 | CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C552 | CC 270PF+-2%6X9N750 CAPACITOR | CC 0087.6958.00 | PHILIPS_CO | 2222 631 58271 | |
| C553 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C561 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C570 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C574 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C575 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C580 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C581 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C590 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C592 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C593 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C560 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| D1 | BL MM74HCOON 4X2IN.NAND QUAD 2-INPUT NAND GATE | 0571.3194.00 | PHILIPS_SE | (PC)74HCOON(P) | |
| D2 | BG SCX6225QLZ GATEARRAY GATE ARRAY | 0007.4947.00 | NSC | SCX6225QLZ-V2 | |
| D3 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D3 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 | 0586.7726.00 | RCA | CD4094BE | |
| D4 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D4 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 | 0586.7726.00 | RCA | CD4094BE | |
| D5 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |

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| D5 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER | 0586.7726.00 | RCA | CD4094BE | |
| D6 | NUR VAR/ONLY MOD: 04 BL PC74HC123 2XMULTIVIB DUAL MONOST.MULTIVIBRATOR | 0099.9540.00 | PHILIPS_SE | (PC)74HC123N(P) | |
| D7 | BL 74F74PC 2XD-FLIPFLOP DUAL D-FLIPFLOP | 0344.6694.00 | PHILIPS_SE | N74F74N | |
| D8 | BL 74F191PC U/D-BIN.CNT UP/DOWN BIN.-COUNTER | 0344.6871.00 | PHILIPS_SE | (N)74F191N | |
| D9 | BL 74F191PC U/D-BIN.CNT UP/DOWN BIN.-COUNTER | 0344.6871.00 | PHILIPS_SE | (N)74F191N | |
| D10 | BL 74F374PC 8B.D-FLIPF 3S 8BIT-D-REGISTER | 0344.6642.00 | PHILIPS_SE | N74F374N | |
| D11 | BL MM74HCOON 4X2IN.NAND QUAD 2-INPUT NAND GATE | 0571.3194.00 | PHILIPS_SE | (PC)74HCOON(P) | |
| D12 | BL PC74HCT74P 2XD-FF DUAL D-FLIP-FLOP | 0571.3436.00 | PHILIPS_SE | (PC)74HCT74N(P) | |
| D13 | BL PC74HCT74P 2XD-FF DUAL D-FLIP-FLOP | 0571.3436.00 | PHILIPS_SE | (PC)74HCT74N(P) | |
| D14 | BL MM74HC112N 2XJK-FF DUAL J-K FLIPFLOP | 0099.9770.00 | PHILIPS_SE | (PC)74HC112N(P) | |
| D15 | BL MM74HC4051N 8CH.AN.MUX 8CH.ANALOG MUX/DEMUX | 0099.9670.00 | PHILIPS | (PC)74HC4051N(P) | |
| D16 | BL MM74HC74N 2XD-FLIPFL DUAL D FLIP-FLOP | 0571.3171.00 | PHILIPS_SE | (PC)74HC74N(P) | |
| D17 | BL MM74HCOON 4X2IN.NAND QUAD 2-INPUT NAND GATE | 0571.3194.00 | PHILIPS_SE | (PC)74HCOON(P) | |
| D18 | BL MM74HC191N U/D BI.CTR UP/DOWN BINARY COUNTER | 0099.9586.00 | PHILIPS_SE | (PC)74HC191N(P) | |
| D20 | BL 74F161PC 4B.BIN.CNT 4BIT SYNC.PRES.BIN.COUNT. | 0344.7103.00 | PHILIPS_SE | (N)74F161AN | |
| D22 | BL MM74HC390N 2X4B.COUNT DUAL 4-BIT DECADE COUNTER | 0099.9640.00 | PHILIPS_SE | (PC)74HC390N(P) | |
| D23 | BL MC4044P PHASE-L-L PHASE LOCKED LOOP | BL 0443.2980.00 | MOTOROLA | MC4044P | |
| D24 | BL MC10116L 3XL. RECEIV LINE RECEIVER | BL 0282.3275.00 | MOTOROLA | MC10116L | |
| D540 | BS TL604CP 2X ANALOGSCH ANALOG SWITCH | BJ 0300.6199.00 | TEXAS | TL604CP | |
| E330 | BM SRA1 MIXER 0.5GHZ MIXER | BM 0207.3465.00 | MINI-CIRCU | SRA1 | |
| K580 | SR 5V2000HM 1MAL UM 1 REED RELAY | SR 0267.5364.00 | HAMLIN | HE721C0520 | |
| L3 | LD 2,20UH10%,400HMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |
| L4 | LD 2,20UH10%,400HMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |
| L5 | LD 2,20UH10%,400HMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |
| L20 | LD 0,33UH10%,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L25 | LD 0,33UH10%,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L35 | LD 1,20UH10%,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |
| L215 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L218 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L231 | LD 3,30UH10%,850HMO,285A CHOKE | LD 0067.2928.00 | DALE | IM2 | |
| L235 | LD 1,20UH10%,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |
| L239 | LD 1,20UH10%,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |
| L241 | LD 1,20UH10%,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |
| L244 | LD 1,20UH10%,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |
| L250 | LD 2,20UH10%,400HMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |
| L251 | LD UKW-DR.Z=750 OHM 50MHZ CHOKE | LD 0026.4578.00 | FASTRON_GE | 06H-751X-00 | |
| L270 | LD 2,20UH10%,400HMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |

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| L271 | LD UKW-DR.Z=750 OHM 50MHZ CHOKE | LD 0026.4578.00 | FASTRON_GE | 06H-751X-00 | |
| L272 | LD 66NH 2,5W CM38P FE-K CHOKE | 0303.9199.00 | TOKO | 301SS-0200 | |
| L273 | LD 2,20UH10%0,400HMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |
| L274 | LD UKW-DR.Z=750 OHM 50MHZ CHOKE | LD 0026.4578.00 | FASTRON_GE | 06H-751X-00 | |
| L277 | LD 3,90UH10%1,000HMO,263A CHOKE | LD 0067.2934.00 | DALE | IM2 | |
| L285 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L312 | LD 0,15UH10%0,100HM1,230A CHOKE | LD 0067.2763.00 | DALE | IM2 | |
| L317 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L323 | LD 0,15UH10%0,100HM1,230A CHOKE | LD 0067.2763.00 | DALE | IM2 | |
| L327 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L340 | LD 0,82UH10%0,850HMO,420A CHOKE | LD 0067.2857.00 | DALE | IM2 | |
| L341 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |
| L342 | LD 0,82UH10%0,850HMO,420A CHOKE | LD 0067.2857.00 | DALE | IM2 | |
| L347 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L350 | LL SPULE 2,5 WDG COIL | 0801.4871.00 | | | 0801.3946.00 |
| L351 | LD 287NH 8,5W CM18P FE-K COIL+CORE | 0613.6289.00 | TOKO | E521HN080023 | |
| L364 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L367 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L374 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L375 | LD 115NH 4,4W CM22P FE-K CHOKE | 0300.6601.00 | TOKO | E521 HN-040023 | |
| L376 | LL SPULE 1,5 WDG COIL | 0801.4888.00 | | | 0801.3946.00 |
| L385 | LD 0,47UH10%0,350HMO,660A CHOKE | LD 0067.2828.00 | DALE | IM2 | |
| L386 | LD 53NH 2,5W CM47P FE-K CHOKE | 0300.6653.00 | TOKO | E521 HN-020023 | |
| L395 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L410 | LD 0,18UH10%0,120HM1,120A CHOKE | LD 0067.2770.00 | DALE | IM2 | |
| L411 | LD 53NH 2,5W CM47P FE-K CHOKE | 0300.6653.00 | TOKO | E521 HN-020023 | |
| L414 | LD 53NH 2,5W CM47P FE-K CHOKE | 0300.6653.00 | TOKO | E521 HN-020023 | |
| L430 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L432 | LD 188NH 11,5W CM13P5 ALU MOLDED COIL+ALU-CORE | 0801.3952.00 | TOKO | E521 AN-110013 | |
| L435 | LD 2,20UH10%0,400HMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |
| L436 | LD 0,82UH10%0,850HMO,420A CHOKE | LD 0067.2857.00 | DALE | IM2 | |
| L437 | 0.56UH/LD 067.2834 0.68UH/LD 067.2840 LD 5,60UH10%1,800HMO,195A CHOKE | LD 0067.2957.00 | DALE | IM2 | |
| L438 | LD 5,60UH10%1,800HMO,195A CHOKE | LD 0067.2957.00 | DALE | IM2 | |
| L455 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L465 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L467 | LD 85NH 3,5W CM30P FE-K COI-CORE | 0801.4865.00 | TOKO | E521 HN-030023 | |
| L471 | LD 85NH 3,5W CM30P FE-K COI-CORE | 0801.4865.00 | TOKO | E521 HN-030023 | |
| L472 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |

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|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| L480 | LD 1,00UH10%1,00OHMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | |
| L485 | LD 0,15UH10%0,100HM1,230A CHOKE | LD 0067.2763.00 | DALE | IM2 | |
| L487 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L492 | LD 85NH 3,5W CM30P FE-K COI-CORE | 0801.4865.00 | TOKO | E521 HN-030023 | |
| L493 | LD 0,47UH10%0,35OHMO,660A CHOKE | LD 0067.2828.00 | DALE | IM2 | |
| L498 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L511 | LD 0,15UH10%0,100HM1,230A CHOKE | LD 0067.2763.00 | DALE | IM2 | |
| L512 | LD 0,18UH10%0,120HM1,120A CHOKE | LD 0067.2770.00 | DALE | IM2 | |
| L521 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L522 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L550 | LD 1,50UH10%0,22OHMO,560A CHOKE | LD 0067.2886.00 | DALE | IM2 | |
| L551 | LD 1,50UH10%0,22OHMO,560A CHOKE | LD 0067.2886.00 | DALE | IM2 | |
| L560 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L592 | LD 3,30UH10%0,85OHMO,285A CHOKE | LD 0067.2928.00 | DALE | IM2 | |
| N40 | BO OPO7CP OPAMP OPERATIONAL AMPLIFIER | BO 0394.8884.00 | PMI | OP 07 CP | |
| N50 | BO OPO7CP OPAMP OPERATIONAL AMPLIFIER | BO 0394.8884.00 | PMI | OP 07 CP | |
| N60 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N120 | BO NE5532AFE 2XLN OPAMP OPERATIONAL AMPLIFIER | BO 0356.0450.00 | SIGNETICS | NE5532AFE | |
| N130 | BO LM318P OPAMP OPERATIONAL AMPLIFIER | 0280.2459.00 | TEXAS | LM318P | |
| N145 | AK CA3146AE 5XN TR.ARRAY TRANSISTOR ARRAY | AK 0249.6633.00 | RCA | CA3146AE | |
| N170 | BO NE5532AFE 2XLN OPAMP OPERATIONAL AMPLIFIER | BO 0356.0450.00 | SIGNETICS | NE5532AFE | |
| N180 | BS TL191CN 4X ANALOGSCH ANALOG SWITCH | BJ 0300.6182.00 | TEXAS | TL191CN | |
| N200 | BO LM339N 4X COMPAR COMPARATOR | 0342.2062.00 | NSC | LM339N | |
| N520 | BO RC4558DN 2X OPAMP OPERATIONAL AMPLIFIER | BO 0475.1672.00 | TEXAS_INST | RC4558P | |
| N530 | BO LF411CN FET OPAMP OPERATIONAL AMPLIFIER | 0349.3058.00 | NSC | LF411CN | |
| N550 | BJ SN75140P 2XLINE REC LINE RECEIVER | 0801.8254.00 | TEXAS | SN75140P | |
| P1 ..24 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| R3 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | |
| R4 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | |
| R5 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | |
| R9 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R10 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R14 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | |
| R15 | RL 0,60W 221 KOHM+-1%TK50 RESISTOR | RL 0083.2270.00 | RESISTA | MK2 | |
| R16 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R17 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R19 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |


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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| R20 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R21 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R25 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R26 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R27 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R28 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R35 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | |
| R36 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R37 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R40 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | |
| R41 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | |
| R42 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R43 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R44 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R45 | RN 1X30K1/4X3K/1X2,74K/2X RESISTOR NETWORK | 0801.4842.00 | EBG | UPRN 11 | |
| R50 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R51 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R52 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R60 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R61 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R62 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R65 | RL 0,60W 301 KOHM+-1%TK50 RESISTOR | RL 0083.2406.00 | RESISTA | MK2 | |
| R66 | RL 0,60W 301 KOHM+-1%TK50 RESISTOR | RL 0083.2406.00 | RESISTA | MK2 | |
| R67 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R68 | RL 0,35W29,8KOHM+-0,1%T25 RESISTOR | RL 0084.3970.00 | DRALORIC | SMA0207 | |
| R70 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R71 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R75 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R83 | RL 0,60W 68,1KOHM+-1%TK50 RESISTOR | RL 0082.2602.00 | RESISTA | MK2 | |
| R90 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | |
| R91 | RS 0,3W 10KOHM+-10%TCERMET TRIMMING POTENTIOMETER | RS 0006.9145.00 | BI_TECHNOL | 67W | |
| R92 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R93 | RL 0,60W 16,2KOHM+-1%TK50 RESISTOR | RL 0083.1439.00 | RESISTA | MK2 | |
| R94 | RS 0,5W10KOHM+-10%10X10X5 TCERMET POTENTIOMETER T | RS 0247.7903.00 | BI_TECHNOL | 72PM | |
| R95 | RL 0,35W30,1KOHM+-0,1%T25 RESISTOR | RL 0084.3987.00 | DRALORIC | SMA0207 | |
| R96 | RL 0,35W301 OHM+-0,1%TK25 RESISTOR | RL 0083.8140.00 | DRALORIC | SMA0207 | |
| R97 | RL 0,60W 301 KOHM+-1%TK50 RESISTOR | RL 0083.2406.00 | RESISTA | MK2 | |
| R98 | RL 0,60W 301 OHM+-1%TK50 RESISTOR | RL 0083.0210.00 | RESISTA | MK2 | |


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| R99 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R100 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R101 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R102 | RL 0,60W 4,32KOHM+-1%TK50 RESISTOR | RL 0082.6572.00 | RESISTA | MK2 | |
| R103 | RL 0,60W 11,0KOHM+-1%TK50 RESISTOR | RL 0083.1322.00 | RESISTA | MK2 | |
| R104 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R105 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R106 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R120 | RL 0,35W1,24KOHM+-0,1%T25 RESISTOR | RL 0083.9323.00 | DRALORIC | SMA0207 | |
| R121 | RL 0,35W1,24KOHM+-0,1%T25 RESISTOR | RL 0083.9323.00 | DRALORIC | SMA0207 | |
| R122 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R123 | RL 0,35W5,11KOHM+-0,1%T25 RESISTOR | RL 0084.2500.00 | DRALORIC | SMA0207 | |
| R124 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R126 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R127 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R132 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R133 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R137 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R140 | RL 0,60W 121 OHM+-1%TK50 RESISTOR | RL 0082.9859.00 | RESISTA | MK2 | |
| R141 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R145 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R146 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R147 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R148 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R149 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R150 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R151 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R160 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R161 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R162 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R163 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R164 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R165 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R166 | RL 0,60W 1,21KOHM+-1%TK50 RESISTOR | RL 0083.0655.00 | RESISTA | MK2 | |
| R167 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | |
| R173 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R174 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R175 | RL 0,60W 10,2KOHM+-1%TK50 RESISTOR | RL 0082.2331.00 | RESISTA | MK2 | |
| R176 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |

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| R177 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R180 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R181 | RL 0,60W 309 KOHM+-1%TK50 RESISTOR | RL 0083.2412.00 | RESISTA | MK2 | |
| R182 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R183 | RL 0,60W 40,2KOHM+-1%TK50 RESISTOR | RL 0083.1751.00 | RESISTA | MK2 | |
| R184 | RL 0,60W 19,6KOHM+-1%TK50 RESISTOR | RL 0083.1516.00 | RESISTA | MK2 | |
| R185 | RL 0,60W 5,11KOHM+-1%TK50 RESISTOR | RL 0082.2348.00 | RESISTA | MK2 | |
| R186 | RL 0,60W 7,87KOHM+-1%TK50 RESISTOR | RL 0083.1216.00 | PHILIPS_CO | MRS 25 | |
| R190 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R191 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R192 | RL 0,60W 301 KOHM+-1%TK50 RESISTOR | RL 0083.2406.00 | RESISTA | MK2 | |
| R193 | RL 0,60W 75,0KOHM+-1%TK50 RESISTOR | RL 0083.1916.00 | RESISTA | MK2 | |
| R201 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R202 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R203 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R204 | RL 0,60W 6,19KOHM+-1%TK50 RESISTOR | RL 0082.2283.00 | RESISTA | MK2 | |
| R205 | RL 0,60W 16,2KOHM+-1%TK50 RESISTOR | RL 0083.1439.00 | RESISTA | MK2 | |
| R206 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R208 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R209 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R216 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R220 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R221 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R222 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R260 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | |
| R265 | RL 0,60W 1,21KOHM+-1%TK50 RESISTOR | RL 0083.0655.00 | RESISTA | MK2 | |
| R277 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R278 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R280 | RL 0,60W 182 OHM+-1%TK50 RESISTOR | RL 0083.0010.00 | RESISTA | MK2 | |
| R290 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |
| R291 | RG 5,62KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0007.0735.00 | PHILIPS_CO | RC02 | |
| R292 | RG 215 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8961.00 | ROEDERSTEI | D25 | |
| R293 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R300 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R301 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R310 | RL 0,60W 39,2 OHM+-1%TK50 RESISTOR | RL 0082.9420.00 | RESISTA | MK2 | |
| R311 | RL 0,60W 68,1 OHM+-1%TK50 RESISTOR | RL 0082.9636.00 | RESISTA | MK2 | |
| R312 | RG 6,81KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0007.0758.00 | PHILIPS_CO | RC02 | |
| R313 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |


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| R314 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R315 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RCO2 | |
| R316 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R317 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RCO2 | |
| R320 | RL 0,60W 61,9 OHM+-1%TK50 RESISTOR | RL 0082.9607.00 | RESISTA | MK2 | |
| R321 | RL 0,60W 68, 1 OHM+-1%TK50 RESISTOR | RL 0082.9636.00 | RESISTA | MK2 | |
| R322 | RG 8,25KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0007.0770.00 | PHILIPS_CO | RCO2 | |
| R323 | RG 1,21KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9968.00 | PHILIPS_CO | RCO2 | |
| R324 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R325 | RG 14,7OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8684.00 | DRALORIC | CB 1206 ... | |
| R327 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RCO2 | |
| R330 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R331 | RL 0,60W 68, 1 OHM+-1%TK50 RESISTOR | RL 0082.9636.00 | RESISTA | MK2 | |
| R332 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | |
| R333 | RL 0,60W 68, 1 OHM+-1%TK50 RESISTOR | RL 0082.9636.00 | RESISTA | MK2 | |
| R340 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R342 | RL 0,60W 68, 1 OHM+-1%TK50 RESISTOR | RL 0082.9636.00 | RESISTA | MK2 | |
| R343 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R344 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R345 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RCO2 | |
| R346 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RCO2 | |
| R347 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R348 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | |
| R351 | RL 0,60W 1,82KOHM+-1%TK50 RESISTOR | RL 0082.2277.00 | PHILIPS_CO | MRS 25 | |
| R352 | RL 0,60W 56,2 OHM+-1%TK50 RESISTOR | RL 0082.9571.00 | RESISTA | MK2 | |
| R360 | RG 15,0KOHM+-1%TK100 1206 RESISTOR CHIP TRIMMWERT/SELECTED 10K-50K | RG 0007.5843.00 | PHILIPS_CO | RCO2 | |
| R361 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R362 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R363 | RL 0,60W 121KOHM+-1%TK50 RESISTOR | RL 0083.2070.00 | RESISTA | MK2 | |
| R365 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R370 | RG 10,0KOHM+-1%TK100 1206 RG CHIP RESISTOR | RG 0007.0793.00 | PHILIPS_CO | RCO2 | |
| R371 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R372 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R373 | RL 0,60W 121KOHM+-1%TK50 RESISTOR | RL 0083.2070.00 | RESISTA | MK2 | |
| R375 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R376 | RG 215 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8961.00 | ROEDERSTEI | D25 | |
| R380 | RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T | RS 0247.7903.00 | BI_TECHNOL | 72PM | |
| R381 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |

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| R382 | RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T | RS 0247.7903.00 | BI_TECHNOL | 72PM | |
| R383 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R384 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R387 | RL 0,60W 274 OHM+-1%TK50 RESISTOR | RL 0083.0178.00 | RESISTA | MK2 | |
| R388 | RL 0,60W22,10 OHM+-1%TK50 RESISTOR | RL 0082.9188.00 | RESISTA | MK2 | |
| R390 | RL 0,60W 432 OHM+-1%TK50 DEPOS.-CARBON RESISTOR | RL 0083.0355.00 | RESISTA | MK2 | |
| R391 | RL 0,60W 365 OHM+-1%TK50 RESISTOR | RL 0083.0290.00 | RESISTA | MK2 | |
| R392 | RL 0,60W 3,01KOHM+-1%TK50 RESISTOR | RL 0083.0961.00 | RESISTA | MK2 | |
| R393 | RL 0,60W 274 OHM+-1%TK50 RESISTOR | RL 0083.0178.00 | RESISTA | MK2 | |
| R394 | RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8661.00 | PHILIPS_CO | RC02 | |
| R395 | RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8661.00 | PHILIPS_CO | RC02 | |
| R400 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R401 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R402 | RL 0,60W22,10 OHM+-1%TK50 RESISTOR | RL 0082.9188.00 | RESISTA | MK2 | |
| R403 | RL 0,60W 274 OHM+-1%TK50 RESISTOR | RL 0083.0178.00 | RESISTA | MK2 | |
| R415 | RL 0,60W 274 OHM+-1%TK50 RESISTOR | RL 0083.0178.00 | RESISTA | MK2 | |
| R416 | RL 0,60W22,10 OHM+-1%TK50 RESISTOR | RL 0082.9188.00 | RESISTA | MK2 | |
| R417 | RL 0,60W 274 OHM+-1%TK50 RESISTOR | RL 0083.0178.00 | RESISTA | MK2 | |
| R420 | RL 0,60W 301 KOHM+-1%TK50 RESISTOR | RL 0083.2406.00 | RESISTA | MK2 | |
| R421 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R422 | RL 0,60W 825 OHM+-1%TK50 RESISTOR | RL 0082.2502.00 | RESISTA | MK2 | |
| R423 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R429 | RL 0,60W 39,2 OHM+-1%TK50 RESISTOR | RL 0082.9420.00 | RESISTA | MK2 | |
| R430 | RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8861.00 | PHILIPS_CO | RC02 | |
| R431 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R432 | RG 10,0KOHM+-1%TK100 1206 RG CHIP RESISTOR | RG 0007.0793.00 | PHILIPS_CO | RC02 | |
| R433 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R436 | RG 34,8 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8778.00 | ROEDERSTEI | D25 | |
| R437 | RG 4,64KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0712.00 | DRALORIC | CB 1206 . . . | |
| R438 | RG 332 OHM+-1%TK100 1206 RESISTOR CHIP | RG 0007.5650.00 | PHILIPS_CO | RC02 | |
| R439 | RG 2,37KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0641.00 | DRALORIC | CB 1206 . . . | |
| R440 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R441 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R442 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R443 | RL 0,60W 182 OHM+-1%TK50 RESISTOR | RL 0083.0010.00 | RESISTA | MK2 | |
| R450 | RL 0,60W 121 OHM+-1%TK50 RESISTOR | RL 0082.9859.00 | RESISTA | MK2 | |
| R451 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R452 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R453 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| R460 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R461 | RL 0,60W 8,25KOHM+-1%TK50 RESISTOR | RL 0083.1239.00 | RESISTA | MK2 | |
| R462 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R463 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R464 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R465 | RG 4,75OHM+-1%TK100 1206 CHIP-RESISTOR | RG 0007.8420.00 | PHILIPS | RC 02 | |
| R472 | RL 0,60W27,40 OHM+-1%TK50 RESISTOR | RL 0082.9271.00 | RESISTA | MK2 | |
| R473 | RL 0,60W 82,5 OHM+-1%TK50 RESISTOR | RL 0082.9707.00 | RESISTA | MK2 | |
| R479 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R480 | RL 0,60W27,40 OHM+-1%TK50 RESISTOR | RL 0082.9271.00 | RESISTA | MK2 | |
| R481 | RL 0,60W 82,5 OHM+-1%TK50 RESISTOR | RL 0082.9707.00 | RESISTA | MK2 | |
| R482 | RG 1,21KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9968.00 | PHILIPS_CO | RC02 | |
| R483 | RG 8,25KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0007.0770.00 | PHILIPS_CO | RC02 | |
| R484 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R485 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R486 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R487 | RL 0,60W18,20 OHM+-1%TK50 RESISTOR | RL 0082.9107.00 | RESISTA | MK2 | |
| R488 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R489 | RG 14,7OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8684.00 | DRALORIC | CB 1206 ... | |
| R490 | RG 1,21KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9968.00 | PHILIPS_CO | RC02 | |
| R491 | RG 8,25KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0007.0770.00 | PHILIPS_CO | RC02 | |
| R492 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R493 | RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR TRIMMWERT/SELECTED 4,7OHM-12,1OHM | RG 0006.8661.00 | PHILIPS_CO | RC02 | |
| R495 | RL 0,60W 182 OHM+-1%TK50 RESISTOR | RL 0083.0010.00 | RESISTA | MK2 | |
| R496 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | |
| R497 | RL 0,60W 182 OHM+-1%TK50 RESISTOR | RL 0083.0010.00 | RESISTA | MK2 | |
| R498 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R500 | RL 0,60W27,40 OHM+-1%TK50 RESISTOR | RL 0082.9271.00 | RESISTA | MK2 | |
| R501 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R502 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R503 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R504 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R512 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R513 | RL 0,60W 274 OHM+-1%TK50 RESISTOR TRIMMWERT/SELECTED | RL 0083.0178.00 | RESISTA | MK2 | |
| R514 | RL 0,60W22,10 OHM+-1%TK50 RESISTOR | RL 0082.9188.00 | RESISTA | MK2 | |
| R515 | RL 0,60W 274 OHM+-1%TK50 RESISTOR TRIMMWERT/SELECTED | RL 0083.0178.00 | RESISTA | MK2 | |
| R520 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | |

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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| R521 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R522 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R525 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R530 | RL 0,60W 82,5KOHM+-1%TK50 RESISTOR | RL 0082.2302.00 | PHILIPS_CO | MRS 25 | |
| R531 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R532 | RL 0,60W2,21MOHM+-1%TK50 METALFILMRESISTOR | RL 0099.8173.00 | RESISTA | MK2 | |
| R533 | RL 0,60W 121KOHM+-1%TK50 RESISTOR | RL 0083.2070.00 | RESISTA | MK2 | |
| R534 | RL 0,60W 82,5KOHM+-1%TK50 RESISTOR | RL 0082.2302.00 | PHILIPS_CO | MRS 25 | |
| R535 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R536 | RL 0,60W 121KOHM+-1%TK50 RESISTOR | RL 0083.2070.00 | RESISTA | MK2 | |
| R537 | RL 0,60W 8,25KOHM+-1%TK50 RESISTOR | RL 0083.1239.00 | RESISTA | MK2 | |
| R540 | RL 0,60W 8,25KOHM+-1%TK50 RESISTOR | RL 0083.1239.00 | RESISTA | MK2 | |
| R541 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R542 | RS 0,75W10KOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET | RS 0037.7396.00 | BI_TECHNOL | 89 P | |
| R543 | RL 0,60W 619 OHM+-1%TK50 RESISTOR | RL 0083.0478.00 | PHILIPS_CO | MRS 25 | |
| R544 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R546 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R547 | RL 0,60W 301 KOHM+-1%TK50 RESISTOR | RL 0083.2406.00 | RESISTA | MK2 | |
| R548 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R550 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R551 | RL 0,60W 274 OHM+-1%TK50 RESISTOR | RL 0083.0178.00 | RESISTA | MK2 | |
| R560 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R562 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R570 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R571 | RL 0,60W 1,21KOHM+-1%TK50 RESISTOR | RL 0083.0655.00 | RESISTA | MK2 | |
| R572 | RL 0,60W 1,21KOHM+-1%TK50 RESISTOR | RL 0083.0655.00 | RESISTA | MK2 | |
| R575 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R580 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R581 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R590 | RL 0,60W15 OHM+-1%TK50 RESISTOR | RL 0082.9020.00 | RESISTA | MK2 | |
| V20 | AK BF374 N 25V 100MA TRANSISTOR | 0377.3859.00 | MOTOROLA | BF374 | |
| V25 | AK BF374 N 25V 100MA TRANSISTOR | 0377.3859.00 | MOTOROLA | BF374 | |
| V40 | AM J310 N-D 25V JFET FET | 0283.9031.00 | SILICONIX | J310 | |
| V41 | AM J310 N-D 25V JFET FET | 0283.9031.00 | SILICONIX | J310 | |
| V50 | AM J310 N-D 25V JFET FET | 0283.9031.00 | SILICONIX | J310 | |
| V51 | AM J310 N-D 25V JFET FET | 0283.9031.00 | SILICONIX | J310 | |
| V60 | AM J310 N-D 25V JFET FET | 0283.9031.00 | SILICONIX | J310 | |
| V65 | AM J310 N-D 25V JFET FET | 0283.9031.00 | SILICONIX | J310 | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---------------------------------------|-------------------------|----------------------------|----------------------------|------------------------------|
| V70 | AK BC327-40 P 45V 800MA TRANSISTOR | 0303.9518.00 | PHILIPS_SE | BC327-40 | |
| V75 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V76 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V77 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V81 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V85 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V86 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V87 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V88 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V100 | AK BF450 P 40V 25MA TRANSISTOR | AK 0342.2240.00 | SIEMENS | BF450 | |
| V101 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| V105 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| V122 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| V124 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| V131 | AE BZX55/B4V7 0,5W ZDI ZENER DIODE | AE 0080.4014.00 | VALVO | BZX79B4V7 | |
| V134 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| V140 | AM J310 N-D 25V JFET FET | 0283.9031.00 | SILICONIX | J310 | |
| V141 | AM J310 N-D 25V JFET FET | 0283.9031.00 | SILICONIX | J310 | |
| V160 | AK BF450 P 40V 25MA TRANSISTOR | AK 0342.2240.00 | SIEMENS | BF450 | |
| V165 | AK BF450 P 40V 25MA TRANSISTOR | AK 0342.2240.00 | SIEMENS | BF450 | |
| V171 | AE BZX79B10 0,5W ZDI ZENER DIODE | AE 0289.4302.00 | VALVO | BZX79B10 | |
| V172 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V175 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| V176 | AK BC327-40 P 45V 800MA TRANSISTOR | 0303.9518.00 | PHILIPS_SE | BC327-40 | |
| V208 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V209 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V250 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | |
| V261 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V262 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V265 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V266 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V275 | AM U310 N-D 25V JFET FET | AM 0454.6217.00 | SILICONIX | U310 | |
| V290 | AK BFR90 N 15V 25MA TRANSISTOR | 0236.9139.00 | VALVO | BFR 90 | |
| V300 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V315 | AK BFR90 N 15V 25MA TRANSISTOR | 0236.9139.00 | VALVO | BFR 90 | |
| V325 | AK BFR90 N 15V 25MA TRANSISTOR | 0236.9139.00 | VALVO | BFR 90 | |
| V345 | AK BFY90 N 15V 25MA TRANSISTOR | AK 0010.4550.00 | VALVO | BFY90 | |
| V348 | AK BFY90 N 15V 25MA TRANSISTOR | AK 0010.4550.00 | VALVO | BFY90 | |
| V360 | AM BF961 20V N-D DG MOSF MOS-FET | 0303.9130.00 | SIEMENS | BF961 | |

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|--|---|-------------------------|----------------------------|---------------------------------------|------------------------------|-------------------|
| V365 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | | |
| V370 | AM BF961 20V N-D DG MOSF MOS-FET | 0303.9130.00 | SIEMENS | BF961 | | |
| V375 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | | |
| V384 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | | |
| V390 | AK BFR91A N 12V 35MA TRANSISTOR | 0644.0730.00 | VALVO | BFR 91A | | |
| V400 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | | |
| V423 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | | |
| V434 | AK BFY90 N 15V 25MA TRANSISTOR | AK 0010.4550.00 | VALVO | BFY90 | | |
| V436 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | | |
| V437 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | | |
| V438 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | | |
| V439 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | | |
| V450 | AK BFY90 N 15V 25MA TRANSISTOR | AK 0010.4550.00 | VALVO | BFY90 | | |
| V460 | AK BFY90 N 15V 25MA TRANSISTOR | AK 0010.4550.00 | VALVO | BFY90 | | |
| V465 | AK BF374 N 25V 100MA TRANSISTOR | 0377.3859.00 | MOTOROLA | BF374 | | |
| V485 | AK BFR90 N 15V 25MA TRANSISTOR | 0236.9139.00 | VALVO | BFR 90 | | |
| V490 | AK BFR90 N 15V 25MA TRANSISTOR | 0236.9139.00 | VALVO | BFR 90 | | |
| V500 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | | |
| .503 V537 | AE BZX55/B4V7 0,5W ZDI ZENER DIODE | AE 0080.4014.00 | VALVO | BZX79B4V7 | | |
| V538 | AE BZX55/B12 0,5W ZDI ZENER DIODE | AE 0218.8940.00 | VALVO | BZX79B12 | | |
| V540 | AE BZX79B10 0,5W ZDI ZENER DIODE | AE 0289.4302.00 | VALVO | BZX79B10 | | |
| V541 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | | |
| V544 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | | |
| V545 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | | |
| V580 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | | |
| V581 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | | |
| X1 | FP STECKERLEISTE 32POL. MULTIPOINT CONNECTOR | FP 0514.4550.00 | SIEMENS | V42254-B1200-B641 | | |
| X201 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | | |
| X202 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | | |
| X203 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | | |
| X205 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | | |
| X208 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | | |
| X210 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | | |
| X10A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | | |
| X10B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | | |
| X11A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | | |
| X11B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | | |
| X11C | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | | |
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|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| X12A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X12B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X12C | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X13A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X13B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X13C | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X14A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X14B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X15A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X15B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X15C | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X2A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X2B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X3A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X3B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X3C | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X4A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X4B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X5A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X5B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X6A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X6B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X7A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X7B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X7C | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X8A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X8B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X8C | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X8D | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X9A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X9B | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| Z1 .9 | LD 10GHZ 50DB100V10A4RDX9 LEAD-THROUGH FILTER | LD 0451.4636.00 | SPECTRUM | 51-713-036 | |

095.0026-0693

| | | | | | | |
|---|----------|----------|---------------|---------------------------------------|-------------------------|-------------------|
| MEZ15 | 790 3PLU | Ä1 | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | 66 | 03.05.99 | EE FRN LOOP | 0801.3917.01 SA | 19- | |



ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Baugruppe "HF-Oszillator"

801.5110.02

Printed in West Germany

ENGLISH SERVICE MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5.1 Funktionsbeschreibung

(Hierzu Stromlauf 801.5110 S und Bild 5-1)

Die Baugruppe "HF-Oszillator" enthält zwei Phasenregelschleifen, die mit Hauptoszillator-Loop und FM-Loop bezeichnet sind.

In der Hauptoszillator-Loop wird die Eingangsfrequenz (208...219 MHz) durch 8 geteilt und dann mit dem Faktor M (19...38) vervielfacht. Am Ausgang der Hauptoszillator-Loop steht somit eine Frequenz von 500...1000 MHz zur Verfügung. Die Schrittweite der Eingangsfrequenz beträgt 0,1 Hz. Durch die Umsetzung ergibt sich am Ausgang eine Schrittweite von <0,5 Hz.

In der FM-Loop wird die Frequenzmodulation in einem 50-MHz-Oszillator erzeugt. Je nach Betriebsart wird dieser Oszillator in einer Phasenregelschleife (FM-AC) oder freilaufend (FM-DC) betrieben. Um einen geringen Frequenzversatz beim Umschalten auf FM-DC zu erreichen, wird die Abstimmspannung vor dem Umschalten im synchronisierten Betrieb gemessen und eine entsprechende Spannung mit einem D/A-Wandler erzeugt und zu den Abstimmioden geleitet.

5.1.1 Hauptoszillator-Loop

Das Eingangssignal (208...219 MHz) vom Stecker X310 wird im Verstärker V6 auf ECL-Pegel verstärkt und mit den Teilern D1 und D10 durch 8 geteilt. Dieses geteilte Signal (26...27,4 MHz) wird mit der Step-Recovery-Diode V20 in einen schmalen Puls umgewandelt, der als Schaltsignal für den Samplingdetektor N30 dient. Mit dem Samplingdetektor wird das Oszillatorsignal abgetastet. Am Ausgang 3 des Detektors steht eine Spannung zur Verfügung, welche die Phasendifferenz zwischen dem Abtastpuls und dem Oszillatorsignal widerspiegelt. Über den Integrator N60 wird damit eine Regelspannung erzeugt, die den Oszillator auf ein Vielfaches der Abtastfrequenz synchronisiert.

Der Ausgangsfrequenzbereich der Hauptoszillator-Loop beträgt 500...1000 MHz. Dieser Bereich ist auf zwei Oszillatoren aufgeteilt.

| | Bereich | Transistor |
|--------------|----------------|------------|
| Oszillator 1 | 500....754 MHz | V95 |
| Oszillator 2 | 754...1000 MHz | V115 |

Die Oszillatoren sind vom Negativ-Impedanztyp. Der Schwingtransistor entdämpft mit seiner negativen Impedanz an der Basis einen Serienschwingkreis. Zur Abstimmung werden zwei in Gegentakt geschaltete Kapazitätsdioden verwendet. Die Ausgangsleistung der Oszillatoren wird mit dem einstellbaren Konstantstrom durch den Schwingtransistor eingestellt.

Eine Schaltstufe mit zwei Transistoren, die mit TTL-Pegel angesteuert wird, schaltet die Betriebsspannung von -15 V für den Oszillator ein und gleichzeitig die Schaltodiode (V98 bzw. V118) zum Auskoppeln der HF in Durchlaßrichtung.

Der Entkoppelerverstärker (V130) erhöht die Ausgangsleistung der Oszillatoren von 0 dBm auf 10 dBm. Nach dem Auskoppelerverstärker wird das Signal für den Rückwärtszweig der Phasenregelschleife und für den Ausgang X308 aufgesplittet. Über die Entkoppelerverstärker N70 und N35 wird das Oszillatorsignal zurück auf den Samplingdetektor geführt.

Da der Samplingdetektor kein frequenzsensitives Verhalten hat, ist dieser Phasenregelschleife eine zweite Regelschleife zum Fangen parallel geschaltet. Diese Fangschaltung wird nur während des Fangvorgangs eingeschaltet und nach der Synchronisation der Phasenregelschleife wieder ausgeschaltet. Vom Entkoppelerverstärker N420 kommend, wird das Oszillatorsignal mit den Teilern D430, D435 und D440 durch 32 geteilt und zum programmierbaren M-Teiler geleitet. Nach dem M-Teiler wird das Signal im digitalen Phasendetektor D480 mit dem ebenfalls durch 32 geteilten Schaltsignal verglichen. Bei einer Frequenzdifferenz wird, gesteuert von dem Phasendetektor D480 und den Schaltern in D540, solange ein Strom in den Integrator N60 der Phasenregelschleife eingespeist bis der Oszillator auf das richtige Vielfache synchronisiert hat. Ist die Phasenregelschleife eingerastet, erkennt dies der Out-of-Lock-Detektor (D565, D570) und die Fangschaltung wird bis zum nächsten Frequenzwechsel abgeschaltet.

5.1.2 FM-Loop

Der 50-MHz-Oszillator enthält im Schwingkreis vier Kapazitätsdioden (V260, V261, V262 und V275). Mit den drei Kapazitätsdioden V260, V261 und V262 erfolgt die Frequenzmodulation. Auf die Kapazitätsdiode V275 wird die Abstimmspannung der Phasenregelschleife geleitet und damit die Oszillatordfrequenz auf 50 MHz gehalten. Über die Trennverstärker in D310 wird das Oszillatorsignal auf den Ausgang X301 und auf den Teiler (D320, D325 und D338) im Rückwärtszweig der Phasenregelschleife gegeben. Der Phasendetektor D340 vergleicht das geteilte Oszillatorsignal mit der Referenzfrequenz und erzeugt mit Hilfe des Integrators N350 die Abstimmspannung.

In der Betriebsart FM DC wird die Phasenregelschleife mit dem Schalter N275 aufgetrennt und die Abstimmspannung mit dem D/A-Wandler D265 erzeugt. Die Abstimmspannung wird vor dem Umschalten auf FM DC mittels der Diagnoseeinrichtung gemessen und der Wert der dieser Abstimmspannung entspricht in den D/A-Wandler geladen. Damit wird der Frequenzversatz bei FM DC möglichst gering gehalten.

Der Hubteiler besteht aus den D/A-Wandlern D211 und D231 und dem Schalter N260. Mit dem D/A-Wandler D202 erfolgt die Kompensation des M-Faktors. Zur Erzeugung der Phasenmodulation wird mit dem Relais K240 ein Differenzierglied (C242, R242...R244) in den Signalweg eingeschaltet.

5.1.3 Ansteuerung und Diagnose

Die Ansteuerung der Baugruppe erfolgt über eine serielle Schnittstelle. Die Daten werden in den 6 Schieberegisterbausteinen (D205, D112, D222, D232, D240, D400) gespeichert.

Für eine Diagnose können acht verschiedene Meßpunkte auf der Baugruppe mit dem Multiplexer (D402) abgefragt werden. Zusätzlich wird die Abstimmspannung des 50-MHz-Oszillators mit dem Fensterdiskriminator N300 ständig überwacht. Der Ausgang des Fensterdiskriminators und der Ausgang des Out-of-Lock-Detektors in der Hauptoszillator-Loop führen auf die Loop-OK-Leitung. Über diese Leitung wird dem Mikroprozessor ein Ausfall der Baugruppe gemeldet.

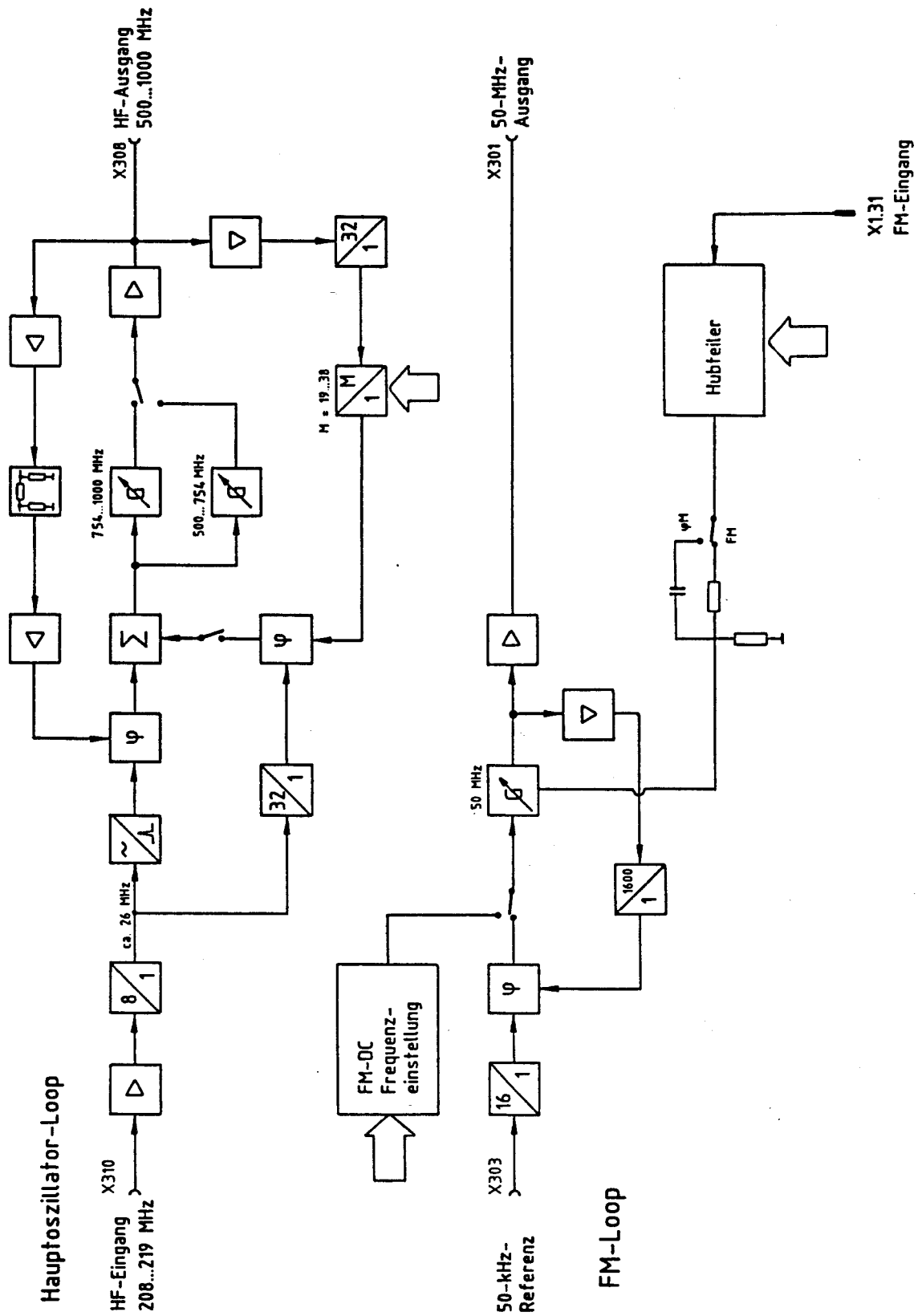


Bild 5-1 Blockschaltbild HF-Oszillator

5.2 Prüfen und Abgleichen

5.2.1 Frequenzabgleich der HF-Oszillatoren

- Gleichspannung von 2 V \pm 0,1 V an X60.B einspeisen.
- An HF-Anschluß X308 einen Frequenzzähler anschließen.
- Abgleich der Frequenz mit den Trimmern C97 und C117 nach Tabelle 5-1.

Tabelle 5-1

| Einstellung am Gerät | Frequenz an X308 | Abgleichelement |
|----------------------|---------------------|-----------------|
| 600 MHz | 500 MHz \pm 5 MHz | C97 |
| 800 MHz | 750 MHz \pm 5 MHz | C117 |

5.2.2 Pegelabgleich der HF-Oszillatoren

- Gleichspannung von 12 V \pm 0,5 V an X60.B einspeisen.
- An HF-Anschluß X308 einen Leistungsmesser anschließen.
- Abgleich des Pegels mit den Trimmern R92 und R112 nach Tabelle 5-2.

Tabelle 5-2

| Einstellung am Gerät | Pegel an X308 | Abgleichelement |
|----------------------|------------------|-----------------|
| 600 MHz | 0 dBm \pm 3 dB | R92 |
| 800 MHz | 0 dBm \pm 3 dB | R112 |

5.2.3 Abgleich des Phasendetektoroffsets

- Gleichspannung von 12 V \pm 0,5 V an X60.B einspeisen.
- DC-Voltmeter an P7 A und B anschließen.
- Brücke X12 abziehen.
- Mit Trimmer R53 die Spannung an P7 auf 0 V \pm 10 mV einstellen.
- Brücke X12 und X60 wieder aufstecken.

5.2.4 Prüfen der Synchronisation

- An X308 einen Frequenzzähler anschließen und die Frequenz nach Tabelle 5-3 prüfen.

Tabelle 5-3

| Einstellung am Gerät | Frequenz an X308 |
|----------------------|------------------|
| 519 MHz | 519 MHz ±5 kHz |
| 520 MHz | 520 MHz ±5 kHz |
| 546 MHz | 546 MHz ±5 kHz |
| 624 MHz | 624 MHz ±5 kHz |
| 702 MHz | 702 MHz ±5 kHz |
| 728 MHz | 728 MHz ±5 kHz |
| 754 MHz | 754 MHz ±5 kHz |
| 832 MHz | 832 MHz ±5 kHz |
| 910 MHz | 910 MHz ±5 kHz |
| 1000 MHz | 1000 MHz ±5 kHz |

5.2.5 Abgleich des 50-MHz-FM-Oszillators

a) Klirrfaktorabgleich

- Einstellung am Gerät: RF = 510 MHz,
FM INT = 800 kHz,
AF = 1 kHz
- Modulationsanalysator mit Klirrfaktormesser an X301 anschließen.
- Mit dem Trimmer R262 den Klirrfaktor auf Minimum einstellen (Klirrfaktor muß <0,5 % sein).

b) Regelspannungsabgleich

- Einstellung am Gerät: FM INT = 1 kHz, AF = 1 kHz
- DC-Voltmeter an Prüfpunkt P6 anschließen.
- Mit dem Trimmer C274 die Spannung an P6 auf 7,5 V ±0,5 V einstellen.

c) Hubabgleich

- Einstellung am Gerät: RF = 510 MHz,
FM INT = 800 kHz,
AF = 1 kHz
- Modulationsanalysator an X301 anschließen.
- Mit dem Trimmer R202 den Hub auf 336 kHz ±3 kHz einstellen.

5.2.6 Prüfen der Frequenzablage bei FM-DC

- + Einstellung am Gerät: FM EXT AC = 1 kHz
- + Frequenzzähler an X301 anschließen.
- + Nach dem Umschalten auf FM EXT DC darf die Frequenzablage nicht größer als 1000 Hz sein.

5.3 Fehlersuche

Die Fehlersuche läßt sich mit Hilfe der angegebenen Gleichspannungsmeßwerte und Signalpegel durchführen.

Gleichspannungsmeßwerte

| Bezeichnung | Spannung DC |
|-------------------|---------------------|
| Kollektor V6 | 7,4 V \pm 1 V |
| Kollektor V18 | 4...6 V |
| Emitter V90, V110 | -10...-11,5 V |
| Kollektor V130 | 6,5 V \pm 1 V |
| Emitter V551 | -0,9 V \pm 0,2 V |
| Kollektor V555 | -2,45 V \pm 0,5 V |
| P13 | 11,8 V \pm 0,4 V |
| D310/Pin 11 | 3,7 V \pm 0,5 V |
| N350 /Pin 3 | 2,55 V \pm 0,1 V |

Signalpegel

| Bezeichnung | Frequenz | Pegel | Bemerkung |
|-------------|------------------|--------------------|--------------------------|
| D1 /Pin 7 | 52...105 MHz | ECL | } Brücke X15 abziehen |
| D10/Pin 7 | ca. 26 MHz | 2,5 V (U_{SS}) | |
| X13 | 15,6...31,25 MHz | TTL | |
| P14, P15 | ca. 0,8 MHz | TTL | |
| X11 | 50 MHz | TTL | |
| P7, P8 | 3,125 kHz | TTL | |

HF-Pegel

Die HF-Pegel werden mit einem 500- Ω -Tastkopf gemessen.

| Bezeichnung | Frequenz | Pegel |
|-------------|----------------|--------------|
| P9 | 500...1000 MHz | +9...+17 dBm |
| P10 | 500...1000 MHz | -16...-9 dBm |
| P12 | 500...1000 MHz | -3...+5 dBm |

Steuersignale für den M-Teiler

| Frequenzein- stellung/MHz | Steuersignale an D205 | | | | | | | |
|------------------------------|-----------------------|----|----|----|---|---|---|---|
| | 11 | 12 | 13 | 14 | 7 | 6 | 5 | 4 |
| 510 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 530 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 550 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 580 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 640 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 850 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

Steuersignale für den FM-Hubteiler

→ Am Gerät 1000 MHz einstellen.

| FM-Hubein- stellung/ kHz | Steuersignale an den Bausteinen | | | | | | | | | | | | | | | | | | |
|--------------------------------|---------------------------------|---|---|------|----|----|----|---|---|---|---|------|----|----|----|---|---|---|---|
| | D232 | | | D222 | | | | | | | | D212 | | | | | | | |
| | 6 | 5 | 4 | 11 | 12 | 13 | 14 | 7 | 6 | 5 | 4 | 11 | 12 | 13 | 14 | 7 | 6 | 5 | 4 |
| 0,01 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0,02 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0,04 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0,08 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0,16 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0,32 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0,64 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 1,28 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2,56 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5,12 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 51,2 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 512 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

5.4 Schnittstellen

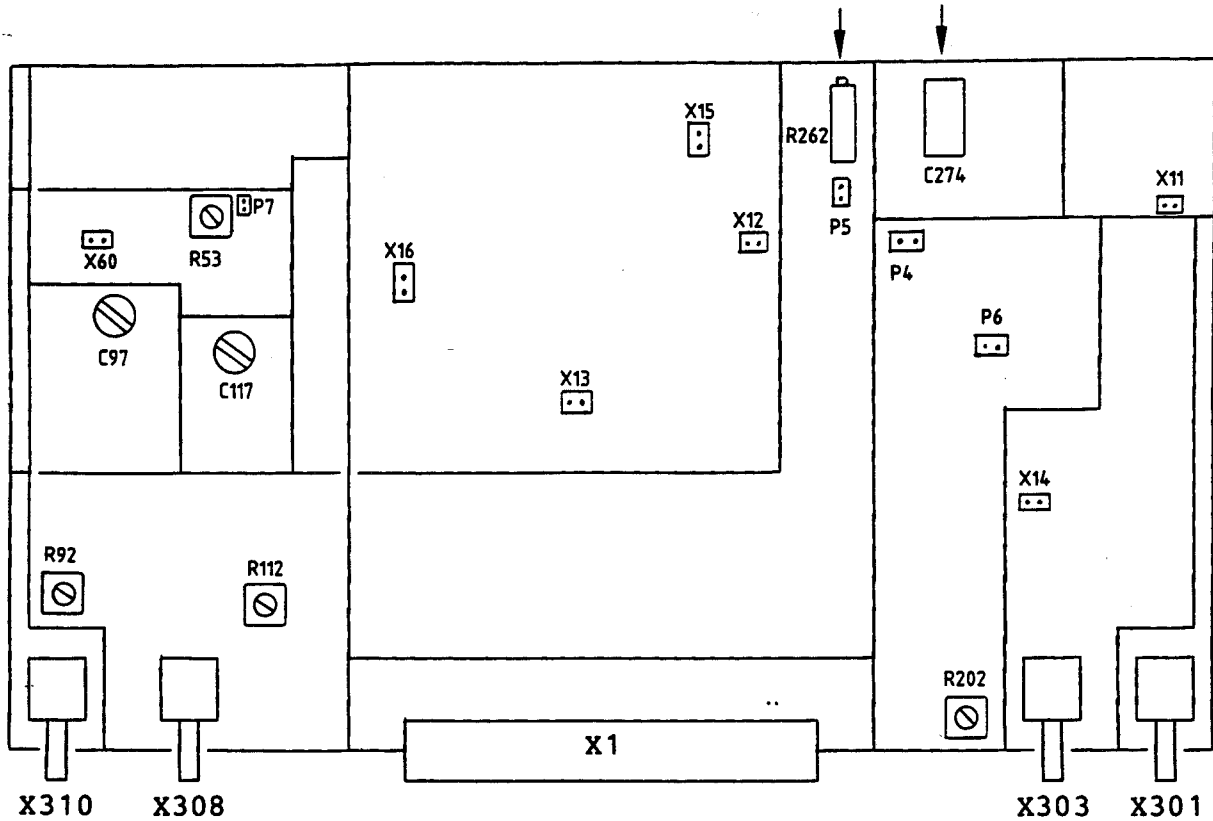


Bild 5-2 Lage der Prüf- und Trimpunkte

| Anschluß | Bezeichnung | Frequenz | Pegel |
|----------|-----------------|----------------|--------------------|
| X301 | 50-MHz-Ausgang | 50 MHz | 0 dBm \pm 3 dB |
| X303 | 50-kHz-Referenz | 50 kHz | TTL |
| X308 | HF-Ausgang | 500...1000 MHz | 0 dBm \pm 3 dB |
| X310 | HF-Eingang | 208...219 MHz | -3 dBm \pm 3 dB |
| X1.3 | Loop OK | DC | 0...+5 V |
| X1.23 | Test | DC | 0...+5 V |
| X1.31 | FM-Eingang | DC...100 kHz | 1 V _{eff} |

Serielle Schnittstelle

| Anschluß | Bezeichnung |
|----------|-------------|
| X1.5 | HF-Strobe 3 |
| X1.6 | HF-Strobe 2 |
| X1.8 | Data |
| X1.10 | Clock |



ROHDE & SCHWARZ

SERVICE DOCUMENTS

RF Oscillator Module

801.5110.02

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Component lists
Circuit diagrams
Component layout diagrams

5.1 Function Description

(See circuit diagram 801.5110 S and Fig. 5-1)

The RF oscillator module contains two phase locked loops (PLL), i.e. main oscillator loop and FM loop.

The input frequency (208 to 219 MHz) is divided by 8 in the main oscillator loop and then multiplied by the factor M (19 to 38). A frequency between 500 and 1000 MHz is then available at the output of the main oscillator loop. The step size of the input frequency is 0.1 Hz. The conversion results in a step size of <0.5 Hz at the output.

The frequency modulation is generated in the FM loop in a 50-MHz oscillator. Depending on the mode, this oscillator is driven in a PLL (FM AC) or open loop (FM DC). In order to achieve a low frequency offset when switching to FM DC, the tuning voltage is measured in synchronized mode prior to switchover and a corresponding voltage is generated using a D/A converter and applied to the tuning diodes.

5.1.1 Main Oscillator Loop

The input signal (208 to 219 MHz) from connector X310 is amplified to ECL level in amplifier V6 and divided by 8 by the dividers D1 and D10. This divided signal (26 to 27.4 MHz) is converted by the step recovery diode V20 into a narrow pulse which is used as the switching signal for the sampling detector N30. The oscillator signal is sampled using the sampling detector. A voltage is available at output 3 of the detector which is a measure of the phase difference between the sampling pulse and the oscillator signal. A control voltage is then generated via integrator N60 which synchronizes the oscillator at a multiple of the sampling frequency.

The output frequency range of the main oscillator loop is 500 to 1000 MHz. This range is divided up between oscillators.

| | Range | Transistor |
|--------------|-----------------|------------|
| Oscillator 1 | 500 to 754 MHz | V95 |
| Oscillator 2 | 754 to 1000 MHz | V115 |

The oscillators are of the negative impedance type. The oscillating transistor with its negative impedance at the base reduces the damping of a series resonant circuit. Two tuning diodes connected in a push-pull circuit are used for tuning. The output power of the oscillators is varied with the oscillating transistor using the adjustable constant current.

A switching stage with two transistors driven at TTL level switches the -15 V operating voltage on for the oscillator and at the same time the switching diode (V98 or V118) to couple out the RF in the forward direction.

The decoupling amplifier (V130) increases the output power of the oscillators from 0 dBm to 10 dBm. Following the decoupling amplifier, the signal is split for the feedback of the PLL and for output X308. The oscillator signal is returned to the sampling detector via the decoupling amplifiers N70 and N35.

Since the response of the sampling detector is not frequency dependent, a second control loop for lock-in is connected in parallel to the PLL. The second loop is only switched on during the lock-in and switched off again following synchronization of the PLL. From the decoupling amplifier N420, the oscillator signal is divided by 32 using the dividers D430, D435 and D440 and applied to the programable M divider. Following the M divider the signal is compared in the digital phase detector D480 with the switching signal which is also divided by 32. If there is a difference between the frequencies, a current is fed to integrator N60 of the PLL, controlled by the phase detector D480 and the switches in D540, until the oscillator has synchronized at the correct multiple of the sampling frequency. The out-of-lock detector (D565, D570) detects if the PLL has locked in and the second loop is switched off until the next change in frequency.

5.1.2 FM Loop

The 50-MHz oscillator contains four tuning diodes (V260, V261, V262 and V275) in the resonant circuit. Frequency modulation is carried out using the three tuning diodes V260, V261 and V262. The tuning voltage of the PLL is applied to the tuning diode V275 and the oscillator frequency is thus held at 50 MHz. The oscillator signal is applied to output X301 via the buffer amplifier in D310 and to the divider (D320, D325 and D338) in the feedback of the PLL. The phase detector D340 compares the divided oscillator signal with the reference frequency and generates the tuning voltage using integrator N350.

The PLL is open in FM DC mode by the switch N275 and the tuning voltage is generated by the D/A converter D265. The tuning voltage is measured by the diagnostic circuit prior to switching to FM DC and the value corresponding to this tuning voltage is loaded into the D/A converter. The frequency offset with FM DC is then kept as small as possible.

The D/A converters D211 and D231 and the switch N260 make up the deviation divider. The M factor is compensated by the D/A converter D202. A differentiator (C242, R242 to R244) is switched into the signal path using relay K240 to generate the phase modulation.

5.1.3 Control and Diagnosis

The module is controlled via a serial interface. The data are stored in six shift register components (D205, D112, D222, D232, D240, D400).

Eight different test points on the module can be checked by the multiplexer (D402) for diagnostic purposes. In addition, the tuning voltage of the 50-MHz oscillator is constantly monitored by the window discriminator. The output of the window discriminator and the output of the out-of-lock detector in the main oscillator loop lead to the loop OK line. This line is used to signal module failure to the microprocessor.

5.2 Checking and Adjustments

5.2.1 Frequency Adjustments of the RF Oscillators

- + Apply DC voltage of 2 V \pm 0.1 V to X60.B.
- + Connect a frequency meter to RF connector X308.
- + Adjust the frequency according to Table 5-1 using trimmers C97 and C117.

Table 5-1

| Instrument setting | Frequency at X308 | Adjustment |
|--------------------|---------------------|------------|
| 600 MHz | 500 MHz \pm 5 MHz | C97 |
| 800 MHz | 750 MHz \pm 5 MHz | C117 |

5.2.2 Level Adjustment of the RF Oscillators

- + Apply DC voltage of 12 V \pm 0.5 V to X60.B.
- + Connect a power meter to RF connector X308.
- + Adjust the level according to Table 5-2 using trimmers R92 and R112.

Table 5-2

| Instrument setting | Level at X308 | Adjustment |
|--------------------|------------------|------------|
| 600 MHz | 0 dBm \pm 3 dB | R92 |
| 800 MHz | 0 dBm \pm 3 dB | R112 |

5.2.3 Adjustment of Phase Detector Offset

- + Apply DC voltage of 12 V \pm 0.5 V to X60.B.
- + Connect DC voltmeter to P7 A and B.
- + Remove jumper X12.
- + Adjust the voltage at P7 to 0 V \pm 10 mV using trimmer R53.
- + Insert jumpers X12 and X60 again.

5.2.4 Checking the Synchronization

- Connect a frequency meter to X308 and test the frequency according to Table 5-3.

Table 5-3

| Instrument setting | Frequency at X308 |
|--------------------|-------------------|
| 519 MHz | 519 MHz ±5 kHz |
| 520 MHz | 520 MHz ±5 kHz |
| 546 MHz | 546 MHz ±5 kHz |
| 624 MHz | 624 MHz ±5 kHz |
| 702 MHz | 702 MHz ±5 kHz |
| 728 MHz | 728 MHz ±5 kHz |
| 754 MHz | 754 MHz ±5 kHz |
| 832 MHz | 832 MHz ±5 kHz |
| 910 MHz | 910 MHz ±5 kHz |
| 1000 MHz | 1000 MHz ±5 kHz |

5.2.5 Adjustment of the 50-MHz FM Oscillator

a) Distortion adjustment

- Instrument setting: RF = 510 MHz,
FM INT = 800 kHz,
AF = 1 kHz
- Connect modulation analyzer with distortion meter to X301.
- Adjust the distortion to a minimum using trimmer R262 (distortion must be <0.5%).

b) Control voltage adjustment

- Instrument setting: FM INT = 1 kHz, AF = 1 kHz
- Connect DC voltmeter to test point P6.
- Adjust the voltage at P6 to 7.5 V ±0.5 V using trimmer C274.

c) Deviation adjustment

- Instrument setting: RF = 510 MHz,
FM INT = 800 kHz,
AF = 1 kHz
- Connect modulation analyzer to X301.
- Adjust the deviation to 336 kHz ±3 kHz using trimmer R202.

5.2.6 Checking the Frequency Offset with FM DC

- Instrument setting: FM EXT AC = 1 kHz
- Connect frequency meter to X301.
- The frequency offset must not be larger than 1000 Hz after switching to FM EXT DC.

5.3 Troubleshooting

Troubleshooting can be carried out using the listed DC test voltages and the signal levels.

DC test voltages

| Designation | DC voltage |
|-------------------|---------------------|
| Collector V6 | 7.4 V \pm 1 V |
| Collector V18 | 4 to 6 V |
| Emitter V90, V110 | -10 to -11.5 V |
| Collector V130 | 6.5 V \pm 1 V |
| Emitter V551 | -0.9 V \pm 0.2 V |
| Collector V555 | -2.45 V \pm 0.5 V |
| P13 | 11.8 V \pm 0.4 V |
| D310/pin 11 | 3.7 V \pm 0.5 V |
| N350 /pin 3 | 2.55 V \pm 0.1 V |

Signal levels

| Designation | Frequency | Level | Remarks |
|-------------|-------------------|--------------------|---------------------|
| D1 /pin 7 | 52 to 105 MHz | ECL | } Remove jumper X15 |
| D10/pin 7 | approx. 26 MHz | 2.5 V (V_{pp}) | |
| X13 | 15.6 to 31.25 MHz | TTL | |
| P14, P15 | approx. 0.8 MHz | TTL | |
| X11 | 50 MHz | TTL | |
| P7, P8 | 3.125 kHz | TTL | |

RF levels

The RF level are measured using a 500- Ω probe.

| Designation | Frequency | Level |
|-------------|-----------------|---------------|
| P9 | 500 to 1000 MHz | +9 to +17 dBm |
| P10 | 500 to 1000 MHz | -16 to -9 dBm |
| P12 | 500 to 1000 MHz | -3 to +5 dBm |

Control signals for the M divider

| Frequency setting/MHz | Control signals at D205 | | | | | | | |
|-----------------------|-------------------------|----|----|----|---|---|---|---|
| | 11 | 12 | 13 | 14 | 7 | 6 | 5 | 4 |
| 510 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 530 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 550 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 580 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 640 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 850 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

Control signals for the FM deviation divider

→ Set 1000 MHz on the instrument.

| FM deviation setting/kHz | Control signals on the components | | | | | | | | | | | | | | | | | | |
|--------------------------|-----------------------------------|---|---|------|----|----|----|---|---|---|---|------|----|----|----|---|---|---|---|
| | D232 | | | D222 | | | | | | | | D212 | | | | | | | |
| | 6 | 5 | 4 | 11 | 12 | 13 | 14 | 7 | 6 | 5 | 4 | 11 | 12 | 13 | 14 | 7 | 6 | 5 | 4 |
| 0.01 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0.02 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 0.04 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0.08 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0.16 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0.32 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0.64 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.28 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.56 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5.12 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 51.2 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 512 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

5.4 Interfaces

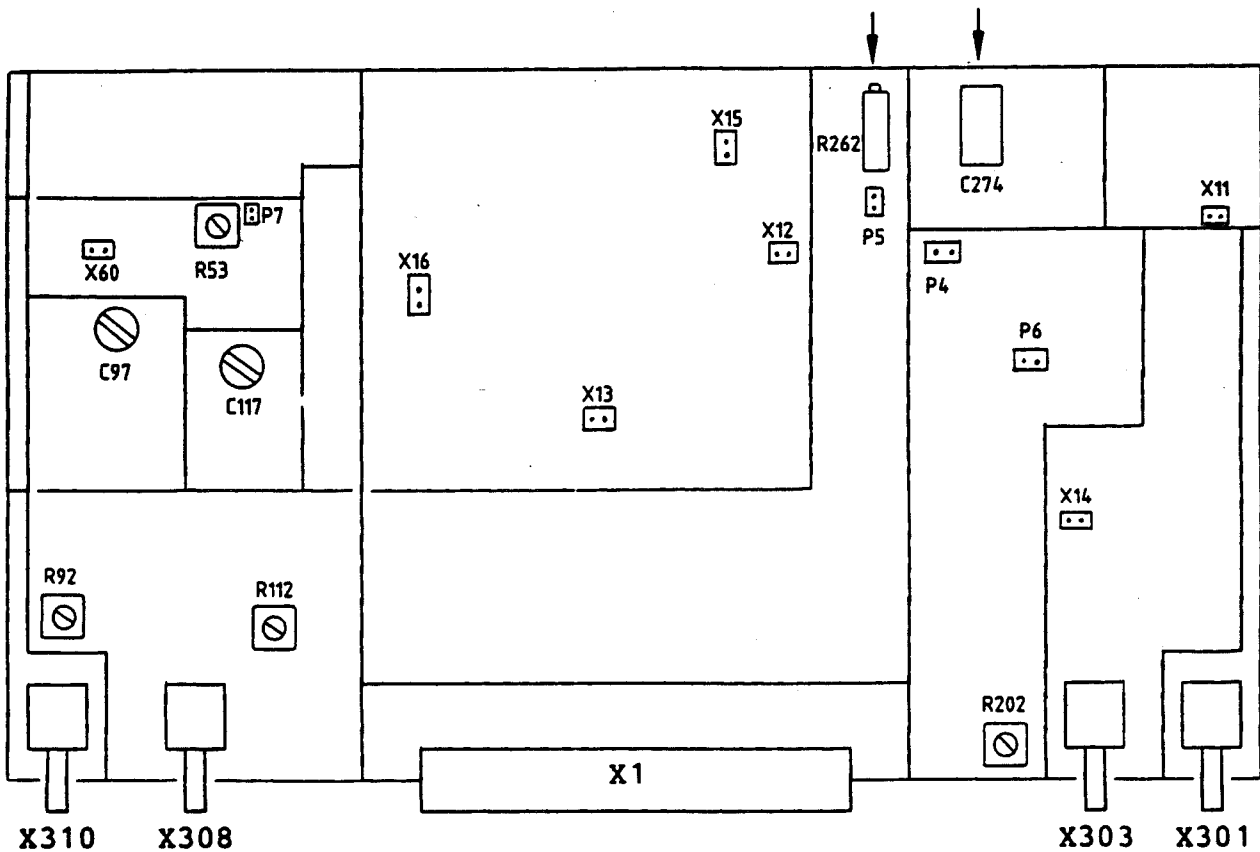


Fig. 5-2 Locations of the test points and trimmers

| Pin | Designation | Frequency | Level |
|-------|------------------|-----------------|--------------------|
| X301 | 50-MHz output | 50 MHz | 0 dBm \pm 3 dB |
| X303 | 50-kHz reference | 50 kHz | TTL |
| X308 | RF output | 500 to 1000 MHz | 0 dBm \pm 3 dB |
| X310 | RF input | 208 to 219 MHz | -3 dBm \pm 3 dB |
| X1.3 | Loop OK | DC | 0 to +5 V |
| X1.23 | Test | DC | 0 to +5 V |
| X1.31 | FM input | DC to 100 kHz | 1 V _{rms} |

Serial interface

| Pin | Designation |
|-------|-------------|
| X1.5 | RF strobe 3 |
| X1.6 | RF strobe 2 |
| X1.8 | Data |
| X1.10 | Clock |



ROHDE & SCHWARZ

Schaltteillisten

Stromläufe

Bestückungspläne

Part lists

Circuit diagrams

Components plans

Listes des pièces détachées


Schémas de Circuit

Plans des composants

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| C1 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C2 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C3 | CE 4,7UF+-20%63V RD9XH13 ELECTROLYTIC CAPACITOR NUR VAR/ONLY MOD: 02 | 0008.7491.00 | PHILIPS_CO | 2222 036 90381 | |
| C3 | CE 47UF+-20%6,3V SAL ELECTR. CAPACITOR NUR VAR/ONLY MOD: 04 | CE 0007.3957.00 | VALVO | 2222 128 33479 | |
| C4 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C5 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C6 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C7 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C8 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C9 | CC 4,7PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C10 | CE 47UF+-20%6,3V SAL ELECTR. CAPACITOR NUR VAR/ONLY MOD: 04 | CE 0007.3957.00 | VALVO | 2222 128 33479 | |
| C10 | CC 10NF-20+50%7X8R4000 CAPACITOR NUR VAR/ONLY MOD: 02 | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C11 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C12 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C13 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C15 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C17 | CK 220NF+-5%63VRD3, 5H9MKT CAPACITOR | CK 0099.2952.00 | SIEMENS | B 32 529-A224-J | |
| C18 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C19 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C20 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C21 | CC 15PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8750.00 | MURATA | GRM42-6COG 150F50ZPT | |
| C22 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C23 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C24 | CC 15PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8750.00 | MURATA | GRM42-6COG 150F50ZPT | |
| C25 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C26 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C27 | CK 150NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR | CK 0006.5040.00 | PLESSEY | R 60 EF 3150 AAM | |
| C28 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C29 | CC 1UF+-10%50V7K1200VIEL CAPACITOR | 0084.5538.00 | UNION_CARB | CK 06 BX 105K | |
| C30 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C31 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C32 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C35 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C36 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C37 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C38 | CC 1PF+-0,25 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8667.00 | MURATA | GRM42-6COG 1R0 C50PT | |
| C40 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |

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|---|----------|----|------------|------------------------------------|------------------------|----------------|
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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| C41 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C42 | CC 47PF+-2%5X6NPO CAPACITOR | CC 0087.6506.00 | PHILIPS_CO | 2222 678 | |
| C50 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C51 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C52 | CC 47PF+-1%50V COG 1206 CERAMIC CHIP CAPACITOR | CC 0099.8496.00 | MURATA | GRM42-6COG 470F50ZPT | |
| C60 | CE 1UF+-20%63V RD9XM13RM5 ELECTROLYTIC CAPACITOR | 0008.7485.00 | PHILIPS_CO | 2222 036 90382 | |
| C61 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C62 | CK 47NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2917.00 | SIEMENS | B 32529-C473-J | |
| C63 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C64 | CC 68PF+-2%6X7NPO CAPACITOR | CC 0087.6529.00 | PHILIPS_CO | 2222 678 | |
| C65 | CC 8,2PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6412.00 | VALVO | 2222 678 | |
| C66 | CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C85 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C86 | CC 47PF+-2%5X6NPO CAPACITOR | CC 0087.6506.00 | PHILIPS_CO | 2222 678 | |
| C90 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | |
| C91 | CC 6,8PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8236.00 | MURATA | GRM42-6COG 6R8 C50PT | |
| C92 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C93 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | |
| C94 | CC 3,9PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C95 | CC 6,8PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8236.00 | MURATA | GRM42-6COG 6R8 C50PT | |
| C96 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | |
| C97 | CT 13PF 7RDX13TK50 250V TRIMMER | CT 0450.7283.00 | TEKELEC | AT 5400 | |
| C98 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C99 | CC 3,9PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C105 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C110 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | |
| C111 | CC 3,9PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C112 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C113 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | |
| C114 | CC 1,8PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8165.00 | MURATA | GRM42-6COG 1R8 C50PT | |
| C115 | CC 3,9PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C116 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | |
| C117 | CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER | CT 0025.7367.00 | TEKELEC | TL 248 | |
| C118 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C130 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C131 | CC 4,7PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C132 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C133 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C140 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |


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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| C141 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C150 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C200 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C201 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C202 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C205 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C206 | CC 47PF+-2%5X6NPO CAPACITOR | CC 0087.6506.00 | PHILIPS_CO | 2222 678 | |
| C211 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C212 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C214 | CK 220NF+-5%63VRD3, 5H9MKT CAPACITOR | CK 0099.2952.00 | SIEMENS | B 32 529-A224-J | |
| C216 | CK 220NF+-5%63VRD3, 5H9MKT CAPACITOR | CK 0099.2952.00 | SIEMENS | B 32 529-A224-J | |
| C218 | CC 22PF+-2%3X4N750 CAPACITOR | CC 0087.6829.00 | VALVO | 2222 678 58229 | |
| C222 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C230 | CC 10PF+-0,25PF3X4N750 CAPACITOR | CC 0087.6787.00 | PHILIPS_CO | 2222 678 57109 | |
| C231 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C232 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C234 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C236 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C240 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C242 | CK 7,5NF+-1,25%63V7,5QUAD CAPACITOR | CK 0213.4376.00 | SIEMENS | B33531-A5752-F | |
| C260 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C261 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C262 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C263 | CC 220PF+-10%63V3X5D2000 CAPACITOR | CC 0099.5616.00 | PHILIPS_CO | 2222 630 08221 | |
| C265 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C266 | CC 22PF+-2%3X4N750 CAPACITOR | CC 0087.6829.00 | VALVO | 2222 678 58229 | |
| C270 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C271 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C274 | CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER | CT 0025.7373.00 | TEKELEC | TL 191 | |
| C275 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C276 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C277 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C278 | CC 3,9PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C5OPT | |
| C279 | CC 18 PF+-2%N470/IA3ROHR CERAMIC CAPACITOR | 0022.3002.00 | DRALORIC | RDLL 3X10 | |
| C280 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C281 | CC 56 PF+-1%N150/IA3ROHR CERAMIC CAPACITOR | 0022.3754.00 | DRALORIC | RDLL | |
| C282 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C283 | CC 120PF+- 5%100V NPO VIE CERAMIC CAPACITOR | CC 0060.0788.00 | UNION_CARB | CO 52C121J 1G5CA | |
| C284 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |

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| C285 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C286 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C287 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C292 | CC 120PF+- 5%100V NPO VIE CERAMIC CAPACITOR | CC 0060.0788.00 | UNION_CARB | CO 52C121J 1G5CA | |
| C300 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C310 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C312 | CC 10PF+-0,25 50VNPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8480.00 | MURATA | GRM42-6COG 100 C5OPT | |
| C313 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C315 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C318 | CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C319 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C320 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C321 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C323 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C324 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C325 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C326 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C338 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C339 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C340 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C341 | CC 2,2NF+-10%5X6R2000 CAPACITOR | CC 0087.7060.00 | PHILIPS_CO | 2222 630 51222 | |
| C351 | CK 220NF+-5%63VRD3,5H9MKT CAPACITOR | CK 0099.2952.00 | SIEMENS | B 32 529-A224-J | |
| C353 | CK 220NF+-5%63VRD3,5H9MKT CAPACITOR | CK 0099.2952.00 | SIEMENS | B 32 529-A224-J | |
| C354 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C355 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C356 | CK 22NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2881.00 | SIEMENS | B 32 529-A223-J | |
| C357 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C362 | CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C363 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C365 | CC 10PF+-0,25PF3X4N750 CAPACITOR | CC 0087.6787.00 | PHILIPS_CO | 2222 678 57109 | |
| C368 | CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR NUR VAR/ONLY MOD: 04 | 0803.0715.00 | NAT_PANASO | ECA-1EM471 | |
| C370 | CC 10PF+-0,25PF3X4N750 CAPACITOR | CC 0087.6787.00 | PHILIPS_CO | 2222 678 57109 | |
| C375 | CC 10PF+-0,25PF3X4N750 CAPACITOR | CC 0087.6787.00 | PHILIPS_CO | 2222 678 57109 | |
| C380 | CC 10PF+-0,25PF3X4N750 CAPACITOR | CC 0087.6787.00 | PHILIPS_CO | 2222 678 57109 | |
| C385 | CE 47UF+-20%6,3V SAL ELECTR.CAPACITOR NUR VAR/ONLY MOD: 04 | CE 0007.3957.00 | VALVO | 2222 128 33479 | |
| C385 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR NUR VAR/ONLY MOD: 02 | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C386 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |

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| C387 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C388 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C389 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C396 | CE 220UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | CE 0008.7904.00 | PANASONIC | ECA 1 VFG 221 B | |
| C400 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C402 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C410 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C420 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C421 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C422 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C423 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C424 | CC 1PF+-0,25 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8667.00 | MURATA | GRM42-6COG 1R0 C50PT | |
| C425 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C430 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C431 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C432 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C433 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C434 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C435 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C436 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C437 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C440 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C450 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C460 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C470 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C475 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C480 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C482 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C490 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C510 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C511 | CC 120PF+-2%5X6N750 CAPACITOR | CC 0087.6912.00 | PHILIPS_CO | 2222 678 58121 | |
| C512 | CK 4,7NF+-10%100V RM5 KC POLYCARBONATE CAPACITOR | 0099.6058.00 | WESTERMANN | FKC2 | |
| C530 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C540 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C541 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C542 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C545 | CC 8,2PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6412.00 | VALVO | 2222 678 | |
| C546 | CC 2,2PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6341.00 | PHILIPS_CO | 2222 678 | |
| C547 | CC 22PF+-2%3X4N750 CAPACITOR | CC 0087.6829.00 | VALVO | 2222 678 58229 | |


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| C548 | CC 5,6PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6393.00 | PHILIPS_CO | 2222 678 | |
| C549 | CC 100PF+-2%6X7N150 CAPACITOR | CC 0087.6712.00 | PHILIPS_CO | 2222 678 34 101 | |
| C550 | CC 100PF+-2%6X7N150 CAPACITOR | CC 0087.6712.00 | PHILIPS_CO | 2222 678 34 101 | |
| C552 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C553 | CC 180PF+-2%6X7N750 CAPACITOR | CC 0087.6935.00 | PHILIPS_CO | 2222 678 58181 | |
| C565 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C569 | CC 150PF+-2%5X6N750 CAPACITOR | CC 0087.6929.00 | PHILIPS_CO | 2222 678 58151 | |
| C570 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C571 | CC 4,7NF+-10%6X9R2000 CAPACITOR | CC 0087.7102.00 | PHILIPS_CO | 2222 630 51472 | |
| C572 | CK 47NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2917.00 | SIEMENS | B 32529-C473-J | |
| C575 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C580 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C600 . .604 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |
| D1 | BL CA3199 4:1 PRESC IC PRESCALERDIVBY4 | 0372.1106.10 | RCA | CA3199E | |
| D10 | BL SN74S112N 2XJK-FLIPFL FLIP FLOP | 0210.6026.00 | TEXAS | SN 74S112N | |
| D65 | BS IH401AJE 4X ANALOGSCH ANALOG SWITCH | 0334.3870.10 | HARRIS | IH401AJE | |
| D202 | BJ AD7523JN 1X8B-DAC D/A CONVERTER | 0801.8219.00 | ANALOG_DEV | AD-7523JN | |
| D205 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D205 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 | 0586.7726.00 | RCA | CD4094BE | |
| D211 | BJ AD7533CQ 1X10B-DAC D/A-CONVERTER | BJ 0300.8740.00 | ANALOG_DEV | AD7533CQ(CD) | |
| D212 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D212 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 | 0586.7726.00 | RCA | CD4094BE | |
| D222 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D222 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 | 0586.7726.00 | RCA | CD4094BE | |
| D231 | BJ AD7523JN 1X8B-DAC D/A CONVERTER | 0801.8219.00 | ANALOG_DEV | AD-7523JN | |
| D232 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D232 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 | 0586.7726.00 | RCA | CD4094BE | |
| D240 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D240 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 | 0586.7726.00 | RCA | CD4094BE | |
| D265 | BJ AD7533CQ 1X10B-DAC D/A-CONVERTER | BJ 0300.8740.00 | ANALOG_DEV | AD7533CQ(CD) | |
| D310 | BL MC10115L 4X L.RECEIV LINE RECEIVER | BL 0302.5831.00 | MOTOROLA | MC10115L | |
| D320 | BL 74F160PC BCD DEC.COUNT ASYNC. BCD DECADE COUNTER | 0099.9886.00 | SIGNETICS | (N)74F160N (AN) | |
| D325 | BL MM74HC390N 2X4B.COUNT DUAL 4-BIT DECADE COUNTER | 0099.9640.00 | PHILIPS_SE | (PC)74HC390N(P) | |

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| D338 | BL MM74HC393N 2X4B.B.CTR DUAL 4-BIT BINARY COUNTER | 0395.2950.00 | PHILIPS_SE | (PC)74HC393N(P) | |
| D340 | BL MC14046BCP PHASE-L-L. PHASE LOCKED LOOP | 0303.8986.00 | MOTOROLA | MC14046BCP | |
| D400 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D400 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 | 0586.7726.00 | RCA | CD4094BE | |
| D402 | BL MM74HC4051N 8CH.AN.MUX 8CH.ANALOG MUX/DEMUX | 0099.9670.00 | PHILIPS | (PC)74HC4051N(P) | |
| D410 | BL 74F193PC U/D-BIN.CNT UP/DOWN BINARY COUNTER | 0286.8559.00 | PHILIPS_SE | (N)74F193N | |
| D430 | BL UPB582C 4:1 PRESC IC PRESCALER | 0820.3390.00 | NEC | (UP)B582C | |
| D435 | BL CA3199 4:1 PRESC IC PRESCALERDIVBY4 | 0372.1106.10 | RCA | CA3199E | |
| D440 | BL SN74S112N 2XJK-FLIPFL FLIP FLOP | 0210.6026.00 | TEXAS | SN 74S112N | |
| D450 | BL 74FO2PC 4X2IN.NORG 4X2-INPUT NOR GATE | 0344.6959.00 | PHILIPS_SE | N74FO2N | |
| D460 | BL 74F74PC 2XD-FLIPFLOP DUAL D-FLIPFLOP | 0344.6694.00 | PHILIPS_SE | N74F74N | |
| D470 | BL 74F193PC U/D-BIN.CNT UP/DOWN BINARY COUNTER | 0286.8559.00 | PHILIPS_SE | (N)74F193N | |
| D475 | BL 74F193PC U/D-BIN.CNT UP/DOWN BINARY COUNTER | 0286.8559.00 | PHILIPS_SE | (N)74F193N | |
| D480 | BL MC4044P PHASE-L-L PHASE LOCKED LOOP | BL 0443.2980.10 | MOTOROLA | MC4044P | |
| D490 | BL MM74HC74N 2XD-FLIPFL DUAL D FLIP-FLOP | 0571.3171.00 | PHILIPS_SE | (PC)74HC74N(P) | |
| D510 | BL TC74HC123AP 2XMULTIVIB DUAL-MONO-FLOP | 0008.1912.00 | TOSHIBA | TC74HC123AP | |
| D530 | BL MM74HCOON 4X2IN.NAND QUAD 2-INPUT NAND GATE | 0571.3194.00 | PHILIPS_SE | (PC)74HCOON(P) | |
| D540 | BS DG211CJ 4X ANALOGSCH ANALOG SWITCH | 0801.8260.00 | SILICONIX | DG211CJ | |
| D565 | BL TC74HC123AP 2XMULTIVIB DUAL-MONO-FLOP | 0008.1912.00 | TOSHIBA | TC74HC123AP | |
| D570 | BL MM74HC74N 2XD-FLIPFL DUAL D FLIP-FLOP | 0571.3171.00 | PHILIPS_SE | (PC)74HC74N(P) | |
| D575 | BL MM74HCOON 4X2IN.NAND QUAD 2-INPUT NAND GATE | 0571.3194.00 | PHILIPS_SE | (PC)74HCOON(P) | |
| K240 | SR 5V2000HM 1MAL UM 1 REED RELAY | SR 0267.5364.00 | HAMLIN | HE721C0520 | |
| L1 | LD 4,70UH10%1,200HMO,239A CHOKE | LD 0067.2940.00 | DALE | IM2 | |
| L5 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L10 | LD 4,70UH10%1,200HMO,239A CHOKE | LD 0067.2940.00 | DALE | IM2 | |
| L20 | LL SPULE COIL | 0801.5226.00 | | | 0801.5203.00 |
| L25 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L35 | LD 1,00UH10%1,000HMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | |
| L65 | LD 0,47UH10%0,350HMO,660A CHOKE | LD 0067.2828.00 | DALE | IM2 | |
| L85 | LD 0,22UH10%0,140HM1,045A CHOKE | LD 0067.2786.00 | DALE | IM2 | |
| L85 | NUR VAR/ONLY MOD: 02 LD 0,22UH10%0,140HM1,045A CHOKE | LD 0067.2786.00 | DALE | IM2 | |
| L86 | NUR VAR/ONLY MOD: 04 LD 100 UH10%8,000HMO,084A CHOKE | LD 0067.3101.00 | DALE | IM2 | |
| L90 | NUR VAR/ONLY MOD: 04 LD SPULE COIL | 0801.6422.00 | | | 0801.5203.00 |
| L91 | LD 0,33UH10%0,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L92 | LD 0,33UH10%0,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |

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| L93 | LD SPULE COIL | 0801.6422.00 | | | 0801.5203.00 |
| L94 | LD 0,33UH10%,22OHMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L95 | LD SPULE COIL | 0801.6422.00 | | | 0801.5203.00 |
| L96 | LD SPULE COIL | 0801.6422.00 | | | 0801.5203.00 |
| L98 | LL SPULE COIL | 0801.5261.00 | | | 0801.5203.00 |
| L99 | LL SPULE COIL | 0801.5278.00 | | | 0801.5203.00 |
| L110 | LD SPULE COIL | 0801.6422.00 | | | 0801.5203.00 |
| L111 | LD 0,22UH10%,14OHM1,045A CHOKE | LD 0067.2786.00 | DALE | IM2 | |
| L112 | LD 0,22UH10%,14OHM1,045A CHOKE | LD 0067.2786.00 | DALE | IM2 | |
| L113 | LD SPULE COIL | 0801.6422.00 | | | 0801.5203.00 |
| L114 | LD 0,22UH10%,14OHM1,045A CHOKE | LD 0067.2786.00 | DALE | IM2 | |
| L115 | LD SPULE COIL | 0801.6422.00 | | | 0801.5203.00 |
| L116 | LD SPULE COIL | 0801.6422.00 | | | 0801.5203.00 |
| L118 | LL SPULE COIL | 0801.5249.00 | | | 0801.5203.00 |
| L119 | LL SPULE COIL | 0801.5255.00 | | | 0801.5203.00 |
| L130 | LD 1,00UH10%,1,00OHMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | |
| L142 | LD 0,22UH10%,14OHM1,045A CHOKE | LD 0067.2786.00 | DALE | IM2 | |
| L260 | LD 10 UH10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L275 | LD 287NH 8,5W CM18P FE-K COIL+CORE | 0613.6289.00 | TOKO | E521HN080023 | |
| L276 | LD 287NH 8,5W CM18P FE-K COIL+CORE | 0613.6289.00 | TOKO | E521HN080023 | |
| L282 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L310 | LD 15,0UH10%,2,80OHMO,157A CHOKE | LD 0067.3001.00 | DALE | IM2 | |
| L320 | LD 15,0UH10%,2,80OHMO,157A CHOKE | LD 0067.3001.00 | DALE | IM2 | |
| L325 | LD 100 UH10%8,00OHMO,084A CHOKE | LD 0067.3101.00 | DALE | IM2 | |
| L385 | LD 100NH 10% 0,08OHM 1,4A CHOKE | LD 0067.2740.00 | DALE | IM2 | |
| L387 | LD 2,20UH10%,40OHMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |
| L420 | LD 1,00UH10%,1,00OHMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | |
| L546 | LD 15,0UH10%,2,80OHMO,157A CHOKE | LD 0067.3001.00 | DALE | IM2 | |
| L547 | LD 18,0UH10%,3,10OHMO,149A CHOKE | LD 0067.3018.00 | DALE | IM2 | |
| N30 | BD MISCHER MIXER | 0914.5608.00 | | | 0801.5284.00 |
| N35 | BM OM361A HYBRID ANT AMPL ANTENNA AMPLIFIER | BM 0334.5314.00 | PHILIPS_SE | OM361A | |
| N40 | BM OM345 HYBRID ANT AMPL ANTENNA AMPLIFIER | BM 0285.1596.00 | PHILIPS_SE | OM345 | |
| N60 | BO SE5534AFE LN OPAMP OPERATIONAL AMPLIFIER | 0301.3335.00 | SIGNETICS | SE5534AFE | |
| N200 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N213 | BO LF156J FET OPAMP OPERATIONAL AMPLIFIER | BO 0645.7251.00 | ANALOG_DEV | PM156Z | |
| N233 | BO LF156J FET OPAMP OPERATIONAL AMPLIFIER | BO 0645.7251.00 | ANALOG_DEV | PM156Z | |
| N260 | BS TL601CP 1X ANALOGSCH ANALOG SWITCH | BJ 0213.4530.00 | TEXAS | TL601CP [MJG] | |
| N270 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |

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EE HF-OSZILLATOR
RF OSCILLATOR

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| N275 | BS TL601CP 1X ANALOGSCH ANALOG SWITCH | BJ 0213.4530.00 | TEXAS | TL601CP [MJG] | |
| N300 | BO LM393N 2X COMPAR COMPARATOR | 0803.0696.00 | NSC | LM393N | |
| N350 | BO LF156J FET OPAMP OPERATIONAL AMPLIFIER | BO 0645.7251.00 | ANALOG_DEV | PM156Z | |
| N360 | BO NE5532AFE 2XLN OPAMP OPERATIONAL AMPLIFIER | BO 0356.0450.00 | SIGNETICS | NE5532AFE | |
| N420 | BM MSA0304 MMIC BROADBAND AMPLIFIER | 0840.6094.00 | AVANTEK | MSA0304 | |
| P7 | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P8 | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P9 | XX ENTHALTEN IN INCLUDED IN | | | | |
| P10 | LEITERPLATTE/PCB XX ENTHALTEN IN INCLUDED IN | | | | |
| P11 | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P12 | XX ENTHALTEN IN INCLUDED IN | | | | |
| P13 | LEITERPLATTE/PCB VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P14 | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P15 | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P1A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P1B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P2A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P2B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P3A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P3B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P4A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P4B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P5A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P5B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P6A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P6B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P7A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| P7B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| R1 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R2 | RL 0,60W 274 OHM+-1%TK50 RESISTOR | RL 0083.0178.00 | RESISTA | MK2 | |
| R3 | RG 316 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9000.00 | ROEDERSTEI | D25 | |
| R4 | RG 38,3 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8784.00 | DRALORIC | CB 1206 ... | |
| R5 | RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8661.00 | PHILIPS_CO | RC02 | |
| R6 | RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8661.00 | PHILIPS_CO | RC02 | |
| R7 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R11 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| R12 | RL 0,60W 1,21KOHM+-1%TK50 RESISTOR | RL 0083.0655.00 | RESISTA | MK2 | |
| R13 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R15 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R16 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R17 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R18 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R19 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R20 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R21 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R22 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RCO2 | |
| R30 | RL 0,60W 825 OHM+-1%TK50 RESISTOR | RL 0082.2502.00 | RESISTA | MK2 | |
| R31 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | |
| R32 | RL 0,60W 825 OHM+-1%TK50 RESISTOR | RL 0082.2502.00 | RESISTA | MK2 | |
| R33 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | |
| R35 | RL 0,60W 56,2 OHM+-1%TK50 RESISTOR | RL 0082.9571.00 | RESISTA | MK2 | |
| R36 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RCO2 | |
| R37 | RG 215 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8961.00 | ROEDERSTEI | D25 | |
| R38 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RCO2 | |
| R40 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R50 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R51 | RL 0,60W 56,2 OHM+-1%TK50 RESISTOR | RL 0082.9571.00 | RESISTA | MK2 | |
| R52 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R53 | RS 0,5W100 OHM+-10%10X10X CERMET POTENTIOMETER T | RS 0247.7984.00 | BI_TECHNOL | 72PM | |
| R54 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R55 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R56 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R60 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R61 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R62 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R63 | RL 0,60W 1,82KOHM+-1%TK50 RESISTOR | RL 0082.2277.00 | PHILIPS_CO | MRS 25 | |
| R64 | RL 0,60W 82,5KOHM+-1%TK50 RESISTOR | RL 0082.2302.00 | PHILIPS_CO | MRS 25 | |
| R65 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R66 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R67 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R70 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R71 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R72 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R73 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R80 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| R81 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | |
| R82 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R90 | RL 0,60W 56,2 OHM+-1%TK50 RESISTOR | RL 0082.9571.00 | RESISTA | MK2 | |
| R91 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R92 | RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T | RS 0247.7878.00 | BI_TECHNOL | 72PM | |
| R93 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R94 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R95 | RG 11,0 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8655.00 | PHILIPS_CO | RC02 | |
| R96 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R98 | RG 10,0KOHM+-1%TK100 1206 RG CHIP RESISTOR | RG 0007.0793.00 | PHILIPS_CO | RC02 | |
| R99 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R100 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R101 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | |
| R102 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R110 | RL 0,60W 56,2 OHM+-1%TK50 RESISTOR | RL 0082.9571.00 | RESISTA | MK2 | |
| R111 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R112 | RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T | RS 0247.7878.00 | BI_TECHNOL | 72PM | |
| R113 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R114 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R115 | RG 14,7OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8684.00 | DRALORIC | CB 1206 ... | |
| R116 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R118 | RG 10,0KOHM+-1%TK100 1206 RG CHIP RESISTOR | RG 0007.0793.00 | PHILIPS_CO | RC02 | |
| R119 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R120 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R131 | RG 38,3 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8784.00 | DRALORIC | CB 1206 ... | |
| R132 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RC02 | |
| R133 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R134 | RL 0,60W 182 OHM+-1%TK50 RESISTOR | RL 0083.0010.00 | RESISTA | MK2 | |
| R135 | RG 2,61KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0658.00 | DRALORIC | CB 1206 ... | |
| R141 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R142 | RL 0,60W 1,21KOHM+-1%TK50 RESISTOR | RL 0083.0655.00 | RESISTA | MK2 | |
| R143 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R150 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R151 | RL 0,60W 475 KOHM+-1%TK50 RESISTOR | RL 0083.2593.00 | PHILIPS_CO | MRS 25 | |
| R152 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R153 | RG 68,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8849.00 | PHILIPS_CO | RC02 | |
| R154 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R155 | RG 68,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8849.00 | PHILIPS_CO | RC02 | |
| R156 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |

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|  | ROHDE & SCHWARZ | 62 | 03.05.99 | EE HF-OSZILLATOR RF OSCILLATOR | 0801.5110.01 SA | 11+ |

| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| R158 | RG 68,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8849.00 | PHILIPS_CO | RC02 | |
| R159 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R160 | RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8861.00 | PHILIPS_CO | RC02 | |
| R161 | RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8861.00 | PHILIPS_CO | RC02 | |
| R200 | RL 0,60W 39,2KOHM+-1%TK50 RESISTOR | RL 0083.1745.00 | RESISTA | MK2 | |
| R201 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R202 | RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T | RS 0247.7878.00 | BI_TECHNOL | 72PM | |
| R240 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R241 | RL 0,35W1,62KOHM+-0,1%T25 RESISTOR MODEL SMG 44, SMH 44 FITTED WITH 562 OHM RL 083.0461 | RL 0083.9546.00 | DRALORIC | SMA0207 | |
| R242 | RL 0,35W200 OHM+-0,1%TK25 RESISTOR | RL 0083.7808.00 | DRALORIC | SMA0207 | |
| R243 | RL 0,35W200 OHM+-0,1%TK25 RESISTOR | RL 0083.7808.00 | DRALORIC | SMA0207 | |
| R244 | RL 0,35W100 OHM+-0,1%TK25 RESISTOR | RL 0083.7220.00 | DRALORIC | SMA0207 | |
| R260 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R261 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R262 | RS 0,75W10KOHM+-10%CERMET DEPOS.-CARBON POTENTIOMET | RS 0037.7396.00 | BI_TECHNOL | 89 P | |
| R263 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R264 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R270 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R271 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R272 | RL 0,60W 1,30KOHM+-1%TK50 RESISTOR | RL 0083.0678.00 | RESISTA | MK2 | |
| R273 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | |
| R274 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R275 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R280 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R281 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R282 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | |
| R283 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R285 | RL 0,60W 27,4KOHM+-1%TK50 RESISTOR | RL 0082.2583.00 | RESISTA | MK2 | |
| R300 | RL 0,60W 2,43KOHM+-1%TK50 RESISTOR | RL 0083.0884.00 | RESISTA | MK2 | |
| R301 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R302 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R303 | RL 0,60W 2,43KOHM+-1%TK50 RESISTOR | RL 0083.0884.00 | RESISTA | MK2 | |
| R304 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R305 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R306 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R307 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R312 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |

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| R314 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R315 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R317 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R318 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R319 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R320 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R321 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R322 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R323 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R324 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R325 | RL 0,60W 475 KOHM+-1%TK50 RESISTOR | RL 0083.2593.00 | PHILIPS_CO | MRS 25 | |
| R326 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R327 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R328 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R337 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R338 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R339 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R341 | RL 0,60W 475 KOHM+-1%TK50 RESISTOR | RL 0083.2593.00 | PHILIPS_CO | MRS 25 | |
| R342 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R350 | RL 0,60W4,75MOHM+-1%TK50 METALFILMRESISTOR | RL 0099.8250.00 | PHILIPS_CO | MRS 25 | |
| R351 | RL 0,60W 56,2KOHM+-1%TK50 RESISTOR | RL 0082.2231.00 | RESISTA | MK2 | |
| R352 | RL 0,60W 56,2KOHM+-1%TK50 RESISTOR | RL 0082.2231.00 | RESISTA | MK2 | |
| R353 | RL 0,60W 221 KOHM+-1%TK50 RESISTOR NUR VAR/ONLY MOD: 02 | RL 0083.2270.00 | RESISTA | MK2 | |
| R353 | RL 0,60W 165 KOHM+-1%TK50 RESISTOR NUR VAR/ONLY MOD: 04 | RL 0083.2158.00 | RESISTA | MK2 | |
| R354 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R355 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R360 | RL 0,60W 1,21KOHM+-1%TK50 RESISTOR | RL 0083.0655.00 | RESISTA | MK2 | |
| R361 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R362 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R363 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R364 | RL 0,60W 5,62KOHM+-1%TK50 RESISTOR | RL 0082.2190.00 | PHILIPS_CO | MRS 25 | |
| R365 | RL 0,60W 6,19KOHM+-1%TK50 RESISTOR | RL 0082.2283.00 | RESISTA | MK2 | |
| R366 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R367 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R400 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R401 | RL 0,60W 2,00KOHM+-1%TK50 RESISTOR | RL 0083.0826.00 | RESISTA | MK2 | |
| R410 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R420 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |

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| R422 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 . . . | |
| R423 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R425 | RG 121 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8903.00 | PHILIPS_CO | RC02 | |
| R430 | RG 2,21KOHM+-1%TK100 1206 RESISTOR CHIP | RG 0007.5743.00 | PHILIPS_CO | RC02 | |
| R432 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R435 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R436 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | |
| R437 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R440 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R460 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R461 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R470 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | |
| R480 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R482 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R490 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R510 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R511 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | |
| R512 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R513 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R530 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R540 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R541 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R545 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R550 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R551 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R552 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | |
| R553 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R554 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R555 | RL 0,60W 274 OHM+-1%TK50 RESISTOR | RL 0083.0178.00 | RESISTA | MK2 | |
| R560 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | |
| R561 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R563 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R564 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R565 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R566 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R569 | RL 0,60W 5,62KOHM+-1%TK50 RESISTOR | RL 0082.2190.00 | PHILIPS_CO | MRS 25 | |
| R570 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R571 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R572 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |

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EE HF-OSZILLATOR
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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| R600 ..604 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R605 ..608 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R609 | RL 0,60W 1KOHM+-1%TK50 RESISTOR TRIMMWERT/SELECTED 1K(-8K) | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| T15 | LU UEBERTRAGER TRANSFORMER | 0801.5232.00 | | | 0801.5203.00 |
| T30 | LU UEBERTRAGER TRANSFORMER | 0801.5210.00 | | | 0801.5284.00 |
| V6 | AK BFR96 N 15V 75MA TRANSISTOR | AK 0093.2738.00 | VALVO | BFR96 | |
| V11 | AK BFR15A N 12V 30MA TRANSISTOR | 0451.4320.10 | SIEMENS | BFR15A | |
| V18 | AK BFR96 N 15V 75MA TRANSISTOR | AK 0093.2738.00 | VALVO | BFR96 | |
| V20 | AE 5082-0833 25V STEPRDI DIODE | AE 0343.0086.00 | HEWLETT_PA | HP5082-0833 | |
| V50 | AM U440 SEL N-D DUALJFET DUAL FET | 0801.8360.00 | SILICONIX | U440 SEL. | |
| V60 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V70 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| V72 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V75 | AE BZX79B10 0,5W ZDI ZENER DIODE | AE 0289.4302.00 | VALVO | BZX79B10 | |
| V80 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V85 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| V90 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| V95 | AK BFR96 N 15V 75MA TRANSISTOR | AK 0093.2738.00 | VALVO | BFR96 | |
| V96 | AE BB405B 11/ 2PF CDI TUNING DIODE | 0596.6839.00 | PHILIPS | BB405B | |
| V97 | AE BB405B 11/ 2PF CDI TUNING DIODE | 0596.6839.00 | PHILIPS | BB405B | |
| V98 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V100 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V105 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| V110 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| V115 | AK BFR96 N 15V 75MA TRANSISTOR | AK 0093.2738.00 | VALVO | BFR96 | |
| V116 | AE BB405B 11/ 2PF CDI TUNING DIODE | 0596.6839.00 | PHILIPS | BB405B | |
| V117 | AE BB405B 11/ 2PF CDI TUNING DIODE | 0596.6839.00 | PHILIPS | BB405B | |
| V118 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V130 | AK NE85637 N 12V 100MA TRANSISTOR | 0801.8231.00 | NEC | NE85637 (2SC3358) | |
| V140 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V141 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V150 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V240 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| V242 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V260 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | |
| V261 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | |
| V262 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | |


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| V275 | AE BB809 26/ 6PF CDI TUNING DIODE | 0092.9616.00 | VALVO | BB809 | |
| V280 | AM U310 N-D 25V JFET FET | AM 0454.6217.00 | SILICONIX | U310 | |
| V307 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V320 | AK 2N2369A N 15V 200MA TRANSISTOR | AK 0010.4680.00 | VALVO | 2N2369A ODER BSX20 | |
| V324 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V339 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V350 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V360 | AE 1N823 6,2V REF DI REFERENCE DIODE | 0012.2278.00 | SIEMENS | 1N823 | |
| V362 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| V363 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V423 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| V425 | AE BA679 30V PIN PIN DIODE | 0356.1840.00 | TELEFUNKEN | BA679 | |
| V430 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V435 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V436 | AK BSX29 P 12V 200MA TRANSISTOR | 0010.3031.00 | SGS | BSX29 | |
| V460 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V470 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V540 | AE BZX79B3V9 2% 0.5W ZDI ZENER | AE 0008.7685.00 | PHILIPS_SE | BZX79B3V9 | |
| V551 | AK 2N2369A N 15V 200MA TRANSISTOR | AK 0010.4680.00 | VALVO | 2N2369A ODER BSX20 | |
| V555 | AK 2N2369A N 15V 200MA TRANSISTOR | AK 0010.4680.00 | VALVO | 2N2369A ODER BSX20 | |
| V570 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | |
| X1 | FP STECKERLEISTE 32POL. MULTIPOINT CONNECTOR | FP 0514.4550.00 | SIEMENS | V42254-B1200-B641 | |
| X11 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | |
| X12 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | |
| X13 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | |
| X14 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | |
| X15 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | |
| X16 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | |
| X60 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | |
| X301 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| X303 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| X308 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| X310 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| X11A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| X11B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| X12A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| X12B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |
| X13A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT CON | 75403-001/75401-001 | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
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| X13B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X14A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X14B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X15A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X15B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X16A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X16B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X16C | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X60A | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| X60B | VL WIRE-WRAP PIN L=8,7 WIRE-WRAP PIN | 0088.4507.00 | DUPONT | CON 75403-001/75401-001 | |
| Z1 ..6 | LD 10GHZ 50DB100V10A4RDX9 LEAD-THROUGH FILTER | LD 0451.4636.00 | SPECTRUM | 51-713-036 | |

| | | | | | | |
|---|----------------------------|----|---------------|---------------------------------------|-------------------------|-------------------|
| MEZ15 | 790 3PLU | Äl | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | ROHDE & SCHWARZ | 62 | 03.05.99 | EE HF-OSZILLATOR RF OSCILLATOR | 0801.5110.01 SA | 17- |



ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Baugruppe Ausgangsstufe

843.4805.02

ENGLISH MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5.1 Funktionsbeschreibung

(Hierzu Stromlauf 843.4805 S und Bild 5-1)

Die von der Baugruppe "HF-Oszillator" erzeugten Frequenzen zwischen 500 MHz und 1000 MHz werden auf der Baugruppe "Ausgangsstufe" durch Verdopplung, Teilung und Mischung in den Frequenzbereich 0,1...2000 MHz umgesetzt. Der HF-Träger kann elektronisch gedämpft und amplitudenmoduliert werden.

5.1.1 HF-Aufbereitung

Über die Buchse X410 werden der Baugruppe Frequenzen von 500...1000 MHz zugeführt und verstärkt (V5). Mit den binär gestuften Teilerschritten 1:1, 1:2, 1:4, 1:8 und 1:16 kann die Eingangsfrequenz mit D35, D52 und D61 geteilt werden. Die Teilungsverhältnisse 1:8 und 1:16 werden durch Kaskadierung von jeweils zwei Teilern realisiert. Mit Diodenumschaltern kann der gewünschte Teilungsfaktor eingestellt werden.

Das Ausgangssignal der HF-Teiler wird im Verstärker N70 begrenzt und gelangt dann an den Pulsmodulator (V900...V903, N905, V910...V913). Der nachfolgende Pinmodulator besteht aus sechs Pindioden (V94, V95, V97, V98, V93 und V99). Über den Eingang (R97, L97) kann der HF-Pegel gesteuert werden (Stellglied der Pegelregelung, AM-Modulator).

Der nachfolgende zweistufige HF-Verstärker (V112, V133) weist eine Verstärkung von 10...12 dB auf.

Über ein Dämpfungsglied gelangt das Signal auf die Oberwellenfilter, welche in 10 Frequenzbereiche und den Mischerteil aufgeteilt sind. Die 10 Filterbereiche sind in Gruppen zu 2x vier und 1x zwei Filter aufgeteilt, welche durch Pindioden umgeschaltet werden.

Der Mischerteil wird mit Frequenzen zwischen 150,1 und 181,25 MHz angesteuert. Sie werden in einer Verstärkerstufe (V606) auf max. 2,82 V verstärkt. Dieser Pegel wird für die Meßstelle <8 MHz benötigt. Das Signal wird dann über Dämpfungsglieder auf den RF-Eingang des Mixers (U630) geführt. Das 150-MHz-LO-Signal gelangt von der Buchse X405 über eine Verstärkerstufe (V670) an den Mischer.

Das IF-Signal von 0,1...31,25 MHz wird verstärkt (V640, V641; Verstärkung mit R641 einstellbar) und auf den Ausgang X404 gegeben.

Der Verdoppler, bestehend aus T812 und den Dioden V813...V816, wird von dem Verstärker V810 mit der Grundoktave 500...1000 MHz angesteuert. Das verdoppelte Signal (1000...2000 MHz) wird mit dem Verstärker N820 verstärkt und auf den Pinmodulator gegeben. Der Pinmodulator (V824, V827, V828, V829, V834, V837, V838, V839) dient als Stellglied der Pegelregelung. Mit den nachfolgenden Verstärkern N860 und N870 wird das Signal auf den nötigen Ausgangspegel verstärkt.

Der HF-Pegel wird für Frequenzen < 8 MHz mit der Diode V616 gleichgerichtet und einem Umschalter N461 zugeleitet. Dieser schaltet bei 8 MHz zwischen der hochfrequenten Meßstelle, die auf den Eingang X401 führt, und der Meßstelle im Mischerteil um. Die jeweilige Gleichrichtspannung wird dann mit dem Führungswert verglichen. Der Regelverstärker N470 steuert den HF-Pegel über den Pinmodulator so nach, daß der HF-Gleichrichtwert dem Führungswert entspricht. Mit dem Umschalter N890 wird im Verdopplerbetrieb der niederfrequente Pinmodulator mit einer festen Vorspannung betrieben.

5.1.2 Modulationssteuerung

Dieser Schaltungsteil besteht im Wesentlichen aus einem Modulationsgradteiler für AM-Modulation und einem Pegelteiler für die elektronische Pegeleinstellung.

Von einer Referenzspannungsquelle (V515) wird eine DC-Spannung über den Verstärker N510 dem 10-Bit-D/A-Wandler D520 zugeführt, der die Spannung auf den gewünschten Führungswert teilt (Abgleich mit R514).

Über X1.A31 wird die AM-Modulationsfrequenz zugeführt und verstärkt (N500). Ein 8-Bit-D/A-Wandler teilt die NF-Spannung auf den gewünschten Modulationsgrad. Mit R503 wird der Modulationsgrad abgeglichen. Die AC-Spannung wird an N510 zu dem DC-Führungswert addiert.

5.1.3 Ansteuerung und Diagnoseschaltung

Die Baugruppe wird über einen seriellen Datenbus angesteuert. Die Daten für die HF-Einstellung und die Modulationssteuerung werden in insgesamt 5 Latchbausteine eingelesen. Zwei verschiedene "Strobes" unterscheiden die Daten für HF-Einstellung (X1.A6) und Modulationssteuerung (X1.A25).

8 verschiedene Diagnosestellen (DC-Werte) können über den Multiplexerbaustein (D560) auf den Ausgang X1.A23 geführt werden.

Die Überwachung der Pegelregelschleife wird mit dem Komparator N150 durchgeführt. Er schaltet den Ausgang X1.A3 von +5 V auf 0 V, wenn die Pegelregelung ausgefallen ist.

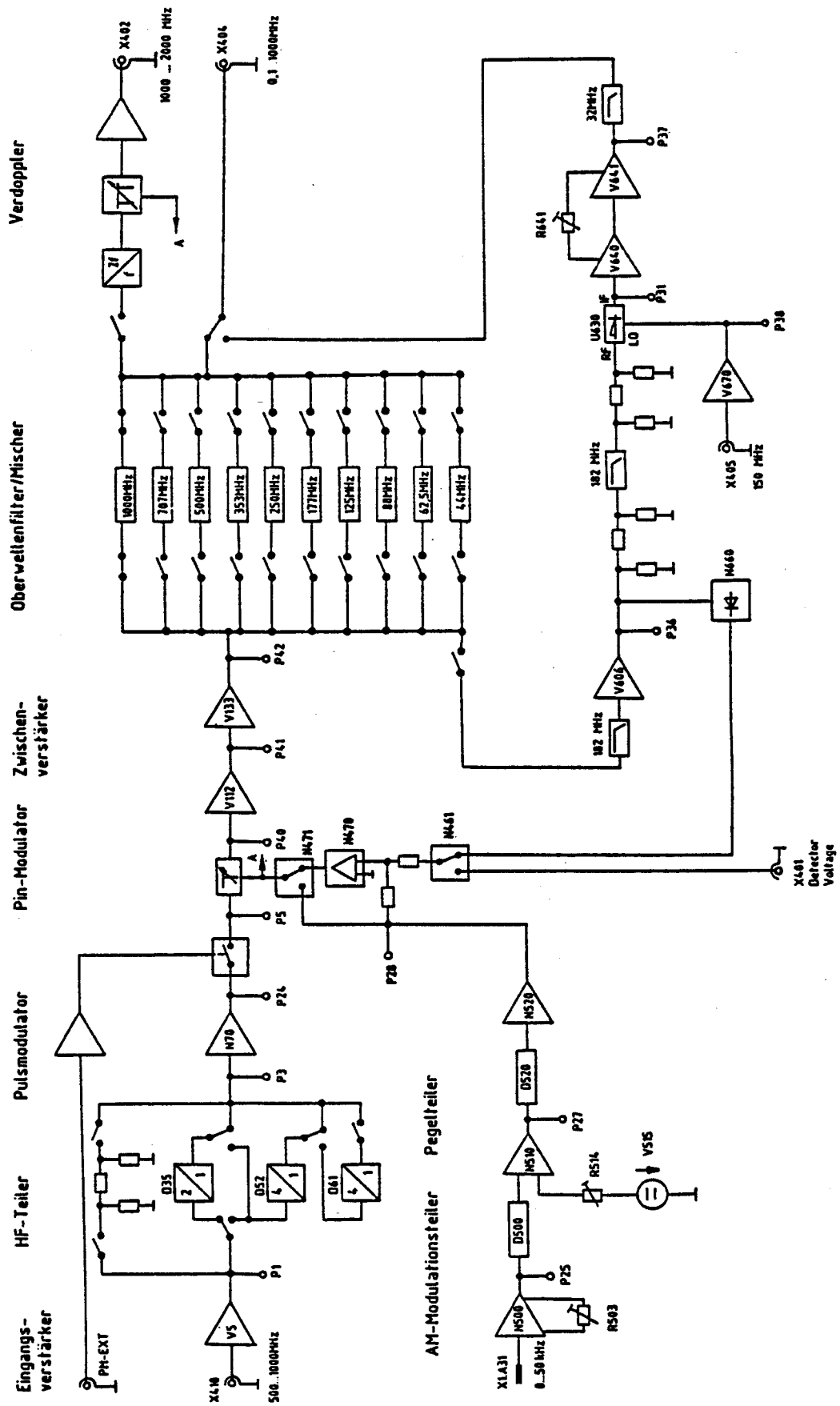


Bild 5-1 Blockschaltbild der Ausgangsstufe

5.2 Prüfen und Abgleichen

- Die Baugruppe auf den Serviceadapter setzen.
- An Buchse RF1 einen HF-Leistungsmesser anschließen.

5.2.1 Pegel-Abgleiche

a) Pegelabgleich für RF >8 MHz

- Einstellung am Gerät: RF = 100 MHz, Pegel = 0 dBm
- Mit Trimmer R514 den Pegel auf 0 dBm $\pm 0,1$ dB einstellen

b) Offsetabgleich für RF < 8MHz

- Einstellung am Gerät: RF = 7,9 MHz, Pegel = 13 dBm
- Spezialfunktion 53 einschalten und den Pegel notieren
- Spezialfunktion 54 einschalten und mit dem Trimmer R663 eine Dämpfung von 25 dB $\pm 0,2$ dB einstellen.

c) Pegelabgleich für RF <8 MHz

- Einstellung am Gerät: Pegel = 0 dBm
- Pegel bei RF = 8 MHz messen und bei 7,999 MHz mit R641 den gleichen Wert ($\pm 0,1$ dB) einstellen.

5.2.2 Abgleich des Modulationsgrades

- Trägerfrequenz 100 MHz und einen Pegel von +0 dBm einstellen.
- Modulationsgrad auf 80 % bei 1 kHz Modulationsfrequenz einstellen.
- An Buchse RF1 ein Modulationsgradmeßgerät anschließen und mit R503 auf 80 % $\pm 0,1$ % abgleichen.

5.2.3 Funktionsprüfung der Baugruppe

Bei einem Ausgangspegel von -7 dBm und -17 dBm (-17 dBm mit 10 dB Feinvariation) den gesamten Frequenzbereich durchstimmen (z.B. über IEC-Bus) und die Regelspannung der Pegelregelung (Spezialfunktion 128) nach Tabelle 5-2 prüfen.

Tabelle 5-2

| Frequenzbereich | Regelspannung der Pegelregelung | |
|-----------------|---------------------------------|---------------|
| | bei -7 dBm | bei -17 dBm |
| 0,1... 999 MHz | -2,2...-0,5 V | -3,0...-1,5 V |
| 1000...2000 MHz | -1,5...-0,3 V | -1,8...-0,9 V |

- Einen RF-Pegel von +13 dBm einstellen und die Oberwellen im gesamten Frequenzbereich prüfen, sie müssen <-30 dBc sein.
- An Buchse RF1 einen AM-Modulationsanalysator anschließen.
- Mit +7 dBm RF-Pegel und 80 % AM den Klirrfaktor prüfen. Bei einer Modulationsfrequenz von 1 kHz soll der Klirrfaktor <2 % sein. (Bei Abweichung vom jeweiligen Toleranzbereich siehe Abschnitt 5.3 Fehlersuche.)

5.3 Fehlersuche

5.3.1 DC-Arbeitspunkte der HF-Verstärker

- Den Federdeckel auf der Leiterseite abschrauben und die Baugruppe über das Serviceadapterkabel anschließen.
- 1000 MHz einstellen und die Buchsen X410 und X405 mit 50 Ω abschließen. DC-Spannungen nach Tabelle 5-3 kontrollieren:

Tabelle 5-3

| Transistor | Kollektorspannung | | Bemerkung |
|------------|-------------------|--------|----------------------------|
| V5 | +5,3 V | ±0,5 V | Eingangsverstärker |
| N905 | +5,1 V | ±0,5 V | Verst. vor Pin-Modulator |
| V112 | +4,4 V | ±0,5 V | Verst. nach Pin-Modulator |
| V133 | +5,5 V | ±0,5 V | Verst. nach Pin-Modulator |
| V810 | +6,7 V | ±0,5 V | Verst. vor Verdoppler |
| N820 | +4,5 V | ±0,5 V | Verst. nach Verdoppler |
| N830 | +4,5 V | ±0,5 V | Verst. nach Verdoppler |
| N860 | +4,5 V | ±0,5 V | Verst. nach Verdoppler |
| N870 | +4,5 V | ±0,5 V | Verst. nach Verdoppler |
| V606 | +5,7 V | ±0,5 V | Mischerteil: RF-Verstärker |
| V640 | +9,4 V | ±0,5 V | Mischerteil: IF-Verstärker |
| V641 | +8,7 V | ±0,5 V | Mischerteil: IF-Verstärker |
| V670 | +9,3 V | ±0,5 V | Mischerteil: LO-Verstärker |

5.3.2 DC-Schaltspannungen zur HF-Einstellung

- An P29 +1,8 V (±0,2 V) prüfen.
- Weitere Prüfungen nach Tabelle 5-4.

Tabelle 5-4

| Träger- frequenz (MHz) | An Meßpunkten DC-Spannung prüfen (Werte in V, ±1,5 V) | | | | | | | | | | | | | | | | |
|------------------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------|
| | P8 | P9 | P10 | P11 | P12 | P13 | P14 | P15 | P16 | P17 | P18 | P19 | P20 | P21 | P22 | P23 | Anode V51 |
| 1000 | -13 | +12 | +13 | +13 | +12 | +12 | -11 | +13 | -14 | -15 | -12 | +12 | -14 | -15 | -14 | -15 | +5 |
| 700 | -13 | +12 | +13 | +13 | +12 | -11 | +12 | +13 | -14 | -15 | -12 | +12 | -14 | -15 | -14 | -15 | +5 |
| 350 | +12 | -14 | +13 | +13 | -14 | -11 | -11 | +13 | -14 | +12 | +12 | -9 | -14 | -15 | -14 | +8 | +5 |
| 300 | +12 | -14 | +13 | +13 | -14 | -11 | -11 | +13 | -14 | +12 | -9 | +12 | -14 | -15 | -14 | +8 | +5 |
| 200 | +12 | +12 | +13 | -14 | +12 | -11 | -11 | +13 | -14 | +12 | +12 | -9 | -14 | -15 | +7 | -15 | 0 |
| 150 | +12 | +12 | +13 | -14 | +12 | -11 | -11 | +13 | -14 | +12 | -9 | +12 | -14 | -15 | +7 | -15 | 0 |
| 100 | +12 | -14 | +13 | -14 | +12 | -11 | -11 | +13 | +12 | +12 | +12 | -9 | -14 | +7 | -14 | -15 | 0 |
| 70 | +12 | -14 | +13 | -14 | +12 | -11 | -11 | +13 | +12 | +12 | +12 | -9 | -14 | +7 | -14 | -15 | 0 |
| 50 | +12 | +12 | -14 | +12 | +12 | -11 | -11 | +13 | +12 | +12 | +12 | -9 | +7 | -15 | -14 | -15 | 0 |
| 40 | +12 | +12 | -14 | +12 | +12 | -11 | -11 | +13 | +12 | +12 | -9 | +12 | +7 | -15 | -14 | -15 | 0 |
| 30 | +12 | +12 | +12 | -14 | +12 | -11 | -11 | -14 | +12 | +12 | -9 | +12 | -9 | -14 | -15 | +7 | -15 |
| 1 | +12 | +12 | +12 | -14 | +12 | -11 | -11 | -14 | +12 | +12 | +12 | -9 | -14 | -15 | +7 | -15 | 0 |

5.3.3 HF-Prüfung

Die HF-Verbindungen der Baugruppe sind über Subminaxkabel herzustellen. Es empfiehlt sich, mit einem hochohmigen Tastkopf zu prüfen, welcher z.B. eine Durchlaßdämpfung von 20 dB aufweist. Die folgenden Pegelangaben sind die an 50 Ω gemessenen Werte + Dämpfung des Tastkopfs.

Bei -7 dBm sind im geregelten Betrieb der Baugruppe die HF-Pegel an den Meßpunkten nach Tabelle 5-5 zu überprüfen.

Tabelle 5-5

| Träger- frequenz (MHz) | An Meßpunkten HF-Pegel (Werte in dBm, ± 3 dB) | | | | | | | | | | | Bemerkung |
|------------------------------|---|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | P1 | P3 | P24 | P5 | P40 | P41 | P42 | P36 | P31 | P37 | P38 | |
| 1500 | +6 | 0 | +4 | +10 | +1 | +11 | +14 | - | - | - | - | Verdoppler Grundbereich Teilung 1:2 Teilung 1:4 Teilung 1:8 Teilung 1:16 Mischerteil |
| 999 | +6 | 0 | +5 | +11 | -1 | +10 | +12 | - | - | - | - | |
| 499 | +6 | -4 | +3 | +9 | -6 | +6 | +10 | - | - | - | - | |
| 249 | +6 | -4 | +2 | +10 | -9 | +1 | +5 | - | - | - | - | |
| 124 | +6 | -3 | +1 | +11 | -9 | +1 | +5 | - | - | - | - | |
| 62 | +6 | -3 | +5 | +11 | -8 | +1 | +6 | - | - | - | - | |
| 31 | +6 | -3 | +1 | +11 | -4 | +5 | +10 | +20 | -10 | 0 | +8 | |

5.4 Schnittstellen

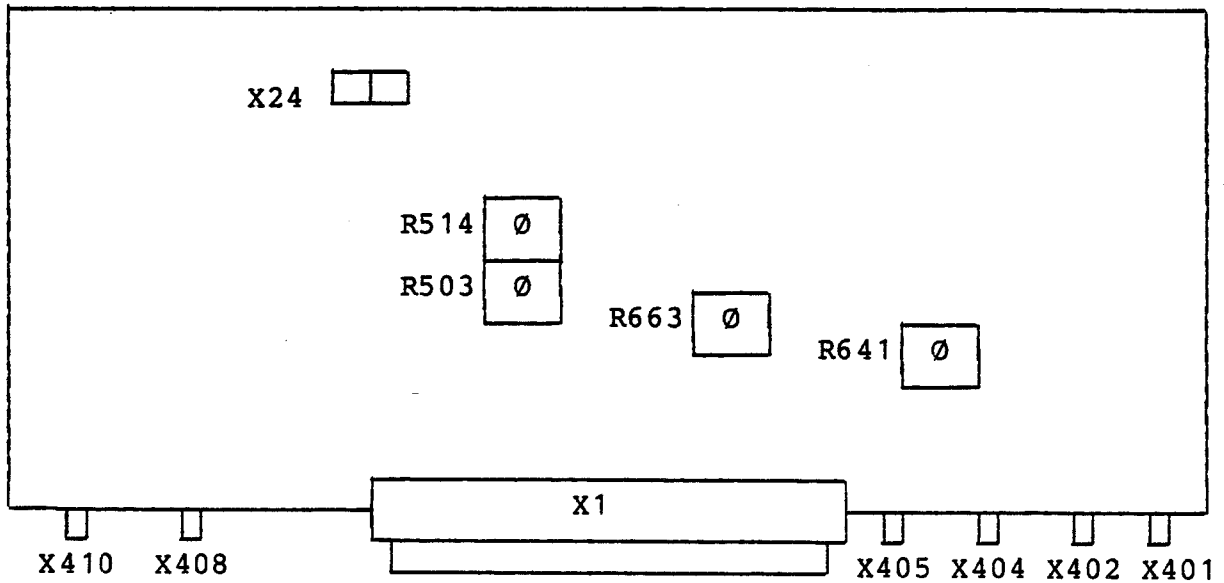


Bild 5-2 Anordnung der Ein-/Ausgänge und der Abgleichelemente
Analoge Schnittstellen

| Bezeichnung | Funktion | Frequenz | Pegel |
|-------------|--------------------|-----------------|---------|
| X410 | HF-Eingang | 500...1000 MHz | 0 dBm |
| X408 | PM-EXT-Eingang | DC...1 MHz | TTL |
| X405 | HF-Eingang | 150 MHz | 0 dBm |
| X404 | HF-Ausgang | 0,1...1000 MHz | +2 dBm |
| X402 | HF-Ausgang | 1000...2000 MHz | +5 dBm |
| X401 | HF-Meßstelle | DC | 0...4 V |
| X1.A23 | Diagnoseausgang | DC | 0...4 V |
| X1.A31 | Modulationseingang | DC...50 kHz | 1 V |

Digitale Schnittstellen (C-MOS)

| Bezeichnung | Funktion | Bemerkung |
|-------------|--------------|-----------------------------------|
| X1.A8 | Dateneingang | seriell |
| X1.A10 | Clock | |
| X1.A6 | Strobe | für HF-Einstellung |
| X1.A25 | Strobe | für Modulationssteuerung/Diagnose |
| X1.A3 | Loop Control | für Pegelregelung |

Versorgungsspannungen

| Bezeichnung | Spannung |
|--|----------|
| X1.A12,A13 | +5 V |
| X1.A15 | +24 V |
| X1.A17 | +15 V |
| X1.A19 | -15 V |
| X1.A2,A7,A11,A14,A16, A18,A20,A30,A32 | Masse |



ROHDE & SCHWARZ

SERVICE DOCUMENTS

Output Stage Module

843.4805.02

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5.1 Function Description

(See circuit diagram 843.4805 S and Fig. 5-1)

The frequencies between 500 MHz and 1000 MHz generated by the RF oscillator module are converted on the output stage module into the frequency range 0.1 to 2000 MHz by doubling, dividing and mixing. The RF carrier can be electronically attenuated and amplitude modulated.

5.1.1 RF Conditioning

Frequencies between 500 and 1000 MHz are applied to the module via connector X410 and amplified (V5). The input frequency can be divided using D35, D52 and D61 in binary steps of 1:1, 1:2, 1:4, 1:8 and 1:16. The ratios 1:8 and 1:16 are implemented by cascading two dividers. The required factor can be set using diode selectors.

The output signal from the RF divider is limited in the amplifier N70 and is then applied to the pulse modulator (V900 to V903, N905, V910 to V913). The following PIN modulator consists of six PIN diodes (V94, V95, V97, V98, V93 and V99). The RF level can be controlled via the input (R97, L97) (control element of level controller, AM modulator).

The following two-stage RF amplifier (V112, V133) has a gain of 10 to 12 dB.

The signal is applied via an attenuator to the harmonics filters which are divided into 10 frequency ranges and the mixer. The 10 filter ranges are divided into groups of 2 x four filters and 1 x two filters which can be switched over using PIN diodes.

The mixer is controlled by frequencies between 150.1 and 181.25 MHz. These are amplified by V606 to a maximum of 2.82 V. This level is required for the channel <8 MHz. The signal is then applied to the RF input of the mixer (U630) via attenuators. The 150 MHz LO signal is applied from connector X405 via an amplifier stage (V670) to the mixer.

The IF signal of 0.1 to 31.25 MHz is amplified (V640, V641; gain adjustable using R641) and applied to output X404.

The doubler, consisting of T812 and the diodes V813 to V816, is driven by amplifier V810 with the fundamental octave 500 to 1000 MHz. The doubled signal (1000 to 2000 MHz) is amplified in amplifier N820 and applied to the pin modulator. The pin modulator (V824, V827, V828, V829, V834, V837, V838, V839) is used as control element of the level controller. The subsequent amplifiers N860 and N870 amplify the signal to the necessary output level.

For frequencies <8 MHz, the RF level is rectified using diode V616 and applied to changeover switch N461. At 8 MHz, this switch switches between the high-frequency channel leading to input X401 and the channel in the mixer. The respective rectified voltage is then compared with the reference value. The control amplifier N470 controls the RF level via the pin modulator such that the rectified RF value corresponds to the reference value. The control loop can be opened up using the changeover switch and the RF level can then be controlled via the modulation controller. Using changeover switch N890, the low-frequency pin modulator is operated with a fixed bias voltage in doubler mode.

5.1.2 Modulation Control

This part of the circuit basically consists of a modulation depth divider for amplitude modulation and a level divider for the electronic level setting.

A DC voltage is applied to the 10-bit D/A converter from a reference voltage source (V515) via amplifier N510 and divided into the required reference value (adjustment using R514).

The AM modulation frequency is applied via X1.A31 and amplified (N500). An 8-bit D/A converter divides the AF voltage to the required modulation depth. The modulation depth is adjusted using R503. The AC voltage is added at N510 to the DC reference value.

5.1.3 Control and Diagnostic Circuit

The subassembly is triggered via a serial data bus. The data for the RF setting and the modulation control are read into a total of 5 latches. Two different strobes differentiate the data for the RF setting (X1.A6) and the modulation control (X1.A5).

Eight different diagnostic positions (DC values) can be connected to output X1.A23 via the multiplexer IC (D560).

The level control loop is monitored by comparator N150. This switches the output X1.A3 from +5 V to 0 V if the level control has failed.

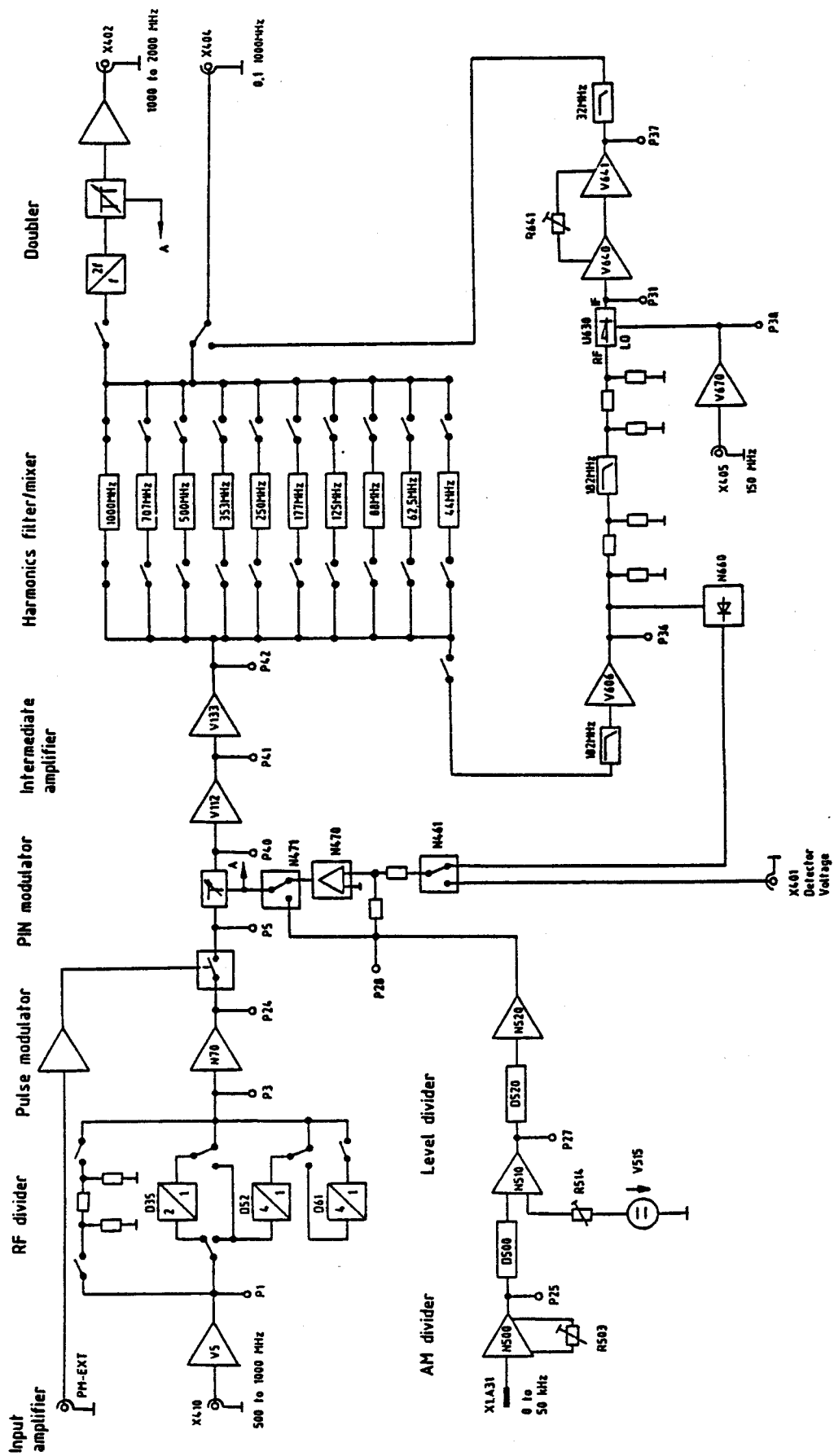


Fig. 5-1 Block diagram of output stage

5.2 Checking and Adjustments

- Connect the module to the service adapter.
- Connect an RF power meter to RF1.

5.2.1 Level Adjustments

a) Level adjustment for RF >8 MHz

- SMH setting : RF = 100 MHz, level = 0 dBm
- Adjust the level to 0 dBm ± 0.1 dB using trimmer R514.

b) Offset adjustment for RF <8 MHz

- SMH setting: RF = 7.9 MHz, level = 13 dBm
- Switch on special function 53 and note the level.
- Switch on special function 54 and set an attenuation of 25 dB ± 0.2 dB using trimmer R663.

c) Level adjustment for RF < 8 MHz

- SMH setting: level = 0 dBm
- Measure level at RF = 8 MHz and adjust to the same value (± 0.1 dB) at 7.999 MHz using R641.

5.2.2 Adjustment of Modulation Depth

- Set carrier frequency of 100 MHz and a level of 0 dBm.
- Set modulation depth to 80% with a modulation frequency of 1 kHz.
- Connect a modulation depth analyzer to connector RF1 and adjust to 80% $\pm 0.1\%$ using R503.

5.2.3 Function Test of Module

- Sweep through the complete frequency range (e.g. via IEC bus) with an output level of -7 dBm and -17 dBm (-17 dBm with 10 dB fine variation) and check the respective control voltage (special function 128) according to Table 5-2.

Table 5-2

| Frequency range | Control voltage of level controller | |
|------------------|-------------------------------------|----------------|
| | At -7 dBm | At -17 dBm |
| 0.1 to 999 MHz | -2.2 to -0.5 V | -3.0 to -1.5 V |
| 1000 to 2000 MHz | -1.5 to -0.3 V | -1.8 to -0.9 V |

- Set an RF level of +13 dBm and check the harmonics in the complete frequency range; they must be <-30 dBc.
- Connect an AM analyzer to RF1.
- Check the distortion with an RF level of +7 dBm and 80 % AM. The distortion should be <2% at a modulation frequency of 1 kHz. (See section 5.3, Troubleshooting, if the value is outside the tolerance.)

5.3 Troubleshooting

5.3.1 DC Working Points of RF Amplifier

- Unscrew the spring cover from the printed side and connect the module via the service adapter cable.
- Set 1000 MHz and terminate connectors X410 and X405 with 50 Ω. Check the DC voltages according to Table 5-3:

Table 5-3

| Transistor | Collector voltage | | Remarks |
|------------|-------------------|--------|-----------------------------|
| V5 | +5.3 V | ±0.5 V | Input amplifier |
| N905 | +5.1 V | ±0.5 V | Ampl. before PIN modulator |
| V112 | +4.4 V | ±0.5 V | Ampl. after PIN modulator |
| V133 | +5.5 V | ±0.5 V | Ampl. after PIN modulator |
| V810 | +6.7 V | ±0.5 V | Ampl. before doubler |
| N820 | +4.5 V | ±0.5 V | Ampl. after doubler |
| N830 | +4.5 V | ±0.5 V | Ampl. after doubler |
| N860 | +4.5 V | ±0.5 V | Ampl. after doubler |
| N870 | +4.5 V | ±0.5 V | Ampl. after doubler |
| V606 | +5.7 V | ±0.5 V | Mixer section: RF amplifier |
| V640 | +9.4 V | ±0.5 V | Mixer section: IF amplifier |
| V641 | +8.7 V | ±0.5 V | Mixer section: IF amplifier |
| V670 | +9.3 V | ±0.5 V | Mixer section: LO amplifier |

5.3.2 DC Switching Voltages for RF Setting

- Check whether +1.8 V (±0.2 V) is present at P29.
- Further tests as in Table 5-4.

Table 5-4

| Carrier frequency (MHz) | Check DC voltage at test points (values in V, ±1.5 V) | | | | | | | | | | | | | | | | Anode V51 |
|-------------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|
| | P8 | P9 | P10 | P11 | P12 | P13 | P14 | P15 | P16 | P17 | P18 | P19 | P20 | P21 | P22 | P23 | |
| 1000 | -13 | +12 | +13 | +13 | +12 | +12 | -11 | +13 | -14 | -15 | -12 | +12 | -14 | -15 | -14 | -15 | +5 |
| 700 | -13 | +12 | +13 | +13 | +12 | -11 | +12 | +13 | -14 | -15 | -12 | +12 | -14 | -15 | -14 | -15 | +5 |
| 350 | +12 | -14 | +13 | +13 | -14 | -11 | -11 | +13 | -14 | +12 | +12 | -9 | -14 | -15 | -14 | +8 | +5 |
| 300 | +12 | -14 | +13 | +13 | -14 | -11 | -11 | +13 | -14 | +12 | -9 | +12 | -14 | -15 | -14 | +8 | +5 |
| 200 | +12 | +12 | +13 | -14 | +12 | -11 | -11 | +13 | -14 | +12 | +12 | -9 | -14 | -15 | +7 | -15 | 0 |
| 150 | +12 | +12 | +13 | -14 | +12 | -11 | -11 | +13 | -14 | +12 | -9 | +12 | -14 | -15 | +7 | -15 | 0 |
| 100 | +12 | -14 | +13 | -14 | +12 | -11 | -11 | +13 | +12 | +12 | +12 | -9 | -14 | +7 | -14 | -15 | 0 |
| 70 | +12 | -14 | +13 | -14 | +12 | -11 | -11 | +13 | +12 | +12 | -9 | +12 | -14 | +7 | -14 | -15 | 0 |
| 50 | +12 | +12 | -14 | +12 | +12 | -11 | -11 | +13 | +12 | +12 | +12 | -9 | +7 | -15 | -14 | -15 | 0 |
| 40 | +12 | +12 | -14 | +12 | +12 | -11 | -11 | +13 | +12 | +12 | -9 | +12 | +7 | -15 | -14 | -15 | 0 |
| 30 | +12 | +12 | +12 | -14 | +12 | -11 | -11 | -14 | +12 | +12 | +12 | -9 | -14 | -15 | +7 | -15 | 0 |
| 1 | +12 | +12 | +12 | -14 | +12 | -11 | -11 | -14 | +12 | +12 | +12 | -9 | -14 | -15 | +7 | -15 | 0 |

5.3.3 RF Test

The RF connections to the module must be made using subminax cables. It is recommendable to use a high-impedance probe to test e.g. which has an insertion loss of 20 dB. The following levels are the values measured at 50 Ω plus attenuation of probe.

The RF levels should be tested at the test points according to Table 5-5 at -7 dBm with the module under ALC.

Table 5-5

| Carrier frequency (MHz) | Check RF level at test points (values in dBm, ± 3 dB) | | | | | | | | | | | Remarks |
|-------------------------|---|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------------|
| | P1 | P3 | P24 | P5 | P40 | P41 | P42 | P36 | P31 | P37 | P38 | |
| 1500 | +6 | 0 | +4 | +10 | +1 | +11 | +14 | - | - | - | - | Doubler |
| 999 | +6 | 0 | +5 | +11 | -1 | +10 | +12 | - | - | - | - | Basic range |
| 499 | +6 | -4 | +3 | +9 | -6 | +6 | +10 | - | - | - | - | Divider 1:2 |
| 249 | +6 | -4 | +2 | +10 | -9 | +1 | +5 | - | - | - | - | Divider 1:4 |
| 124 | +6 | -3 | +1 | +11 | -9 | +1 | +5 | - | - | - | - | Divider 1:8 |
| 62 | +6 | -3 | +5 | +11 | -8 | +1 | +6 | - | - | - | - | Divider 1:16 |
| 31 | +6 | -3 | +1 | +11 | -4 | +5 | +10 | +20 | -10 | 0 | +8 | Mixer section |

5.4 Interfaces

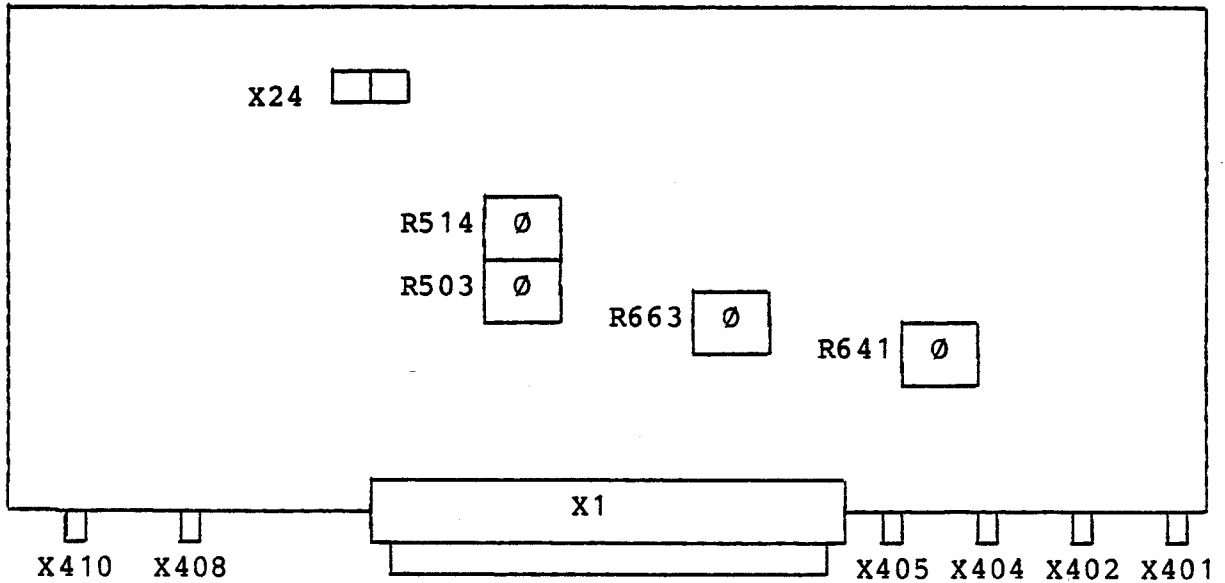


Fig. 5-2 Layout of inputs/outputs and adjusting elements

Analog interfaces

| Designation | Function | Frequency | Level |
|-------------|-------------------|------------------|----------|
| X410 | RF input | 500 to 1000 MHz | 0 dBm |
| X408 | PM-EXT input | DC up to 1 MHz | TTL |
| X405 | RF input | 150 MHz | 0 dBm |
| X404 | RF output | 0.1 to 1000 MHz | +2 dBm |
| X402 | RF output | 1000 to 2000 MHz | +5 dBm |
| X401 | RF channel | DC | 0 to 4 V |
| X1.A23 | Diagnostic output | DC | 0 to 4 V |
| X1.A31 | Modulation input | DC up to 50 kHz | 1 V |

Digital interfaces (CMOS)

| Designation | Function | Remarks |
|-------------|--------------|----------------------------------|
| X1.A8 | Data input | Serial |
| X1.A10 | Clock | |
| X1.A6 | Strobe | For RF setting |
| X1.A25 | Strobe | For modulation control/diagnosis |
| X1.A3 | Loop control | For level control |

Supply voltages

| Designation | Voltage |
|--|---------|
| X1.A12,A13 | +5 V |
| X1.A15 | +24 V |
| X1.A17 | +15 V |
| X1.A19 | -15 V |
| X1.A2,A7,A11,A14,A16, A18,A20,A30,A32 | Ground |

Schaltteillisten
Stromläufe
Bestückungspläne
Part lists
Circuit diagrams
Components plans
Listes des pièces détachées
Schémas de Circuit
Plans des composants

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| C1 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C2 | CC 3,9PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C3 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C5 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C7 | CC 47PF+-1%50V COG 1206 CERAMIC CHIP CAPACITOR | CC 0099.8496.00 | MURATA | GRM42-6COG 470F50ZPT | |
| C8 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C20 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C23 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C24 | CC 1,5NF+-10%4X5R2000 CAPACITOR | CC 0087.7048.00 | DRALORIC | EDPU 4X5 | |
| C31 | CC 2,7PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8188.00 | MURATA | GRM42-6COG 2R7 C50PT | |
| C32 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C33 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C34 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C35 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C38 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C39 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C40 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C41 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C42 | CC 56PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8809.00 | MURATA | GRM42-6COG 560F50ZPT | |
| C48 | CC 18PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8767.00 | MURATA | GRM42-6COG 180F50ZPT | |
| C49 | CC 10PF+-0,25 50VNP0 1206 CERAMIC CHIP CAPACITOR | CC 0099.8480.00 | MURATA | GRM42-6COG 100 C50PT | |
| C50 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C51 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C52 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C53 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C55 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C56 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C57 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C58 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C59 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C60 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C61 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C62 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C63 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C64 | CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8450.00 | AVX | 1206 5 C 472 KA 3 | |
| C65 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C67 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C68 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C69 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C70 | CC 18PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8767.00 | MURATA | GRM42-6COG 180F50ZPT | |

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OUTPUT-STAGE 2GHZ

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| C71 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C72 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C74 | CC 47PF+-1%50V COG 1206 CERAMIC CHIP CAPACITOR | CC 0099.8496.00 | MURATA | GRM42-6COG 470F50ZPT | |
| C75 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C76 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C77 | CC 18PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8767.00 | MURATA | GRM42-6COG 180F50ZPT | |
| C78 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C88 | CC 150PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8509.00 | MURATA | GRM42-6COG 151F 50PT | |
| C93 | CC 150PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8509.00 | MURATA | GRM42-6COG 151F 50PT | |
| C94 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C97 | CC 18PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8767.00 | MURATA | GRM42-6COG 180F50ZPT | |
| C98 | CC 150PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8509.00 | MURATA | GRM42-6COG 151F 50PT | |
| C99 | CC 150PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8509.00 | MURATA | GRM42-6COG 151F 50PT | |
| C100 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C101 | CC 330PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8873.00 | AVX | 1206 5A 331 F 3 | |
| C112 | CC 2,7PF+-0,25 50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8188.00 | MURATA | GRM42-6COG 2R7 C50PT | |
| C113 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C115 | CC 1,5NF+-10%4X5R2000 CAPACITOR | CC 0087.7048.00 | DRALORIC | EDPU 4X5 | |
| C116 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C117 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C118 | CC 56PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8809.00 | MURATA | GRM42-6COG 560F50ZPT | |
| C130 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C131 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C133 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C134 | CC 4,7PF+-0,25 50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C135 | CC 4,7PF+-0,25 50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C136 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C141 | CC 1,5NF+-10%4X5R2000 CAPACITOR | CC 0087.7048.00 | DRALORIC | EDPU 4X5 | |
| C142 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C152 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C200 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C201 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C204 | CC 4,7PF+-0,25 50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C205 | CC 6,2PFO,25PF50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0099.8709.00 | MURATA | GRM42-COG6R2 C 50PT | |
| C206 | CC 2,7PF+-0,25 50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8188.00 | MURATA | GRM42-6COG 2R7 C50PT | |
| C207 | CC 6,2PFO,25PF50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0099.8709.00 | MURATA | GRM42-COG6R2 C 50PT | |
| C208 | CC 2,7PF+-0,25 50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8188.00 | MURATA | GRM42-6COG 2R7 C50PT | |
| C209 | CC 4,7PF+-0,25 50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C214 | CC 2,7PF+-0,25 50V NPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8188.00 | MURATA | GRM42-6COG 2R7 C50PT | |

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|--|----------|----------|--|------------------------------------|----------------------|----------------|
|  | 17 | 03.05.99 | ED AUSGANGSSTUFE 2GHZ OUTPUT-STAGE 2GHZ | 0843.4805.01 SA | 2+ | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| C215 | CC 4,7PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C217 | CC 4,7PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C219 | CC 2,7PF+-0,25 50VNP01206 CERAMIC CHIP CAPACITOR | CC 0007.8188.00 | MURATA | GRM42-6COG 2R7 C50PT | |
| C220 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C224 | CC 1ONF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C225 | CC 1ONF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C226 | CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8450.00 | AVX | 1206 5 C 472 KA 3 | |
| C227 | CC 1ONF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C231 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C232 | CC 150PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8509.00 | MURATA | GRM42-6COG 151F 50PT | |
| C233 | CC 150PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8509.00 | MURATA | GRM42-6COG 151F 50PT | |
| C234 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C236 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C237 | CC 1ONF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C238 | CC 47PF+-1%50V COG 1206 CERAMIC CHIP CAPACITOR | CC 0099.8496.00 | MURATA | GRM42-6COG 470F50ZPT | |
| C241 | CC 56PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8809.00 | MURATA | GRM42-6COG 560F50ZPT | |
| C242 | CC 120PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8838.00 | MURATA | GRM42-6COG 121F50ZPT | |
| C243 | CC 120PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8838.00 | MURATA | GRM42-6COG 121F50ZPT | |
| C244 | CC 56PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8809.00 | MURATA | GRM42-6COG 560F50ZPT | |
| C247 | CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8450.00 | AVX | 1206 5 C 472 KA 3 | |
| C251 | CC 47PF+-1%50V COG 1206 CERAMIC CHIP CAPACITOR | CC 0099.8496.00 | MURATA | GRM42-6COG 470F50ZPT | |
| C252 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C253 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C254 | CC 47PF+-1%50V COG 1206 CERAMIC CHIP CAPACITOR | CC 0099.8496.00 | MURATA | GRM42-6COG 470F50ZPT | |
| C255 | CC 12PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8744.00 | MURATA | GRM42-6COG 120F50ZPT | |
| C256 | CC 12PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8744.00 | MURATA | GRM42-6COG 120F50ZPT | |
| C261 | CC 1ONF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C263 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C265 | CC 1ONF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C266 | CC 1ONF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C267 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C271 | CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C272 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| ..280 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C284 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| ..289 | CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C292 | CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C293 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C294 | CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C295 | CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C300 | CC 10PF+-0,25 50VNP0 1206 CERAMIC CHIP CAPACITOR | CC 0099.8480.00 | MURATA | GRM42-6COG 100 C50PT | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
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| C301 | CC 15PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8750.00 | MURATA | GRM42-6COG 150F50ZPT | |
| C303 | CC 15PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8750.00 | MURATA | GRM42-6COG 150F50ZPT | |
| C305 | CC 10PF+-0,25 50VNPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8480.00 | MURATA | GRM42-6COG 100 C50PT | |
| C306 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C307 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C308 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C310 | CC 15PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8750.00 | MURATA | GRM42-6COG 150F50ZPT | |
| C311 | CC 27PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8409.00 | MURATA | GRM42-6COG 270F50ZPT | |
| C314 | CC 27PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8409.00 | MURATA | GRM42-6COG 270F50ZPT | |
| C315 | CC 15PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8750.00 | MURATA | GRM42-6COG 150F50ZPT | |
| C317 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C320 | CC 15PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8750.00 | MURATA | GRM42-6COG 150F50ZPT | |
| C321 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | |
| C323 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | |
| C325 | CC 15PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8750.00 | MURATA | GRM42-6COG 150F50ZPT | |
| C326 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C327 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C330 | CC 33PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8780.00 | MURATA | GRM42-6COG 330F50ZPT | |
| C331 | CC 56PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8809.00 | MURATA | GRM42-6COG 560F50ZPT | |
| C334 | CC 56PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8809.00 | MURATA | GRM42-6COG 560F50ZPT | |
| C335 | CC 33PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8780.00 | MURATA | GRM42-6COG 330F50ZPT | |
| C341 | CC 39PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8796.00 | MURATA | GRM42-6COG 390F50ZPT | |
| C342 | CC 68PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8815.00 | MURATA | GRM42-6COG 680F50ZPT | |
| C343 | CC 68PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8815.00 | MURATA | GRM42-6COG 680F50ZPT | |
| C346 | CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8450.00 | AVX | 1206 5 C 472 KA 3 | |
| C347 | CC 39PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8796.00 | MURATA | GRM42-6COG 390F50ZPT | |
| C350 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C351 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C352 | CC 56PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8809.00 | MURATA | GRM42-6COG 560F50ZPT | |
| C354 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C355 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C360 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C361 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C364 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C365 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C366 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C451 | CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C461 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C462 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| C466 | CC 180PF+-2%6X7N750 CAPACITOR | CC 0087.6935.00 | PHILIPS_CO | 2222 678 58181 | |
| C470 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C471 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C510 | CC 15PF+-2%3X4NPO CAPACITOR | CC 0087.6441.00 | PHILIPS_CO | 2222 678 | |
| C520 | CC 22PF+-2%4X5NPO CAPACITOR | CC 0087.6464.00 | PHILIPS_CO | 2222 678 | |
| C600 | CC 27PF+-2%4X5NPO CAPACITOR | CC 0087.6470.00 | PHILIPS_CO | 2222 678 | |
| C600 | NUR VAR/ONLY MOD: 02 04 CC 33PF+-2%4X5NPO CAPACITOR | CC 0087.6487.00 | PHILIPS_CO | 2222 678 | |
| C601 | NUR VAR/ONLY MOD: 06 CC 47PF+-2%5X6NPO CAPACITOR | CC 0087.6506.00 | PHILIPS_CO | 2222 678 | |
| C601 | NUR VAR/ONLY MOD: 02 04 CC 56PF+-2%5X6NPO CAPACITOR | CC 0087.6512.00 | PHILIPS_CO | 2222 678 | |
| C602 | NUR VAR/ONLY MOD: 06 CC 27PF+-2%4X5NPO CAPACITOR | CC 0087.6470.00 | PHILIPS_CO | 2222 678 | |
| C602 | NUR VAR/ONLY MOD: 02 04 CC 33PF+-2%4X5NPO CAPACITOR | CC 0087.6487.00 | PHILIPS_CO | 2222 678 | |
| C603 | NUR VAR/ONLY MOD: 06 CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C604 | CC 56PF+-2%5X6NPO CAPACITOR | CC 0087.6512.00 | PHILIPS_CO | 2222 678 | |
| C604 | NUR VAR/ONLY MOD: 02 04 CC 15PF+-2%3X4NPO CAPACITOR | CC 0087.6441.00 | PHILIPS_CO | 2222 678 | |
| C606 | NUR VAR/ONLY MOD: 06 CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C611 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C612 | CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C614 | CC 27PF+-2%4X5NPO CAPACITOR | CC 0087.6470.00 | PHILIPS_CO | 2222 678 | |
| C614 | NUR VAR/ONLY MOD: 02 04 CC 33PF+-2%4X5NPO CAPACITOR | CC 0087.6487.00 | PHILIPS_CO | 2222 678 | |
| C615 | NUR VAR/ONLY MOD: 06 CC 68PF+-2%6X7NPO CAPACITOR | CC 0087.6529.00 | PHILIPS_CO | 2222 678 | |
| C616 | CC 15PF+-2%3X4NPO CAPACITOR | CC 0087.6441.00 | PHILIPS_CO | 2222 678 | |
| C617 | CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C618 | CC 33PF+-2%4X5NPO CAPACITOR | CC 0087.6487.00 | PHILIPS_CO | 2222 678 | |
| C626 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C627 | CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C627 | NUR VAR/ONLY MOD: 02 04 CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C628 | NUR VAR/ONLY MOD: 06 CC 680PF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8421.00 | MURATA | GRM42-6 X7R681K50PT | |
| C628 | NUR VAR/ONLY MOD: 02 04 CC 470PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8515.00 | AVX | 1206 5 A 471 F 3 | |
| C630 | NUR VAR/ONLY MOD: 06 CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C631 | CC 56PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8809.00 | MURATA | GRM42-6COG 560F50ZPT | |
| C632 | CC 120PF+-2%6X9NPO CAPACITOR | CC 0087.6558.00 | PHILIPS_CO | 2222 678 10121 | |
| | NUR VAR/ONLY MOD: 02 04 | | | | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
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| C632 | CC 100PF+-2%6X9NPO CAPACITOR NUR VAR/ONLY MOD: 06 | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C633 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C642 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR NUR VAR/ONLY MOD: 02 04 | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K5OPT | |
| C642 | CC 3,3NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR NUR VAR/ONLY MOD: 06 | CC 0099.8909.00 | PHILIPS_CO | 2238 581 16621 | |
| C643 | CE 4,7UF+-20%10V 5X 4X 7 ELECTROLYTIC CAPACITOR | CE 0022.8056.00 | KEMET | T340 A475M010 AS | |
| C646 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR NUR VAR/ONLY MOD: 02 04 | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C646 | CC 100NF+-10%50V5K1200VIE CAPACITOR NUR VAR/ONLY MOD: 06 | CC 0084.5350.00 | UNION_CARB | CK 05 BX 104K | |
| C647 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR NUR VAR/ONLY MOD: 02 04 | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K5OPT | |
| C648 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C650 | CC 82PF+-2%6X7NPO CAPACITOR NUR VAR/ONLY MOD: 02 04 | CC 0087.6535.00 | PHILIPS_CO | 2222 678 10 829 | |
| C650 | CC 120PF+-2%6X9NPO CAPACITOR NUR VAR/ONLY MOD: 06 | CC 0087.6558.00 | PHILIPS_CO | 2222 678 10121 | |
| C651 | CC 180PF+-1%50V NPO 1206 CHIP CAPACITOR NUR VAR/ONLY MOD: 02 04 | CC 0099.8844.00 | MURATA | GRM42-6COG 181F50ZPT | |
| C651 | CC 220PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR NUR VAR/ONLY MOD: 06 | CC 0099.8850.00 | MURATA | GRM42-6COG 221F 50PT | |
| C652 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR NUR VAR/ONLY MOD: 02 04 | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C652 | CC 120PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR NUR VAR/ONLY MOD: 06 | CC 0099.8838.00 | MURATA | GRM42-6COG 121F50ZPT | |
| C653 | CC 10PF+-0,25 50VNPO 1206 CERAMIC CHIP CAPACITOR NUR VAR/ONLY MOD: 02 04 | CC 0099.8480.00 | MURATA | GRM42-6COG 100 C50PT | |
| C653 | CC 47PF+-1%50V COG 1206 CERAMIC CHIP CAPACITOR NUR VAR/ONLY MOD: 06 | CC 0099.8496.00 | MURATA | GRM42-6COG 470F50ZPT | |
| C660 | CC 1,5NF+-10%4X5R2000 CAPACITOR | CC 0087.7048.00 | DRALORIC | EDPU 4X5 | |
| C664 | CC 100NF+-10%50V5K1200VIE CAPACITOR | CC 0084.5350.00 | UNION_CARB | CK 05 BX 104K | |
| C665 | CC 100NF+-10%50V5K1200VIE CAPACITOR | CC 0084.5350.00 | UNION_CARB | CK 05 BX 104K | |
| C670 | CC 680PF+-10%4X5R2000 CAPACITOR | CC 0087.7019.00 | PHILIPS_CO | 2222 630 51681 | |
| C671 | CC 47PF+-1%50V COG 1206 CERAMIC CHIP CAPACITOR | CC 0099.8496.00 | MURATA | GRM42-6COG 470F50ZPT | |
| C673 | CC 680PF+-10%4X5R2000 CAPACITOR | CC 0087.7019.00 | PHILIPS_CO | 2222 630 51681 | |
| C676 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C677 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C679 | CC 680PF+-10%4X5R2000 CAPACITOR | CC 0087.7019.00 | PHILIPS_CO | 2222 630 51681 | |
| C702 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C712 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C732 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C750 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |
| C760 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |
| C770 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |


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|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| C780 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |
| C792 | LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER | 0911.0705.00 | SPECTRUM | SCI-9920-101HT | |
| C800 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C801 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C803 | CC 4,7PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C804 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C805 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C806 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C807 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C810 | CC 4,7PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C812 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C813 | CC 1PF+-0,25 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8667.00 | MURATA | GRM42-6COG 1R0 C50PT | |
| C820 | CC 1,8PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8165.00 | MURATA | GRM42-6COG 1R8 C50PT | |
| C821 | CC 3,9PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C822 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C823 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C824 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C826 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C828 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C830 | CC 3,9PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C831 | CC 3,9PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C832 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C833 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C834 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C835 | CC 4,7PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8213.00 | MURATA | GRM42-6COG 4R7C 50PT | |
| C838 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C840 | CC 3,9PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8207.00 | MURATA | GRM42-6COG 3R9 C50PT | |
| C841 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| ..844 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C845 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C846 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C847 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C849 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C850 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C851 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C852 | CC 1PF+-0,25 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8667.00 | MURATA | GRM42-6COG 1R0 C50PT | |
| C853 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C854 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C855 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C856 | CC 1PF+-0,25 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8667.00 | MURATA | GRM42-6COG 1R0 C50PT | |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
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| C857 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C858 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C859 | CC 82PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8821.00 | MURATA | GRM42-6COG 820F50ZPT | |
| C860 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C861 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C862 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C864 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C865 | CC 1,8PF+-0,25 50VNPO1206 CERAMIC CHIP CAPACITOR | CC 0007.8165.00 | MURATA | GRM42-6COG 1R8 C50PT | |
| C870 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C871 | CC 1,5NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8896.00 | MURATA | GRM42-6 X7R152K50PT | |
| C872 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C881 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C890 | CC 100NF+-10%50V5K1200VIE CAPACITOR | CC 0084.5350.00 | UNION_CARB | CK 05 BX 104K | |
| C891 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | |
| C892 | CE 1UF+-10%35V TANTALUM SMD-CAPACITOR | 0843.3221.00 | SPRAGUE | 195D 105 X9 035 D2 | |
| C905 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C908 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C909 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | |
| C915 | CC 100PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8415.00 | MURATA | GRM42-6COG 101F50ZPT | |
| C920 | CC 10PF+-0,25 50VNPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8480.00 | MURATA | GRM42-6COG 100 C50PT | |
| C922 | CC 56PF+-2%5X6NPO CAPACITOR | CC 0087.6512.00 | PHILIPS_CD | 2222 678 | |
| C926 | CC 18PF+-1% 50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8767.00 | MURATA | GRM42-6COG 180F50ZPT | |
| C927 | CC 100NF+-10%50V5K1200VIE CAPACITOR | CC 0084.5350.00 | UNION_CARB | CK 05 BX 104K | |
| C928 | CC 100NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0007.5237.00 | AVX | 1206 5C 104 KA 3 | |
| D35 | BL SP8605BDG 2:1UHF PRESC IC PRESCALER | BL 0092.9280.00 | PLESSEY | SP8605B(DG)..(BDC) | |
| D52 | BL UPB582C 4:1 PRESC IC PRESCALER | 0820.3390.00 | NEC | (UP)B582C | |
| D61 | BL CA3199 4:1 PRESC IC PRESCALERDIVBY4 | 0372.1106.10 | RCA | CA3199E | |
| D370 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D370 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 06 | 0586.7726.00 | RCA | CD4094BE | |
| D371 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D500 | BJ AD7523JN 1X8B-DAC D/A CONVERTER | 0801.8219.00 | ANALOG_DEV | AD-7523JN | |
| D520 | BJ AD7533CQ 1X10B-DAC D/A-CONVERTER | BJ 0300.8740.00 | ANALOG_DEV | AD7533CQ(CD) | |
| D530 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D530 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 06 | 0586.7726.00 | RCA | CD4094BE | |
| D540 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D540 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 06 | 0586.7726.00 | RCA | CD4094BE | |

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| D550 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. NUR VAR/ONLY MOD: 02 | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | | |
| D550 | BL CD4094BE 8BIT SH.REG SHIFT REGISTER NUR VAR/ONLY MOD: 04 06 | 0586.7726.00 | RCA | CD4094BE | | |
| D560 | BL MM74HC4051N 8CH.AN.MUX 8CH.ANALOG MUX/DEMUX | 0099.9670.00 | PHILIPS | (PC)74HC4051N(P) | | |
| L6 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | | |
| L18 | LD 100NH 10% 0,080HM 1,4A CHOKE | LD 0067.2740.00 | DALE | IM2 | | |
| L35 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | | |
| L40 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | | |
| L44 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | | |
| L52 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | | |
| L55 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | | |
| L58 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | | |
| L61 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | | |
| L64 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | | |
| L70 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | | |
| L71 | LD 100NH 10% 0,080HM 1,4A CHOKE | LD 0067.2740.00 | DALE | IM2 | | |
| L97 | LD 2,20UH10%0,400HMO,415A CHOKE | LD 0067.2905.00 | DALE | IM2 | | |
| L114 | LD 1,00UH10%1,000HMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | | |
| L140 | LD 1,00UH10%1,000HMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | | |
| L204 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | | |
| L206 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | | |
| L208 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | | |
| L214 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | | |
| L216 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | | |
| L218 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | | |
| L231 | LD 0,27UH10%0,160HMO,975A CHOKE | LD 0067.2792.00 | DALE | IM2 | | |
| L232 | LD 0,27UH10%0,160HMO,975A CHOKE | LD 0067.2792.00 | DALE | IM2 | | |
| L233 | LD 0,27UH10%0,160HMO,975A CHOKE | LD 0067.2792.00 | DALE | IM2 | | |
| L241 | LD 0,18UH10%0,120HM1,120A CHOKE | LD 0067.2770.00 | DALE | IM2 | | |
| L242 | LD 0,18UH10%0,120HM1,120A CHOKE | LD 0067.2770.00 | DALE | IM2 | | |
| L243 | LD 0,18UH10%0,120HM1,120A CHOKE | LD 0067.2770.00 | DALE | IM2 | | |
| L251 | LD 0,12UH10%0,090HM1,300A CHOKE | LD 0067.2757.00 | DALE | IM2 | | |
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| L252 | LD 0, 12UH10%0, 090HM1, 300A CHOKE | LD 0067.2757.00 | DALE | IM2 | |
| L253 | LD 0, 12UH10%0, 090HM1, 300A CHOKE | LD 0067.2757.00 | DALE | IM2 | |
| L262 | LD 1, 00UH10%1, 000HMO, 390A CHOKE | LD 0067.2863.00 | DALE | IM2 | |
| L300 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | |
| L301 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | |
| L302 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB PRINTED COMP. | | | | |
| L310 | LL SPULE 30N COIL 30N | 0801.6468.00 | | | 0843.4870.00 |
| L311 | LL SPULE 30N COIL 30N | 0801.6468.00 | | | 0843.4870.00 |
| L312 | LL SPULE 30N COIL 30N | 0801.6468.00 | | | 0843.4870.00 |
| L320 | LL SPULE 45N COIL 45N | 0801.6451.00 | | | 0843.4870.00 |
| L321 | LL SPULE 45N COIL 45N | 0801.6451.00 | | | 0843.4870.00 |
| L322 | LL SPULE 45N COIL 45N | 0801.6451.00 | | | 0843.4870.00 |
| L330 | LL SPULE 60N COIL 60N | 0801.6445.00 | | | 0843.4870.00 |
| L331 | LL SPULE 60N COIL 60N | 0801.6445.00 | | | 0843.4870.00 |
| L332 | LL SPULE 60N COIL 60N | 0801.6445.00 | | | 0843.4870.00 |
| L340 | LL SPULE 75N COIL 75N | 0801.6439.00 | | | 0843.4870.00 |
| L341 | LL SPULE 75N COIL 75N | 0801.6439.00 | | | 0843.4870.00 |
| L342 | LL SPULE 75N COIL 75N | 0801.6439.00 | | | 0843.4870.00 |
| L450 | LD 2, 20UH10%0, 400HMO, 415A CHOKE | LD 0067.2905.00 | DALE | IM2 | |
| L600 | LD 0, 047 UH 10% CHOKE | 0249.5995.00 | DELEVAN | 1026-08 | |
| L600 | NUR VAR/ONLY MOD: 02 04 LD 100NH 10% 0, 080HM 1, 4A CHOKE | LD 0067.2740.00 | DALE | IM2 | |
| L601 | NUR VAR/ONLY MOD: 06 LD 100NH 10% 0, 080HM 1, 4A CHOKE | LD 0067.2740.00 | DALE | IM2 | |
| L601 | NUR VAR/ONLY MOD: 06 LD 0, 047 UH 10% CHOKE | 0249.5995.00 | DELEVAN | 1026-08 | |
| L602 | NUR VAR/ONLY MOD: 02 04 LD 0, 33UH10%0, 220HMO, 830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L603 | NUR VAR/ONLY MOD: 06 LD 0, 33UH10%0, 220HMO, 830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L614 | NUR VAR/ONLY MOD: 06 LD 0, 27UH10%0, 160HMO, 975A CHOKE | LD 0067.2792.00 | DALE | IM2 | |
| L614 | NUR VAR/ONLY MOD: 06 LD 0, 047 UH 10% CHOKE | 0249.5995.00 | DELEVAN | 1026-08 | |
| L615 | NUR VAR/ONLY MOD: 02 04 LD 0, 12UH10%0, 090HM1, 300A CHOKE | LD 0067.2757.00 | DALE | IM2 | |
| L616 | NUR VAR/ONLY MOD: 06 LD 0, 047 UH 10% CHOKE | 0249.5995.00 | DELEVAN | 1026-08 | |
| L616 | NUR VAR/ONLY MOD: 02 04 LD 0, 12UH10%0, 090HM1, 300A CHOKE | LD 0067.2757.00 | DALE | IM2 | |
| | NUR VAR/ONLY MOD: 06 | | | | |

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| L616 | LD 0,047 UH 10% CHOKE | 0249.5995.00 | DELEVAN | 1026-08 | |
| L617 | NUR VAR/ONLY MOD: 02 04 LD 0,27UH10%0,160HMO,975A CHOKE | LD 0067.2792.00 | DALE | IM2 | |
| L623 | NUR VAR/ONLY MOD: 06 LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L632 | LD 0,33UH10%0,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L633 | LD 0,33UH10%0,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L650 | LD 0,33UH10%0,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L651 | LD 0,33UH10%0,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L675 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L676 | LD 1,50UH10%0,220HMO,560A CHOKE | LD 0067.2886.00 | DALE | IM2 | |
| L810 | LD SPULE COIL | 0801.6474.00 | | | 0843.4870.00 |
| L815 | LD SPULE COIL | 0801.6422.00 | | | 0843.4870.00 |
| L816 | LL SPULE COIL | 0843.3215.00 | | | 0843.4870.00 |
| L820 | LD SPULE COIL | 0801.6422.00 | | | 0843.4870.00 |
| L830 | LD SPULE COIL | 0801.6422.00 | | | 0843.4870.00 |
| L850 | LD 1,00UH10%1,000HMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | |
| L851 | LD 1,00UH10%1,000HMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | |
| L860 | LD SPULE COIL | 0801.6422.00 | | | 0843.4870.00 |
| L870 | LD SPULE COIL | 0801.6422.00 | | | 0843.4870.00 |
| L900 | LD 0,47UH10%0,350HMO,660A CHOKE | LD 0067.2828.00 | DALE | IM2 | |
| L904 | LD 0,47UH10%0,350HMO,660A CHOKE | LD 0067.2828.00 | DALE | IM2 | |
| L908 | LD 1,00UH10%1,000HMO,390A CHOKE | LD 0067.2863.00 | DALE | IM2 | |
| L910 | LD 0,33UH10%0,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L914 | LD 0,33UH10%0,220HMO,830A CHOKE | LD 0067.2805.00 | DALE | IM2 | |
| L920 | LD 100NH 10% 0,080HM 1,4A CHOKE | LD 0067.2740.00 | DALE | IM2 | |
| N70 | BM 0M350 HYBRID ANT AMPL ANTENNA AMPLIFIER | BM 0334.4953.00 | PHILIPS_SE | 0M350 | |
| N150 | BO LM393N 2X COMPAR COMPARATOR | 0803.0696.00 | NSC | LM393N | |
| N350 | BO LM124J 4XLP OPAMP OPERATIONAL AMPLIFIER | 0300.6353.00 | NSC | LM124J | |
| N354 | BO LM124J 4XLP OPAMP OPERATIONAL AMPLIFIER | 0300.6353.00 | NSC | LM124J | |
| N360 | BO LM124J 4XLP OPAMP OPERATIONAL AMPLIFIER | 0300.6353.00 | NSC | LM124J | |
| N364 | BO LM124J 4XLP OPAMP OPERATIONAL AMPLIFIER | 0300.6353.00 | NSC | LM124J | |
| N461 | BS TL604CP 2X ANALOGSCH ANALOG SWITCH | BJ 0300.6199.00 | TEXAS | TL604CP | |
| N470 | BO LF356J LN FET OPAMP OPERATIONAL AMPLIFIER | 0300.6053.00 | MOTOROLA | LF356J | |
| N471 | BS TL604CP 2X ANALOGSCH ANALOG SWITCH | BJ 0300.6199.00 | TEXAS | TL604CP | |
| N500 | NUR VAR/ONLY MOD: 02 BO LF156J FET OPAMP OPERATIONAL AMPLIFIER | BO 0645.7251.00 | ANALOG_DEV | PM156Z | |
| N510 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N520 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N660 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |

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ROHDE & SCHWARZ

17 03.05.99


ED AUSGANGSSTUFE 2GHZ
OUTPUT-STAGE 2GHZ

0843.4805.01 SA

11+

| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| N820 | BM MSA0404 MMIC BROADBAND AMPLIFIER | 0822.0075.00 | MINI-CIRCU | MAV-4 | |
| N830 | BM MSA0404 MMIC BROADBAND AMPLIFIER | 0822.0075.00 | MINI-CIRCU | MAV-4 | |
| N860 | BM MSA0404 MMIC BROADBAND AMPLIFIER | 0822.0075.00 | MINI-CIRCU | MAV-4 | |
| N870 | BM MSA0404 MMIC BROADBAND AMPLIFIER | 0822.0075.00 | MINI-CIRCU | MAV-4 | |
| N880 | BO MC1558JG 2X OPAMP OPERATIONAL AMPLIFIER | BO 0275.0816.00 | TEXAS | MC1558JG | |
| N890 | BS TL604CP 2X ANALOGSCH ANALOG SWITCH | BJ 0300.6199.00 | TEXAS | TL604CP | |
| N905 | BM MSA0404 MMIC BROADBAND AMPLIFIER | 0822.0075.00 | MINI-CIRCU | MAV-4 | |
| P1 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | |
| P2 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT | CON 75403-003 | |
| P3 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | |
| P5 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | |
| P6 ..23 P24 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | 0088.4542.00 | DUPONT | CON 75403-003 | |
| P25 ..30 P31 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | 0088.4542.00 | DUPONT | CON 75403-003 | |
| P32 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | |
| P33 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT | CON 75403-003 | |
| P35 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT | CON 75403-003 | |
| P36 ..38 P40 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | |
| P41 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | |
| P43 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT | CON 75403-003 | |
| R2 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R3 | RL 0,40W 100 OHM2% UNGEW. RESISTOR | RL 0092.5956.00 | DRALORIC | SMA 0204 | |
| R4 | RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8861.00 | PHILIPS_CO | RC02 | |
| R6 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R7 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R8 | RG 316 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9000.00 | ROEDERSTEI | D25 | |
| R12 | RG 1,78KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0006.00 | DRALORIC | CB 1206 ... | |
| R13 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R14 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RC02 | |
| R15 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RC02 | |
| R16 | RG 31,6 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8761.00 | DRALORIC | CB 1206 ... | |

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|  | 17 | 03.05.99 | ED AUSGANGSSTUFE 2GHZ OUTPUT-STAGE 2GHZ | 0843.4805.01 SA | 12+ | |

095.0026-0693

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| R20 | RG 2,61KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0658.00 | DRALORIC | CB 1206 ... | |
| R21 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R22 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R23 | RL 0,60W22, 10 OHM+-1%TK50 RESISTOR | RL 0082.9188.00 | RESISTA | MK2 | |
| R25 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R30 | RG 147 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8926.00 | DRALORIC | CB 1206 ... | |
| R31 | RG 30,1 OHM+-1%TK100 1206 RESISTOR CHIP | RG 0007.5514.00 | PHILIPS_CO | RCO2 | |
| R32 | RG 147 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8926.00 | DRALORIC | CB 1206 ... | |
| R33 | RG 26,1KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0958.00 | ROEDERSTEI | D25 | |
| R35 | RG 383 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9022.00 | ROEDERSTEI | D25 | |
| R36 | RG 383 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9022.00 | ROEDERSTEI | D25 | |
| R37 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R38 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R39 | RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8661.00 | PHILIPS_CO | RCO2 | |
| R41 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RCO2 | |
| R45 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R46 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RCO2 | |
| R51 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RCO2 | |
| R52 | RL 0,60W 825 OHM+-1%TK50 RESISTOR | RL 0082.2502.00 | RESISTA | MK2 | |
| R53 | RL 0,60W 825 OHM+-1%TK50 RESISTOR | RL 0082.2502.00 | RESISTA | MK2 | |
| R59 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RCO2 | |
| R60 | RG 10,0KOHM+-1%TK100 1206 RG CHIP RESISTOR | RG 0007.0793.00 | PHILIPS_CO | RCO2 | |
| R63 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RCO2 | |
| R64 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RCO2 | |
| R65 | RG 31,6 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8761.00 | DRALORIC | CB 1206 ... | |
| R66 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RCO2 | |
| R67 | RG 316 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9000.00 | ROEDERSTEI | D25 | |
| R68 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RCO2 | |
| R71 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RCO2 | |
| R72 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R73 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RCO2 | |
| R74 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RCO2 | |
| R75 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R76 | RG 147 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8926.00 | DRALORIC | CB 1206 ... | |
| R93 | RG 7,5KOHM+-1%TK100 1206 RG CHIP RESISTOR | RG 0007.0764.00 | PHILIPS_CO | RCO2 | |
| R94 | RG 8,25KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0007.0770.00 | PHILIPS_CO | RCO2 | |
| R95 | RG 14,7KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0864.00 | DRALORIC | CB 1206 ... | |
| R97 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RCO2 | |
| R99 | RG 7,5KOHM+-1%TK100 1206 RG CHIP RESISTOR | RG 0007.0764.00 | PHILIPS_CO | RCO2 | |

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ROHDE & SCHWARZ

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OUTPUT-STAGE 2GHZ

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| R100 | RG 14,7KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0864.00 | DRALORIC | CB 1206 ... | |
| R101 | RG 8,25KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0007.0770.00 | PHILIPS_CO | RC02 | |
| R111 | RG 2,61KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0658.00 | DRALORIC | CB 1206 ... | |
| R112 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R113 | RL 0,40W 47 OHM2% UNGEW. RESISTOR | RL 0092.5910.00 | DRALORIC | SMA 0204 | |
| R114 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R115 | RL 0,60W 182 OHM+-1%TK50 RESISTOR | RL 0083.0010.00 | RESISTA | MK2 | |
| R116 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | |
| R117 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R118 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R119 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R130 | RG 2,61KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0658.00 | DRALORIC | CB 1206 ... | |
| R132 | RG 38,3 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8784.00 | DRALORIC | CB 1206 ... | |
| R134 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R135 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R136 | RG 562 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9068.00 | PHILIPS_CO | RC02 | |
| R138 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R139 | RG 562 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9068.00 | PHILIPS_CO | RC02 | |
| R140 | RG 42,2 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8790.00 | DRALORIC | CB 1206 ... | |
| R141 | RL 0,60W 68,1 OHM+-1%TK50 RESISTOR | RL 0082.9636.00 | RESISTA | MK2 | |
| R143 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R144 | RL 0,60W 2,43KOHM+-1%TK50 RESISTOR | RL 0083.0884.00 | RESISTA | MK2 | |
| R145 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R149 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RC02 | |
| R150 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R151 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R153 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R154 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R200 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R201 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |
| R205 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R209 | RG 511 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9051.00 | PHILIPS_CO | RC02 | |
| R210 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R219 | RG 511 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9051.00 | PHILIPS_CO | RC02 | |
| R221 | RG 1,78KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0006.00 | DRALORIC | CB 1206 ... | |
| R222 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R224 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R225 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R227 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |


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|  | 17 | 03.05.99 | ED AUSGANGSSTUFE 2GHZ OUTPUT-STAGE 2GHZ | 0843.4805.01 SA | 14+ | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| R228 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R229 | RG 1,21KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9968.00 | PHILIPS_CO | RC02 | |
| R237 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R247 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R260 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R261 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R262 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R263 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |
| R265 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |
| R266 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RC02 | |
| R270 | RG 422 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9039.00 | DRALORIC | CB 1206 ... | |
| R271 | RG 422 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9039.00 | DRALORIC | CB 1206 ... | |
| R272 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R274 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R300 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R306 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R317 | RG 1,21KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9968.00 | PHILIPS_CO | RC02 | |
| R318 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R326 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R346 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R348 | RG 1,47KOHM+-1%TK100 1206 CHIP RESISTOR | 0006.9980.00 | PHILIPS_CO | RC02 | |
| R350 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R351 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R352 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R365 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R366 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R450 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R461 | RL 0-OHM-WIDERST. 0204 O-OHM RESISTOR | RL 0069.0000.00 | DRALORIC | DMA 0204 | |
| R463 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R464 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R466 | RL 0,60W 2,00KOHM+-1%TK50 RESISTOR | RL 0083.0826.00 | RESISTA | MK2 | |
| R472 | RL 0,60W 8,25KOHM+-1%TK50 RESISTOR | RL 0083.1239.00 | RESISTA | MK2 | |
| R473 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R474 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R500 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R501 | RL 0,60W 5,62KOHM+-1%TK50 RESISTOR | RL 0082.2190.00 | PHILIPS_CO | MRS 25 | |
| R502 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | |
| R503 | RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T | RS 0247.7890.00 | BI_TECHNOL | 72PM | |
| R510 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| R511 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R512 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R513 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R514 | RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T | RS 0247.7903.00 | BI_TECHNOL | 72PM | |
| R515 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R516 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R521 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R523 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R524 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R525 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R525 | NUR VAR/ONLY MOD: 02 04 RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R560 | NUR VAR/ONLY MOD: 06 RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R603 | RG 1,21KOHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9968.00 | PHILIPS_CO | RC02 | |
| R604 | RG 38,3 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8784.00 | DRALORIC | CB 1206 ... | |
| R605 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R606 | RG 681 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9080.00 | PHILIPS_CO | RC02 | |
| R606 | NUR VAR/ONLY MOD: 02 04 RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R610 | NUR VAR/ONLY MOD: 06 RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R611 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R612 | RG 19,6KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0893.00 | PHILIPS_CO | RC02 | |
| R613 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R614 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R615 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |
| R616 | RL 0,40W 100 OHM2% UNGEW. RESISTOR | RL 0092.5956.00 | DRALORIC | SMA 0204 | |
| R617 | RL 0,60W 681 KOHM+-1%TK50 RESISTOR | RL 0083.2735.00 | PHILIPS_CO | MRS 25 | |
| R618 | RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8861.00 | PHILIPS_CO | RC02 | |
| R618 | NUR VAR/ONLY MOD: 02 04 RG 75,0 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8855.00 | PHILIPS_CO | RC02 | |
| R619 | NUR VAR/ONLY MOD: 06 RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R619 | NUR VAR/ONLY MOD: 02 04 RG 121 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8903.00 | PHILIPS_CO | RC02 | |
| R620 | NUR VAR/ONLY MOD: 06 RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8861.00 | PHILIPS_CO | RC02 | |
| R620 | NUR VAR/ONLY MOD: 02 04 RG 75,0 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8855.00 | PHILIPS_CO | RC02 | |
| R621 | NUR VAR/ONLY MOD: 06 RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R622 | RL 0,60W 1,30KOHM+-1%TK50 RESISTOR | RL 0083.0678.00 | RESISTA | MK2 | |
| | NUR VAR/ONLY MOD: 02 04 | | | | |

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| R622 | RL 0,60W 1KOHM+-1%TK50 RESISTOR NUR VAR/ONLY MOD: 06 | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R623 | RD 0,8W 100 OHM+-1% WIRE WOUND RESISTOR | RD 0082.6420.00 | DRALORIC | RS-1A... | |
| R624 | RL 0,60W22,10 OHM+-1%TK50 RESISTOR | RL 0082.9188.00 | RESISTA | MK2 | |
| R625 | RG 422 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9039.00 | DRALORIC | CB 1206 ... | |
| R626 | RG 100 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8884.00 | PHILIPS_CO | RC02 | |
| R627 | RG 68,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8849.00 | PHILIPS_CO | RC02 | |
| R633 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R640 | RG 681 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9080.00 | PHILIPS_CO | RC02 | |
| R641 | RS 0,5W200 OHM+-10%10X10X CERMET POTENTIOMETER T NUR VAR/ONLY MOD: 02 04 | RS 0087.7554.00 | BI_TECHNOL | 72PM | |
| R641 | RS 0,5W100 OHM+-10%10X10X CERMET POTENTIOMETER T NUR VAR/ONLY MOD: 06 | RS 0247.7984.00 | BI_TECHNOL | 72PM | |
| R642 | RG 34,8 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8778.00 | ROEDERSTEI | D25 | |
| R643 | RG 464 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.9045.00 | DRALORIC | CB 1206 ... | |
| R644 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RC02 | |
| R645 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RC02 | |
| R646 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R647 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RC02 | |
| R653 | RG 46,4 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8803.00 | DRALORIC | CB 1206 ... | |
| R660 | RL 0,60W 681 KOHM+-1%TK50 RESISTOR | RL 0083.2735.00 | PHILIPS_CO | MRS 25 | |
| R662 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R663 | RS 0,5W100KOHM+-10%10X10X CERMET POTENTIOMETER T | RS 0087.7583.00 | BOURNS | 3386F | |
| R664 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R665 | RL 0,60W 681 KOHM+-1%TK50 RESISTOR | RL 0083.2735.00 | PHILIPS_CO | MRS 25 | |
| R667 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R668 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | |
| R669 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R670 | RG 38,3 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8784.00 | DRALORIC | CB 1206 ... | |
| R671 | RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8661.00 | PHILIPS_CO | RC02 | |
| R672 | RG 12,1 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8661.00 | PHILIPS_CO | RC02 | |
| R673 | RG 511 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9051.00 | PHILIPS_CO | RC02 | |
| R673 | NUR VAR/ONLY MOD: 02 04 RG 562 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9068.00 | PHILIPS_CO | RC02 | |
| R674 | NUR VAR/ONLY MOD: 06 RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R676 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | |
| R750 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |
| R760 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |
| R770 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |
| R780 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RC02 | |


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| R790 | RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R792 | RG 1,0 KO +-1%TK100 1206 CHIP RESISTOR | RG 0006.7271.00 | PHILIPS_CO | RCO2 | |
| R800 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RCO2 | |
| R801 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R802 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R803 | RG 38,3 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8784.00 | DRALORIC | CB 1206 ... | |
| R804 | RL 0,60W 47,5 OHM+-1%TK50 RESISTOR | RL 0082.9507.00 | RESISTA | MK2 | |
| R805 | RG 110 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.8890.00 | PHILIPS_CO | RCO2 | |
| R806 | RG 2,61KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0658.00 | DRALORIC | CB 1206 ... | |
| R807 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RCO2 | |
| R810 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RCO2 | |
| R811 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RCO2 | |
| R812 | RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR | RG 0006.8649.00 | PHILIPS_CO | RCO2 | |
| R822 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | |
| R823 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | |
| R824 | RL 0,40W 10,0KOHM+-1%TK50 RESISTOR | RL 0092.1567.00 | DRALORIC | SMA0204 | |
| R825 | RG 2,61KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0658.00 | DRALORIC | CB 1206 ... | |
| R826 | RG 511 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9051.00 | PHILIPS_CO | RCO2 | |
| R829 | RL 0,40W 4,75KOHM+-1%TK50 RESISTOR | RL 0092.1521.00 | RESISTA | MK1 | |
| R832 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | |
| R833 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | |
| R834 | RL 0,40W 4,75KOHM+-1%TK50 RESISTOR | RL 0092.1521.00 | RESISTA | MK1 | |
| R839 | RL 0,40W 10,0KOHM+-1%TK50 RESISTOR | RL 0092.1567.00 | DRALORIC | SMA0204 | |
| R840 | RG 2,61KOHM+-1%TK100 1206 CHIP RESISTOR | 0007.0658.00 | DRALORIC | CB 1206 ... | |
| R841 | RG 511 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9051.00 | PHILIPS_CO | RCO2 | |
| R850 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RCO2 | |
| R851 | RG 178 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8949.00 | PHILIPS_CO | RCO2 | |
| R860 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | |
| R861 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | |
| R862 | RG 90,9 OHM+-1%TK100 1206 CHIP RESISTOR NUR VAR/ONLY MOD: 04 06 | RG 0006.8878.00 | PHILIPS_CO | RCO2 | |
| R862 | RG 215 OHM+-1%TK100 1206 CHIP RESISTOR NUR VAR/ONLY MOD: 02 | 0006.8961.00 | ROEDERSTEI | D25 | |
| R863 | RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR NUR VAR/ONLY MOD: 04 06 | RG 0006.8861.00 | PHILIPS_CO | RCO2 | |
| R863 | RG 23,7OHM+-1%TK100 1206 CHIP RESISTOR NUR VAR/ONLY MOD: 02 | 0006.8732.00 | DRALORIC | CB 1206 ... | |
| R864 | RG 90,9 OHM+-1%TK100 1206 CHIP RESISTOR NUR VAR/ONLY MOD: 04 06 | RG 0006.8878.00 | PHILIPS_CO | RCO2 | |
| R864 | RG 215 OHM+-1%TK100 1206 CHIP RESISTOR NUR VAR/ONLY MOD: 02 | 0006.8961.00 | ROEDERSTEI | D25 | |
| R870 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | |


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| R871 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | |
| R880 | RG 825 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.7259.00 | PHILIPS_CO | RC02 | |
| R882 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R890 | RL 0,60W 4,12KOHM+-1%TK50 RESISTOR | RL 0083.1051.00 | RESISTA | MK2 | |
| R891 | RL 0,60W 6,04KOHM+-1%TK50 RESISTOR | RL 0082.6089.00 | RESISTA | MK2 | |
| R903 | RG 2,21KOHM+-1%TK100 1206 RESISTOR CHIP | RG 0007.5743.00 | PHILIPS_CO | RC02 | |
| R908 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R909 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R914 | RG 681 OHM+-1%TK100 1206 CHIP RESISTOR | RG 0006.9080.00 | PHILIPS_CO | RC02 | |
| R915 | RG 332 OHM+-1%TK100 1206 RESISTOR CHIP | RG 0007.5650.00 | PHILIPS_CO | RC02 | |
| R920 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R921 | RL 0,60W 301 OHM+-1%TK50 RESISTOR | RL 0083.0210.00 | RESISTA | MK2 | |
| R922 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R923 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R926 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R927 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R929 | RL 0,60W 301 OHM+-1%TK50 RESISTOR | RL 0083.0210.00 | RESISTA | MK2 | |
| T38 | LU UEBERTRAGER TRANSFORMER | 0801.6416.00 | | | 0843.4870.00 |
| T812 | DW UEBERTRAGER DOUBLER | 0843.3244.00 | | | |
| U630 | BM SRA1 MIXER 0.5GHZ MIXER | BM 0207.3465.00 | MINI-CIRCU | SRA1 | |
| V5 | AK NE85637 N 12V 100MA TRANSISTOR | 0801.8231.00 | NEC | NE85637(2SC3358) | |
| V7 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V10 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V11 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V20 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V22 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V33 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V40 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V42 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V43 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V44 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V46 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V51 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V55 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V56 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V58 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V60 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |

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| V64 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V65 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V67 | AE 5082-3379 50V PIN PINDIODE | AE 0397.0049.00 | HEWLETT_PA | HP5082-3379 | |
| V68 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V74 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V93 | AE 5082-3379 50V PIN PINDIODE | AE 0397.0049.00 | HEWLETT_PA | HP5082-3379 | |
| V94 | AE MA47047SELEKT 200V PIN PIN DIODE MA4PH274 | AE 0450.7060.00 | MACOM | 0450.7060.00 | |
| V95 | AE MA47047SELEKT 200V PIN PIN DIODE MA4PH274 | AE 0450.7060.00 | MACOM | 0450.7060.00 | |
| V97 | AE MA47047SELEKT 200V PIN PIN DIODE MA4PH274 | AE 0450.7060.00 | MACOM | 0450.7060.00 | |
| V98 | AE MA47047SELEKT 200V PIN PIN DIODE MA4PH274 | AE 0450.7060.00 | MACOM | 0450.7060.00 | |
| V99 | AE 5082-3379 50V PIN PINDIODE | AE 0397.0049.00 | HEWLETT_PA | HP5082-3379 | |
| V112 | AK NE85637 N 12V 100MA TRANSISTOR | 0801.8231.00 | NEC | NE85637(2SC3358) | |
| V115 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V117 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V133 | AK BFR96 N 15V 75MA TRANSISTOR | AK 0093.2738.00 | VALVO | BFR96 | |
| V143 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V144 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V152 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V201 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V202 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V204 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V205 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V208 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V212 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V214 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V215 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V218 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V222 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V223 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V225 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V226 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V227 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V230 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V231 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V236 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V237 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V240 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V241 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V243 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |

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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| V246 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V247 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V250 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V251 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V256 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V257 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V260 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V261 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V265 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V271 | AE 5082-3379 50V PIN PINDIODE | AE 0397.0049.00 | HEWLETT_PA | HP5082-3379 | |
| V272 | AE 5082-3379 50V PIN PINDIODE | AE 0397.0049.00 | HEWLETT_PA | HP5082-3379 | |
| V300 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V301 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V305 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V306 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V310 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V311 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V315 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V316 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V318 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V320 | AE 5082-3379 50V PIN PINDIODE | AE 0397.0049.00 | HEWLETT_PA | HP5082-3379 | |
| V325 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V326 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V330 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V331 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V336 | AE 5082-3379 50V PIN PINDIODE | AE 0397.0049.00 | HEWLETT_PA | HP5082-3379 | |
| V340 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V341 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V345 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V346 | AE BA483 BER.SCH.DI.UHF DIODE | AE 0568.2290.00 | VALVO | BA483 | |
| V360 | AE BZX55/B5V1 0,5W ZDI ZENER DIODE | AE 0262.5837.00 | TELEFUNKEN | BZX55B5V1 | |
| V361 | AE BZX55/B5V1 0,5W ZDI ZENER DIODE | AE 0262.5837.00 | TELEFUNKEN | BZX55B5V1 | |
| V365 | AE BZX55/B5V1 0,5W ZDI ZENER DIODE | AE 0262.5837.00 | TELEFUNKEN | BZX55B5V1 | |
| V451 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V473 | AE BZX79B4V3 2% 0.5W ZDI ZENER | AE 0008.7691.00 | PHILIPS_SE | BZX79B4V3 | |
| V474 | AE BZX79B4V3 2% 0.5W ZDI ZENER | AE 0008.7691.00 | PHILIPS_SE | BZX79B4V3 | |
| V515 | AE 1N827 6,2V REF DI ZENER REFERENCE DIODE | AE 0418.0029.00 | COMPENSATE | 1N827(A) | |
| V560 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V606 | AK BFQ34T N 18V 150MA TRANSISTOR | 0801.8283.00 | PHILIPS | BFQ34T | |

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| V616 | ZE DIODENP. HPA 5082-2810 PAIR OF DIODES V616+V666 | 0801.6480.00 | | | |
| V621 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V622 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V640 | AK BFT66 N 15V 30MA TRANSISTOR | 0252.5728.10 | SIEMENS | BFT66 | |
| V641 | AK 2N2369A N 15V 200MA TRANSISTOR | AK 0010.4680.00 | VALVO | 2N2369A ODER BSX20 | |
| V660 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V664 | AE BZX55/B4V7 0,5W ZDI ZENER DIODE | AE 0080.4014.00 | VALVO | BZX79B4V7 | |
| V665 | AE BZX55/B4V7 0,5W ZDI ZENER DIODE | AE 0080.4014.00 | VALVO | BZX79B4V7 | |
| V666 | XX BEMERKUNG PLEASE NOTE 1/2 DIODENPAAR 1/2 PAIR OF DIODES SIEHE/SEE ALSO V616 | | | | |
| V668 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V670 | AK BFR96 N 15V 75MA TRANSISTOR | AK 0093.2738.00 | VALVO | BFR96 | |
| V800 | AD BAV99 75V DUO UDI HIGH-SPEED DOUBLE DIODE | AD 0911.0092.00 | VALVO | BAV99 | |
| V801 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V802 | AK BC253C P 25V 100MA PNP TRANSISTOR | 0010.2829.00 | ITT-SEMICO | BC559C | |
| V810 | AK BFR96 N 15V 75MA TRANSISTOR | AK 0093.2738.00 | VALVO | BFR96 | |
| V813 ..816 | AE 5082-2835 SCHOTTKY DIODE | 0263.8430.00 | HEWLETT_PA | HP5082-2835 | |
| V824 | AE MA4P274-287 200V PIN PIN DIODE | 0843.3238.00 | MA-COM | MA4P1110 | |
| V827 | AE MA4P274-287 200V PIN PIN DIODE | 0843.3238.00 | MA-COM | MA4P1110 | |
| V828 | AE MA4P274-287 200V PIN PIN DIODE | 0843.3238.00 | MA-COM | MA4P1110 | |
| V829 | AE MA4P274-287 200V PIN PIN DIODE | 0843.3238.00 | MA-COM | MA4P1110 | |
| V834 | AE MA4P274-287 200V PIN PIN DIODE | 0843.3238.00 | MA-COM | MA4P1110 | |
| V837 | AE MA4P274-287 200V PIN PIN DIODE | 0843.3238.00 | MA-COM | MA4P1110 | |
| V838 | AE MA4P274-287 200V PIN PIN DIODE | 0843.3238.00 | MA-COM | MA4P1110 | |
| V839 | AE MA4P274-287 200V PIN PIN DIODE | 0843.3238.00 | MA-COM | MA4P1110 | |
| V882 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V883 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V900 ..903 | AE 5082-3043 50V PIN PIN DIODE | AE 0359.9013.00 | HEWLETT_PA | 5082-3043 | |
| V910 ..913 | AE 5082-3043 50V PIN PIN DIODE | AE 0359.9013.00 | HEWLETT_PA | 5082-3043 | |
| V920 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V921 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V924 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V925 | AK BSX29 P 12V 200MA TRANSISTOR | 0010.3031.00 | SGS | BSX29 | |
| V929 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V930 | AK BSX29 P 12V 200MA TRANSISTOR | 0010.3031.00 | SGS | BSX29 | |
| W1 | DW KABEL W1 CABLE | 0801.7287.00 | | | |
| W2 | DW KABEL W2 CABLE | 0801.7293.00 | | | |

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|--|----------|----------|--|---------------------------------------|-------------------------|-------------------|
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|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| W3 | DW KABEL W3 CABLE NUR VAR/ONLY MOD: 04 06 | 0801.7306.00 | | | |
| W4 | DW KABEL CABLE | 0843.3167.00 | | | |
| W5 | DW KABEL CABLE W5 | 0843.4263.00 | | | |
| X1 | FP STECKERLEISTE 32POL. MULTIPOINT CONNECTOR | FP 0514.4550.00 | SIEMENS | V42254-B1200-B641 | |
| X11 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN 2-POLIG/2 PINS | 0088.4542.00 | DUPONT | CON 75403-003 | |
| X22 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN 4-POLIG/4 PINS | 0088.4542.00 | DUPONT | CON 75403-003 | |
| X24 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN 2-POLIG/2 PINS | 0088.4542.00 | DUPONT | CON 75403-003 | |
| X401 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| X402 | FJ EINBAUWINKELST. SMC ANGLE CONNECTOR | FJ 0249.9684.00 | IMS | 82.1524.201 | |
| X404 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| X405 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| X406 | FJ EINBAUWINKELST. SMC ANGLE CONNECTOR | FJ 0249.9684.00 | IMS | 82.1524.201 | |
| X408 | NUR VAR/ONLY MOD: 04 06 FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| X410 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |
| Z700 | LD 10GHZ 50DB100V10A4RDX9 LEAD-THROUGH FILTER | LD 0451.4636.00 | SPECTRUM | 51-713-036 | |
| Z710 | LD 10GHZ 50DB100V10A4RDX9 LEAD-THROUGH FILTER | LD 0451.4636.00 | SPECTRUM | 51-713-036 | |
| Z730 | LD 10GHZ 50DB100V10A4RDX9 LEAD-THROUGH FILTER | LD 0451.4636.00 | SPECTRUM | 51-713-036 | |
| Z740 | LD 10GHZ 50DB100V10A4RDX9 LEAD-THROUGH FILTER | LD 0451.4636.00 | SPECTRUM | 51-713-036 | |
| Z790 | LD 10GHZ 50DB100V10A4RDX9 LEAD-THROUGH FILTER | LD 0451.4636.00 | SPECTRUM | 51-713-036 | |
| Z791 | LD 10GHZ 50DB100V10A4RDX9 LEAD-THROUGH FILTER | LD 0451.4636.00 | SPECTRUM | 51-713-036 | |

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|---|----------------------------|----|---------------|--|-------------------------|-------------------|
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|  | ROHDE & SCHWARZ | 17 | 03.05.99 | ED AUSGANGSSTUFE 2GHZ OUTPUT-STAGE 2GHZ | 0843.4805.01 SA | 23- |

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ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Baugruppe Rechner

801.2410.04

ENGLISH MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5.1 Funktionsbeschreibung

(Hierzu Stromlauf 801.2410 S und Bild 5-4)

Die Baugruppe "Rechner" enthält einen Mikroprozessor, der alle Eingaben von der Tastatur oder über den IEC-Bus entgegennimmt und die Baugruppen des Geräts ansteuert. Die Datenübertragung geschieht in serieller Form.

Die serielle Datenausgabe, die Tastaturerkennung und die Auswertung des Drehimpulsgebers werden von einem zentralen Interfacebaustein erledigt, dem kundenspezifischen Gate Array "IFPAS".

Außerdem ist eine Diagnoseschaltung mit Spannungsmesser vorhanden, mit der bis zu 35 Meßpunkte im Gerät automatisch überwachbar sind.

5.1.1 Mikroprozessor und Adreßlatch

Als Zentraleinheit (CPU) dient der 16-Bit-Mikroprozessor 80186, der mit einer Taktfrequenz von 8 MHz arbeitet. Daraus resultiert eine maximale Busfrequenz von 2 MHz.

Die CPU umfaßt einen Adreßraum von 1 MByte, wozu sie 20 Adreßsignale ausgibt. Die 8-Bit-Latches D2 und D3 dienen mit Hilfe des ALE-Signals (Address Latch Enable) zum Abspeichern der zu Beginn eines Buszyklus herausgeführten Adresse. Danach steht der Bus DB0 bis DB15 zur Übertragung der Daten bereit.

5.1.2 Programmspeicher (EPROMS)

Für den Programmspeicher werden zwei EPROMs des Typs 27256 verwendet.

Diese EPROM-Bausteine D70, D71 sind jeweils 8 Bit (1 Byte) breit. Da sie auf der Baugruppe parallel geschaltet sind, erscheinen sie für die CPU wie ein 16-bit-breiter Programmspeicher. Dabei beinhaltet D70 die niederwertigen 8-Bit (Low-Byte) und D71 die höherwertigen 8-Bit (High-Byte) eines 16-bit-breiten Wortes.

5.1.3 Datenspeicher (RAMs)

Für den Datenspeicher werden CMOS-RAMs vom Typ 6116 bzw. 6264 verwendet, mit einer Speicherkapazität von 4 KByte bzw. 16 KByte. Je nach Wahl der Bausteine muß die Beschaltung durch Umstecken der Steckbrücke X90 angepaßt werden.

Über die Bussignale AB0 und BHE* ist der Datenspeicher byteweise oder wortweise ansteuerbar.

Um Geräteeinstellungen und wichtige Betriebsdaten auch bei abgeschalteter Stromversorgung zu erhalten, sind die RAMs über eine Batterie gepuffert.

Die Schaltung zum Umschalten von Netzteilspannung auf Batterie- speisung und umgekehrt besteht aus V90, V91, V94, V95 usw.

Wenn das RES*-Signal inaktiv wird, und damit der aktive Betriebs- modus des Rechners eingeschaltet ist, wird der Transistor V90 durchgeschaltet. Er verbindet die RAM-Versorgungsanschlüsse mit der +5-V-Versorgung. Die Diode V95 schützt die Lithiumbatterie vor unzulässigem Ladestrom. Die Diode V94 und der Kondensator C90 glätten den Spannungsverlauf während der Umschaltvorgänge.

Bei abgeschalteter Stromversorgung des Geräts liegt das RES*-Signal auf Low-Potential und V90, V94 sind in Richtung der niederohmigen +5-V-Leitung gesperrt. Dann werden die RAMs aus der Batterie (über Diode V95) gespeist und befinden sich im "Stand- by"-Modus.

Ebenso sind dann die Kontrolleitungen CE (Chip Enable) inaktiv high, weil sie über die elektrischen Schalter, bestehend aus V92, V96 bzw. V93, V97 von der restlichen Schaltung abgetrennt sind.

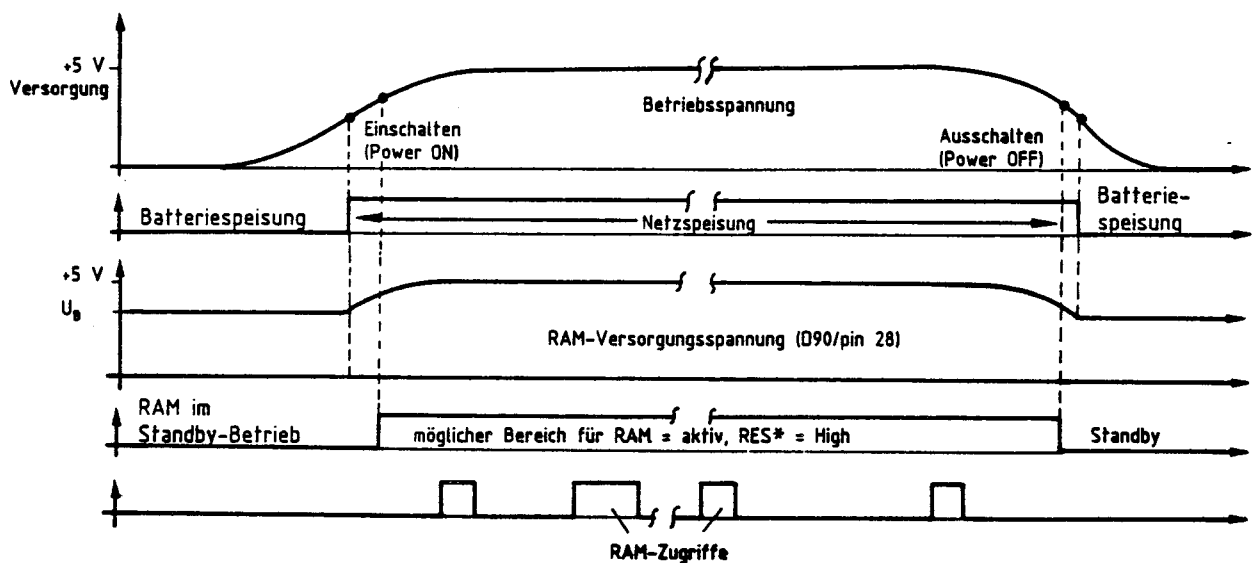


Bild 5-1 Stromversorgung des RAMs (nicht maßstäblich)

5.1.4 Interface zur Frontplatte und zum seriellen Datenbus

Das kundenspezifische Gate Array "IFPAS" (Interface for Front Panel and Serial Bus) beinhaltet drei unabhängige Schaltungen.

Interface für Drehimpulsgeber (RMK)

An seinen Eingangsklemmen RMK.PLS und RMK.DIR liegen die um 90° phasenverschobenen Signale "Puls" und "Richtung" des Drehimpulsgebers an. Intern werden die Pulse je nach Drehrichtung in einem Zähler aufsummiert. Der 1. Puls führt zum Interrupt, der über den Anschluß RMK.INT* zur CPU geleitet wird. Der Zähler wird nach dem Auslesen automatisch gelöscht.

Interface zur Tastenmatrix

Im Ruhezustand, wenn keine Taste gedrückt ist, werden die Leitungen KC1 bis KC8 des D40 auf Low-Potential gehalten.

Die Anschlüsse KR1 bis KR8 stellen immer hochohmige CMOS-Eingänge dar. Die Kondensatoren C61 bis C67 sind wichtiger Bestandteil des Tastatur-Interface, während C111 bis C118 nur zur Unterdrückung von Störsignalen dienen.

Beim Betätigen einer Taste wird in der Tastenmatrix eine Zeilenleitung (KEY.ROW1 bis KEY.ROW7) mit einer Spaltenleitung (KEY.COL1 bis KEY.COL8) verbunden und die Ladung des entsprechenden Kondensators (aus C61 bis C67) in den IFPAS-Baustein D40 hinein entladen.

Eine interne Schaltung erzeugt einen Tastaturinterrupt durch Low-Potential auf der KEY.INT*-Leitung.

Mit einem Lesezyklus wird der Tastencode gelesen. Für die Dauer dieses Zyklus werden die Pins KC1 bis KC8 zu Eingängen und damit hochohmig geschaltet.

Kurz vor dem Ende des Lesezyklus haben alle am Tastendruck unbeteiligten (offenen) Spaltenleitungen mit Hilfe der Pullup-Widerstände in R64 High-Potential erreicht. Nur die mit dem entladenen Kondensator verbundenen Zeilen- und Spaltenleitungen weisen dann noch Low-Potential auf. Aus diesem Signalzustand wird ein (1 aus 56) Tastencode erzeugt und zum Lesen an den Datenbus gelegt. Beim Auslesen wird der Interrupt automatisch gelöscht.

Interface zwischen dem 16-bit-parallelen Mikroprozessorbus und dem seriellen Bus

Dieser serielle Bus besteht aus den drei unidirektionalen Leitungen TFR.CLK (Transfer Clock), TM.DATA (Transmit Data) und RC.DATA (Receive Data). Zum Konzept der seriellen Übertragung gehören auch Strobe-Leitungen (siehe Abschnitt 5.1.5), die die Adreß- und Selektsignale zu den peripheren Datenlatches auf anderen Baugruppen darstellen. Sie sind weiterhin parallel geführt.

5.1.5 Strobeerzeugung und Zusatzschaltung

Strobeerzeugung

Zur Erzeugung der Strobes dienen die Bausteine D42 und D63, deren Ausgangsbits einzeln adressierbar sind.

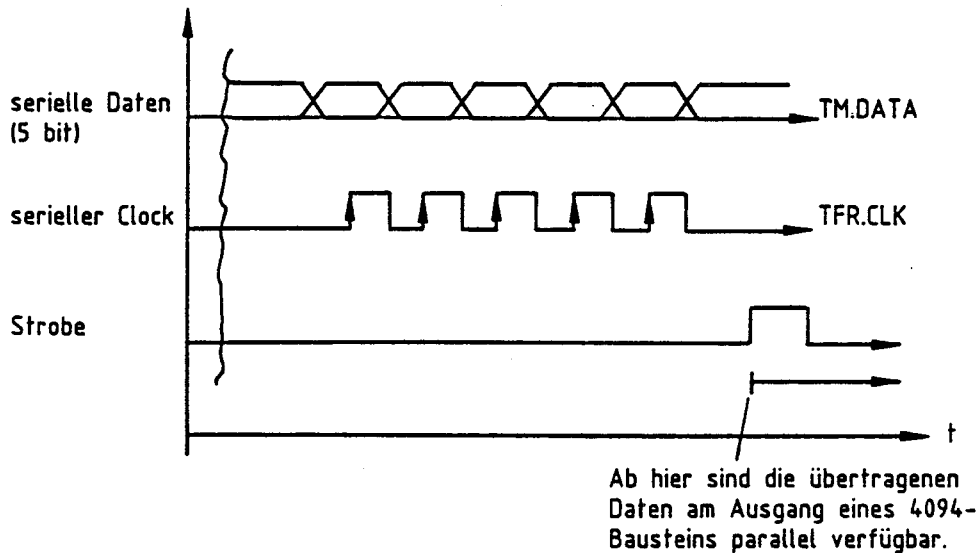


Bild 5-2 Serielle Übertragung von fünf Datenbits

Als Empfänger der seriell gesendeten Daten werden Schieberegister vom Typ 4094 verwendet. Sie sind zweistufig aufgebaut: einem 8-Bit-Schieberegister als Eingangsstufe und einem 8-Bit-parallelen Latch als Ausgangsstufe.

Ein am Strobeeingang angelegter Puls (┌─┐) lädt das Ausgangslatch mit dem augenblicklichen Inhalt des Schieberegisters. Für die übrige Zeit sind beide Register im Baustein 4094 vollkommen getrennt.

Das Eingangsschieberegister ist mit den Leitungen TRF.CLK und TM.DATA verbunden und übernimmt alle darauf gesendeten Daten. Danach erfolgt die Datenübernahme infolge eines kurzen Strobeimpulses.

Zusatzschaltung

Zu Testzwecken kann X12 mit einer Kurzschlußbrücke bestückt werden, um die Powerfail-Schaltung, die sich auf der Netzteilbaugruppe befindet, unwirksam zu machen.

5.1.6 Interface zum IEC-Bus

Bei dem IEC-Bus-Interface, bestehend aus den Bausteinen D50, D51 und D52, handelt es sich um eine Standardapplikation, mit der die Fernsteuerschnittstelle nach IEC-625-Norm implementiert wird.

Das Interface ist in der Lage, über die Leitungen DRQ0 und DMA.SEL* und einem DMA-Kanal (Direct Memory Access) des Mikroprozessors Daten direkt in den Datenspeicher zu laden oder von dort zu lesen.

Das Interface wickelt das Datenübergabeprotokoll (Handshake) auf dem IEC-Bus selbständig ab. Adressierungen und Schnittstellenkommandos werden ohne Beteiligung des Prozessors bearbeitet und entsprechende Informationen in internen Statusregistern abgelegt. Über die Interruptleitung INT12 werden Bedienanforderungen an die CPU weitergeleitet.

5.1.7 Diagnoseschaltung mit Spannungsmesser

Im Mittelpunkt der Diagnoseschaltung steht der 12-Bit-Analog/Digital-Wandler D10, der als integrierender Zwei-Flankenwandler arbeitet.

Mit der von N10 gelieferten Referenzspannung von 2,048 V wird eine Meßauflösung von 1 mV und ein Meßbereich von -4,095 V bis +4,095 V erzielt.

Die Meßsignale werden über eine Eingangsstufe (N11, D18) mit umschaltbarer Verstärkung von 1:1 und 10:1 an den Eingang des A/D-Wandlers geführt. Sie können von anderen Baugruppen (über Steckerpin X1.A28 oder auch von der Rechnerbaugruppe selbst stammen. Im letzteren Fall schaltet der Analogmultiplexer D16, angesteuert vom adressierbaren Latch D17, einen der 8 Meßpunkte auf den Eingang von N11.

Weitere Schaltungsdetails:

- a) Zur Messung der Batteriespannung wird der Transistor V14 durchgeschaltet und mit R32 die Belastung der Batterie im Standby-Modus simuliert.
- b) Die Frequenz des freischwingenden Oszillators des A/D-Wandlers wird durch R13 und C24 bestimmt und beträgt 100 kHz ± 15 %.

5.1.8 Reset-Schaltung

Die Reset-Schaltung (mit N80-I,II,III und V83) hat die Aufgabe, den Mikroprozessor und andere aktive Bauelemente abzuschalten, wenn vor dem Ansteigen und nach dem Absinken der +5-V-Versorgungsspannung ein sicheres Arbeiten der Baugruppe noch nicht oder nicht mehr gewährleistet ist.

Mit einer Verzögerungsschaltung wird erreicht, daß das RES*-Signal ca. 0,5 bis 1 s lang ansteht, während die Versorgungsspannung für den Betrieb schon ausreicht, also 4,7 V überschritten hat.

An X80 kann zu Testzwecken eine Taste angeschlossen werden, so daß ein Netzausfall simulierbar ist.

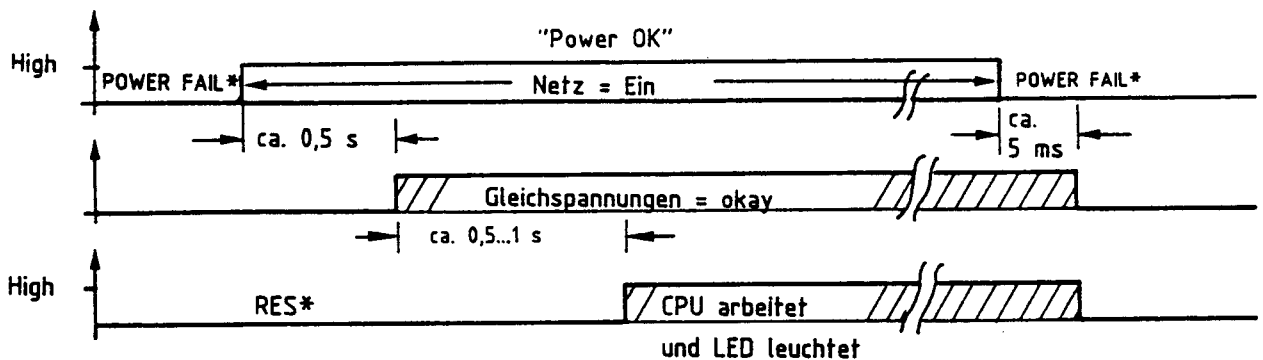


Bild 5-3 Netzteil Ein-/Ausschaltsequenzen (nicht maßstäblich)

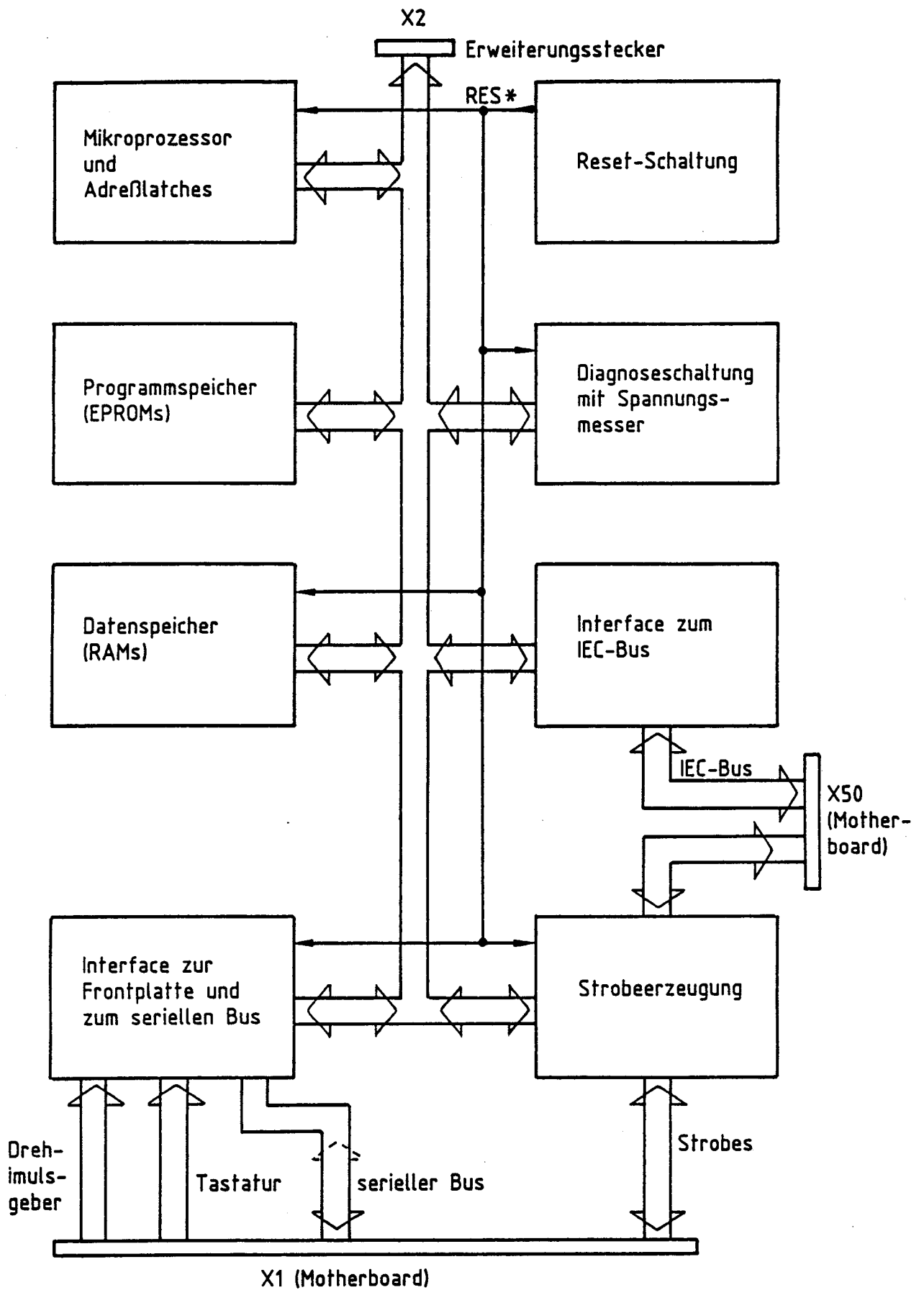


Bild 5-4 Blockschaltbild Rechner

5.2 Abgleich

Die Spannung am Testpunkt P10 wird mit R18 auf +2,048 V \pm 1 mV abgeglichen.

5.3 Fehlersuche

Einfache Tests

(mit Digitalvoltmeter (DVM) und Oszilloskop (SKOP))

- Alle Steckbrücken kontrollieren.
- Am Pluspol von C1 sind meßbar: $+5,2 \text{ V} \pm 0,25 \text{ V}$ (DVM)
- Am Pluspol von C2 sind meßbar: $+15 \text{ V} \pm 0,5 \text{ V}$ (DVM)
- Am Minuspol von C3 sind meßbar: $-15 \text{ V} \pm 0,4 \text{ V}$ (DVM)
- Am Pluspol von C4 sind meßbar: $+24 \text{ V} \pm 0,5 \text{ V}$ (DVM)
- Das CLK.OUT-Signal an D1/56 ist ein 8-MHz-TTL-Signal (SKOP). Wenn ein Fehler auftritt, Quarzoszillator D1/58, 59 untersuchen.
- Wenn LED "V82" leuchtet, dann sind die Resetsignale RES* = LOW (D1/24) und RESET = High (D1/57) (DVM).
- Referenzspannung an X10 ist mit R18 auf $2,048 \text{ V} \pm 1 \text{ mV}$ justiert (DVM).
- An D40/50,49 lassen sich mit dem Oszilloskop TTL-Signale abgreifen, sobald der Drehknopf betätigt wird.
- Bei nicht betätigter Tastatur sind alle Zeilenleitungen (KEY.ROW1 bis KEY.ROW7) auf High-Potential und alle Spaltenleitungen (KEY.COL1 bis KEY.COL8) auf Low. Wenn eine Taste gedrückt ist, geht die entsprechende Zeilenleitung ebenfalls auf Low (DVM).
- Wenn X80 z.B. durch eine Prüftaste kurzgeschlossen wird, muß sofort die LED V82 verlöschen. Nachdem der Kontakt wieder geöffnet wurde, darf sie erst nach ca. 0,5 bis 1 s wieder aufleuchten. Dann durchläuft der Mikroprozessor die Powerup-Routine, erkennbar an der Initialisierung der Eichleitung.
- Die Spannung am D70 bzw. D71/26 darf bei Netzbetrieb max. $0,2 \text{ V}$ unter der +5-V-Versorgung liegen (V90). Bei abgeschaltetem Netz muß die von der Batterie gelieferte Standby-Spannung am gleichen Punkt größer als $2,6 \text{ V}$ sein (DVM).

Konfigurierung der Steckbrücken und ihre Benutzung zu Testzwecken

- X3 : wird nicht benötigt
- X4/1-2 : im Normalfall **geschlossen**
im Test offen; ermöglicht die Einspeisung eines externen Taktes
- X5 : im Normalfall **offen**
im Test geschlossen; bringt den Mikroprozessor in den Hold-Zustand und macht den Bus hochohmig.
- X12 : im Normalfall **offen**
im Test geschlossen; trennt das vom Netzteil herangeführte Powerfail-Signal (PWR.FAIL*) ab.
- X40: : wird nicht benötigt
- X41/7-8 : **geschlossen**; bildet die Rückführung der seriellen Transmit-Leitung auf die nicht benötigte Receive-Leitung und ermöglicht so einen einfachen Selbsttest des IFPAS (D40).
- X51 : im Normalfall **offen**
im Test geschlossen; unterbricht die Select-Signale zu den Interface-Schaltungen und verhindert dadurch ihre Aktivierung.
- X52 : dient dem Anschluß eines Geräts für die Signaturanalyse.
- X70/1-2 : **geschlossen**, wenn D70, D71 EPROMs vom Typ 27256 sind.
- X70/2-3 : **geschlossen**, wenn D70, D71 EPROMs vom Typ 27128 sind.
- X80 : erlaubt den Anschluß einer Reset-Taste zu Testzwecken.
- X90/1-2 : **geschlossen**, wenn D90, D91 CMOS-RAMs vom Typ 6264 sind.
- X90/2-3 : **geschlossen**, wenn D90, D91 CMOS-RAMs vom Typ 6116 sind.

5.4 Schnittstellen

Abkürzungen: TS = Tristate-Leitung
 TTL = TTL-kompatible Leitung
 OC = Open-Collector-Leitung
 PS = Power-Supply-Leitung
 I = Eingangsleitung (Input)
 O = Ausgangsleitung (Output)
 * = Negationszeichen für Signale mit negativer Logik
 AL = Analoges Signal

| Anschluß | Leiterart | Signalrichtung | Bezeichnung/Beschreibung |
|------------------------|-----------|----------------|--|
| X1.A1 | TTL | I | DREHG.DIR, Drehimpulsgeber Richtung |
| X1.B1 | TTL | I | DREHG.PULS, Drehimpulsgeber Puls |
| X1.A3-A6 X1.B3-B6 | TTL (TS) | I/O | KEY.COL1 bis KEY.COL8, Spaltenleitungen der Tastenmatrix |
| X1.B7 | TTL | O | EXT.RES*, externes Resetsignal |
| X1.A7-A10 X1.B8-B10 | TTL | I | KEY.ROW1 bis KEY.ROW7, Zeilenleitungen der Tastenmatrix |
| X1.B11 | TTL | O | DIS.STB3* |
| X1.A11 | TTL | O | DIS.STB2* |
| X1.B12 | TTL | O | DIS.STB1* |
| | | | } Strobes zur Ansteuerung der LCD-Controller auf der Frontplatte (Display) |
| X1.A12 | TTL | I | LCD.BUSY*, Handshake-Signal |
| X1.B13 | TTL | O | DIS.C/D*, Command/Data-Umschaltung |
| X1.A13 | TTL | O | DIS.DAT, serielle Datenleitung |
| X1.B14 | TTL | O | DIS.CLK, serielle Clock-Leitung |
| X1.A14 | TTL | O | LED.STB, Strobe zur LED-Ansteuerung |
| X1.A16 | TTL | I | PWR.FAIL*, Powerfail-Signal vom Netzteil |
| X1.A17,B17 | PS | -- | GND, Masseverbindung |
| X1.A18,B18 | PS | -- | +24 V Stromversorgung |
| X1.A19,B19 | PS | -- | -15 V Stromversorgung |
| X1.A20,B20 | PS | -- | +15 V Stromversorgung |
| X1.A21,B21 | PS | -- | +5 V Stromversorgung |
| X1.A22,B22 | PS | -- | GND, Masseverbindung |
| X1.A23 | TTL | I | FM.EXT, Modulationssignal der FM/AM |

| Anschluß | Leiterart | Signal richtung | Bezeichnung/Beschreibung |
|--------------------------|-----------------|--------------------|--|
| X1.A24 | TTL | I | AM.EXT, Modulationssignal der AM |
| X1.B24 | AL | I | EICH.TEST, Testsignal von der Eichleitung |
| X1.B25 | TTL | I | HF.OVERLOAD, Alarmsignal der Eichleitung |
| X1.A25,A26 | TTL | O | MOD.STB1, MOD.STB2, Strobes zur Einstellung der Modu- lationssteuerung |
| X1.A27 | TTL | O | TFR.CLK, serieller Clock zu den HF-Baugruppen |
| X1.B27 | TTL | O | TM.DATA, serielle Daten- leitung |
| X1.A28 | AL | I | TEST, analoge Meßleitung |
| X1.A29-A31 | TTL | O | HF.STB1 bis HF.STB6, Strobes zur Einstellung der HF-Bau- gruppen |
| X1.B28-B30 | | | |
| X1.B31 | TTL (OC) | I | LOOP.OK, Alarm-Leitung der Regelschleifen |
| X1.A32,B32 | PS | -- | GND |
| X50.A1-A7 | PS | -- | GND |
| X50.C1 | | | |
| X50.A9-A12 X50.C9-C12 | TTL (OC, TS) | I/O | I.DAT1 bis I.DAT8, Datenbus |
| X50.C2 | TTL (TS) | I/O | I.ATN, ATTENTION-Leitung |
| X50.C3 | TTL (OC) | I/O | I.SRQ, SERVICE REQUEST |
| X50.C4 | TTL (TS) | I/O | I.IFC, INTERFACE CLEAR |
| X50.C5 | TTL (OC) | I/O | I.NDAC, NOT DATA ACCEPTED |
| X50.C6 | TTL (OC) | I/O | I.NRFD, NOT READY FOR DATA |
| X50.C7 | TTL (TS) | I/O | I.DAV, DATA VALID |
| X50.C8 | TTL (TS) | I/O | I.EOI, END OR IDENTIFY |
| X50.A8 | TTL (TS) | I/O | I.REN, REMOTE ENABLE |
| X50.A13,C13 | PS | -- | GND |
| X50.A14 | TTL | I | OPT.AVAIL, Statussignal einer externen Option |
| X50.C14 | TTL (OC) | I | EXT.LOOPOK, Regelschleifen- überwachung |
| X50.A15 | TTL | O | EXT.TMDAT, serielle Sende- daten |
| X50.C15 | TTL | O | EXT.STB, Strobe zur ext. Option |
| X50.C16 | TTL | O | EXT.TFRCLK, serieller Clock |



ROHDE & SCHWARZ

SERVICE DOCUMENTS

Processor Module

801.2410.04

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5.1 Function Description

(See circuit diagram 801.2410 S and Fig. 5-4)

The processor contains a microprocessor which handles all inputs from the keyboard or via the IEC bus and triggers the instrument modules. Data transmission takes place in serial mode.

Serial data output, keyboard polling and spinwheel evaluation are handled by a central interface IC, the customer-specific gate array IFPAS.

A diagnosis circuit with a voltmeter is also provided and permits the automatic monitoring of up to 35 test points of the unit.

5.1.1 Microprocessor and Address Latch

The CPU is an 80186 16-bit microprocessor which operates with a clock frequency of 8 MHz. This results in a maximum bus frequency of 2 MHz.

The CPU has an address space of 1 Mbyte for which it outputs 20 address signals. The 8-bit latches D2 and D3 together with the ALE signal (Address Latch Enable) are used to store the address output at the start of a bus cycle. The bus DB0 to DB15 is subsequently available for data transmission.

5.1.2 Program Memory (EPROMs)

Two EPROMs of type 27256 are used for the program memory. These two EPROMs D70 and D71 are each 8 bit (1 byte) wide. Since they are connected in parallel on the module, they appear to the CPU as a 16-bit wide program memory.

D70 contains the least significant 8 bits (Low byte) and D71 the most significant 8 bits (High byte) of a 16-bit word.

5.1.3 Data Memory (RAMs)

CMOS-RAMs of type 6116 and 6264 with capacities of 4 Kbyte and 16 Kbyte respectively are used for the data memory. Depending on the components used, the circuit must be adapted by repositioning the plug-in jumper X90.

The data memory can be addressed in bytes or words using the bus signals AB0 and BHE*.

The RAMs are backed up by a battery to retain instrument settings and important operating data when the power supply is switched off.

The circuit V90, V91, V94, V95 etc. is used to switch from the power supply to the battery supply and vice versa.

Transistor V90 is connected through if the RES* signal becomes inactive indicating the active operating mode of the processor. The transistor connects the RAM supply terminals to the +5-V supply. The diode V95 protects the lithium battery from an excessive charging current. Diode V94 and capacitor C90 smoothen the voltage characteristic during the switchover processes.

The RES* signal is at Low with the power supply to the instrument switched off, and +5-V line is thus isolated from the battery voltage by the non-conducting V90, V94. The RAMs are then powered by the battery (via diode V95) and are in standby mode.

The control lines CE (Chip Enable) are then also inactive (High) because they are isolated from the rest of the circuitry by the electronic switches formed by V92, V96 or V93, V97.

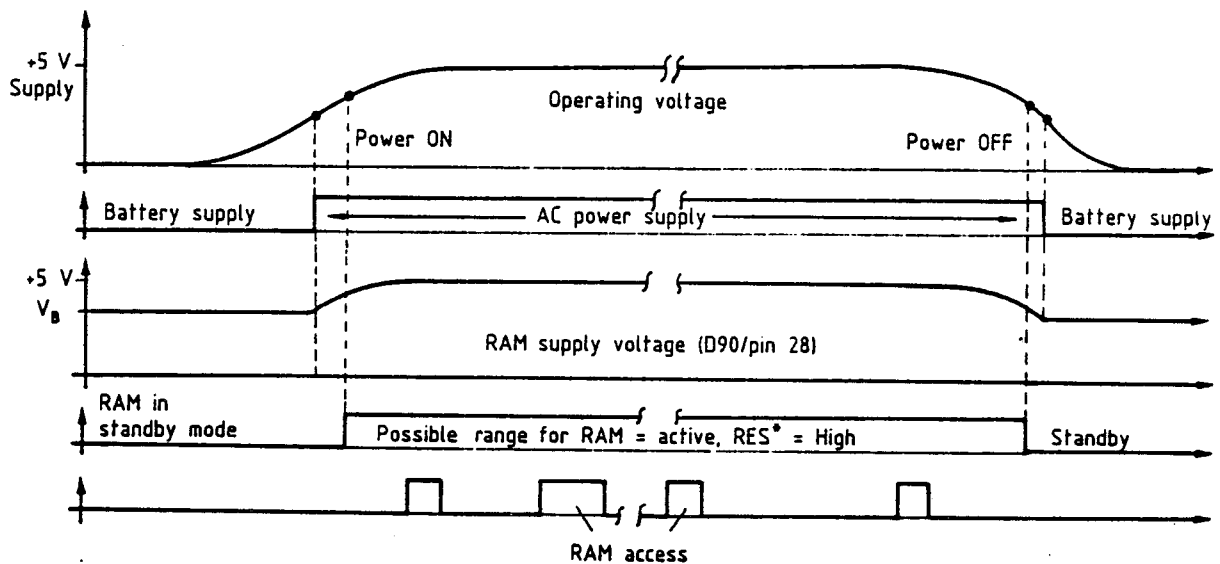


Fig. 5-1 Power supply to RAM (not to scale)

5.1.4 Interface for Front Panel and Serial Data Bus

The customer-specific gate array IFPAS (Interface for Front Panel and Serial bus) contains three independent circuits.

Interface for spinwheel (RMK)

The signals "Pulse" and "Direction" from the spinwheel, offset in phase by 90°, are applied to input terminals RMK.PLS and RMK.DIR of the interface. The pulses are counted internally depending on the direction of rotation. The first pulse generates an interrupt which is applied to the CPU via the connection RMK.INT*. The counter is automatically cleared once it has been read.

Interface to the keyboard

Lines KC1 to KC8 of the D40 are held at Low potential in the quiescent state when no keys are pressed.

The pins KR1 to KR8 always represent high-impedance CMOS inputs. Capacitors C61 to C67 are important components of the keyboard interface, whereas C111 to C118 are only used to suppress noise signals.

A row line (KEY.ROW1 to KEY.ROW7) is connected to a column line (KEY.COL1 to KEY.COL8) in the key matrix when a key is pressed and the charge of the corresponding capacitor (C61 to C67) is discharged into the IFPAS component D40.

An internal circuit generates a keyboard interrupt by a Low potential on the KEY.INT* line.

The key code is read using a read cycle. Pins KC1 to KC8 become inputs for the duration of this cycle and are thus set to high impedance.

Shortly before the end of the read cycle, all column lines not affected by the pressed key (open) are set to High using the pull-up resistors in R64. Only the row and column lines connected to the discharged capacitor are then at Low. A key code (1-out-of-56) is generated from this signal status and applied to the data bus for reading. The interrupt is automatically cleared during reading.

Interface between the 16-bit parallel microprocessor bus and the serial bus

This serial bus consists of the three unidirectional lines TFR.CLK (Transfer Clock), TM.DATA (Transmit Data) and RC.DATA (Receive Data). The strobe lines (see Section 5.1.5) are also included in the serial transmission and represent the address and select signals to the peripheral data latches on other modules. They remain applied in parallel.

5.1.5 Strobe Generation and Additional Circuit

Strobe generation

The strobe is generated by ICs D42 and D63 the output bits of which are addressed individually.

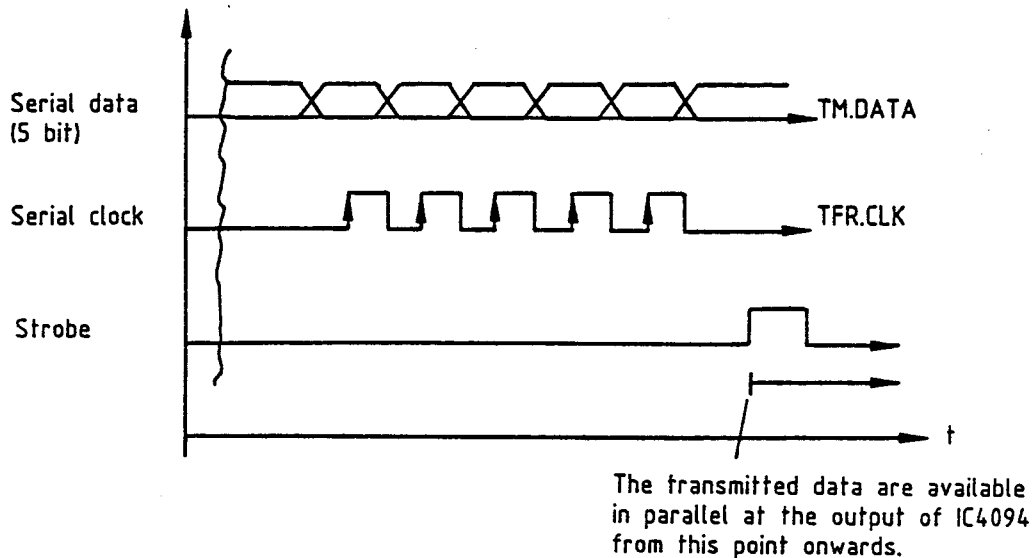
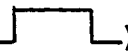


Fig. 5-2 Serial transmission of five data bits

Shift registers of type 4094 are used as receivers for the serially transmitted data. They are designed in two stages: an 8-bit shift register as the input stage and an 8-bit parallel latch as the output stage.

A pulse () applied to the strobe input loads the output latch with the current contents of the shift register. The two registers in the 4094 component are completely isolated for the remaining period.

The input shift register is connected to lines TRF.CLK and TM.DATA and accepts all data transmitted on these lines. Data transfer then takes place following a short strobe pulse.

Additional circuit

X12 can be fitted with a short-circuit jumper for test purposes in order to disable the power failure circuit located on the power pack module.

5.1.6 Interface for IEC Bus

The IEC-bus interface consisting of the ICs D50, D51 and D52 is a standard configuration with which the remote control interface is implemented according to the IEC 625 standard.

The interface is able to directly load data into the data memory or to read from it via the lines DRQO and DMA.SEL* and a DMA (direct memory access) channel of the microprocessor.

The interface automatically handles the data transfer protocol (handshake) on the IEC bus. Address functions and interface commands are processed without participation of the processor and the corresponding information stored in internal status registers. Input requests are passed on to the CPU via the interrupt line INT12.

5.1.7 Diagnostic Circuit with Voltmeter

The main component of the diagnostic circuit is the 12-bit analog/digital converter D10 which operates as an integrating dual-slope converter.

The reference voltage of 2.048 V supplied by N10 enables a resolution of 1 mV and a measuring range of -4.095 V to +4.095 V.

The input signals are applied via an input stage (N11, D18) with a selectable gain of 1:1 and 10:1 to the input of the A/D converter. They can also originate from other modules (via X1.A28) or from the processor module itself. In the latter case, the analog multiplexer D16, triggered by the addressable latch D17, connects one of the 8 inputs to the input of N11.

Further circuit details:

- a) Transistor V14 is connected through to measure the battery voltage and the battery loading in standby mode simulated using R32.
- b) The frequency of the A/D converter oscillator is determined by R13 and C24 and is 100 kHz $\pm 15\%$.

5.1.8 Reset Circuit

The reset circuit (with N80-I,II,III and V83) switches off the microprocessor and other active components if correct operation of the module cannot as yet or no longer be guaranteed such as before the supply has risen to +5 V or after it has fallen again.

A delay circuit is used to prolong the RES* signal for approx. 0.5 to 1 s when the supply voltage is already sufficiently high for operation, i.e. >4.7 V.

A key can be connected to X80 to simulate a power failure for test purposes.

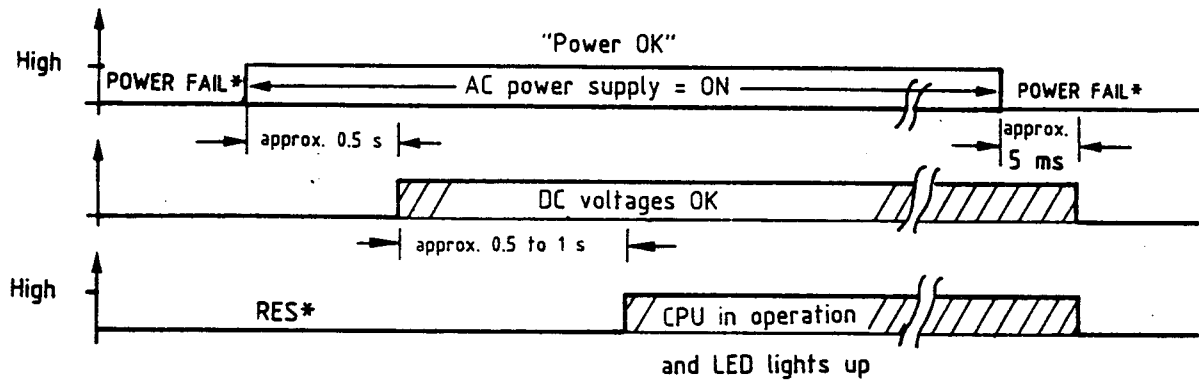


Fig. 5-3 On/off sequences in the power pack (not to scale)

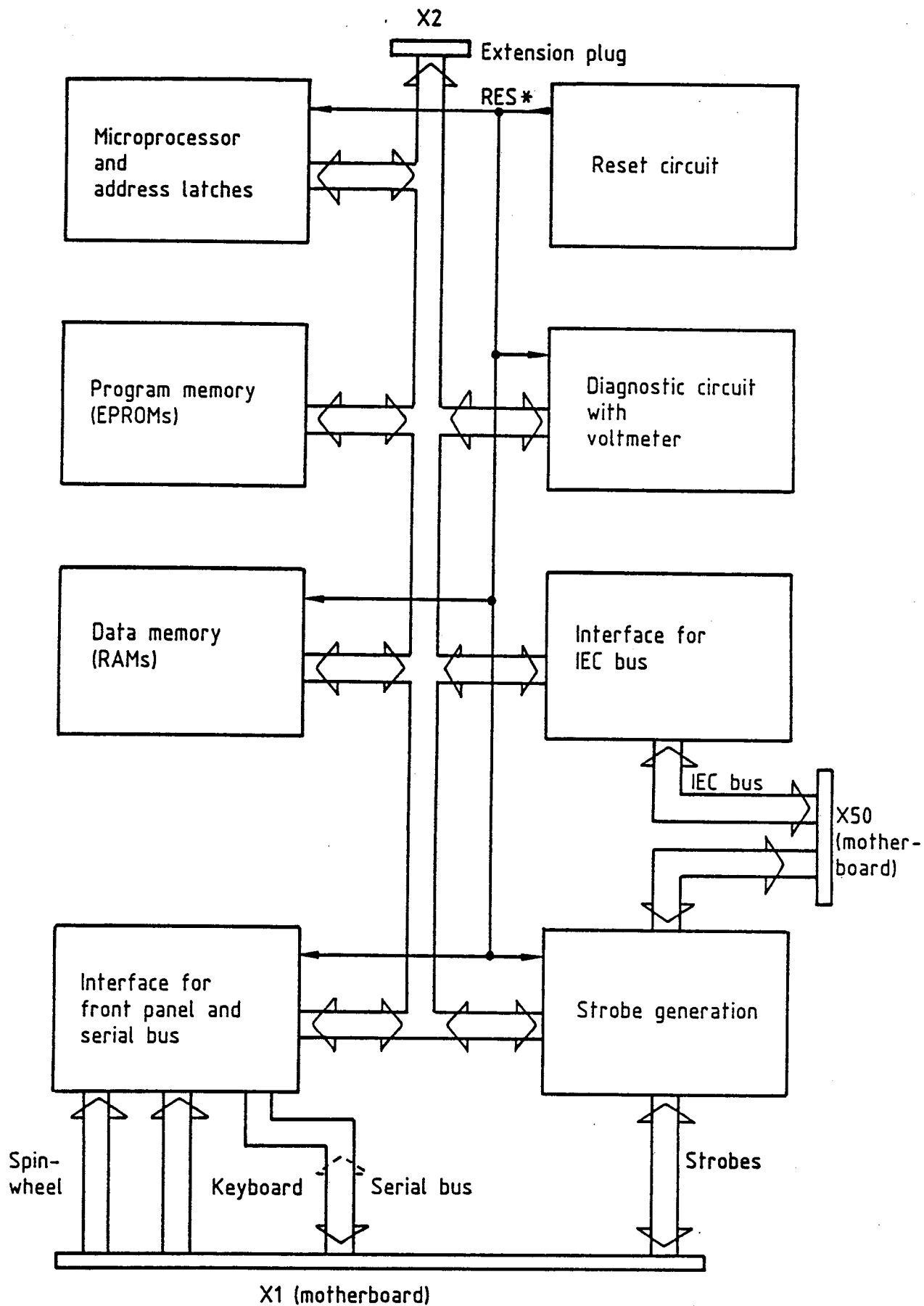


Fig. 5-4 Block diagram of processor

5.2 Adjustment

The voltage at test point P10 is adjusted to +2.048 V \pm 1 mV using R18.

5.3 Troubleshooting

Simple tests

(With digital voltmeter (DVM) and oscilloscope (SCOPE))

- Check all plug-in jumpers.
- Measure on the positive terminal of C1: +5.2 V \pm 0.25 V (DVM).
- Measure on the positive terminal of C2: +15 V \pm 0.5 V (DVM).
- Measure on the negative terminal of C3: -15 V \pm 0.4 V (DVM).
- Measure on the positive terminal of C4: +24 V \pm 0.5 V (DVM).
- The CLK.OUT signal at D1/56 is an 8-MHz TTL signal (SCOPE). Check crystal oscillator D1/58, 59 if a fault is present.
- The reset signals RES* (D1/24) and RESET (D1/57) are Low and High, respectively if LED V82 lights up (DVM).
- The reference voltage at X10 can be adjusted to 2.048 V \pm 1 mV using R18 (DVM).
- TTL signals can be measured at D40/50,49 using the oscilloscope as soon as the spinwheel is activated.
- All row lines (KEY.ROW1 to KEY.ROW7) are High and column lines (KEY.COL1 to KEY.COL8) are Low if no keys are pressed on the keyboard. The corresponding row line becomes Low if a key is pressed (DVM).
- LED V82 must immediately go out if X80 is short-circuited, e.g. by a test key. The LED may only light up again after approx. 0.5 to 1 s after opening the contact again. The microprocessor then runs through the power-up routine which can be recognized by initialization of the attenuation set.
- In AC power operation, the voltage at D70 or D71/26 must not be more than 0.2 V below the +5 V supply (V90). With the power supply switched off, the standby voltage supplied by the battery must be greater than 2.6 V at the same point (DVM).

Plug-in jumper configurations and use for test purposes

- X3 : Not used
- X4/1-2 : Normally closed
Open during test; enables connection of an external clock.
- X5 : Normally open
Closed during test; sets microprocessor into HOLD status and bus high-impedance.
- X12 : Normally open
Closed during test; separates the power failure signal (PWR.FAIL*) provided by the power pack.
- X40 : Not used
- X41/7-8 : Closed; constitutes the feedback of the serial transmit line to the unrequired receive line and thus enables a simple self-test of the IFPAS (D40).
- X51 : Normally open
Closed during test; interrupts the select signals to the interface circuits and thus prevents their activation.
- X52 : Used to connect an instrument for signature analysis.
- X70/1-2 : Closed if D70 and D71 are EPROMs of type 27256.
- X70/2-3 : Closed if D70 and D71 are EPROMs of type 27128.
- X80 : Enables connection of a reset key for test purposes.
- X90/1-2 : Closed if D90 and D91 are CMOS RAMs of type 6264.
- X90/2-3 : Closed if D90 and D91 are CMOS RAMs of type 6116.

5.4 Interfaces

Abbreviations: TS = Tristate line
 TTL = TTL compatible line
 OC = Open collector line
 PS = Power supply line
 I = Input
 O = Output
 * = Negation sign for signals with negative logic
 AL = Analog signal

| Pin | Type of line | Signal direction | Designation/description |
|------------|--------------|------------------|--|
| X1.A1 | TTL | I | DREHG.DIR, spinwheel direction |
| X1.B1 | TTL | I | DREHG.PULS, spinwheel pulse |
| X1.A3-A6 | TTL (TS) | I/O | KEY.COL1 to KEY.COL8, columns of key matrix |
| X1.B3-B6 | | | |
| X1.B7 | TTL | O | EXT.RES*, external reset signal |
| X1.A7-A10 | TTL | I | KEY.ROW1 to KEY.ROW7, rows of key matrix |
| X1.B8-B10 | | | |
| X1.B11 | TTL | O | DIS.STB3* } strobes to trigger the LCD controller on the front panel (display) |
| X1.A11 | TTL | O | |
| X1.B12 | TTL | O | |
| X1.A12 | TTL | I | LCD.BUSY*, handshake signal |
| X1.B13 | TTL | O | DIS.C/D*, command/data switchover |
| X1.A13 | TTL | O | DIS.DAT, serial data line |
| X1.B14 | TTL | O | DIS.CLK, serial clock line |
| X1.A14 | TTL | O | LED.STB, strobe for LED triggering |
| X1.A16 | TTL | I | PWR.FAIL*, power failure signal from power pack |
| X1.A17,B17 | PS | -- | GND, ground connection |
| X1.A18,B18 | PS | -- | +24 V line |
| X1.A19,B19 | PS | -- | -15 V line |
| X1.A20,B20 | PS | -- | +15 V line |
| X1.A21,B21 | PS | -- | +5 V line |
| X1.A22,B22 | PS | -- | GND, ground connection |
| X1.A23 | TTL | I | FM.EXT, FM/PM signal |

| Pin | Type of line | Signal direction | Designation/description |
|--------------------------|-----------------|------------------|--|
| X1.A24 | TTL | I | AM.EXT, AM modulation signal |
| X1.B24 | AL | I | EICH.TEST, test signal from attenuation set |
| X1.B25 | TTL | I | HF.OVERLOAD, alarm signal from attenuation set |
| X1.A25,A26 | TTL | O | MOD.STB1, MOD.STB2, strobes for setting the modulation control |
| X1.A27 | TTL | O | TFR.CLK, serial clock to the RF modules |
| X1.B27 | TTL | O | TM.DATA, serial data line |
| X1.A28 | AL | I | TEST, analog signal line |
| X1.A29-A31 | TTL | O | HF.STB1 to HF.STB6, strobes for setting the RF modules |
| X1.B28-B30 | TTL | O | |
| X1.B31 | TTL (OC) | I | LOOP.OK, alarm line of control loops |
| X1.A32,B32 | PS | -- | GND |
| X50.A1-A7 | PS | -- | GND |
| X50.C1 | PS | -- | GND |
| X50.A9-A12 X50.C9-C12 | TTL (OC, TS) | I/O | I.DAT1 to I.DAT8, data bus |
| X50.C2 | TTL (TS) | I/O | I.ATN, ATTENTION line |
| X50.C3 | TTL (OC) | I/O | I.SRQ, SERVICE REQUEST |
| X50.C4 | TTL (TS) | I/O | I.IFC, INTERFACE CLEAR |
| X50.C5 | TTL (OC) | I/O | I.NDAC, NOT DATA ACCEPTED |
| X50.C6 | TTL (OC) | I/O | I.NRFD, NOT READY FOR DATA |
| X50.C7 | TTL (TS) | I/O | I.DAV, DATA VALID |
| X50.C8 | TTL (TS) | I/O | I.EOI, END OR IDENTIFY |
| X50.A8 | TTL (TS) | I/O | I.REN, REMOTE ENABLE |
| X50.A13,C13 | PS | -- | GND |
| X50.A14 | TTL | I | OPT.AVAIL, status signal from an external option |
| X50.C14 | TTL (OC) | I | EXT.LOOPOK, control loop monitoring |
| X50.A15 | TTL | O | EXT.TMDAT, serial transmitted data |
| X50.C15 | TTL | O | EXT.STB, strobe for external option |
| X50.C16 | TTL | O | EXT.TFRCLK, serial clock |



ROHDE & SCHWARZ

Schaltteillisten

Stromläufe

Bestückungspläne

Part lists

Circuit diagrams

Components plans

Listes des pièces détachées


Schémas de Circuit

Plans des composants

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| . | XX VARIANTENERKLAERUNG IDENTIFICATION OF MODELS VAR/MOD 02 = GRUNDAUSF. BASIC-MODEL VAR/MOD 04 = 2GHZ-VERSION | | | | |
| B1 | EQ 16,000000MHZ CL30HC43U CRYSTAL 16MHZ | EQ 0091.0321.00 | PHILIPS | N. R&S SACHNUMMER | |
| C1 | CE 220UF+-20%16V RM5 ELECTROLYTIC CAPACITOR | 0008.7562.00 | FROLYT | EKSO0CC322DG | |
| C2 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C3 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C4 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C5 | CC 22PF+-2%4X5NPO CAPACITOR | CC 0087.6464.00 | PHILIPS_CO | 2222 678 | |
| C6 | CC 22PF+-2%4X5NPO CAPACITOR | CC 0087.6464.00 | PHILIPS_CO | 2222 678 | |
| C7 | CC 100NF+-10%50V5K120OVIE CAPACITOR | CC 0084.5350.00 | UNION_CARB | CK 05 BX 104K | |
| C8 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C9 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C10 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C11 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C12 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C13 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C15 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C16 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C20 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C21 | CK 68NF+-1%63V12X12X12 PP CAPACITOR | CK 0303.7067.00 | SIEMENS | B33531-A5683-F | |
| C22 | CK 30NF+-1%63V10QUX13 KP CAPACITOR | CK 0334.5808.00 | SIEMENS | B33531-A5303-F | |
| C23 | CK 68NF+-1%63V12X12X12 PP CAPACITOR | CK 0303.7067.00 | SIEMENS | B33531-A5683-F | |
| C24 | CC 82PF+-2%6X7NPO CAPACITOR | CC 0087.6535.00 | PHILIPS_CO | 2222 678 10 829 | |
| C25 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C26 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C27 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C28 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C29 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C30 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C31 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C32 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C33 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C34 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C35 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C36 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C37 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C38 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |

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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| C40 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C42 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C50 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C51 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C52 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C53 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C54 | CC 220PF+-2%6X7N750 CAPACITOR | CC 0087.6941.00 | PHILIPS_CO | 2222 678 58221 | |
| C58 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C61 | CK 10NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2869.00 | ROEDERSTEI | MKT 1826-310-014W | |
| C70 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C71 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C72 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C73 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C76 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C77 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C78 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C79 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C80 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C81 | CE 22 UF+-20%16V 7X 5X11 ELECTROLYTIC CAPACITOR | CE 0022.8091.00 | KEMET | T340 C226M016 AS | |
| C82 | CC 2,2NF+-20%63V6X7 K2000 CAPACITOR | 0092.7865.00 | STETTNER | EGPZ | |
| C83 | CC 2,2NF+-20%63V6X7 K2000 CAPACITOR | 0092.7865.00 | STETTNER | EGPZ | |
| C84 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C90 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C93 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C110 | CC 47 PF+-2%63V5,5X6,5NPO CAPACITOR | 0092.7407.00 | STETTNER | EGPZ | |
| C111 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C112 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C113 | CC 100PF+-2% 63V NPO CAPACITOR | 0092.7442.10 | STETTNER | EGPZ | |
| C118 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| D1 | BC R80186 16B.MCU IC EMBEDDED PROCESSOR | 0393.1211.00 | INTEL | R80186 | |
| D2 | BL MM74HC373N 8XD-LATCH OCTAL D-TYPE LATCH TRIST. | 0645.6726.00 | PHILIPS_SE | (PC)74HC373N(P) | |
| D3 | BL MM74HC373N 8XD-LATCH OCTAL D-TYPE LATCH TRIST. | 0645.6726.00 | PHILIPS_SE | (PC)74HC373N(P) | |
| D10 | BJ ICL7109C 1X12B-ADC A/D-CONVERTER | BJ 0337.6970.00 | INTERSIL | ICL7109CPL | |
| D11 | BL MM74HC74N 2XD-FLIPFL DUAL D FLIP-FLOP | 0571.3171.00 | PHILIPS_SE | (PC)74HC74N(P) | |
| D12 | BL MM74HC244N 8XBUFF. 3S OCTAL BUFFER TRISTATE | 0099.9763.00 | PHILIPS_SE | (PC)74HC244N(P) | |
| D13 | BL MM74HC244N 8XBUFF. 3S OCTAL BUFFER TRISTATE | 0099.9763.00 | PHILIPS_SE | (PC)74HC244N(P) | |
| D14 | BL MM74HC08N 4X2IN ANDG QUAD 2INP. AND GATE | 0571.3313.00 | PHILIPS_SE | (PC)74HC08N(P) | |
| D15 | BL MC74HC32N 4X2INP-OR-G QUAD 2-INPUT OR GATE | 0571.3220.00 | PHILIPS_SE | (PC)74HC32N(P) | |

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| D16 | BL MM74HC4051N 8CH.AN.MUX | 0099.9670.00 | PHILIPS | (PC)74HC4051N(P) | |
| D17 | 8CH.ANALOG MUX/DEMUX BL MM74HC259N 8B.A.LATCH | 0394.9097.00 | PHILIPS_SE | (PC)74HC259N(P) | |
| D18 | 8 BIT ADDRESSABLE LATCH BS TL601CP 1X ANALOGSCH | BJ 0213.4530.00 | TEXAS | TL601CP [MJG] | |
| D19 | ANALOG SWITCH BL MM74HC86N 4X2IN.EXOR | 0571.3159.00 | PHILIPS_SE | (PC)74HC86N(P) | |
| D20 | QUAD 2-INP.EXCL.OR GATE BL MC74HC32N 4X2INP-OR-G | 0571.3220.00 | PHILIPS_SE | (PC)74HC32N(P) | |
| D21 | QUAD 2-INPUT OR GATE BL MM74HC08N 4X2IN ANDG | 0571.3313.00 | PHILIPS_SE | (PC)74HC08N(P) | |
| D22 | QUAD 2INP. AND GATE BL MM74HC04N 6XINVERTER | 0571.3365.00 | PHILIPS_SE | (PC)74HC04N(P) | |
| D23 | HEX-INVERTER BL MM74HC04N 6XINVERTER | 0571.3365.00 | PHILIPS_SE | (PC)74HC04N(P) | |
| D40 | HEX-INVERTER BG CLA3726 IFPAS ASIC | 0801.8348.00 | PLESSEY | CLA3726(PLCC) | |
| D41 | IC GATEARRAY BL MM74HCOON 4X2IN.NAND | 0571.3194.00 | PHILIPS_SE | (PC)74HCOON(P) | |
| D42 | QUAD 2-INPUT NAND GATE BL MM74HC259N 8B.A.LATCH | 0394.9097.00 | PHILIPS_SE | (PC)74HC259N(P) | |
| D50 | 8 BIT ADDRESSABLE LATCH BC NAT7210APD GPIB IF CON | 0010.9198.00 | NATIONAL/I | NAT7210APD | |
| D51 | GPIB INTERFACE CONTROLLER BJ DS75160AN 8XBUS TRANSC | 0345.6517.00 | TEXAS | SN75160BN | |
| D52 | IEEE-448 GPIB TRANSCEIVER BJ DS75161AN 8XBUS TRANSC | 0345.6523.00 | TEXAS | SN75161BN | |
| D58 | IEEE-448 GPIB TRANSCEIVER BL MM74HC138N 3/8L.DECOD | 0571.3165.00 | PHILIPS_SE | (PC)74HC138N(P) | |
| D63 | 3-TO-8 LINE DECODER BL MM74HC259N 8B.A.LATCH | 0394.9097.00 | PHILIPS_SE | (PC)74HC259N(P) | |
| D64 | 8 BIT ADDRESSABLE LATCH BL MM74HC259N 8B.A.LATCH | 0394.9097.00 | PHILIPS_SE | (PC)74HC259N(P) | |
| D70 | 8 BIT ADDRESSABLE LATCH BC SOFTW.N.BESTUECKUNGSP | 0344.6507.90 | | | |
| D71 | SOFTW. SEE COMPONENTSPLAN BC SOFTW.N.BESTUECKUNGSP | 0344.6507.90 | | | |
| D90 | SOFTW. SEE COMPONENTSPLAN BC HM6264LP10 8KX8 SRAM | 0813.9738.00 | HYUNDAI | HY6264ALP-10 | |
| D91 | SRAM BC HM6264LP10 8KX8 SRAM | 0813.9738.00 | HYUNDAI | HY6264ALP-10 | |
| G1 | EB 3,4V LITHIUM-BATTERIE LI BATTERY | 0565.1687.00 | ACCU_SONNE | SL-750/P/009 1110750 | |
| L1 | LD 8UH 3A 0,0250HM CHOKER | LD 0026.4778.00 | SIEMENS | B82111-B-C13 | |
| L2 | LD 15,0UH10%2,800HMO, 157A CHOKER | LD 0067.3001.00 | DALE | IM2 | |
| L3 | LD 15,0UH10%2,800HMO, 157A CHOKER | LD 0067.3001.00 | DALE | IM2 | |
| L4 | LD 15,0UH10%2,800HMO, 157A CHOKER | LD 0067.3001.00 | DALE | IM2 | |
| N10 | BO CA3240AE 2XMOSFETOPAMP DUAL MOSFET-INPUT OPAMP | 0302.7040.00 | RCA | CA3240AE | |
| N11 | BO LF156J FET OPAMP OPERATIONAL AMPLIFIER | BO 0645.7251.00 | ANALOG_DEV | PM156Z | |
| N80 | BO LM339N 4X COMPAR COMPARATOR | 0342.2062.00 | NSC | LM339N | |
| P2 | FP STECKERLEISTE 64POL. 64-PIN INSERT | FP 0290.1255.00 | ERNI | 043.278 | |
| P5 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P7 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P10 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P11 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P12 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P30 | XX ENTHALTEN IN INCLUDED IN | | | | |
| ..37 | LEITERPLATTE/PCB | | | | |

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| P40 | VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P51 | WIRE-WRAP PIN VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P52 | WIRE-WRAP PIN FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | |
| P80 | 1X4POLE/PINS VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P81 | WIRE-WRAP PIN VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| P100 | WIRE-WRAP PIN XX ENTHALTEN IN INCLUDED IN | | | | |
| P101 | LEITERPLATTE/PCB XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | |
| R1 | RL 0,60W 10,0KOHM+-1%TK50 | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R2 | RESISTOR RL 0,60W 10,0KOHM+-1%TK50 | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R3 | RESISTOR RL 0,60W 10,0KOHM+-1%TK50 | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R4 | RESISTOR RL 0,60W 1KOHM+-1%TK50 | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R5 | RESISTOR RL 0,60W 1KOHM+-1%TK50 | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R9 | RESISTOR RL 0,60W 27,4KOHM+-1%TK50 | RL 0082.2583.00 | RESISTA | MK2 | |
| R10 | RESISTOR RL 0,60W 825 OHM+-1%TK50 | RL 0082.2502.00 | RESISTA | MK2 | |
| R11 | RESISTOR RL 0,60W 10,0KOHM+-1%TK50 | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R12 | RESISTOR RL 0,60W 205 KOHM+-1%TK50 | RL 0083.2241.00 | RESISTA | MK2 | |
| R13 | RESISTOR RL 0,60W 53,6KOHM+-1%TK50 | RL 0082.2590.00 | RESISTA | MK2 | |
| R14 | RESISTOR RL 0,60W 2,00KOHM+-1%TK50 | RL 0083.0826.00 | RESISTA | MK2 | |
| R15 | RESISTOR RL 0,60W 475 OHM+-1%TK50 | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R16 | RESISTOR RL 0,60W 1,65KOHM+-1%TK50 | RL 0083.0761.00 | RESISTA | MK2 | |
| R17 | RESISTOR RL 0,60W 1,13KOHM+-1%TK50 | RL 0082.2383.00 | RESISTA | MK2 | |
| R18 | RS 0,5W200 OHM+-10%10X10X CERMET POTENTIOMETER T | RS 0087.7554.00 | BI_TECHNOL | 72PM | |
| R19 | RESISTOR RL 0,60W 715 OHM+-1%TK50 | RL 0083.0510.00 | RESISTA | MK2 | |
| R21 | RESISTOR RL 0,60W 11,3KOHM+-1%TK50 | RL 0082.2202.00 | RESISTA | MK2 | |
| R22 | RESISTOR RL 0,60W 102KOHM+-1%TK50 | RL 0083.2012.00 | DRALORIC | SMA 0207 | |
| R23 | RESISTOR RL 0,60W 100 OHM+-1%TK50 | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R24 | RESISTOR RL 0,60W 10,0KOHM+-1%TK50 | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R25 | RESISTOR RL 0,60W 24,3KOHM+-1%TK50 | RL 0083.1574.00 | RESISTA | MK2 | |
| R26 | RESISTOR RL 0,60W 2,21KOHM+-1%TK50 | RL 0082.2477.00 | RESISTA | MK2 | |
| R27 | RESISTOR RL 0,60W 13,0KOHM+-1%TK50 | RL 0083.1368.00 | RESISTA | MK2 | |
| R28 | RESISTOR RL 0,60W 2,00KOHM+-1%TK50 | RL 0083.0826.00 | RESISTA | MK2 | |
| R29 | RESISTOR RL 0,60W 16,9KOHM+-1%TK50 | RL 0083.1451.00 | PHILIPS_CO | MRS 25 | |
| R30 | RESISTOR RL 0,60W 22,1KOHM+-1%TK50 | RL 0083.1545.00 | RESISTA | MK2 | |
| R31 | RESISTOR RL 0,60W 68,1KOHM+-1%TK50 | RL 0082.2602.00 | RESISTA | MK2 | |
| R32 | RESISTOR RL 0,60W 27,4KOHM+-1%TK50 | RL 0082.2583.00 | RESISTA | MK2 | |
| R33 | RESISTOR RL 0,60W 4,75KOHM+-1%TK50 | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R34 | RESISTOR RL 0,60W4,75MOHM+-1%TK50 METALFILMRESISTOR | RL 0099.8250.00 | PHILIPS_CO | MRS 25 | |


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|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| R35 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R36 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R37 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R40 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R41 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R42 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R43 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R47 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R48 | XX TRIMMWERT SELECTED | | | | |
| R49 | XX TRIMMWERT SELECTED | | | | |
| R50 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R53 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R60 | XX TRIMMWERT SELECTED | | | | |
| R61 | XX TRIMMWERT SELECTED | | | | |
| R62 | RN 7X 10KOHM+-2% RESISTOR NETWORK | RN 0581.2184.00 | BI_TECHNOL | L 08 1 S 103 M* | |
| R63 | RN 9X47 KOHM+-2% RESISTOR NETWORK | RN 0341.9286.00 | BI_TECHNOL | L 10 1 S 473 M* | |
| R64 | RN 9X3,3KOHM+-2% RESISTOR NETWORK | RN 0340.2765.00 | BI_TECHNOL | L 10 1 S 332 M* | |
| R65 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R66 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R73 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R80 | RL 0,60W 2,55KOHM+-1%TK50 RESISTOR | RL 0082.2354.00 | RESISTA | MK2 | |
| R81 | RL 0,60W 2,00KOHM+-1%TK50 RESISTOR | RL 0083.0826.00 | RESISTA | MK2 | |
| R82 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | |
| R83 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | |
| R84 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R85 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R86 | RL 0,60W 2,00KOHM+-1%TK50 RESISTOR | RL 0083.0826.00 | RESISTA | MK2 | |
| R87 | RL 0,60W 2,00KOHM+-1%TK50 RESISTOR | RL 0083.0826.00 | RESISTA | MK2 | |
| R88 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R89 | RL 0,60W 200 OHM+-1%TK50 RESISTOR | RL 0083.0049.00 | PHILIPS_CO | MRS 25 | |
| R90 | RL 0,60W3,92MOHM+-1%TK50 METALFILMRESISTOR | RL 0099.8238.00 | RESISTA | MK2 | |
| R91 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R92 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| . .98 | | | | | |
| R100 | RN 9X 10KOHM+-SIL10 H5 RESISTOR NETWORK | RN 0343.4523.00 | BI_TECHNOL | L 10 1 S 103 M* | |
| R101 | RN 9X 10KOHM+-SIL10 H5 RESISTOR NETWORK | RN 0343.4523.00 | BI_TECHNOL | L 10 1 S 103 M* | |
| R102 | RN 9X 10KOHM+-SIL10 H5 RESISTOR NETWORK | RN 0343.4523.00 | BI_TECHNOL | L 10 1 S 103 M* | |
| R103 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R104 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R110 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| R112 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R113 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R200 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| V1 | AE BZX55/B6V2 0,5W ZDI ZENER DIODE | AE 0012.2161.00 | PHILIPS | BZX79B6V2 | |
| V10 | AE BZX79B10 0,5W ZDI ZENER DIODE | AE 0289.4302.00 | VALVO | BZX79B10 | |
| V11 | AE BZX79B3V9 2% 0.5W ZDI ZENER | AE 0008.7685.00 | PHILIPS_SE | BZX79B3V9 | |
| V12 | AE BZX79B3V9 2% 0.5W ZDI ZENER | AE 0008.7685.00 | PHILIPS_SE | BZX79B3V9 | |
| V13 | AE ICL8069DCQ 1,2V REF DI REFERENCE DIODE | AE 0332.3908.00 | HARRIS | ICL8069DCSQ | |
| V14 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V17 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V40 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V80 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V82 | AF HLMP1719 LED3 GE585N LED | 0099.9140.00 | QUALITY | HLMP-1719.L31S | |
| V83 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | |
| V90 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | |
| V91 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V92 | AK 2N2369A N 15V 200MA TRANSISTOR | AK 0010.4680.00 | VALVO | 2N2369A ODER BSX20 | |
| V93 | AK 2N2369A N 15V 200MA TRANSISTOR | AK 0010.4680.00 | VALVO | 2N2369A ODER BSX20 | |
| V94 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V95 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V96 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| V97 | AD 1N4151 50V OA2 UDI DIODE | AD 0012.0723.00 | VALVO | 1N4151 GEGURTET | |
| X1 | FP STECKERLEISTE 64POLIG 64-PIN INSERT | FP 0084.6470.00 | DEUT_ELCO | 10 8457 064 002 025 | |
| X3 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X4 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X41 | FP STIFTLISTE 36P.R2,54 PIN CONNECTOR 1X8POLE/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | |
| X50 | FP STECKERLEISTE 32P.KURZ MULTIPOINT CONNECTOR | FP 0565.8100.00 | DEUT_ELCO | 10 8457 048 002 026 | |
| X53 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X70 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X90 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X6A | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X6D | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |

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BESTUECKUNGSPLAN / COMPONENTS PLAN

| BENENNUNG SOFTWARE SOFTWARE DESIGNATION | | BEN. DER ZUEGH. INFORMATIONSTRAEGER NAMES OF APPERTAINING DATA MEDIA | SACHNUMMER STOCK NO |
|---|---|---|------------------------|
| | | HS EPROM-SATZ | 843.4505 |
| EL. KENNZEICHEN DER BAUGRUPPE EL. DESIGNATION OF SUBASSEMBLY | EL. KENNZ. DES PROG. INFOTRAEGERS EL. DESIGNATION OF DATA MEDIA USED | BENENNUNG DESIGNATION | SACHNUMMER STOCK NO |
| A5 | | ED RECHNER OHNE SOFTWARE VAR/MOD 52 | 801.2410.04 |
| A5 | | ED RECHNER OHNE SOFTWARE VAR/MOD 53 | 843.4705.02 |
| | D70 | HS D27256 PROGRAM. (D70) | 843.4511 |
| | D71 | HS D27256 PROGRAM. (D71) | 843.4528 |

PRUEFANWEISUNG / TESTING INSTRUCTIONS : T

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IMMER ALLE INFORMATIONSTRAEGER DIESER SOFTWARE GEWECHSELT WERDEN !!
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NOTE: IF SOFTWARE IS STORED ON SEVERAL DATA MEDIA, ALL MEDIA MUST BE EXCHANGED IN CASE OF
A REPLACEMENT OF SOFTWARE (ADDRESS-MODIFICATIONS POSSIBLE !)

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| ROHDE & SCHWARZ | | | | DRUCK | ABT | NAME | BENENNUNG / DESIGNATION : | |
| | | | | 25.02.88 | 1KGB | LS | BESTUECKUNGSPLAN | |
| | | | | TYP | : | SMH | ZEICHN.-NR./DRAWING NO | BLATT |
| | | | | | | | 845.4031.00 BP | 1- |
| AEI | AEND.M. | DATUM | NAME | REG.I.V | 843.3009.00 V | 845.4031.00 BP | | v. |



ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Baugruppe "NF-Generator"

801.7312.02

Printed in West Germany

ENGLISH SERVICE MANUAL FOLLOWS FIRST COLOURED DIVIDER

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Schaltteillisten
Stromläufe
Bestückungspläne

5.1 Funktionsbeschreibung

(Hierzu Stromlauf 801.7312 S und Bild 5-1)

Die Baugruppe "NF-Generator" besteht aus drei Funktionseinheiten:

- AM-Eingangswahlschaltung
- FM-Eingangswahlschaltung
- interner Modulationsgenerator

Die AM- und FM-Eingangsschaltungen sind identisch aufgebaut. Im folgenden Text wird die Funktion der AM-Schaltung beschrieben, die entsprechenden Bauteile für die FM-Schaltung sind in Klammern angegeben.

Eingangswahlschaltungen

Mit dem Eingangswahlschalter N8 (N9) wird zwischen AM EXT AC, AM EXT DC und AM INT (FM EXT AC, FM EXT DC und FM INT) unterschieden.

Das AM EXT-Signal wird über den Steckeranschluß X1.A31 (X1.A30) zugeführt. Der Eingangswiderstand kann durch Umstecken der Brücke X13 (X11) zwischen 600 Ω und 100 k Ω gewählt werden. Die Dioden V7 und V8 (V13 und V14) dienen als Überspannungsschutz. Über den Eingangsverstärker N5 (N2) gelangt das externe Signal über C21 (C12) auf den Eingangswahlschalter N8 (N9). Bei AM EXT DC (FM EXT DC) ist der jeweilige Kondensator überbrückt. Gleichzeitig gelangt die interne Generatorspannung an den Eingang des Schalters N8 (N9).

Mit den nachfolgenden Verstärkern N4 (N3) wird das gewählte Modulationssignal an den nachfolgenden Modulationssteuerteil der Baugruppe "Ausgangsstufe" (AM) bzw. der Baugruppe "HF-Oszillator" (FM) weitergeleitet (über X1.A28 bzw. X1.A29). Über die Verstärkung werden die Schaltverluste ausgeglichen.

Das externe Modulationssignal wird außerdem über einen Verstärker einem Gleichrichter zugeführt. Die Gleichrichterspannung wird zur Überwachung der Eingangsspannung am AM EXT-Eingang (FM EXT-Eingang) benötigt.

Interner Generator

Der interne Generator kann acht verschiedene Modulationsfrequenzen generieren. Er ist als Wien-Robinson-Brücke aufgebaut. Die Widerstände der frequenzbestimmenden RC-Glieder werden mit den Multiplexerbausteinen N6 und N7 umgeschaltet. Um die Schwingbedingung zu erhalten, wird die Verstärkung mit einem FET (V1) geregelt. Die Generatorspannung wird hierzu gleichgerichtet und mit einer abgleichbaren Referenzspannung verglichen. Ein Regelverstärker stellt die Schleifenverstärkung entsprechend nach. Über V6 kann der Generator ausgeschaltet werden.

Die gleichgerichtete Generatorspannung wird über N9 und X1.A27 zu Diagnosezwecken der Baugruppe "Rechner" zugeführt.

Die Baugruppe "NF-Generator" wird über einen seriellen Datenbus angesteuert. Die Daten werden hierbei in die zwei Latchbausteine D1 und D2 eingelesen.

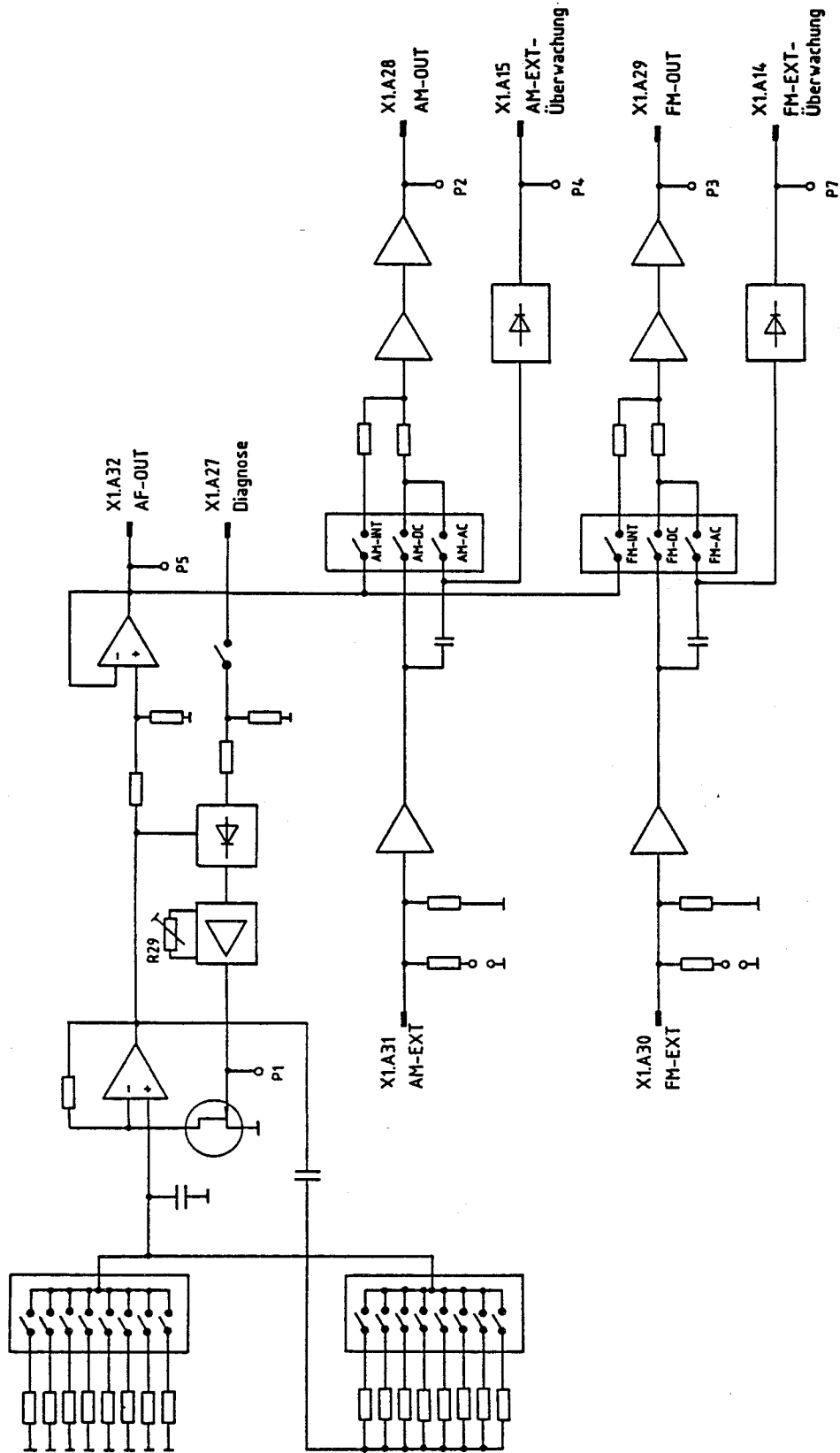


Bild 5-1 Blockschaltbild NF-Generator

5.2 Prüfen und Abgleichen

5.2.1 Abgleich

- Internen Modulationsgenerator auf 1 kHz einstellen.
- An Buchse AF INT ein AC-Voltmeter anschließen.
- Mit R29 auf 1,00 V ($\pm 0,01$ V) abgleichen.

5.2.2 Prüfen der Eingangswahlschaltungen

- Die Baugruppe "NF-Generator" über das Serviceadapterkabel anschließen und AM EXT einschalten.
- An Buchse AM EXT ein Signal von 1 kHz/1 V (U_{eff}) anlegen. An P2 muß eine NF-Spannung von 1 V messbar sein. An P4 muß eine DC-Spannung von +2,5 V ($\pm 0,06$ V) anliegen.
- NF-Frequenzgang an P2 und P4 messen. Er soll bei konstanter Eingangsspannung an der Buchse AM EXT $\pm 0,1$ dB nicht überschreiten.
- An Buchse AM EXT eine DC-Spannung von +1,4 V anlegen. Auf AM DC-Betrieb umschalten. An P2 muß eine DC-Spannung von +1,4 V (± 1 %) meßbar sein.
- Auf AM INT-Betrieb umschalten. An P2 muß eine NF-Spannung von 1 V (± 1 %) meßbar sein.

Die FM-Eingangswahlschaltung wird auf die gleiche Weise geprüft.

5.2.3 Prüfen des NF-Generators

- An P5 ein AC-Voltmeter anschließen.
- An Buchse AF INT einen Frequenzzähler und an P1 ein DC-Voltmeter anschließen.
- Prüfung nach Tabelle 5-1 durchführen.

Tabelle 5-1

| Ein- stellung | Spannung an P5 AC $\pm 0,5 \%$ | Buchse AF INT Frequenz $\pm 3 \%$ | Spannung an P1 DC | Bemerkung |
|------------------|-----------------------------------|--------------------------------------|----------------------|-----------|
| 40 Hz | 1,0 V | 40 Hz | -1,5...-3,5 V | |
| 150 Hz | 1,0 V | 150 Hz | -1,5...-3,5 V | |
| 300 Hz | 1,0 V | 300 Hz | -1,5...-3,5 V | |
| 400 Hz | 1,0 V | 400 Hz | -1,5...-3,5 V | |
| 1 kHz | 1,0 V | 1 kHz | -1,5...-3,5 V | |
| 3 kHz | 1,0 V | 3 kHz | -1,5...-3,5 V | |
| 6 kHz | 1,0 V | 6 kHz | -1,5...-3,5 V | |
| 15 kHz | 1,0 V | 15 kHz | -1,5...-3,5 V | |
| AF OFF | 0 | 0 | <-3,5 V | Gen. off |

Der Klirrfaktor (k_{ges}) muß bei allen Frequenzen $< 0,2 \%$ und bei 1 kHz $< 0,07 \%$ sein (Meßbandbreite 100 kHz).

5.3 Fehlersuche

Die AM- bzw. FM-Eingangswahlschaltungen können durch Vergleich von AM mit FM (oder umgekehrt) unter Berücksichtigung von Kapitel 5.2.2 repariert werden.

Der NF-Generator wird nach Kapitel 5.2.3 repariert.

5.4 Schnittstellen

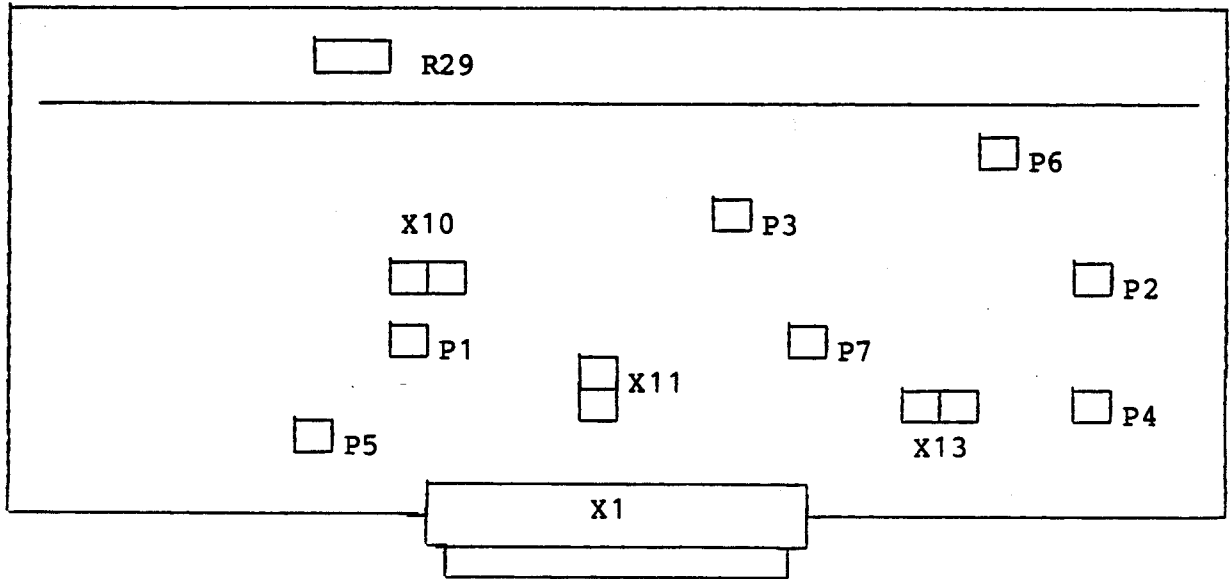


Bild 5-2 Anordnung der Abgleichelemente

Analoge Schnittstellen

| Bezeichnung | Funktion | Frequenz | Pegel (U_{eff}) |
|-------------|--------------------|---------------|-----------------------|
| X1.A14 | FM EXT-Überwachung | DC | 2,5 V ($\pm 0,06$ V) |
| X1.A15 | AM EXT-Überwachung | DC | 2,5 V ($\pm 0,06$ V) |
| X1.A28 | AM-Ausgang | 0.....50 kHz | 1 V |
| X1.A29 | FM-Ausgang | 0....100 kHz | 1 V |
| X1.A30 | FM EXT-Eingang | 0....100 kHz | 1 V |
| X1.A31 | AM EXT-Eingang | 0.....50 kHz | 1 V |
| X1.A32 | AF-Ausgang | 40 Hz..15 kHz | 1 V |

Digitale Schnittstellen (C-MOS)

| Bezeichnung | Funktion | Bemerkung |
|-------------|------------------|------------------|
| X1.A25 | Dateneingang | seriell |
| X1.A24 | Clock | |
| X1.A23 | Strobe | |
| X1.A27 | Diagnose-Ausgang | für NF-Generator |

Versorgungsspannungen

| Bezeichnung | Spannung |
|----------------------------|----------|
| X1.A21 | +5 V |
| X1.A20 | +15 V |
| X1.A19 | -15 V |
| X1.A11, A12, A13, A16, A26 | Masse |



ROHDE & SCHWARZ

SERVICE DOCUMENTS

AF Generator Module

801.7312.02

Printed in West Germany



Contents

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| 5.1 | Function Description | 5.1 |
| 5.2 | Checking and Adjustments | 5.3 |
| 5.2.1 | Adjustment | 5.3 |
| 5.2.2 | Checking the Input Selection Circuits | 5.3 |
| 5.2.3 | Checking the AF Generator | 5.3 |
| 5.3 | Troubleshooting | 5.5 |
| 5.4 | Interfaces | 5.6 |

Component lists
Circuit diagrams
Component layout diagrams

5.1 Function Description

(See circuit diagram 801.7312 S and Fig. 5-1)

The AF generator module consists of three functional units:

- AM input selection circuit
- FM input selection circuit
- Internal modulation generator

The AM and FM input circuits are of identical design. The function of the AM circuit is described below, the corresponding components for the FM circuit are shown in brackets.

Input selection circuits

The input selector N8 (N9) is used to select between AM EXT AC, AM EXT DC and AM INT (FM EXT AC, FM EXT DC and FM INT).

The AM EXT signal is connected via plug X1.A31 (X1.A30). The input impedance can be selected between 600 Ω and 100 k Ω by repositioning jumper X13 (X11). Overvoltage protection is provided by diodes V7 and V8 (V13 and V14). The external signal is applied to the input selector N8 (N9) via the input amplifier N5 (N2) and via C21 (C12). The respective capacitor is bypassed with AM EXT DC (FM EXT DC). At the same time the internal generator voltage is applied to the input of switch N8 (N9).

The selected modulation signal is passed on to the subsequent modulation control section of the output stage module (AM) or the RF oscillator module (FM) (via X1.A28 or X1.A29) by the subsequent amplifier N4 (N3). Losses occurring as a result of switching are compensated by the amplification.

The external modulation signal is also applied via an amplifier to a rectifier. The rectified voltage is required to monitor the voltage at the AM EXT input (FM EXT input).

Internal generator

The internal generator can produce eight different modulation frequencies and is configured as a Wien-Robinson bridge. The resistances of the RC networks which determine the frequency are switched using the multiplexer ICs N6 and N7. The generator gain is regulated by an FET (V1) in order to obtain conditions for oscillation. The generator voltage is rectified and compared with an adjustable reference voltage. A control amplifier readjusts the loop gain accordingly. The generator can be switched off using V6.

The rectified generator voltage is connected to the controller module via N9 and X1.A27 for diagnostics.

The AF generator module is controlled via a serial data bus. The data are read into the two latches D1 and D2.

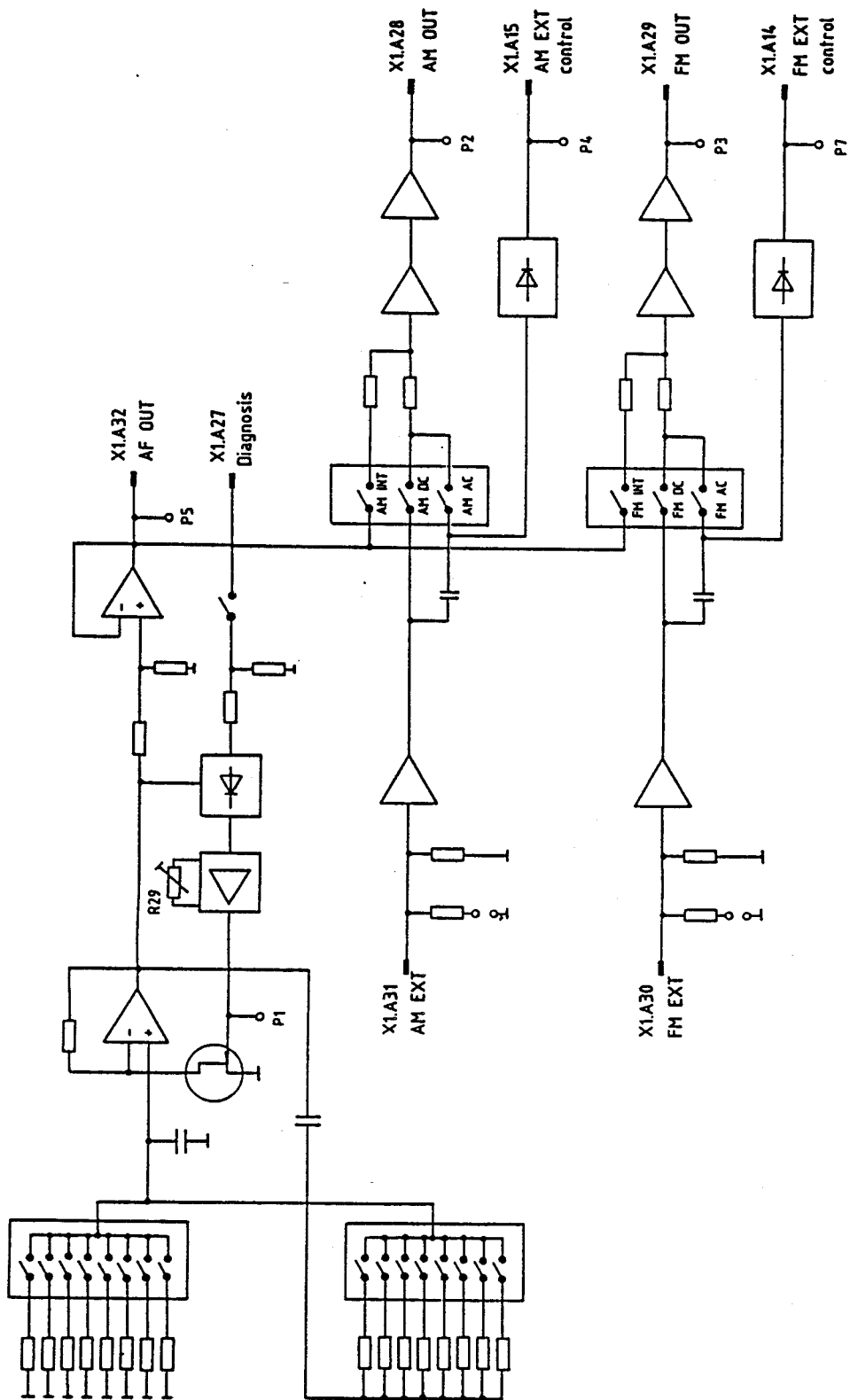


Fig. 5-1 Block diagram of AF generator

5.2 Checking and Adjustments

5.2.1 Adjustment

- Set internal modulation generator to 1 kHz.
- Connect an AC voltmeter to AF INT connector.
- Adjust to 1.00 V (± 0.01 V) using R29.

5.2.2 Checking the Input Selection Circuits

- Connect the AF generator module using the service adapter cable and switch on AM EXT.
- Connect a signal of 1 kHz/1 V (V_{rms}) to the AM EXT connector. An AF voltage of 1 V must now be measurable at P2. A DC voltage of +2.5 V (± 0.06 V) must be present at P4.
- Measure the AF frequency response at P2 and P4. It should not exceed ± 0.1 dB at the AM EXT connector with a constant input voltage.
- Apply a DC voltage of +1.4 V to the AM EXT connector. Switch to AM DC mode. A DC voltage of +1.4 V ($\pm 1\%$) must be measurable at P2.
- Switch to AM INT mode. An AF voltage of 1 V ($\pm 1\%$) must be measurable at P2.

The FM input selection circuit is tested in the same manner.

5.2.3 Checking the AF Generator

- Connect an AC voltmeter to P5.
- Connect a frequency meter to the AF INT connector and a DC voltmeter to P1.
- Carry out the test as in Table 5-1.

Table 5-1

| Setting | Voltage at P5 AC $\pm 0.5\%$ | AF-INT connector frequency $\pm 3\%$ | Voltage at P1 DC | Remarks |
|---------|---------------------------------|---|---------------------|----------|
| 40 Hz | 1.0 V | 40 Hz | -1.5 to -3.5 V | |
| 150 Hz | 1.0 V | 150 Hz | -1.5 to -3.5 V | |
| 300 Hz | 1.0 V | 300 Hz | -1.5 to -3.5 V | |
| 400 Hz | 1.0 V | 400 Hz | -1.5 to -3.5 V | |
| 1 kHz | 1.0 V | 1 kHz | -1.5 to -3.5 V | |
| 3 kHz | 1.0 V | 3 kHz | -1.5 to -3.5 V | |
| 6 kHz | 1.0 V | 6 kHz | -1.5 to -3.5 V | |
| 15 kHz | 1.0 V | 15 kHz | -1.5 to -3.5 V | |
| AF OFF | 0 | 0 | <-3.5 V | Gen. off |

The distortion (d_{total}) must be $<0.2\%$ at all frequencies and $<0.07\%$ at 1 kHz (test bandwidth 100 kHz).

5.3 Troubleshooting

The troubleshooting of the AM or FM input selection circuits is based on comparing AM with FM (or vice versa) and taking into account Section 5.2.2.

The AF generator is dealt with as in Section 5.2.3.

5.4 Interfaces

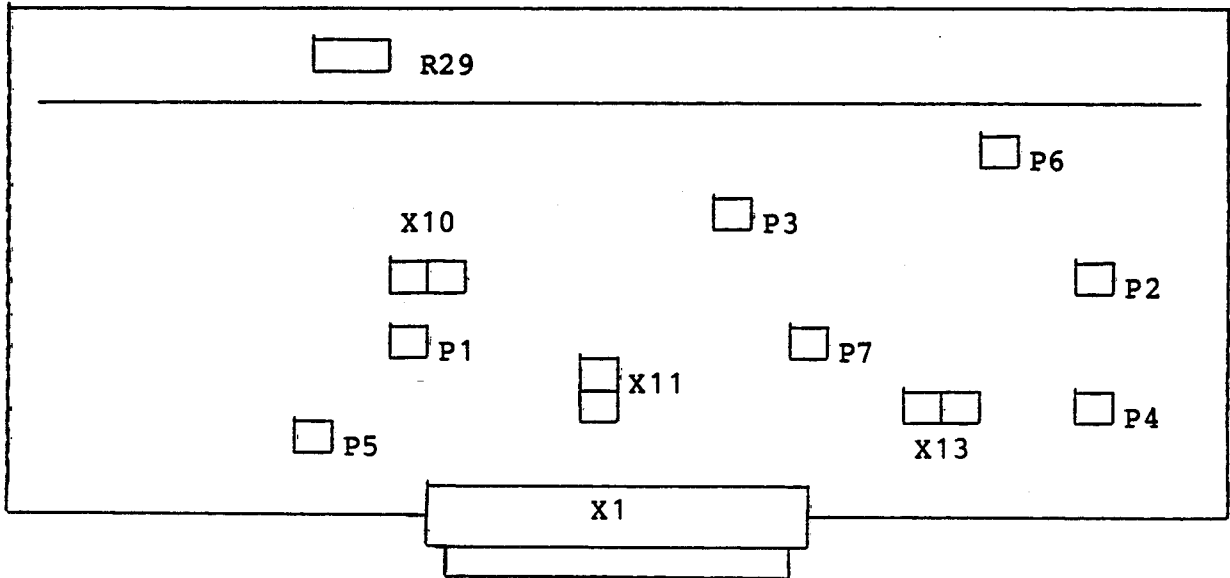


Fig. 5-2 Layout of adjusting elements

Analog interfaces

| Designation | Function | Frequency | Level (V _{rms}) |
|-------------|-------------------|-----------------|---------------------------|
| X1.A14 | FM EXT monitoring | DC | 2.5 V (± 0.06 V) |
| X1.A15 | AM EXT monitoring | DC | 2.5 V (± 0.06 V) |
| X1.A28 | AM output | 0 to 50 kHz | 1 V |
| X1.A29 | FM output | 0 to 100 kHz | 1 V |
| X1.A30 | FM EXT input | 0 to 100 kHz | 1 V |
| X1.A31 | AM EXT input | 0 to 50 kHz | 1 V |
| X1.A32 | AF output | 40 Hz to 15 kHz | 1 V |

Digital interfaces (CMOS)

| Designation | Function | Remarks |
|-------------|-------------------|------------------|
| X1.A25 | Data input | Serial |
| X1.A24 | Clock | |
| X1.A23 | Strobe | |
| X1.A27 | Diagnostic output | For AF generator |

Supply voltages

| Designation | Voltage |
|----------------------------|---------|
| X1.A21 | +5 V |
| X1.A20 | +15 V |
| X1.A19 | -15 V |
| X1.A11, A12, A13, A16, A26 | Ground |



ROHDE & SCHWARZ

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Part lists

Circuit diagrams

Components plans


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Plans des composants

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| C1 | CK 1,8NF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR | CK 0283.1699.00 | SIEMENS | B33531-A5182-F | |
| C2 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C3 | CK 1,8NF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR | CK 0283.1699.00 | SIEMENS | B33531-A5182-F | |
| C4 | CE 47UF-10+50% 40V 13X17 ERSATZ: 008.9688.00 | CE 0247.4991.00 | ROEDERSTEI | EKU 20 GD 247G | |
| C5 | CK 68NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2923.00 | SIEMENS | B 32 529-A683-J | |
| C6 | CK 220NF+-5%63VRD3,5H9MKT CAPACITOR | CK 0099.2952.00 | SIEMENS | B 32 529-A224-J | |
| C7 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C8 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C10 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C11 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C12 | CE 10UF+-20% 63V RM5BIPOL ELECTROLYTIC CAPACITOR | CE 0008.9742.00 | PHILIPS_CO | 2222 036 92103 | |
| C13 | CC 8,2PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6412.00 | VALVO | 2222 678 | |
| C14 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C15 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C16 | CC 10PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6429.00 | PHILIPS_CO | 2222 678 10109 | |
| C17 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C18 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C19 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C21 | CE 10UF+-20% 63V RM5BIPOL ELECTROLYTIC CAPACITOR | CE 0008.9742.00 | PHILIPS_CO | 2222 036 92103 | |
| C22 | CC 8,2PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6412.00 | VALVO | 2222 678 | |
| C23 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C24 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C25 | CC 10PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6429.00 | PHILIPS_CO | 2222 678 10109 | |
| C26 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C27 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C28 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C29 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C30 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C31 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C32 | CE 10UF+-20%63V RD9XH12 ELECTROLYTIC CAPACITOR | 0008.7910.00 | PHILIPS_CO | 2222 036 90362 | |
| C33 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C34 | CE 10UF+-20%63V RD9XH12 ELECTROLYTIC CAPACITOR | 0008.7910.00 | PHILIPS_CO | 2222 036 90362 | |
| C35 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C36 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C37 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C100 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| D1 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D2 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |

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|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| L1 | LD 1,20UH10%, 18OHMO, 620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |
| L2 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| L3 | LD 10 UH 10% 3R3 144 MA CHOKE | LD 0026.4184.00 | DALE | IM2 | |
| N1 | BO TLO74IN LN 4XFET OPAMP OPERATIONAL AMPLIFIER | 0568.7528.00 | TEXAS | TLO74IN | |
| N2 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N6 | BL MM74HC4051N 8CH.AN.MUX 8CH.ANALOG MUX/DEMUX | 0099.9670.00 | PHILIPS | (PC)74HC4051N(P) | |
| N7 | BL MM74HC4051N 8CH.AN.MUX 8CH.ANALOG MUX/DEMUX | 0099.9670.00 | PHILIPS | (PC)74HC4051N(P) | |
| N8 | BS DG211CJ 4X ANALOGSCH ANALOG SWITCH | 0801.8260.00 | SILICONIX | DG211CJ | |
| N9 | BS DG211CJ 4X ANALOGSCH ANALOG SWITCH | 0801.8260.00 | SILICONIX | DG211CJ | |
| P1 | VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| ..7 | WIRE-WRAP PIN 1-POLIG/1 PIN | | | | |
| R1 | RL 0,60W 2,43KOHM+-1%TK50 RESISTOR | RL 0083.0884.00 | RESISTA | MK2 | |
| R2 | RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R3 | RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R4 | RL 0,60W 5,62KOHM+-1%TK50 RESISTOR | RL 0082.2190.00 | PHILIPS_CO | MRS 25 | |
| R5 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R7 | RL 0,60W 392 OHM+-1%TK50 RESISTOR | RL 0082.2183.00 | RESISTA | MK2 | |
| R8 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R9 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R10 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R11 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R12 | RL 0,60W 200KOHM+-1%TK50 RESISTOR | RL 0083.2235.00 | RESISTA | MK2 | |
| R13 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R14 | RL 0,60W 392 KOHM+-1%TK50 RESISTOR | RL 0083.2512.00 | RESISTA | MK2 | |
| R15 | RL 0,60W 274 KOHM+-1%TK50 RESISTOR | RL 0083.2364.00 | RESISTA | MK2 | |
| R16 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R17 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R18 | RL 0,60W 604 OHM+-1%TK50 RESISTOR | RL 0082.2425.00 | RESISTA | MK2 | |
| R19 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R20 | RL 0,40W 1,0KOHM2% UNGEW. RESISTOR | RL 0092.6075.00 | DRALORIC | SMA 0204 | |
| R21 | RL 0,40W 1,0KOHM2% UNGEW. RESISTOR | RL 0092.6075.00 | DRALORIC | SMA 0204 | |
| R23 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R24 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R25 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R26 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R27 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R28 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R29 | RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER | RS 0247.7961.00 | BI_TECHNOL | 72X-R | |

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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| R30 | RL 0,60W 8,25KOHM+-1%TK50 RESISTOR | RL 0083.1239.00 | RESISTA | MK2 | |
| R31 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R32 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R33 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R34 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R35 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R37 | RL 0,35W 100KOHM+-0,1%TK25 RESISTOR | RL 0084.4983.00 | DRALORIC | SMA0207 | |
| R38 | RL 0,35W 52,3KOHM+-0,1%T25 RESISTOR | RL 0084.4448.00 | RUF | BPO207 | |
| R39 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R40 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | |
| R41 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | |
| R42 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | |
| R43 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R44 | RL 0,60W 604 OHM+-1%TK50 RESISTOR | RL 0082.2425.00 | RESISTA | MK2 | |
| R45 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R47 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R50 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | |
| R51 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R52 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R53 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R54 | RL 0,60W 18,2KOHM+-1%TK50 RESISTOR | RL 0083.1480.00 | PHILIPS_CO | MRS 25 | |
| R55 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R56 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R57 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R58 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | |
| R59 | RL 0,35W 1 KOHM+-0,1%TK25 RESISTOR | 0083.9146.00 | DRALORIC | SMA0207 | |
| R60 | RL 0,35W 4,99KOHM+-0,1%T25 RESISTOR | RL 0084.2480.00 | DRALORIC | SMA0207 | |
| R62 | RL 0,35W 100KOHM+-0,1%TK25 RESISTOR | RL 0084.4983.00 | DRALORIC | SMA0207 | |
| R63 | RL 0,35W 52,3KOHM+-0,1%T25 RESISTOR | RL 0084.4448.00 | RUF | BPO207 | |
| R64 | RL 0,60W 2,00MOHM+-1%TK50 METALFILMRESISTOR | RL 0099.8167.00 | ROEDERSTEI | MK2 | |
| R65 | RL 0,60W 576KOHM+-1%TK50 RESISTOR | RL 0083.6847.00 | DRALORIC | SMA 0207 | |
| R66 | RL 0,60W 287 KOHM+-1%TK50 RESISTOR | RL 0083.2387.00 | RESISTA | MK2 | |
| R67 | RL 0,60W 215 KOHM+-1%TK50 RESISTOR | RL 0083.2264.00 | RESISTA | MK2 | |
| R68 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | |
| R69 | RL 0,60W 82,5KOHM+-1%TK50 RESISTOR | RL 0082.2302.00 | PHILIPS_CO | MRS 25 | |
| R70 | RL 0,60W 28,7KOHM+-1%TK50 RESISTOR | RL 0083.1616.00 | RESISTA | MK2 | |
| R71 | RL 0,60W 13,0KOHM+-1%TK50 RESISTOR | RL 0083.1368.00 | RESISTA | MK2 | |
| R72 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R73 | RL 0,60W 5,11KOHM+-1%TK50 RESISTOR | RL 0082.2348.00 | RESISTA | MK2 | |

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| R74 | RL 0,60W2,00MOHM+-1%TK50 METALFILMRESISTOR | RL 0099.8167.00 | ROEDERSTEI | MK2 | |
| R75 | RL 0,60W 576KOHM+-1%TK50 RESISTOR | RL 0083.6847.00 | DRALORIC | SMA 0207 | |
| R76 | RL 0,60W 287 KOHM+-1%TK50 RESISTOR | RL 0083.2387.00 | RESISTA | MK2 | |
| R77 | RL 0,60W 215 KOHM+-1%TK50 RESISTOR | RL 0083.2264.00 | RESISTA | MK2 | |
| R78 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | |
| R79 | RL 0,60W 82,5KOHM+-1%TK50 RESISTOR | RL 0082.2302.00 | PHILIPS_CO | MRS 25 | |
| R80 | RL 0,60W 28,7KOHM+-1%TK50 RESISTOR | RL 0083.1616.00 | RESISTA | MK2 | |
| R81 | RL 0,60W 13,0KOHM+-1%TK50 RESISTOR | RL 0083.1368.00 | RESISTA | MK2 | |
| R82 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | |
| R83 | RL 0,60W 5,11KOHM+-1%TK50 RESISTOR | RL 0082.2348.00 | RESISTA | MK2 | |
| R84 | RL 0,60W 56,2KOHM+-1%TK50 RESISTOR | RL 0082.2231.00 | RESISTA | MK2 | |
| R85 | RL 0,60W 56,2KOHM+-1%TK50 RESISTOR | RL 0082.2231.00 | RESISTA | MK2 | |
| R90 | RL 0,60W 140 KOHM+-1%TK50 RESISTOR | RL 0083.2106.00 | RESISTA | MK2 | |
| R91 | RL 0,60W 140 KOHM+-1%TK50 RESISTOR | RL 0083.2106.00 | RESISTA | MK2 | |
| R92 | RL 0,60W 1,1KOHM+-1%TK50 RESISTOR | RL 0082.2483.00 | RESISTA | MK2 | |
| R93 | RL 0,60W 1,1KOHM+-1%TK50 RESISTOR | RL 0082.2483.00 | RESISTA | MK2 | |
| R100 | RL 0,35W 1 KOHM+-0,1%TK25 RESISTOR | 0083.9146.00 | DRALORIC | SMA0207 | |
| R101 | RL 0,35W4,99KOHM+-0,1%T25 RESISTOR | RL 0084.2480.00 | DRALORIC | SMA0207 | |
| V1 | AM J232 N-D 40V JFET FET | 0340.5535.00 | SILICONIX | J232 | |
| V2 | AE BZX55/B12 0,5W ZDI ZENER DIODE | AE 0218.8940.00 | VALVO | BZX79B12 | |
| V4 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V10 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V12 | AE 1N827 6,2V REF DI ZENER REFERENCE DIODE | AE 0418.0029.00 | COMPENSATE | 1N827(A) | |
| V13 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V14 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V15 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V17 | AE BZX79B10 0,5W ZDI ZENER DIODE | AE 0289.4302.00 | VALVO | BZX79B10 | |
| X1 | FP STECKERLEISTE 32POL. MULTIPOINT CONNECTOR | FP 0514.4550.00 | SIEMENS | V42254-B1200-B641 | |
| X10 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN 2-POLIG/2 PINS | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X11 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN 3-POLIG/3 PINS | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X13 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |

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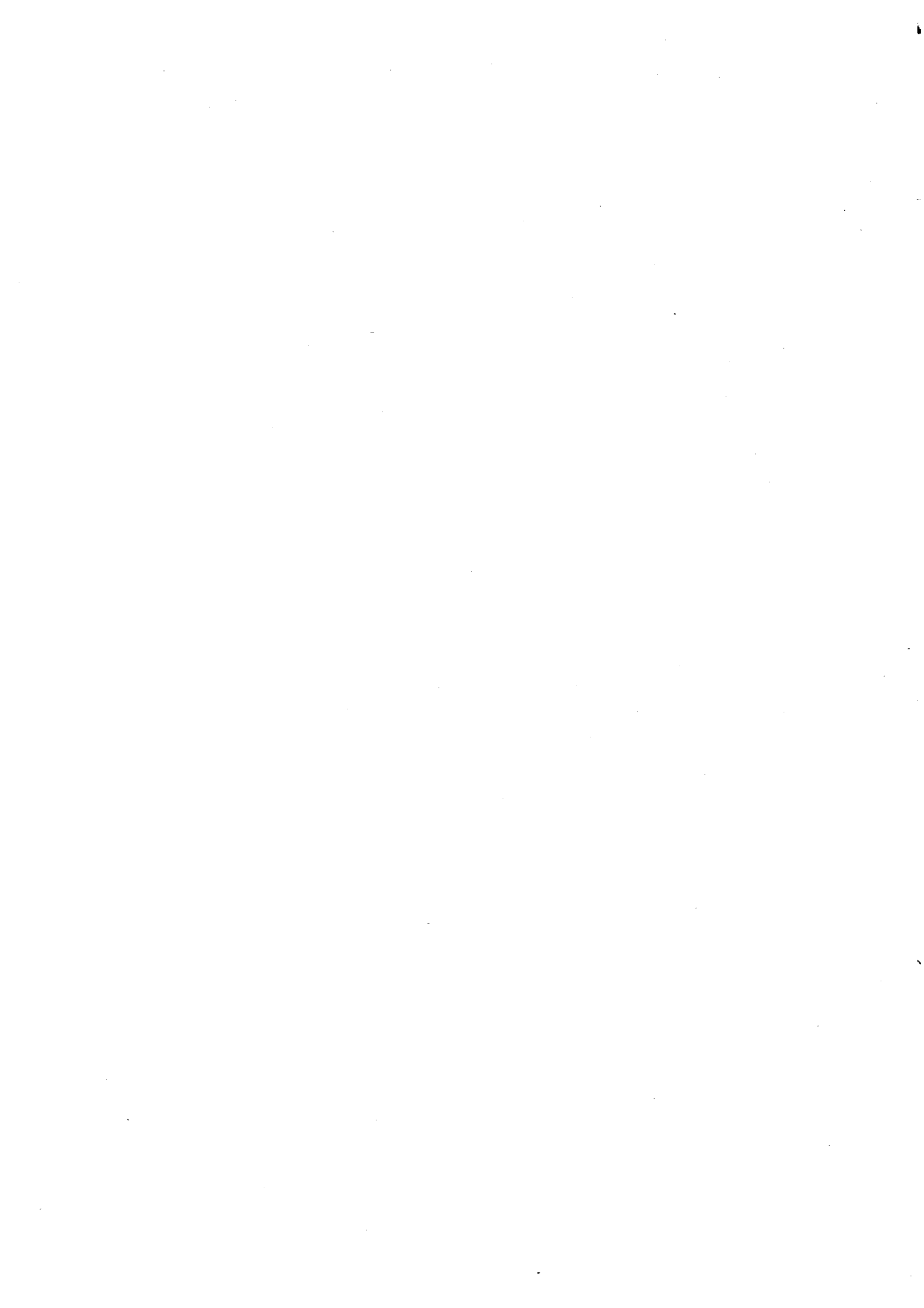
SERVICEUNTERLAGEN

Baugruppe "Netzteil"

801.1614.02

Printed in West Germany

ENGLISH SERVICE MANUAL FOLLOWS FIRST COLOURED DIVIDER



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Schaltteillisten
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Bestückungspläne

5.1 Funktionsbeschreibung

(Hierzu Stromlauf 801.1614 S und Bild 5-1)

Die Baugruppe "Netzteil" besteht aus dem Netztrafo T1, den Gleichrichterschaltungen V1, V12, V50, V100 und V150, der Referenzspannungserzeugung, den Spannungsreglerschaltungen sowie einer Powerfail-Schaltung zum Erkennen von Netzspannungseinbrüchen und -ausfällen.

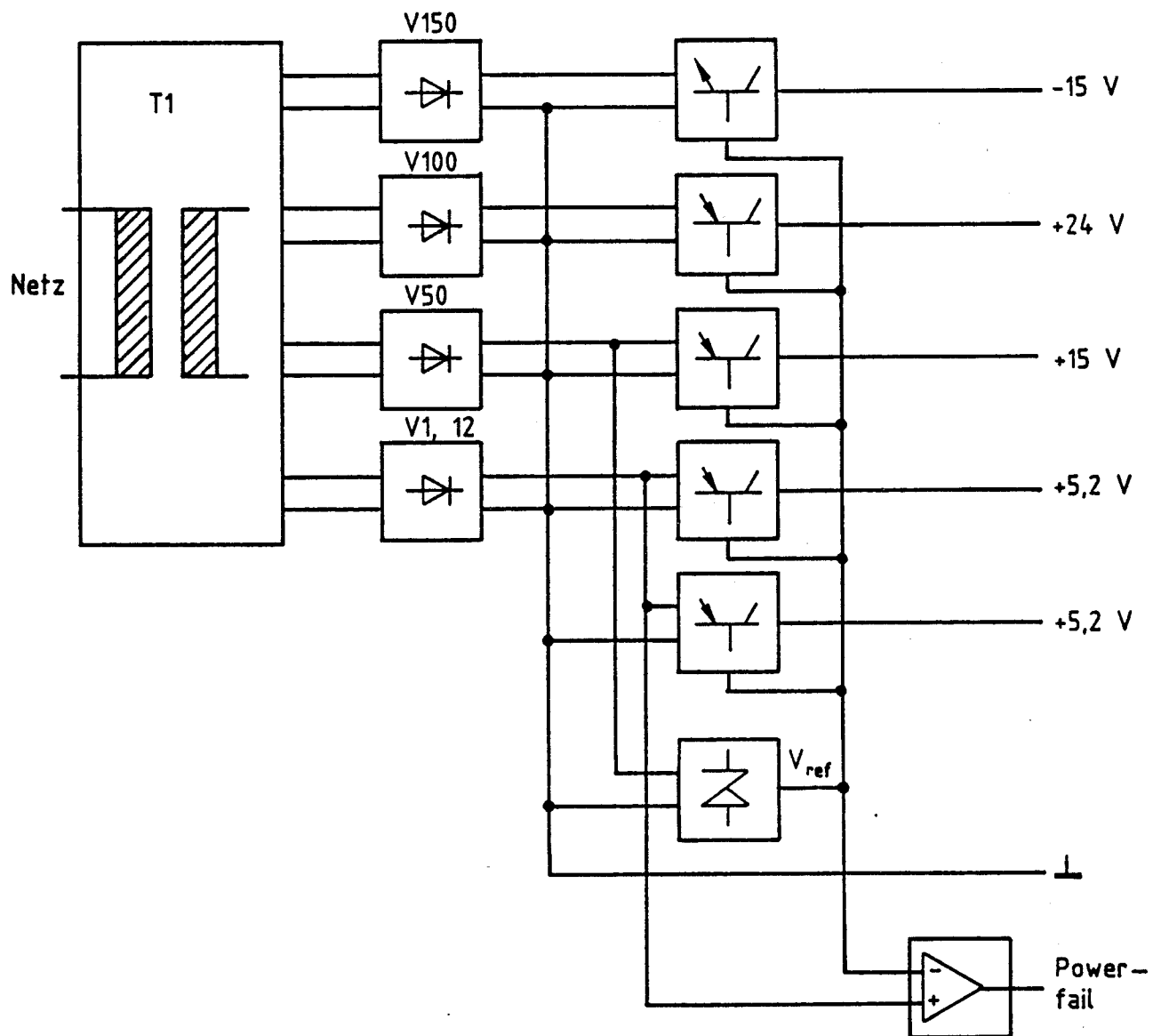


Bild 5-1 Blockschaltbild des Netzteils

Das Netzteil versorgt das Gerät mit drei geregelten Gleichspannungen von -15 V, +24 V, +15 V sowie zwei Spannungen von je +5,2 V.

Der Netztrafo wird primärseitig über ein Netzfilter und einen Spannungswähler gespeist. Es stehen vier verschiedene Primärspannungen zur Auswahl: 100 V, 120 V, 220 V und 240 V.

Der Netztrafo ist primärseitig durch eine Schmelzsicherung gegen Kurzschluß sowie über einen Thermoschalter, der im Trafobecher vergossen ist, gegen thermische Überlastung geschützt. Auf der Sekundärseite weist der Netztrafo vier Wicklungen auf, von denen die 5-V-Wicklung mit Rücksicht auf die hohe Belastung durch die beiden 5-V-Regelteile eine Mittelanzapfung besitzt und eine mit zwei Schottky-Leistungsdioden aufgebaute Mittelpunkt-Gleichrichterschaltung speist.

Die übrigen drei Gleichrichterschaltungen sind mit Brückengleichrichtern bestückt. Die an den vier Ladekondensatoren der Gleichrichterschaltungen anstehenden Oberspannungen werden fünf prinzipiell gleich aufgebauten Regelschaltungen zugeführt, die die Restwelligkeit ausregeln und ihre Ausgangsspannungen auf die oben genannten Werte stabilisieren. Durch die Anbindung aller Regler an nur eine hochstabile Referenz wird erreicht, daß sich alle Ausgangsspannungen mit nur einem Potentiometer abgleichen lassen.

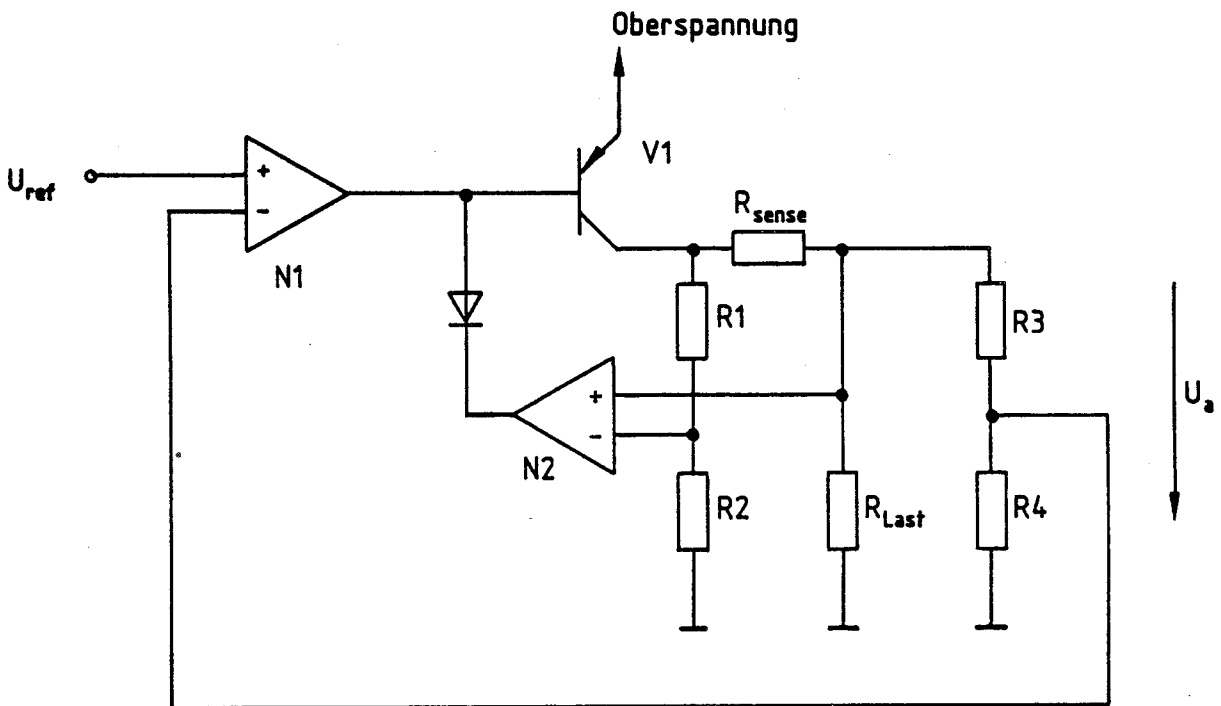


Bild 5-2 Prinzipschaltung eines Reglers

Der Regelverstärker N1 vergleicht die über den Spannungsteiler R3, R4 geteilte Ausgangsspannung des Reglers mit einer von einer Referenzdiode abgeleiteten Referenzspannung und steuert den als Stellglied wirkenden Transistor V1 so, daß sich folgende konstante Ausgangsspannung einstellt:

$$U_a = \left(1 + \frac{R_3}{R_4}\right) \cdot U_{Ref}$$

Um den Regeltransistor V1 vor Überlastung zu schützen weist die Strom/Spannungskennlinie des Reglers eine Fold-back-Charakteristik auf.

Überschreitet der Laststrom einen Maximalwert, so reduziert der Regler mit zunehmender Belastung seinen Ausgangsstrom auf immer kleinere Werte, so daß die im Transistor V1 auftretende Verlustleistung begrenzt wird.

Dieses Verhalten wird vom Fold-back-Verstärker N2 gesteuert, der auf die Ansteuerung des Regeltransistors eingreift, sobald der mittels R_{sense} gemessene Ausgangsstrom einen vom Spannungsteiler R1, R2 festgelegten Grenzwert überschreitet.

Das Netzteil enthält außer den Spannungsreglern eine Powerfail-Schaltung, deren Aufgabe es ist, Netzspannungseinbrüche bzw. Netzausfall frühzeitig zu erkennen, um dem Prozessor die Möglichkeit zu geben, ein Unterprogramm zur Datenrettung durchzuführen. Überwacht wird der Wert der Oberspannung des 5-V-Regelteils, der gerade noch eine sichere Funktion gewährleistet. Bei Unterschreitung dieser Spannung wechselt der Ausgang der Powerfail-Schaltung sein Potential auf Low und erzeugt damit einen Interrupt, der die Datenrettung einleitet.

Zur Kühlung der Baugruppen besitzt das Gerät einen in seiner Drehzahl umschaltbaren Lüfter, der bei Temperaturen unter 45 °C aus der Oberspannung des 5-V-Regelteils gespeist wird. Erreicht die Temperatur im Geräteinnern einen Wert von 45 °C, so wird über einen Thermoschalter die Oberspannung des 15-V-Regelteils auf den Lüfter geschaltet, so daß sich die Drehzahl und somit die Luftleistung steigert. Fällt die Temperatur unter eine Schwelle von 35 °C, so öffnet der Schalter und reduziert die Drehzahl auf den Anfangswert.

Durch diese Maßnahme werden die akustischen und elektrischen Störungen des Lüfters auf ein Minimum reduziert.

5.2 Prüfen und Abgleichen

5.2.1 Prüfen der Oberspannungen

→ Oberspannungen an den in Tabelle 5-1 angegebenen Meßpunkten ohne Belastung des Netzteils messen.

Die Genauigkeit der Oberspannungen soll bei 220 V ± 1 V (50 Hz) $\pm 0,5$ V betragen.

Tabelle 5-1

| Meßpunkt | Spannung | Toleranz |
|----------|----------|-------------|
| P1 | 10,8 V | $\pm 0,5$ V |
| P50 | 25,2 V | $\pm 0,5$ V |
| P100 | 34,3 V | $\pm 0,5$ V |
| P150 | -22,8 V | $\pm 0,5$ V |

5.2.2 Einstellung der Netzteilspannungen

Das Einstellen aller fünf geregelten Ausgangsspannungen des Netzteils erfolgt durch Abgleichen der Referenzspannung.

→ Netzteil ohne Belastung an 220 V ± 1 V (50 Hz) betreiben.

→ Referenzspannung am Meßpunkt P154 mittels R172 auf einen Wert von 2,5 V $\pm 0,01$ V einstellen.

Tabelle 5-2

| Meßpunkt | Spannung | Toleranz | Abgleich |
|----------|----------|--------------|----------|
| P154 | 2,5 V | $\pm 0,01$ V | R172 |

5.2.3 Prüfen der Ausgangsspannungen

Bei Netzspannungsänderung von 198 V...242 V sind die in Tabelle 5-3 angegebenen Werte zu überprüfen.

- Netzteil mit Belastung betreiben.
- Zur Messung der Störspannungen Lüfter abklemmen.
- Störspannungen mit einem erdfreien Millivoltmeter messen (UPGR).

Tabelle 5-3

| Meßpunkt | Spannung | Änderung (max.) | Störspannung |
|----------|--------------------|-----------------|-------------------------|
| P4 | 5,3 V $\pm 0,1$ V | 0,03 V | <0,1 mV _{eff} |
| P7 | 5,3 V $\pm 0,1$ V | 0,03 V | <0,1 mV _{eff} |
| P53 | 15 V $\pm 0,3$ V | 0,1 V | <0,2 mV _{eff} |
| P103 | 24 V $\pm 0,5$ V | 0,15 V | <0,2 mV _{eff} |
| P153 | -15 V $\pm 0,3$ V | 0,1 V | <0,2 mV _{eff} |
| P154 | 2,5 V $\pm 0,01$ V | 0,015 V | <0,05 mV _{eff} |

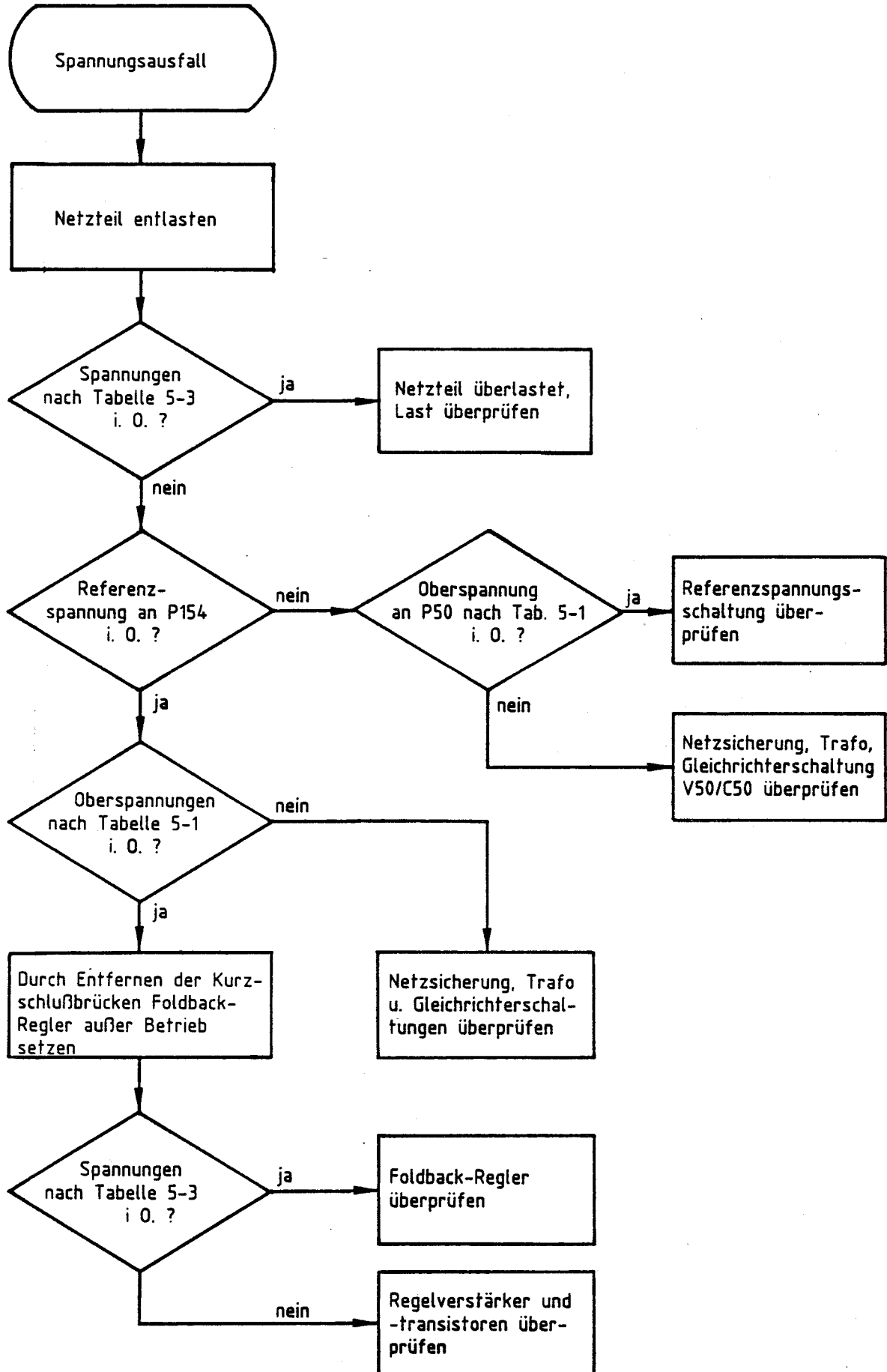
5.2.4 Abgleich der Spannungsüberwachung (Powerfail-Schaltung)

- Die Ansprechschwelle der Powerfail-Schaltung mit R2 so einstellen, daß bei Unterschreitung von 190 V ± 1 V Primärspannung die Spannung am Meßpunkt P8 von ca. 5,3 V auf ca. 0,3 V $\pm 0,1$ V wechselt.
- Anschließend prüfen, ob bei Erhöhung der Primärspannung von 185 V auf 197 V ± 1 V Primärspannung die Spannung am Meßpunkt P8 von 0,3 V auf 5,3 V wechselt.

Tabelle 5-4

| Primärspannung | Spannung an P8 | Abgleich |
|-----------------|-------------------|----------|
| 190 V ± 1 V | 0,3 V $\pm 0,1$ V | R2 |
| 197 V ± 1 V | 5,3 V $\pm 0,1$ V | -- |

5.3 Fehlersuche



5.4 Schnittstellen

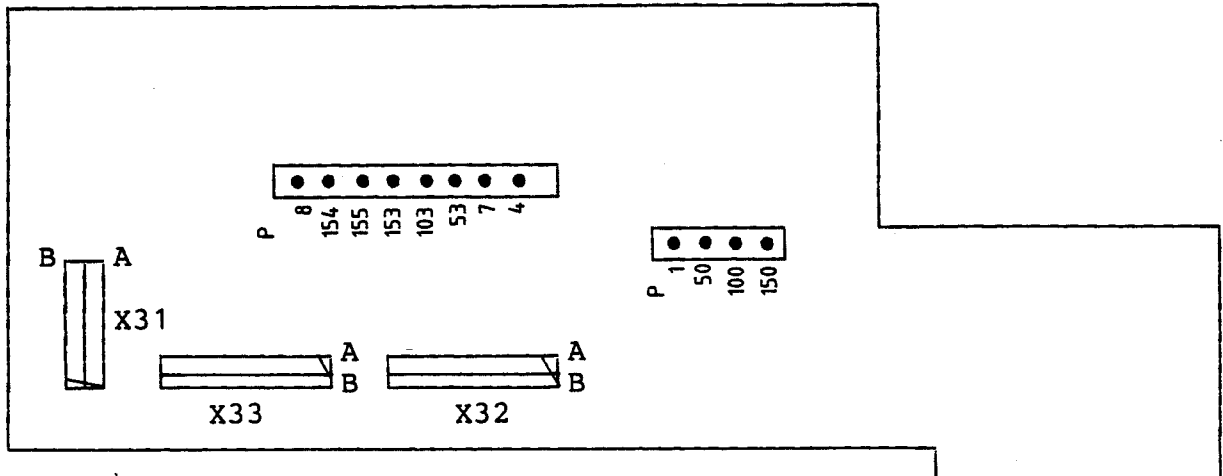


Bild 5-3 Lage der Prüf- und Trimpunkte

Analoge Schnittstellen

Primärspannung: 220 V \pm 1 V (50 Hz)

| Spannung | X31 | X32 | X33 | Meßpunkt | Spannung am Meßpunkt |
|--------------|--------------|-------------------------|----------------------|---------------|----------------------|
| 5,2 V \sim | A1,B1 | A1,A2,B1,B2 | - | P7 | 5,3 V \pm 0,1 V |
| 5,2 V | - | - | A2,A3,B2,B3 | P4 | 5,3 V \pm 0,1 V |
| 15 V | A3,B3 | A6,B6 | A4,B4 | P53 | 15,0 V \pm 0,3 V |
| -15 V | - | A8,B8 | A5,B5 | P153 | -15 V \pm 0,3 V |
| 24 V | - | A4,B4 | B7 | P103 | 24 V \pm 0,5 V |
| \perp | A2,B2, A4 | A3,B3,A5,B5 A7,B7,A9 | A1,B1,A6,B6 A7,A8 | P \emptyset | 0 V |

Digitale Schnittstelle

| Netzspannung | X33.B8 |
|--------------|-------------------|
| 220 V/50 Hz | 5,3 V \pm 0,1 V |
| 190 V/50 Hz | 0,3 V \pm 0,1 V |



ROHDE & SCHWARZ

SERVICE DOCUMENTS

Power Pack Module

801.1614.02

Printed in West Germany

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Component lists
Circuit diagrams
Component layout diagrams

5.1 Function Description

(See circuit diagram 801.1614 S and Fig. 5-1)

The power pack module consists of the line transformer T1, the rectifier circuits V1, V12, V50, V100 and V150, the reference voltage generator circuit, the voltage regulator circuits and a power failure circuit to detect reduction and loss of AC power supply.

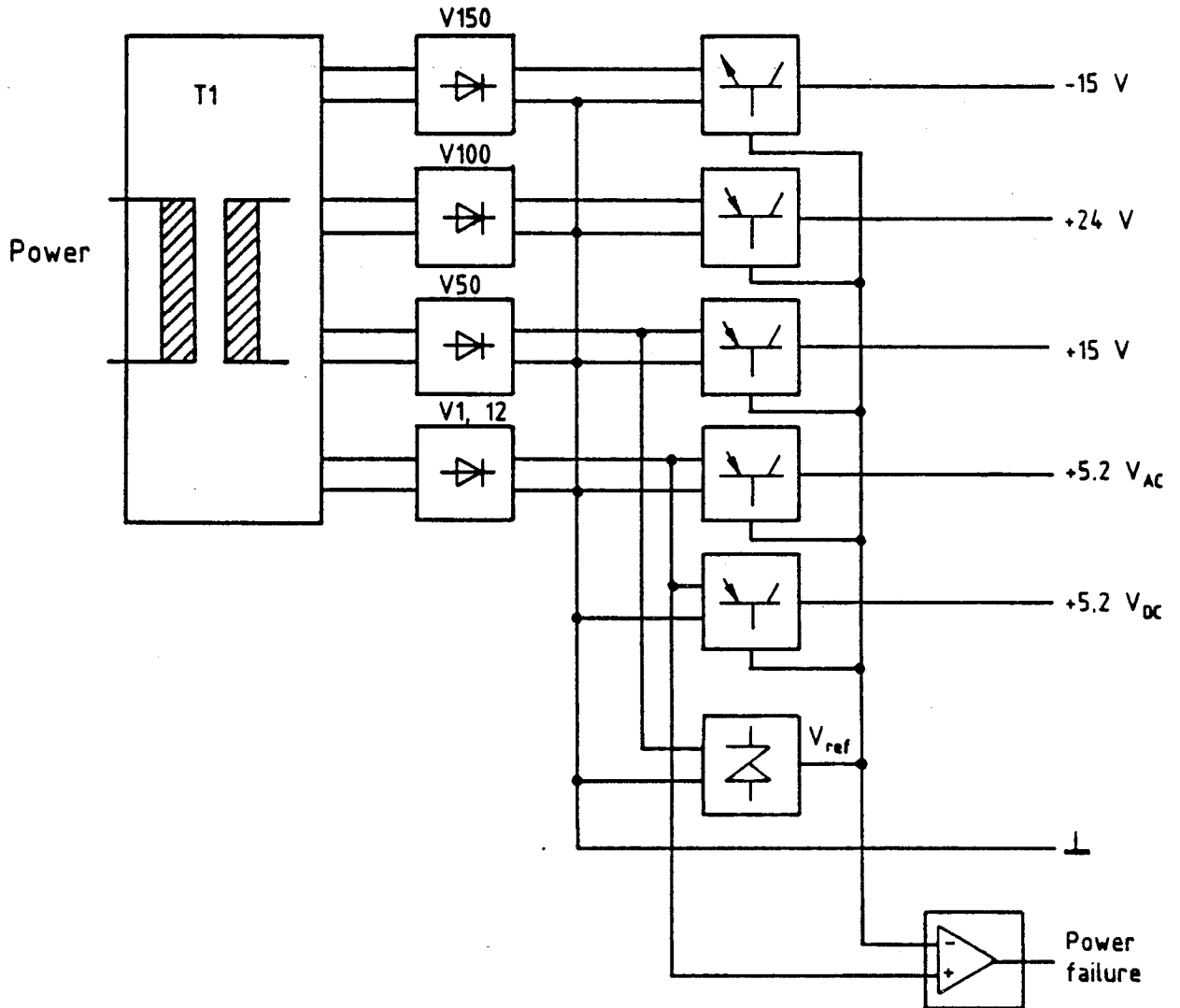


Fig. 5-1 Block diagram of the power pack

The power pack supplies the instrument with three regulated DC voltages of -15 V, +24 V, +15 V and two voltages of +5.2 V.

The primary side of the line transformer is connected via a line filter and a voltage selector. Four different line voltages can be selected: 100 V, 120 V, 220 V and 240 V.

The primary side of the line transformer is protected against short-circuits by a fuse and against thermal overloads by a thermal switch sealed in the transformer laminations. Four windings are present on the secondary side of the transformer where, because of the high loading by the two 5-V regulating units, the 5-V centre-tap winding has a mid-point full-wave rectifier circuit made up of two Schottky power diodes.

The other three rectifier circuits are fitted with bridge rectifiers. The high-end voltages present on the four charging capacitors of the rectifier circuits are connected to five control circuits of basically the same design which eliminate the ripple and stabilize their output voltages at the values mentioned above. All regulators are connected to one highly stable reference which means that all output voltages can be adjusted using only one potentiometer.

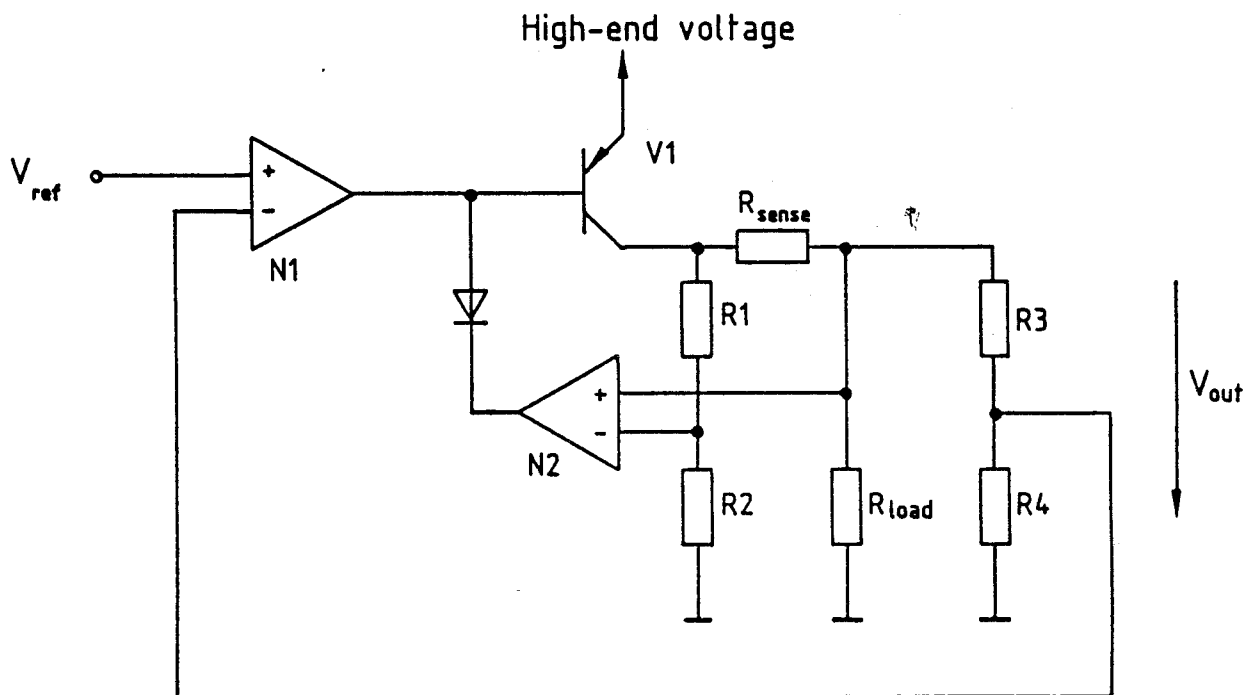


Fig. 5-2 Basic circuit diagram of a regulator

The control amplifier N1 compares the output voltage of the regulator divided by the voltage divider R3, R4 with a reference voltage derived from a reference diode and controls the transistor V1 (which acts as a control element) so that the following constant output voltage is set:

$$V_a = \left(1 + \frac{R3}{R4}\right) \times V_{Ref}$$

The current/voltage characteristic of the regulator has a fold-back characteristic in order to protect the control transistor V1 from overloads.

If the load current exceeds a maximum value, the regulator reduces its output current as the load increases so that the power loss occurring in transistor V1 is limited.

This response is controlled by the fold-back amplifier N2 which acts on the control of transistor V1 as soon as the output current measured using R_{sense} exceeds a limit value defined by the voltage divider R1, R2.

In addition to the voltage regulators, the power pack contains a power failure circuit which detects reduction or loss of the AC power supply early enough to enable the processor to execute a routine to save the data. The value of the high-end voltage of the 5-V control unit is monitored. The output of the power failure circuit is switched to Low if the high-end voltage drops below the limit and an interrupt is generated which initiates data saving routine.

For cooling the modules, the instrument is equipped with a ventilator with variable speed which is supplied from the high-end voltage of the 5-V control unit at temperatures below 45 °C. If the temperature inside the instrument reaches 45 °C, a thermal switch switches the high-end voltage of the 15-V control unit to the ventilator so that the ventilator speed increases. If the temperature drops below 35 °C, the switch is opened and the speed is reduced to the initial value.

The noise (audible and electrical) caused by the ventilator is thereby reduced to a minimum.

5.2 Checking and Adjustments

5.2.1 Checking the High-end Voltages

→ Measure the high-end voltages at the test points listed in Table 5-1 without loading the power pack.

The accuracy of the high-end voltages should be ± 0.5 V at 220 V ± 1 V (50 Hz).

Table 5-1

| Test point | Voltage | Tolerance |
|------------|---------|-------------|
| P1 | 10.8 V | ± 0.5 V |
| P50 | 25.2 V | ± 0.5 V |
| P100 | 34.3 V | ± 0.5 V |
| P150 | -22.8 V | ± 0.5 V |

5.2.2 Adjusting the Power Pack Voltages

All five regulated output voltages of the power pack are set by adjusting the reference voltage.

- Connect the power pack without a load to 220 V ± 1 V (50 Hz).
- Adjust reference voltage at test point P154 to a value of 2.5 V ± 0.01 V using R172.

Table 5-2

| Test point | Voltage | Tolerance | Adjustment |
|------------|---------|--------------|------------|
| P154 | 2.5 V | ± 0.01 V | R172 |

5.2.3 Checking the Control Response and the Noise Voltages

Check the values listed in Table 5-3 when changing the AC power supply voltage from 198 V to 242 V.

- Operate power pack without load.
- Disconnect ventilator when measuring the noise voltages.
- Measure the noise voltages using a floating millivoltmeter (UPGR).

Table 5-3

| Test point | Voltage | Change (max.) | Noise voltage |
|------------|--------------------|---------------|-------------------------|
| P4 | 5.3 V \pm 0.1 V | 0.03 V | <0.1 mV _{rms} |
| P7 | 5.3 V \pm 0.1 V | 0.03 V | <0.1 mV _{rms} |
| P53 | 15 V \pm 0.3 V | 0.1 V | <0.2 mV _{rms} |
| P103 | 24 V \pm 0.5 V | 0.15 V | <0.2 mV _{rms} |
| P153 | -15 V \pm 0.3 V | 0.1 V | <0.2 mV _{rms} |
| P154 | 2.5 V \pm 0.01 V | 0.015 V | <0.05 mV _{rms} |

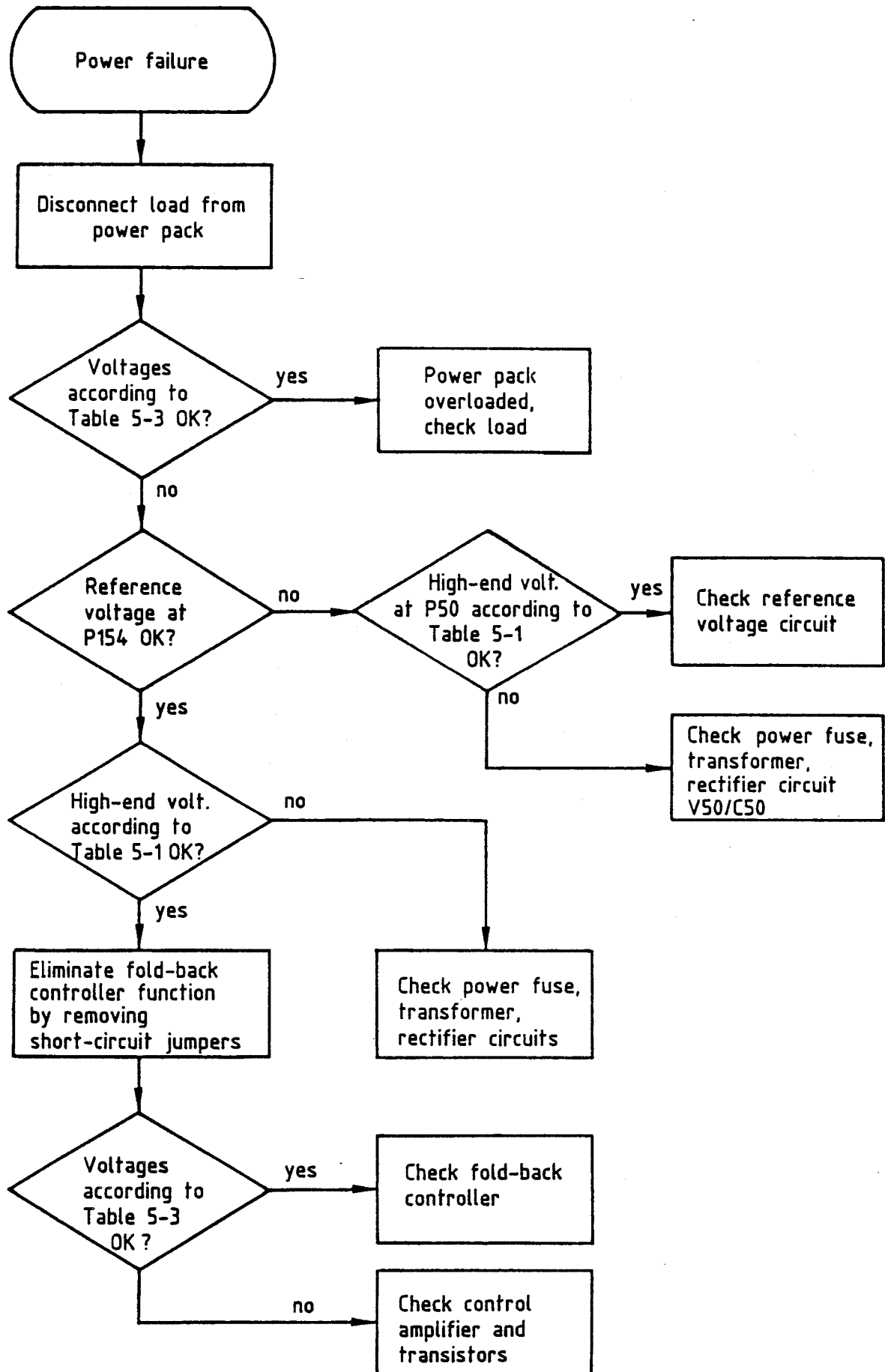
5.2.4 Adjust Voltage Monitoring (Power Failure Circuit)

- Adjust the response threshold of the power failure circuit using R2 such that the voltage at test point P8 changes from approx. 5.3 V to approx. 0.3 V \pm 0.1 V when the primary voltage drops below 190 V \pm 1 V.
- Subsequently check whether the voltage at test point P8 changes from 0.3 V to 5.3 V when the primary voltage is increased from 185 V to 197 V \pm 1 V.

Table 5-4

| Primary voltage | Voltage at P8 | Adjustment |
|-----------------|-------------------|------------|
| 190 V \pm 1 V | 0.3 V \pm 0.1 V | R2 |
| 197 V \pm 1 V | 5.3 V \pm 0.1 V | -- |

5.3 Troubleshooting



5.4 Interfaces

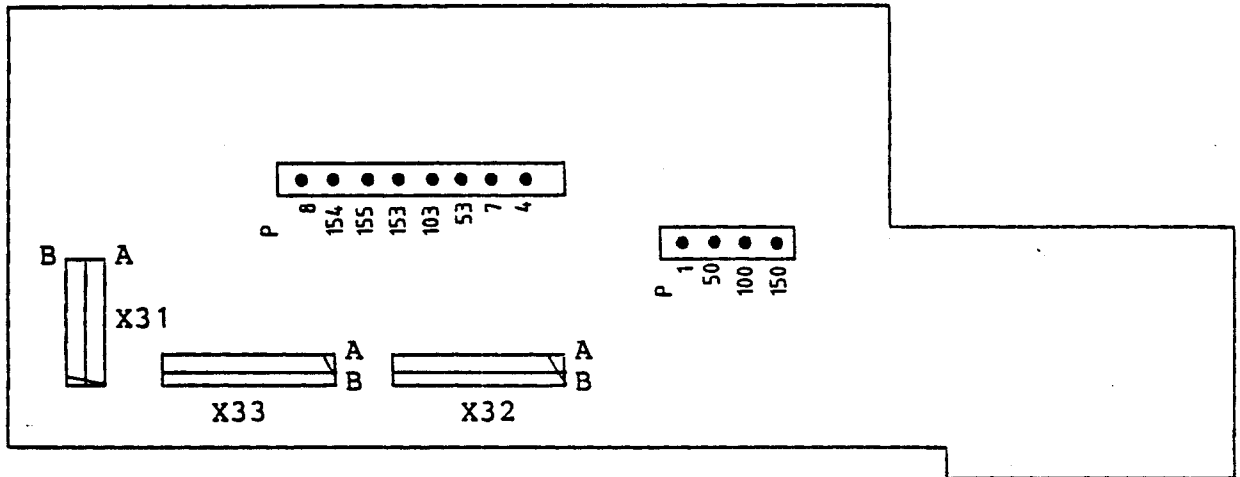


Fig. 5-3 Positions of the test points and trimmers

Analog interfaces

Primary voltage: 220 V \pm 1 V (50 Hz)

| Voltage | X31 | X32 | X33 | Test point | Voltage at test point |
|--------------|------------|----------------------------|------------------------|------------|-----------------------|
| 5.2 V \sim | A1, B1 | A1, A2, B1, B2 | - | P7 | 5.3 V \pm 0.1 V |
| 5.2 V | - | - | A2, A3, B2, B3 | P4 | 5.3 V \pm 0.1 V |
| 15 V | A3, B3 | A6, B6 | A4, B4 | P53 | 15.0 V \pm 0.3 V |
| -15 V | - | A8, B8 | A5, B5 | P153 | -15 V \pm 0.3 V |
| 24 V | - | A4, B4 | B7 | P103 | 24 V \pm 0.5 V |
| \perp | A2, B2, A4 | A3, B3, A5, B5, A7, B7, A9 | A1, B1, A6, B6, A7, A8 | P0 | 0 V |

Digital interface

| Line voltage | X33.B8 |
|--------------|-------------------|
| 220 V/50 Hz | 5.3 V \pm 0.1 V |
| 190 V/50 Hz | 0.3 V \pm 0.1 V |



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Schaltteillisten

Stromläufe

Bestückungspläne

Part lists

Circuit diagrams

Components plans

Listes des pièces détachées

Schémas de Circuit

Plans des composants

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| C1 | CE 2200UF-10+50%25V40RD ELECTROLYTIC CAPACITOR | 0099.0443.00 | ROEDERSTEI | EYV 00 DF 522 E 01 | 0801.1666.01 |
| C2 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | 0801.1666.01 |
| C3 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C4 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C5 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C6 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | 0801.1666.01 |
| C11 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | 0801.1666.01 |
| C12 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | 0801.1666.01 |
| C13 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C14 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C50 | CE 10MF-10+50%40VRD35X45 ELECTROLYTIC CAPACITOR | 0250.3134.00 | PHILIPS_CO | 2222 051 57103 | 0801.1666.01 |
| C51 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C52 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | 0801.1666.01 |
| C54 | CE 100UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | CE 0008.7879.00 | PANASONIC | ECA 1 JFG 101 B | 0801.1666.01 |
| C55 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C100 | CE 4700UF-10+50%63V35X80 ELECTROLYTIC CAPACITOR | 0292.9024.00 | PHILIPS_CO | 2222 051 58472 | 0801.1666.01 |
| C103 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C104 | CE 100UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | CE 0008.7879.00 | PANASONIC | ECA 1 JFG 101 B | 0801.1666.01 |
| C105 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| C150 | CE 2200UF-10+50%40V30X50 ELECTROLYTIC CAPACITOR | 0291.6180.00 | ROEDERSTEI | EYV 00 BB 422 G 01 | 0801.1666.01 |
| C151 | CE 100UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | CE 0008.7879.00 | PANASONIC | ECA 1 JFG 101 B | 0801.1666.01 |
| C152 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | 0801.1666.01 |
| C153 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | 0801.1666.01 |
| C154 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | 0801.1666.01 |
| C155 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | 0801.1666.01 |
| E1 | DX LUEFTEREINHEIT BLOWER UNIT | 0801.1708.00 | | | |
| F1 | SS SCHMELZ.T1,6IEC127-2/3 FUSE T1,6 FUER/FOR 220V/240V SCHMELZS/FUSE T2,0D IEC 127 (009.0578) FUER/FOR 100V/120V | SS 0009.0561.00 | WICKMANN | T1.6 L NR.19195 | |
| N1 | BO LM339N 4X COMPAR COMPARATOR | 0342.2062.00 | NSC | LM339N | 0801.1666.01 |
| N2 | BO LM124J 4XLP OPAMP OPERATIONAL AMPLIFIER | 0300.6353.00 | NSC | LM124J | 0801.1666.01 |
| N50 | BO LM124J 4XLP OPAMP OPERATIONAL AMPLIFIER | 0300.6353.00 | NSC | LM124J | 0801.1666.01 |
| N150 | BO LM124J 4XLP OPAMP OPERATIONAL AMPLIFIER | 0300.6353.00 | NSC | LM124J | 0801.1666.01 |
| P0 | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR 9-POLIG/9 PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P1 | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR 4-POLIG/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P3 | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |

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Datum Date

Schaltteilliste für Parts list for

Sachnummer Stock No.

Blatt-Nr. Page



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ZJ NETZTEIL
POWER SUPPLY


0801.1614.01 SA

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| P4 | 2X5-POLIG/PINS FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P0 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P6 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P3 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P7 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P0 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P8 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P0 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P50 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P1 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P52 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P3 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P53 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P0 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P100 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P1 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P102 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P3 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P103 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P0 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P150 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P1 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P152 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P3 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P153 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P0 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P154 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P0 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| P155 | FP STIFTELEISTE 36P.R2,54 PIN CONNECTOR ENTHALTEN/INCLUDED IN P0 | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| R1 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R2 | RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T | RS 0247.7903.00 | BI_TECHNOL | 72PM | 0801.1666.01 |
| R3 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | 0801.1666.01 |
| R4 | RL 0,60W 36,5KOHM+-1%TK50 RESISTOR | RL 0083.1716.00 | RESISTA | MK2 | 0801.1666.01 |
| R5 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R6 | RL 0,60W 121KOHM+-1%TK50 RESISTOR | RL 0083.2070.00 | RESISTA | MK2 | 0801.1666.01 |
| R7 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R9 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | 0801.1666.01 |
| R11 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R12 | RL 0,35W 511 OHM+-1%TK50 RESISTOR | RL 0083.0426.00 | RESISTA | MK2 | 0801.1666.01 |
| R13 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R14 | RL 0,60W 536 OHM+-1%TK50 RESISTOR | RL 0083.0449.00 | RESISTA | MK2 | 0801.1666.01 |
| R15 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R16 | RL 0,60W 5,62KOHM+-1%TK50 RESISTOR | RL 0082.2190.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R17 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | 0801.1666.01 |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| R18 | RL 0,60W22,10 OHM+-1%TK50 RESISTOR | RL 0082.9188.00 | RESISTA | MK2 | 0801.1666.01 |
| R19 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R20 | RL 0,60W 82,5 OHM+-1%TK50 RESISTOR | RL 0082.9707.00 | RESISTA | MK2 | 0801.1666.01 |
| R21 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R23 | RL 0,60W 20,0KOHM+-1%TK50 RESISTOR | RL 0083.1522.00 | RESISTA | MK2 | 0801.1666.01 |
| R24 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | 0801.1666.01 |
| R26 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R27 | RD 0,8W 0,1 OHM+-1% WIRE WOUND RESISTOR | RD 0087.5216.00 | DALE | LVR-1 ... (RS-1A) | 0801.1666.01 |
| R30 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R31 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R32 | RL 0,60W 536 OHM+-1%TK50 RESISTOR | RL 0083.0449.00 | RESISTA | MK2 | 0801.1666.01 |
| R33 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R34 | RL 0,60W 7,50KOHM+-1%TK50 RESISTOR | RL 0083.1197.00 | RESISTA | MK2 | 0801.1666.01 |
| R35 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | 0801.1666.01 |
| R36 | RL 0,60W22,10 OHM+-1%TK50 RESISTOR | RL 0082.9188.00 | RESISTA | MK2 | 0801.1666.01 |
| R37 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R38 | RL 0,60W 82,5 OHM+-1%TK50 RESISTOR | RL 0082.9707.00 | RESISTA | MK2 | 0801.1666.01 |
| R39 | RL 0,60W 619 OHM+-1%TK50 RESISTOR | RL 0083.0478.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R41 | RL 0,60W 20,0KOHM+-1%TK50 RESISTOR | RL 0083.1522.00 | RESISTA | MK2 | 0801.1666.01 |
| R42 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | 0801.1666.01 |
| R44 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R45 | RD 0,8W 0,1 OHM+-1% WIRE WOUND RESISTOR | RD 0087.5216.00 | DALE | LVR-1 ... (RS-1A) | 0801.1666.01 |
| R50 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R51 | RL 0,35W 511 OHM+-1%TK50 RESISTOR | RL 0083.0426.00 | RESISTA | MK2 | 0801.1666.01 |
| R52 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | 0801.1666.01 |
| R53 | RL 0,60W 750 OHM+-1%TK50 RESISTOR | RL 0082.2360.00 | ROEDERSTEI | MK2 | 0801.1666.01 |
| R54 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R55 | RL 0,60W 7,50KOHM+-1%TK50 RESISTOR | RL 0083.1197.00 | RESISTA | MK2 | 0801.1666.01 |
| R56 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | 0801.1666.01 |
| R57 | RL 0,60W 432 OHM+-1%TK50 DEPOS.-CARBON RESISTOR | RL 0083.0355.00 | RESISTA | MK2 | 0801.1666.01 |
| R58 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R59 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R60 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R61 | RL 0,60W 121 OHM+-1%TK50 RESISTOR | RL 0082.9859.00 | RESISTA | MK2 | 0801.1666.01 |
| R62 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | 0801.1666.01 |
| R63 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R64 | RL 0,60W30,10 OHM+-1%TK50 RESISTOR | RL 0082.9313.00 | RESISTA | MK2 | 0801.1666.01 |
| R65 | RD 0,8W 0,1 OHM+-1% WIRE WOUND RESISTOR | RD 0087.5216.00 | DALE | LVR-1 ... (RS-1A) | 0801.1666.01 |
| R66 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | 0801.1666.01 |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| R100 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R101 | RL 0,60W 232 OHM+-1%TK50 RESISTOR | RL 0083.0103.00 | RESISTA | MK2 | 0801.1666.01 |
| R102 | RL 0,60W 1,74KOHM+-1%TK50 RESISTOR | RL 0083.0784.00 | RESISTA | MK2 | 0801.1666.01 |
| R103 | RL 0,60W 255 OHM+-1%TK50 RESISTOR | RL 0083.0149.00 | RESISTA | MK2 | 0801.1666.01 |
| R104 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R105 | RL 0,60W 11,5KOHM+-1%TK50 RESISTOR | RL 0083.1339.00 | RESISTA | MK2 | 0801.1666.01 |
| R106 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | 0801.1666.01 |
| R107 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | 0801.1666.01 |
| R108 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R109 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R110 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R111 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R112 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | 0801.1666.01 |
| R113 | RL 0,60W 75,0KOHM+-1%TK50 RESISTOR | RL 0083.1916.00 | RESISTA | MK2 | 0801.1666.01 |
| R114 | RL 0,60W 18,20 OHM+-1%TK50 RESISTOR | RL 0082.9107.00 | RESISTA | MK2 | 0801.1666.01 |
| R115 | RD 0,8W 0,1 OHM+-1% WIRE WOUND RESISTOR | RD 0087.5216.00 | DALE | LVR-1 ... (RS-1A) | 0801.1666.01 |
| R116 | RD 2.4W 15 OHM+-1% WIRE-WOUND RESISTOR | RD 0087.5100.00 | DALE | RS-2B | 0801.1666.01 |
| R150 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | 0801.1666.01 |
| R151 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR | RL 0083.1674.00 | RESISTA | MK2 | 0801.1666.01 |
| R152 | RL 0,60W 150 OHM+-1%TK50 RESISTOR | RL 0082.9942.00 | RESISTA | MK2 | 0801.1666.01 |
| R153 | RL 0,60W 750 OHM+-1%TK50 RESISTOR | RL 0082.2360.00 | ROEDERSTEI | MK2 | 0801.1666.01 |
| R154 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R155 | RL 0,60W 9,09KOHM+-1%TK50 RESISTOR | RL 0082.2177.00 | RESISTA | MK2 | 0801.1666.01 |
| R156 | RL 0,60W 3,32KOHM+-1%TK50 RESISTOR | RL 0083.0990.00 | RESISTA | MK2 | 0801.1666.01 |
| R157 | RL 0,60W 475 OHM+-1%TK50 RESISTOR | RL 0083.0390.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R158 | RL 0,60W 33,2 OHM+-1%TK50 RESISTOR | RL 0082.9359.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R159 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R160 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R161 | RL 0,60W 121 OHM+-1%TK50 RESISTOR | RL 0082.9859.00 | RESISTA | MK2 | 0801.1666.01 |
| R162 | RL 0,60W 5,11KOHM+-1%TK50 RESISTOR | RL 0082.2348.00 | RESISTA | MK2 | 0801.1666.01 |
| R163 | RL 0,60W 27,4KOHM+-1%TK50 RESISTOR | RL 0082.2583.00 | RESISTA | MK2 | 0801.1666.01 |
| R164 | RL 0,60W 30,10 OHM+-1%TK50 RESISTOR | RL 0082.9313.00 | RESISTA | MK2 | 0801.1666.01 |
| R165 | RD 0,8W 0,1 OHM+-1% WIRE WOUND RESISTOR | RD 0087.5216.00 | DALE | LVR-1 ... (RS-1A) | 0801.1666.01 |
| R170 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R171 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | 0801.1666.01 |
| R172 | RS 0,5W 1KOHM+-10% 10X10X5 CERMET POTENTIOMETER | RS 0087.7560.00 | BI_TECHNOL | 72PM | 0801.1666.01 |
| R173 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R175 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |
| R176 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | 0801.1666.01 |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| R216 | RD 2.4W 15 OHM+-1% WIRE-WOUND RESISTOR | RD 0087.5100.00 | DALE | RS-2B | 0801.1666.01 |
| S1 | SB NETZSCHALTER 2XU 0.KN. POWER SWITCH | SB 0007.5143.00 | ITT-SEL | NE18 2U E E | |
| S2 | ST TEMP.SICH. 133 GRD. 3A THERMOFUSE | ST 0349.1903.00 | WICKMANN | TYP X24-3A-250-133 G | 0801.1920.00 |
| S10 | ENTHALTEN/INCLUDED IN T1 ST TEMP.SCHALT.45GRD SCHL TEMPERATURE SWITCH | 0801.8325.00 | MIDWEST_CO | MTS 45 A | |
| T1 | LT TRAFEOINHEIT TRANSFORMER | 0801.1914.00 | | | |
| V1 | AG MBR1645 SGL 45V 12AO RECTIFIER | 0355.0057.00 | GEN_INSTRU | MBR1645 | 0801.1666.01 |
| V4 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1666.01 |
| V5 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | 0801.1666.01 |
| V6 | AL MJD45H11 P 80V 8AO PNP TRANSISTOR | AL 0284.4562.00 | MOTOROLA | D45H11 | 0801.1666.01 |
| V8 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1666.01 |
| V9 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | 0801.1666.01 |
| V10 | AL MJD45H11 P 80V 8AO PNP TRANSISTOR | AL 0284.4562.00 | MOTOROLA | D45H11 | 0801.1666.01 |
| V11 | AF HLMP1503 LED GN RD3 LED | 0252.5570.00 | QUALITY | HLMP1503-(74)19(D) | 0801.1666.01 |
| V12 | AG MBR1645 SGL 45V 12AO RECTIFIER | 0355.0057.00 | GEN_INSTRU | MBR1645 | 0801.1666.01 |
| V50 | AG B80C5000/3300 BRGL RECTIFIER | AG 0084.5109.00 | TELEFUNKEN | B80C5000/3300SI | 0801.1666.01 |
| V51 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1666.01 |
| V52 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | 0801.1666.01 |
| V53 | AL MJD45H11 P 80V 8AO PNP TRANSISTOR | AL 0284.4562.00 | MOTOROLA | D45H11 | 0801.1666.01 |
| V54 | AE BZX79B3V3 2% 0.5W ZDI ZENER | AE 0008.7704.00 | PHILIPS_SE | BZX79B3V3 | 0801.1666.01 |
| V100 | AG B80C5000/3300 BRGL RECTIFIER | AG 0084.5109.00 | TELEFUNKEN | B80C5000/3300SI | 0801.1666.01 |
| V104 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1666.01 |
| V105 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | 0801.1666.01 |
| V106 | AL MJD45H11 P 80V 8AO PNP TRANSISTOR | AL 0284.4562.00 | MOTOROLA | D45H11 | 0801.1666.01 |
| V150 | AG B80C5000/3300 BRGL RECTIFIER | AG 0084.5109.00 | TELEFUNKEN | B80C5000/3300SI | 0801.1666.01 |
| V151 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1666.01 |
| V152 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | 0801.1666.01 |
| V153 | AL MJD44H11 NPN 80V NPN TRANSISTOR | AL 0300.6318.00 | MOTOROLA | D44H11 | 0801.1666.01 |
| V154 | AE 1N827 6,2V REF DI ZENER REFERENCE DIODE | AE 0418.0029.00 | COMPENSATE | 1N827(A) | 0801.1666.01 |
| V155 | AG 1N4007 GL1000V 1AO RECTIFIER | AG 0013.0310.00 | ITT-SEMICO | 1N4007 | 0801.1666.01 |
| X3 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | 0801.1666.01 |
| X4 | FP EINLOETSTECKER 3POL. CONNECTOR 3POL. | 0805.7630.00 | AMP | 350789-1 | 0801.1666.01 |
| X6 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | 0801.1666.01 |
| X30 | XX ENTHALTEN IN INCLUDED IN Z1" | | | | |
| X50 | FP EINLOETSTECKER 3POL. CONNECTOR 3POL. | 0805.7630.00 | AMP | 350789-1 | 0801.1666.01 |
| X52 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | 0801.1666.01 |
| X102 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | 0801.1666.01 |

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|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| X103 | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR 3-POLIG/3 PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| X150 | FP EINLOETSTECKER 3POL. CONNECTOR 3POL. | 0805.7630.00 | AMP | 350789-1 | 0801.1666.01 |
| X152 | FP KURZSCHLUSSBUCHSE SHORTING PLUG | FP 0491.7042.00 | IS | IPC-254-BL01 | 0801.1666.01 |
| X31A | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| X31B | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR 2X5-POLIG/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| X32A | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR 10-POLIG/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| X32B | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR 10-POLIG/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| X33A | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR 8-POLIG/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| X33B | FP STIFTLAISTE 36P.R2,54 PIN CONNECTOR 8-POLIG/PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1666.01 |
| Z1 | FN NETZFILT.M.SPANNUNGSW. MAINS FILTER W.VOLT.SELEK | FN 0099.3313.00 | KONFEKTRON HGN 369-2E | | |

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| | | | | | | |
|---|----------|----------|-----------------------------|---------------------------------------|-------------------------|-------------------|
| MEZ15 | 790 3PLU | Äl | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  ROHDE & SCHWARZ | 40 | 03.05.99 | ZJ NETZTEIL POWER SUPPLY | 0801.1614.01 SA | 6- | |

095.0026-0693



ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Baugruppe "HF-Eichleitung"

801.1108.02

ENGLISH MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5 Serviceanleitung Baugruppe "HF-Eichleitung"

Achtung! Baugruppe darf nicht geöffnet werden, da sonst der Garantieanspruch erlöscht und ein Neuabgleich durchgeführt werden muß.

5.1 Funktionsbeschreibung

(Hierzu Stromlauf 801.1108 S und Bild 5-1)

5.1.1 Eichleitung mit integriertem Überspannungsschutz

Die Eichleitung ist zwischen Ausgangsstufe und Geräteausgang geschaltet. Mit ihr kann das Signal um 135 dB in 5-dB-Schritten gedämpft werden. Kleinere Pegelsprünge werden mit der elektronischen Pegelregelung eingestellt. Die Eichleitung enthält sechs Dämpfungsglieder mit den Werten 5, 10, 2x20 und 2x40 dB, ein Überspannungsschutzsubstrat und einen 50- Ω -Abschlußwiderstand. Die Dämpfungsglieder können durch jeweils eine Kontaktgruppe, die aus drei Einzelkontakten besteht, eingeschaltet oder überbrückt werden. Jede dieser Kontaktgruppen wird von einer Wippe betätigt, die von einer Magnetspule angetrieben und durch einen Permanentmagneten in der Endlage gehalten wird.

Hinter den Dämpfungsgliedern sitzt auf der Eichleitungsgrundplatte in Richtung Geräteausgang (siehe Bild 5-1) das Überspannungsschutzsubstrat und anschließend der RF-OFF-Schalter. Der RF-OFF-Schalter wird im Überspannungsfall direkt geöffnet. Er kann aber auch vom Rechner über die Software angesteuert werden (siehe Bild 5-1). Wird der RF-OFF-Schalter betätigt so werden Dämpfungsglieder und Überspannungsschutz mit einem 50- Ω -Abschlußwiderstand abgeschlossen (siehe auch Abschnitt 5.1.2 "Ansteuerung der Diagnose"). Das integrierte Überspannungsschutzsubstrat schützt die Dämpfungsglieder und den Ausgangsverstärker vor hohen HF- und DC-Spannungen, die an die Ausgangsbuchse (X1) angelegt werden. Zudem kann mit dem Überspannungsschutzsubstrat eine Diagnose der Dämpfungsglieder mit den zugehörigen Kontaktgruppen durchgeführt werden. Diese Diagnosemöglichkeit kann vom Benutzer durch eine Spezialfunktion aufgerufen werden.

5.1.2 Ansteuerung der Eichleitung

Ansteuerung der Dämpfungsglieder

Die Dämpfungseinstellung der Eichleitung erfolgt durch serielle Datenübertragung (siehe Abschnitt 5.3.1). Die Ansteuerbits werden über die Datenleitungen (X77.B1 SER.DAT) mit dem Clock (X77.B2 SER.CLK) in das Schieberegister (D5) auf der Eichleitungsansteuer-Druckschaltung (801.1120) geschoben. Mit dem Strobe (X77.B3 EICH.STB) werden die Ausgänge des Schieberegisters gesetzt und die gewünschte Dämpfung eingestellt. Die Ansteuerung der Magnetspulen der Kontaktgruppen erfolgt über die Leistungsgatter D1 bis D4.

Ansteuerung des Überspannungsschutzes

Hohe an die Ausgangsbuchse angelegte HF- oder DC-Spannung wird durch Dioden auf dem Überspannungsschutzsubstrat, die als Spitzenwertgleichrichter arbeiten, erkannt. Die Komparatoren N10 a,b sprechen an und setzen das Flip-Flop D6, das über V8 und D4 direkt den RF-OFF-Schalter betätigt. Während der Ansprechzeit des RF-OFF-Schalters schließen die Pin-Dioden auf dem Überspannungsschutzsubstrat die Überspannung kurz. Durch die beiden Monoflops V33 und V34 wird den Pin-Dioden im Überlastfall (siehe Bild 5-2) ein hoher DC-Strom eingepreßt, und dadurch werden diese sehr niederohmig. Dem Rechner wird der Überlastfall über die Interruptleitung (X77.B4) mitgeteilt. Dieser Interrupt wird dann rückgesetzt, wenn der RF-OFF-Schalter zusätzlich vom Rechner über Software betätigt wird (siehe Bild 5-2). Der RF-OFF-Schalter kann von Hand über die Level/On-Tastenkombination wieder geschlossen werden.

Ansteuerung der Diagnose

Im Diagnosefall wird am Ausgang der Eichleitung der RF-OFF-Schalter geöffnet und damit der 50- Ω -Abschlußwiderstand eingeschaltet (siehe Bilder 5-1 und 5-2). Die Dioden auf dem Überspannungsschutzsubstrat werden über N20 als Spitzenwertgleichrichter betrieben. Der Prozessor kann die Gleichrichterspannung am Ausgang der Eichleitung über die Diagnoseleitung X77.B5 aufnehmen und der gemessenen Spannung eine bestimmte Dämpfung zuordnen. Damit können die Dämpfungsglieder mit den zugehörigen Kontaktgruppen überprüft werden.

Eichleitungsgrundplatte

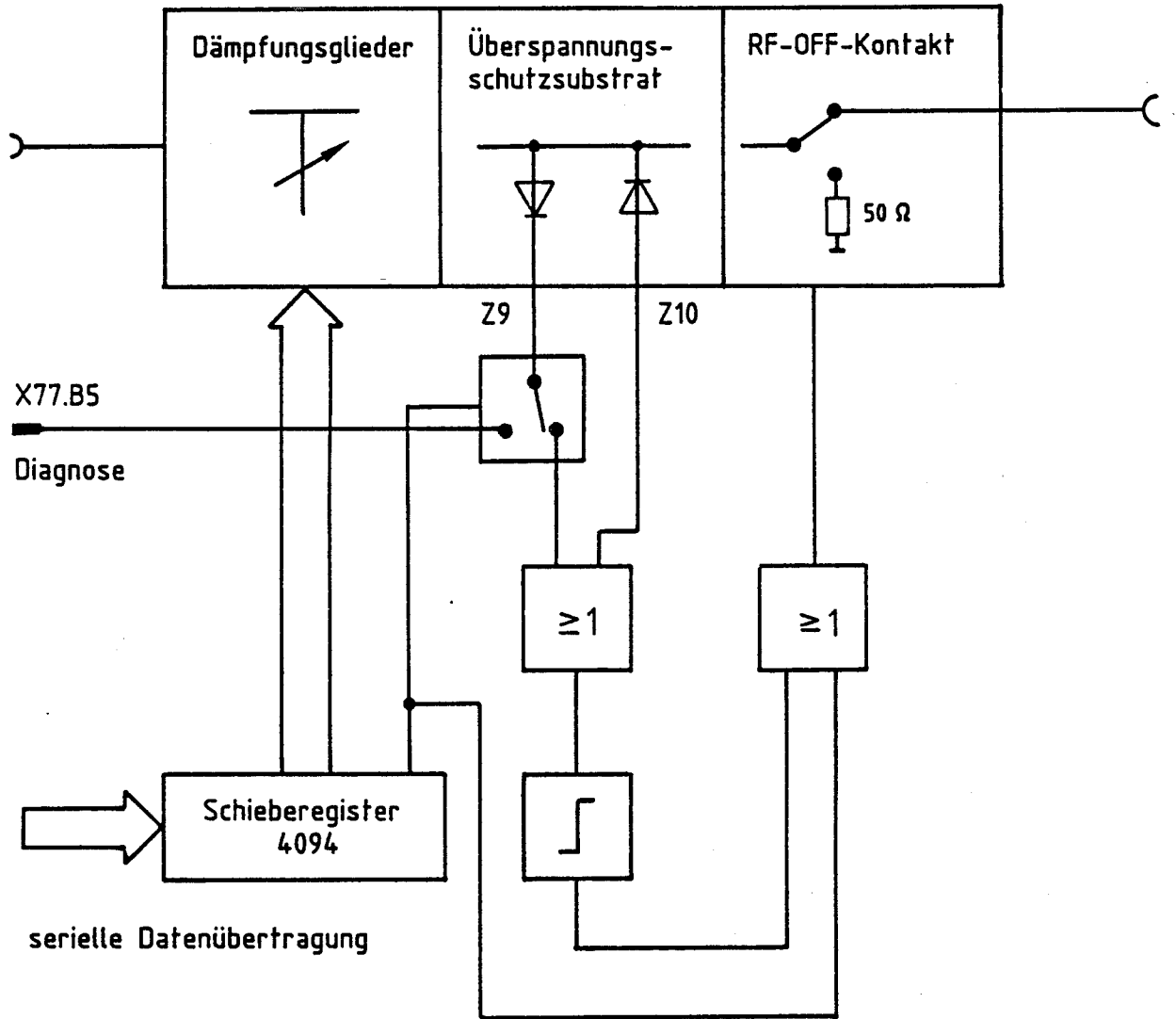


Bild 5-1 Blockschaltbild HF-Eichleitung

5.2 Prüfen und Abgleichen

5.2.1 Prüfen der Dämpfungsglieder und der Ansteuerdruckschaltung

Zum Prüfen der Dämpfungsglieder und der Ansteuerdruckschaltung siehe Kapitel 3 "Eichleitung" des Betriebshandbuchs.

5.2.2 Prüfen und Abgleichen des Überspannungsschutzes

Statische Prüfung des Überspannungsschutzsubstrates

- Stecker X41 von der Eichleitungsansteuer-Druckschaltung abziehen.
- Ausgangspegel von -122 dBm einstellen.
- Mit einem Ohmmeter (Meßbereich bis 2 M Ω) die Dioden auf dem Überspannungsschutzsubstrat in Fluß- und Sperrichtung prüfen. In Sperrichtung muß der Widerstand unendlich groß sein. Die Messung muß zwischen der Ausgangsbuchse (X1) und den Durchführungsfiltern Z9 bzw. Z10 gemacht werden.

Abgleich des Überspannungsschutzes bei Wechselspannung

- Ausgangsleistung von -122 dBm einstellen.
- In die Ausgangsbuchse (X1) ein Signal mit 27 dBm bei 25 MHz einspeisen (z.B. mit SMLU).
- Das Potentiometer R30 so einstellen, daß der RF-OFF-Schalter gerade anspricht.

Prüfen des Überspannungsschutzes bei Gleichspannung

- RF-OFF-Schalter von Hand über die Level/On-Tastenkombination wieder schließen.
- An die Ausgangsbuchse des Geräts ± 15 V über einen 50- Ω -Lastwiderstand anlegen. Der RF-OFF-Schalter muß bei positiver und bei negativer Spannung öffnen. (Overload-Anzeige im Display).

5.3 Fehlersuche

5.3.1 Ansteuercode

Läßt sich am Gerät ein gewünschter Ausgangspegel nicht einstellen, so kann am Schieberegisterausgang D5 der ordnungsgemäße Ansteuercode der einzelnen Dämpfungsglieder überprüft werden (siehe Bild 5-2).

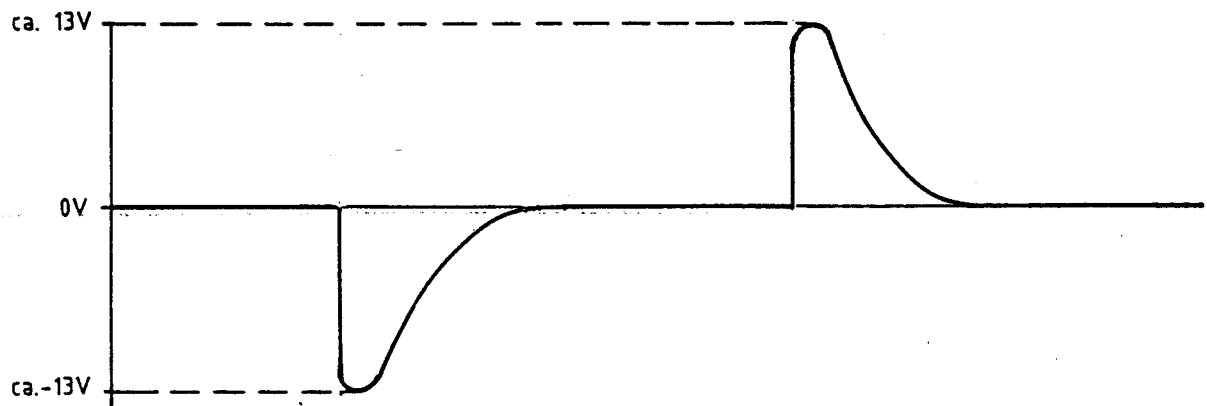
| Pegeleinstellung | Ansteuercode am Schieberegister D5 (74HC 4094) | | | | | | |
|------------------|--|---------------------|---------------------|---------------------|----------------------|----------------------|--|
| | Pin 4 Q ₀ | 5 Q ₁ | 6 Q ₂ | 7 Q ₃ | 14 Q ₄ | 13 Q ₅ | 11, 9 Q ₇ Q ₈ |
| 13 dBm | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 8 dBm | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 3 dBm | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| -7 dBm | 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| -27 dBm | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| -67 dBm | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| -107 dBm | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| -122 dBm | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

"1" ≅ 5 V; "0" ≅ 0 V

Bild 5-2 Rechneransteuerung der Eichleitung

5.3.2 Ansteuerpuls der Dämpfungsglieder

Entspricht der Puls an den Magnetspulen D1 bis D4 nicht der in Bild 5-3 gezeichneten Form, so liegt ein auftretender Dämpfungsfehler (siehe Abschnitt 5.2.1) an der Ansteuerdruckschaltung und nicht an den Dämpfungsgliedern mit den zugehörigen Kontaktgruppen.



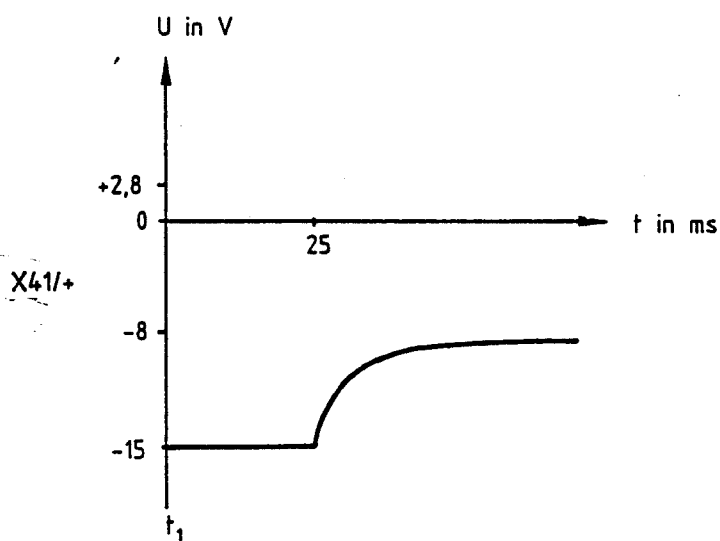
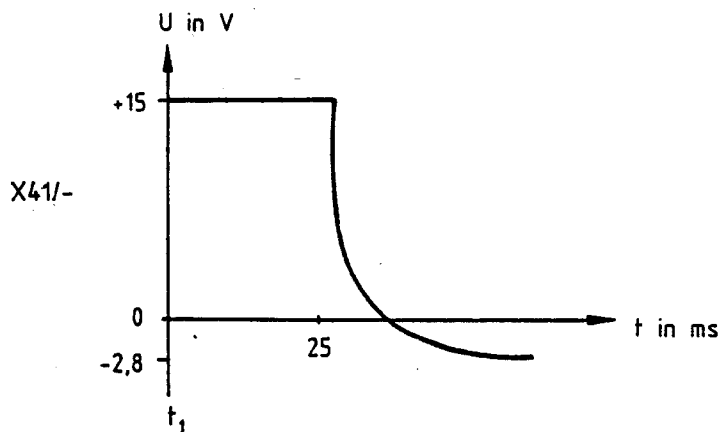
Ausschalten des
Dämpfungsglieds

Einschalten des
Dämpfungsglieds

Bild 5-3

5.3.3 Ansteuerpuls des Überspannungsschutzes

- Stecker X41 lösen und damit die Verbindung zwischen Eichleitungsansteuer-Druckschaltung und Durchführungsfiltern Z9 und Z10 auftrennen.
- Spezialfunktion 108 (Testpunkt "Eichleitung") einschalten. Dabei können am Stecker X41 die in Bild 5-4 gezeigten Kurvenformen nachgemessen werden.



t_1 = Einschaltzeitpunkt der Spezialfunktion

Bild 5-4

5.4 Schnittstellen

Analoge Schnittstellen

| Bezeichnung | Funktion |
|-------------|-----------------------------|
| X2 | Anschluß der Ausgangsstufe |
| X1 | Anschluß des Geräteausgangs |
| X77.B5 | Diagnose |

Digitale Schnittstellen

| Bezeichnung | Funktion |
|-------------|--------------------------------|
| X77.B1 | serielle Daten |
| X77.B2 | serieller Clock |
| X77.B3 | Strobe-Eichleitung |
| X77.B4 | Interrupt im Überspannungsfall |



ROHDE & SCHWARZ

SERVICE DOCUMENTS

RF Attenuation Set Module

801.1108.02

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| 5.1.2 | Control of Attenuation Set | 5.2 |
| 5.2 | Checking and Adjustments | 5.4 |
| 5.2.1 | Checking the Attenuators and the Control Circuit | 5.4 |
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| 5.4 | Interfaces | 5.8 |

Component lists
Circuit diagrams
Component layout diagrams

Caution! The module must not be opened; all guarantee claims are otherwise void and a readjustment must be carried out.

5.1 Function Description

(See circuit diagram 801.1108 S and Fig. 5-1)

5.1.1 Attenuation Set with Integrated Overvoltage Protection

The attenuation set is connected between the output stage and the instrument output. It can be used to attenuate the signal by 135 dB in steps of 5 dB. Smaller level intervals can be set using the electronic level control. The attenuation set contains six attenuators with the values 5, 10, 2x20 and 2x40 dB, an overvoltage protection unit and a 50- Ω terminator. The attenuators can each be switched on or bypassed by a group of three contacts. Each of these contact groups is activated by a rocker which is activated by a magnet coil and held in position by a permanent magnet.

The overvoltage protection unit and the RF-OFF switch are located on the basic board of the attenuation set between the attenuators and the instrument output (see Fig. 5-1). The RF-OFF switch is opened directly in the event of an overvoltage. It can also be activated by the controller via the software (see Fig. 5-1). The attenuators and the overvoltage protection unit are terminated by a 50- Ω resistor if the RF-OFF switch is activated (see also Section 5.1.2 "Diagnosis control"). The integrated overvoltage protection unit protects the attenuators and the output amplifier from high RF and DC voltages connected to the output connector (X1). The overvoltage protection unit can also be used for diagnosis of the attenuators with the associated contact groups. This diagnostic facility can be called using a special function.

5.1.2 Control of Attenuation Set

Attenuator control

The attenuation is set via serial data transmission (see Section 5.3.1). The trigger bits are shifted via the data lines (X77.B1 SER.DAT) by the clock (X77.B2 SER.CLK) into the shift register (D5) on the attenuation set trigger board (801.1120). The shift register outputs are set using the strobe (X77.B3 EICH.STB) and the required attenuation set. The magnet coils of the contact groups are triggered via the power gates D1 to D4.

Overvoltage protection control

High RF or DC voltages applied to the output connector are detected by diodes on the overvoltage protection unit which operate as peak-value rectifiers. The comparators N10 a,b respond and set the flip-flop D6 which directly activates the RF-OFF switch via V8 and D4. The pin diodes on the overvoltage protection unit short-circuit the overvoltage during the response time of the RF-OFF switch. A high DC current is impressed on the pin diodes by the two monoflops V33 and V34 in the event of an overload (see Fig. 5-2) and these become low-resistance. The controller is informed of the overload via the interrupt line (X77.B4). This interrupt is reset if the RF-OFF switch is additionally activated by the controller via the software (see Fig. 5-2). The RF-OFF switch can again be closed manually using the level/on key combination.

Diagnosis control

In the event of diagnosis the RF-OFF switch is opened at the output of the attenuation set and the 50- Ω terminator thus connected (see Figs 5-1 and 5-2). The diodes on the overvoltage protection unit are driven via N20 as peak-value rectifiers. The processor can accept the rectified voltage at the output of the attenuation set via the diagnosis line X77.B5 and assign a specific attenuation to the measured voltage. The attenuators with the associated contact groups can then be tested.

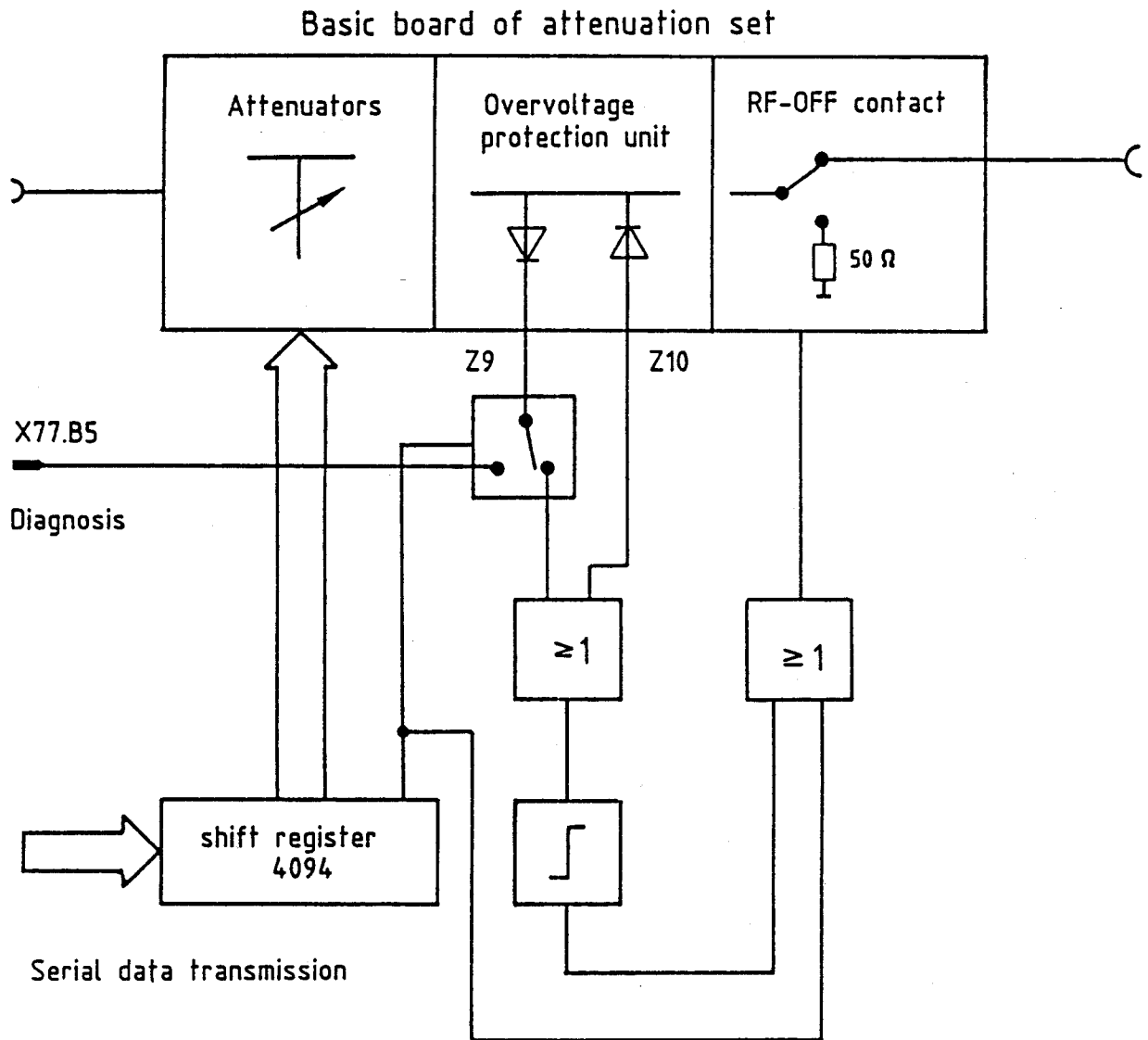


Fig. 5-1 Block diagram of RF attenuation set

5.2 Checking and Adjustments

5.2.1 Checking the Attenuators and the Control Circuit

See Section 3 "Attenuation set" in the manual in order to test the attenuators and control circuit.

5.2.2 Checking and Adjustment of the Overvoltage Protection

Static test of the overvoltage protection unit

- Remove plug X41 from the attenuation set control circuit.
- Set an output level of -122 dBm.
- Check the diodes on the overvoltage protection unit in the forward and backward directions using an ohmmeter (measuring range up to 2 M Ω). The resistance must be infinite in the backward direction. Make the measurement between the output connector (X1) and the lead-through filter Z9 or Z10.

Adjustment of overvoltage protection with AC voltage

- Set output power to -122 dBm.
- Apply a signal of 27 dBm at 25 MHz to the output connector (X1) (e.g. using an SMLU).
- Adjust potentiometer R30 such that the RF-OFF switch just responds.

Checking the overvoltage protection with DC voltage

- Switch off the RF-OFF switch again manually using the level/on key combination.
- Apply ± 15 V via a 50- Ω load resistor to the output connector of the instrument. The RF-OFF switch must open both with positive and negative voltages. (Overload indication is displayed).

5.3 Troubleshooting

5.3.1 Control Code

If the required output level cannot be set on the instrument, the control code of the individual attenuators can be tested at the shift register output D5 (see Fig. 5-2).

| Level setting | Control code at shift register D5 (74HC 4094) | | | | | | |
|---------------|---|---------------------|---------------------|---------------------|----------------------|----------------------|--|
| | Pin 4 Q ₀ | 5 Q ₁ | 6 Q ₂ | 7 Q ₃ | 14 Q ₄ | 13 Q ₅ | 11, 9 Q ₇ Q ₈ |
| 13 dBm | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 8 dBm | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 3 dBm | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| -7 dBm | 1 | 1 | 1 | 0 | 1 | 1 | 0 |
| -27 dBm | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| -67 dBm | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| -107 dBm | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| -122 dBm | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

1 \cong 5 V; 0 \cong 0 V

Fig. 5-2 Setting of attenuation set by controller

5.3.2 Control Pulse of Attenuators

If the pulse at the magnet coils D1 to D4 does not correspond to the waveform shown in Fig. 5-3, an attenuation error (see Section 5.2.1) is caused by the trigger circuit and not by the attenuators with the associated contact groups.

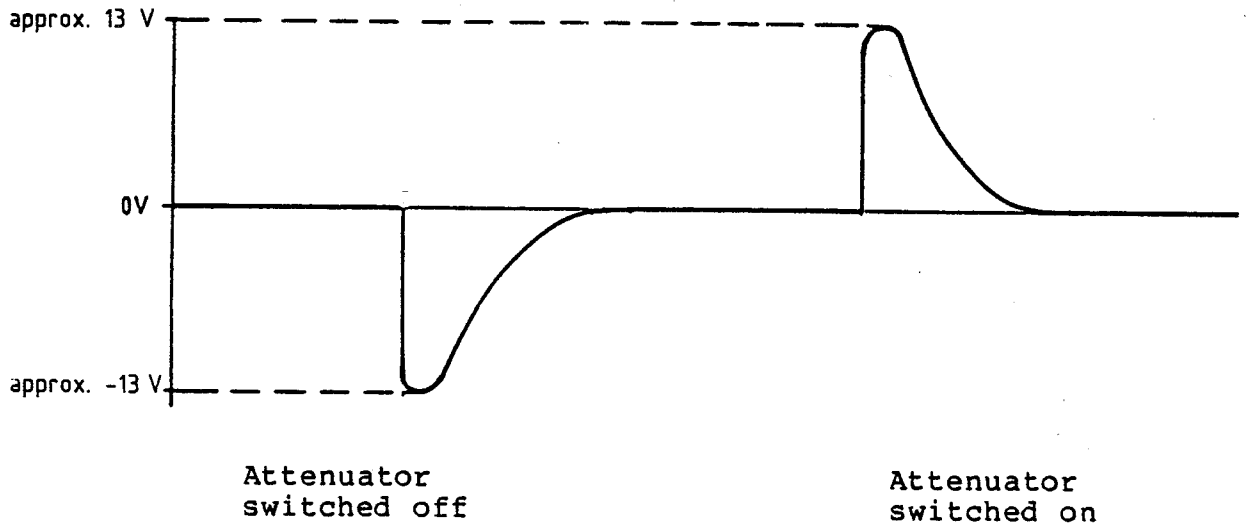
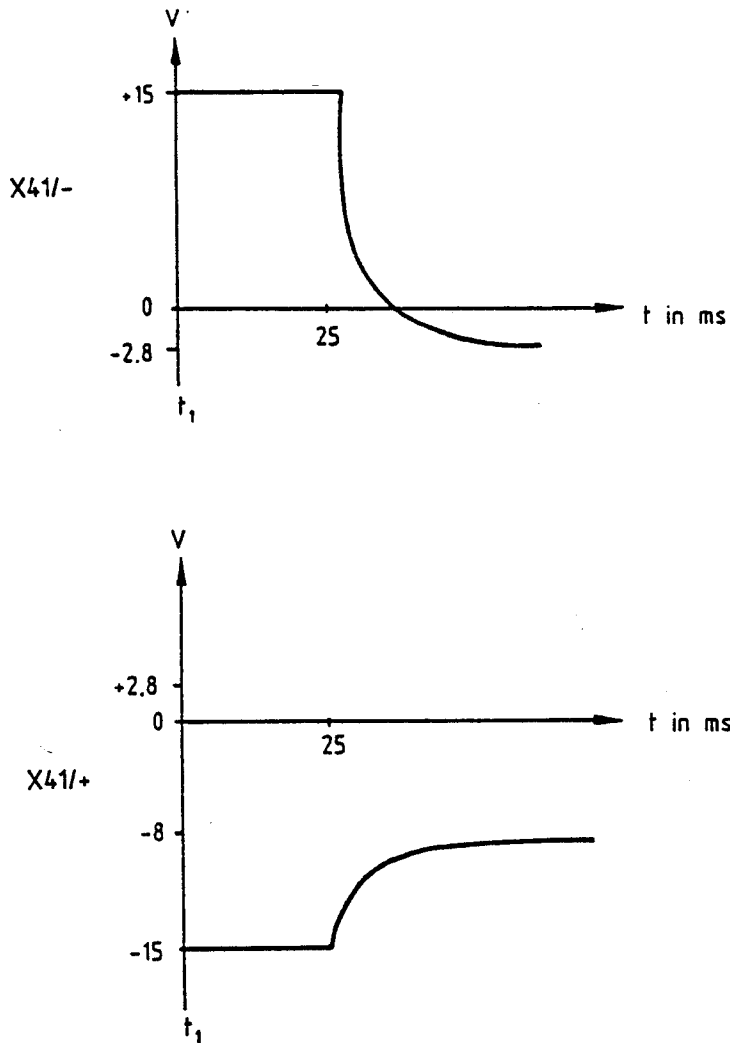


Fig. 5-3

5.3.3 Control Pulse of Overvoltage Protection

- Remove plug X41 and thus isolate the connection between the attenuation set control circuit and the lead-through filters Z9 and Z10.
- Switch on special function 108 (Test point attenuation set). The waveforms shown in Fig. 5-4 can then be measured at plug X41.



t_1 = Special function switched on

Fig. 5-4

5.4 Interfaces

Analog interfaces

| Designation | Function |
|-------------|---------------------------------|
| X2 | Connection of output stage |
| X1 | Connection of instrument output |
| X77.B5 | Diagnosis |


Digital interfaces

| Designation | Function |
|-------------|-----------------------------------|
| X77.B1 | Serial data |
| X77.B2 | Serial clock |
| X77.B3 | Strobe attenuation set |
| X77.B4 | Interrupt in event of overvoltage |

Schalteillisten
Stromläufe
Bestückungspläne
Part lists
Circuit diagrams
Components plans
Listes des pièces détachées
Schémas de Circuit
Plans des composants

Für diese Unterlage behalten wir uns alle Rechte vor.


| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| | XX VARIANTENERKLAERUNG IDENTIFICATION OF MODELS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL ERSETZT/REPLACE VAR 00/MOD 00 VAR 04 = SMY12/44/45+B40 MOD 04 = SMY12/44/45+B40 | | | | |
| A90 | ED ANSTEUERUNG EICHLITG. ATTENUATOR CONTROL NUR VAR/ONLY MOD: 02 ZUEH.STROML./CIRC.DIAGR. 801.1108 S | 0801.1120.02 | | | |
| A90 | ED ANSTEUERUNG EICHLITG. NUR VAR/ONLY MOD: 04 ZUEH.STROML./CIRC.DIAGR. 801.1108S GS UNGEPRUEFT.AK "C" | 0801.1120.04 | | | |
| C1 | CE 220UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | CE 0008.7904.00 | PANASONIC | ECA 1 VFG 221 B | 0801.1120.01 |
| C7 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | 0801.1120.01 |
| C8 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | 0801.1120.01 |
| C9 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | 0801.1120.01 |
| C10 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | 0801.1120.01 |
| C11 | CE 1,5UF+-20%25V 5X 4X 7 ELECTROLYTIC CAPACITOR | CE 0087.9334.00 | KEMET | T340 A155M025 AS | 0801.1120.01 |
| C15 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | 0801.1120.01 |
| C17 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | 0801.1120.01 |
| C18 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | 0801.1120.01 |
| C19 | CC 3,3NF+-10%6X7R2000 CAPACITOR | CC 0087.7083.00 | PHILIPS_CO | 2222 630 5(1)1332 | 0801.1120.01 |
| C20 | CK 33NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2900.00 | SIEMENS | B 32 529-A333-J | 0801.1120.01 |
| C20 | NUR VAR/ONLY MOD: 02 CK 3,3NF +-1% 63V RM5 KP POLYPROPYLENE CAPACITOR NUR VAR/ONLY MOD: 04 | CK 0007.7623.00 | ROEDERSTEI | KP1830-233 06 1 3 W | 0801.1120.01 |
| C30 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | 0801.1120.01 |
| C31 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | 0801.1120.01 |
| C35 | CC 680NF+-10% 50V8K1200VI CAPACITOR | 0082.7785.00 | UNION_CARB | CKR 06 BX 684K | 0801.1120.01 |
| C36 | CC 680NF+-10% 50V8K1200VI CAPACITOR | 0082.7785.00 | UNION_CARB | CKR 06 BX 684K | 0801.1120.01 |
| D1 | BJ SN75361AP 2XTTL/MOS-LC LEVEL CONVERTER | 0294.8490.00 | NSC | DS75361N | 0801.1120.01 |
| D2 | BJ SN75361AP 2XTTL/MOS-LC LEVEL CONVERTER | 0294.8490.00 | NSC | DS75361N | 0801.1120.01 |
| D4 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | 0801.1120.01 |
| D5 | BL CD4013BE 2XD- FLIPFL FLIPFLOP | 0086.7021.00 | RCA | CD4013BE | 0801.1120.01 |
| D6 | BL CD4013BE 2XD- FLIPFL FLIPFLOP | 0086.7021.00 | RCA | CD4013BE | 0801.1120.01 |
| K1 | LD ELEKTROMAGNET (EICHL.) ELECTROMAGNET | 0294.8425.00 | | | 0294.8925.00 |
| K6 | LD ELEKTROMAGNET (EICHL.) ELECTROMAGNET | 0294.8425.00 | | | 0294.8925.00 |
| K9 | LD ELEKTROMAGNET (EICHL.) ELECTROMAGNET | 0294.8425.00 | | | 0294.8925.00 |
| N10 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | 0801.1120.01 |
| N20 | BS TL604CP 2X ANALGSCH ANALOG SWITCH | BJ 0300.6199.00 | TEXAS | TL604CP | 0801.1120.01 |
| R5 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R6 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R7 | RL 0,40W 1,00KOHM+-1%TK50 RESISTOR | RL 0092.1444.00 | ROEDERSTEI | MK1 | 0801.1120.01 |

| MEZ15 | 790 3PLU | Äi | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
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|  | ROHDE & SCHWARZ | 13 | 03.05.99 | ZE EICHL.(SMG) | 0801.1108.01 SA | 1+ |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| R8 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R9 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R10 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R11 | RL 0,60W 24,3KOHM+-1%TK50 RESISTOR | RL 0083.1574.00 | RESISTA | MK2 | 0801.1120.01 |
| R11 | NUR VAR/ONLY MOD: 02 RL 0,60W 66,5KOHM+-1%TK50 RESISTOR | RL 0083.1874.00 | RESISTA | MK2 | 0801.1120.01 |
| R12 | NUR VAR/ONLY MOD: 04 RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R13 | RL 0,60W 11,5KOHM+-1%TK50 RESISTOR | RL 0083.1339.00 | RESISTA | MK2 | 0801.1120.01 |
| R14 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | 0801.1120.01 |
| R16 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | 0801.1120.01 |
| R16 | NUR VAR/ONLY MOD: 02 RL 0,60W 20,0KOHM+-1%TK50 RESISTOR | RL 0083.1522.00 | RESISTA | MK2 | 0801.1120.01 |
| R17 | NUR VAR/ONLY MOD: 04 RL 0,60W 24,3KOHM+-1%TK50 RESISTOR | RL 0083.1574.00 | RESISTA | MK2 | 0801.1120.01 |
| R17 | NUR VAR/ONLY MOD: 02 RL 0,60W 66,5KOHM+-1%TK50 RESISTOR | RL 0083.1874.00 | RESISTA | MK2 | 0801.1120.01 |
| R18 | NUR VAR/ONLY MOD: 04 RL 0,60W 11,5KOHM+-1%TK50 RESISTOR | RL 0083.1339.00 | RESISTA | MK2 | 0801.1120.01 |
| R19 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | 0801.1120.01 |
| R20 | RL 0,60W 681 KOHM+-1%TK50 RESISTOR | RL 0083.2735.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R21 | RL 0,60W 332 KOHM+-1%TK50 RESISTOR | RL 0083.2441.00 | RESISTA | MK2 | 0801.1120.01 |
| R22 | RL 0,40W 10,0KOHM+-1%TK50 RESISTOR | RL 0092.1567.00 | DRALORIC | SMAO204 | 0801.1120.01 |
| R25 | RL 0,40W 10,0KOHM+-1%TK50 RESISTOR | RL 0092.1567.00 | DRALORIC | SMAO204 | 0801.1120.01 |
| R26 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R26 | NUR VAR/ONLY MOD: 02 RL 0-OHM-WIDERST. 0204 O-OHM RESISTOR | RL 0069.0000.00 | DRALORIC | OMA 0204 | 0801.1120.01 |
| R30 | NUR VAR/ONLY MOD: 04 RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T | RS 0247.7903.00 | BI_TECHNOL | 72PM | 0801.1120.01 |
| R30 | NUR VAR/ONLY MOD: 02 RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T | RS 0087.7560.00 | BI_TECHNOL | 72PM | 0801.1120.01 |
| R31 | NUR VAR/ONLY MOD: 04 RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | 0801.1120.01 |
| R32 | RL 0,60W 332 OHM+-1%TK50 RESISTOR | RL 0083.0255.00 | RESISTA | MK2 | 0801.1120.01 |
| R33 | RL 0,60W 82,5KOHM+-1%TK50 RESISTOR | RL 0082.2302.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R34 | RL 0,60W 82,5KOHM+-1%TK50 RESISTOR | RL 0082.2302.00 | PHILIPS_CO | MRS 25 | 0801.1120.01 |
| R35 | RL 0,40W 20,0KOHM+-1%TK50 RESISTOR | 0092.0402.00 | RESISTA | MK1 | 0801.1120.01 |
| R36 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | 0801.1120.01 |
| V6 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V7 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | 0801.1120.01 |
| V8 | AK BC173C N 25V 100MA TRANSISTOR | 0010.4444.00 | ITT-SEMICO | BC549C | 0801.1120.01 |
| V10 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V12 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |

| | | | | | | |
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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| V20 | AE BZX55/B8V2 0,5W ZDI ZENER DIODE | AE 0012.2178.00 | VALVO | BZX79B8V2 | 0801.1120.01 |
| V21 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V22 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V23 | AE BZX85/C8V2 1,3W ZDI ZENER DIODE | AE 0092.8526.00 | THOMSON | BZX85C8V2 | 0801.1120.01 |
| V24 | AE BAV45 35V PICOAMPDI LOW LEAKAGE DIODE | AE 0252.5386.00 | VALVO | BAV45 | 0801.1120.01 |
| V25 | AE BZX55/B8V2 0,5W ZDI ZENER DIODE | AE 0012.2178.00 | VALVO | BZX79B8V2 | 0801.1120.01 |
| V26 | AE BZX85/C8V2 1,3W ZDI ZENER DIODE | AE 0092.8526.00 | THOMSON | BZX85C8V2 | 0801.1120.01 |
| V27 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V28 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V30 | NUR VAR/ONLY MOD: 02 AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V31 | NUR VAR/ONLY MOD: 04 AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V32 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0801.1120.01 |
| V33 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | 0801.1120.01 |
| V34 | AK BC327-40 P 45V 800MA TRANSISTOR | 0303.9518.00 | PHILIPS_SE | BC327-40 | 0801.1120.01 |
| W12 | DX KABEL W12 CABLE W12 | 0801.7629.00 | | | |
| X1 | FJ EINBAUBUCHSE SYST.SMA SOCKET | FJ 0294.8154.00 | ROSENBERGE | 32K-111-500-D3 | 0294.8725.00 |
| X2 | FJ EINBAUBUCHSE SYST.SMA SOCKET | FJ 0294.8154.00 | ROSENBERGE | 32K-111-500-D3 | 0294.8725.00 |
| X41 | FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 3-POLIG/3 PINS | FP 0243.3578.00 | BERG_ELEKT | 75168-113-36 | 0801.1120.01 |
| X77A | FP STIFTL.EISTE 36P.R2,54 PIN CONNECTOR 8-POLIG/8 PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1120.01 |
| X77B | FP STIFTL.EISTE 36P.R2,54 PIN CONNECTOR 8-POLIG/8 PINS | FP 0242.3600.00 | MPE | STL1-1180-14GGT8-036 | 0801.1120.01 |
| Z1 | DT DAEMPF.-GLIED(40DB) ATTENUATOR 40DB/50 | 0912.5269.00 | | | 0294.8725.00 |
| Z2 | DT DAEMPF.-GLIED(20DB) ATTENUATOR 20DB/50 | 0912.5252.00 | | | 0294.8725.00 |
| Z3 | DT DAEMPF.-GLIED(5DB) ATTENUATION 5DB/50 | 0912.5281.00 | | | 0294.8725.00 |
| Z4 | DT DAEMPF.-GLIED(20DB) ATTENUATOR 20DB/50 | 0912.5252.00 | | | 0294.8725.00 |
| Z5 | DT DAEMPF.-GLIED(10DB) ATTENUATOR 10DB/50 | 0912.5246.00 | | | 0294.8725.00 |
| Z6 | DT DAEMPF.-GLIED(40DB) ATTENUATOR 40DB/50 | 0912.5269.00 | | | 0294.8725.00 |
| Z7 | DT ANSCHLUSSLEITUNG CONNECTION LINE | 0915.0800.00 | | | 0294.8725.00 |
| Z8 | BD UEBERSP.-SCHUTZ(SMG) OVERVOLTAGE PROTECTION | 0800.9570.00 | | | 0294.8725.00 |
| Z9 | LD PI-FILTER FILTER | 1008.5850.00 | | | 0294.8725.00 |
| Z10 | LD PI-FILTER FILTER | 1008.5850.00 | | | 0294.8725.00 |

| | | | | | | |
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ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Frequenzerweiterung 2 GHz

843.3273.02

ENGLISH MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5 Serviceanleitung "Frequenzerweiterung"

5.1 Funktionsbeschreibung

(Hierzu Stromläufe 843.3309 S (Steuerplatte), 843.3450 S (Ausgangsverstärker), 843.3550 S (Filtermodul) und Blockschaltbild 5-1).

Die von der Baugruppe "Ausgangsstufe" gelieferten HF-Signale werden im Frequenzbereich $0.1 \text{ MHz} \leq f < 1000 \text{ MHz}$ direkt und im Frequenzbereich $1000 \text{ MHz} \leq f \leq 2000 \text{ MHz}$ über das Filtermodul auf den Eingangsumschalter des Ausgangsverstärkers geschaltet. Anschließend wird das HF-Signal um 14 dB verstärkt.

Zur Pegelregelung und Amplitudenmodulation wird das Ausgangssignal detektiert und die Regelspannung herausgeführt. Die dazu erforderlichen Schaltsignale werden auf der Baugruppe "Steuerplatte" aus der seriellen Schnittstelle zum μP decodiert und gespeichert.

5.1.1 Filtermodul

Die Baugruppe enthält drei elektronisch schaltbare Bandpässe zur Unterdrückung der im Verdopplerspektrum enthaltenen Subharmonischen und höheren Harmonischen. Die Bandpässe und die vor- und nachgeschalteten Pindiodenschalter sind in Dünnschichttechnik auf Keramiksubstraten realisiert.

5.1.2 Ausgangsverstärker

Der Ausgangsverstärker enthält 6 Dünnschichtmodule A242 bis A246, A249 und die gedruckte Schaltung A248.

Die Eingänge X240 und X241 werden über den Pinumschalter A242 auf die Vorstufe A243 geschaltet. In der Treiberstufe A244 und der Endstufe A245 wird das Eingangssignal weiter verstärkt und gelangt zum Detektormodul A246. Dort wird das HF-Signal mit V502 gleichgerichtet. An der Ausgangsbuchse X242 steht die HF-Spannung mit einem Innenwiderstand von 50 Ohm zur Verfügung. Die Pindiode V500 schützt Endstufe und Detektor vor positiven Spannungsspitzen, die vom HF-Ausgang X242 in den Verstärker gelangen.

Die gedruckte Schaltung "AP-Regelung" enthält 3 Stromquellen V5, V15, V25 zur Einprägung des Kollektorstromes der HF-Transistoren in Vor-, Treiber- und Endstufe sowie 3 Regelungen V1, V10, V20 für die jeweiligen Kollektorspannungen.

Die vom Detektormodul gelieferte Gleichrichterspannung wird über N41 auf den Ausgang X243 geschaltet.

Das Dünnschichtmodul A249 enthält 2 Dioden zur Temperaturkompensation und Linearisierung der Gleichrichterspannung.

5.1.3 Steuerplatte

Die Steuerplatte enthält das μP -Interface. Die seriell ankommenden Daten werden im Baustein D10 gespeichert. Die HCMOS-Pegel werden mit N30 und N90 sowie mit den nachgeschalteten Buffertransistoren auf die erforderlichen Pegel umgesetzt.

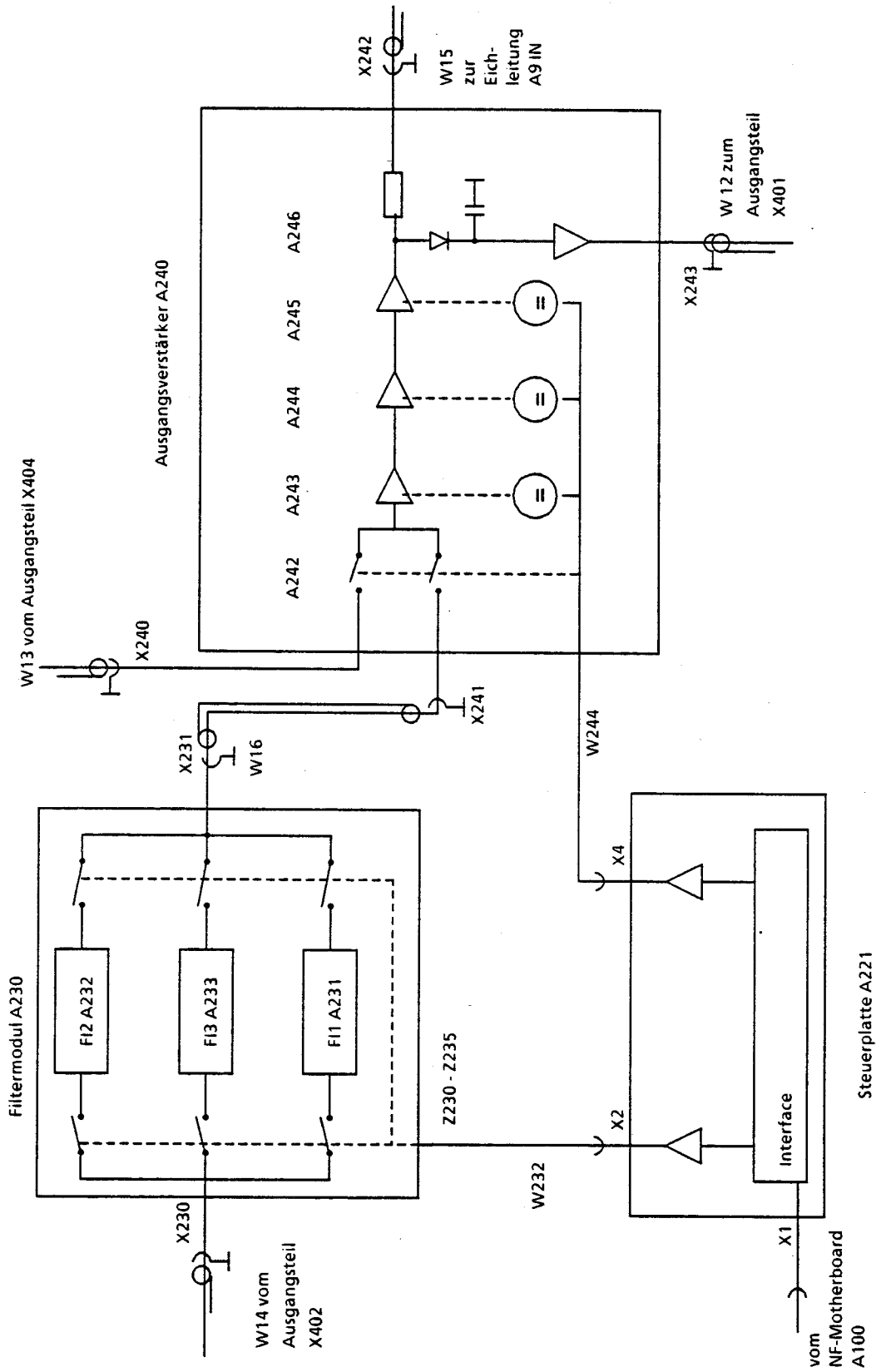


Bild 5-1 Blockschaubild der Frequenzerweiterung-2GHz

5.2 Prüfen und Abgleich

5.2.1 Pegelabgleich

Mit dem Potentiometer R30 im Ausgangsverstärker wird der Minimalpegel bei elektronischer Pegelabsenkung im Frequenzbereich $f > 8$ MHz eingestellt:

- Frequenz auf 500 MHz, Pegel auf +13 dBm einstellen.
- Spezialfunktion 53 einschalten.
- Leistungsmesser an Geräte-RF-Buchse anschließen, Pegelanzeige P_{ref} notieren oder auf relative Anzeige schalten.
- Spezialfunktion 54 einschalten. Damit wird der Generatorpegel um exakt 25 dB abgesenkt.
- Abgleich mit R30 auf einen Pegel von $P_{soll} = (P_{ref} - 25 \text{ dB}) \pm 0.5 \text{ dB}$ am Leistungsmesser.

5.2.2 Prüfen der Steuerplatte

Es sind die Schnittstellendaten nach Tabelle 5-2 in den entsprechenden Frequenzbereichen zu überprüfen:

Bezeichnungen von Frequenz- und Pegelbereichen:

Frequenzbereich FB1: $0.1 \text{ MHz} \leq f < 1000 \text{ MHz}$

Frequenzbereich FB2: $1000 \text{ MHz} \leq f \leq 1260 \text{ MHz}$

Frequenzbereich FB3: $1260 \text{ MHz} < f \leq 1590 \text{ MHz}$

Frequenzbereich FB4: $1590 \text{ MHz} < f \leq 2000 \text{ MHz}$

Pegel H: $3.5 \text{ V} \leq U \leq 5.2 \text{ V}^*)$

L: $0 \text{ V} \leq U \leq 1.5 \text{ V}^*)$

H1: $12 \text{ V} \leq U \leq 15.2 \text{ V}$

L1: $-15.2 \text{ V} \leq U \leq -12 \text{ V}$

H2: $0.7 \text{ V} \leq U \leq 1 \text{ V}$

L2: $-15.2 \text{ V} \leq U \leq -12 \text{ V}$

H: H oder L

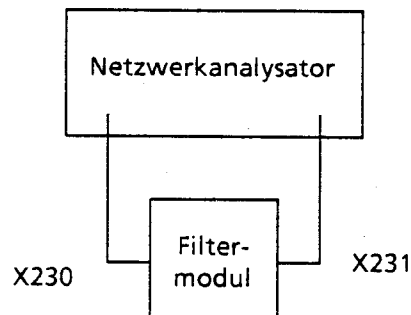
*) (HCMOS-Pegel)

Tabelle 5-2

| Meßpunkt | FB1 | FB2 | FB3 | FB4 |
|----------|-----|-----|-----|-----|
| D10/Q1 | L | H | H | H |
| D10/Q2 | H | L | L | L |
| D10/Q3 | L | H | L | L |
| D10/Q4 | L | L | H | L |
| D10/Q5 | L | L | L | H |
| D10/Q6 | X | X | X | X |
| D10/Q7 | X | X | X | X |
| D10/Q8 | X | X | X | X |
| X2.1 | H2 | H2 | L2 | H2 |
| X2.2 | H2 | H2 | H2 | L2 |
| X2.3 | H2 | L2 | H2 | H2 |
| X4.1 | H1 | L1 | L1 | L1 |
| X4.2 | L1 | H1 | H1 | H1 |

5.2.3 Prüfen des Filtermoduls

Meßanordnung:



Die Kabel W232 an X230 und W16 an X231 sind abzuschrauben. Dazu muß das Filtermodul von der Grundplatte abgeschraubt werden.

Um das zu messende Filter einzuschalten ist am Gerät eine Frequenz zwischen f_u und f_o einzustellen. Die Durchlaßkurve ist mit einem skalaren Netzwerkanalysator zu kontrollieren.

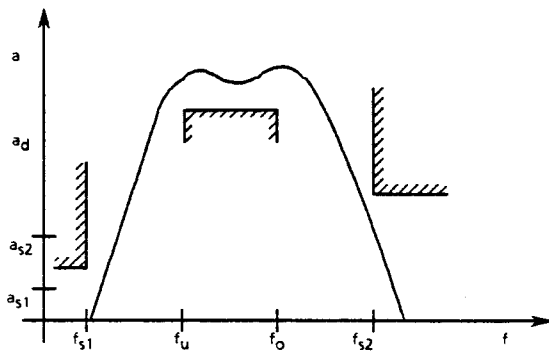


Bild 5-3 Filterdurchlaßkurve

Frequenz in MHz, Pegel in dB relativ zum Pegel an X230:

| Filter | f_{s1} | f_u | f_o | f_{s2} | a_d | a_{s1} | a_{s2} |
|--------|----------|-------|-------|----------|-------|----------|----------|
| 1 | 630 | 1000 | 1260 | 1500 | -5.5 | -35 | -27 |
| 2 | 795 | 1260 | 1590 | 1890 | -5.0 | -35 | -30 |
| 3 | 1060 | 1590 | 2000 | 2385 | -5.0 | -35 | -30 |

Die Kabel W13 an X240, W16 an X241, W15 an X242 und W12 an X243 sind abzuschrauben. Zum Lösen des Kabels W16 ist es erforderlich, den Ausgangsverstärker von der Montageplatte abzuschrauben. Die entsprechenden Schraubenpositionen sind im Bild 5-7 dargestellt.

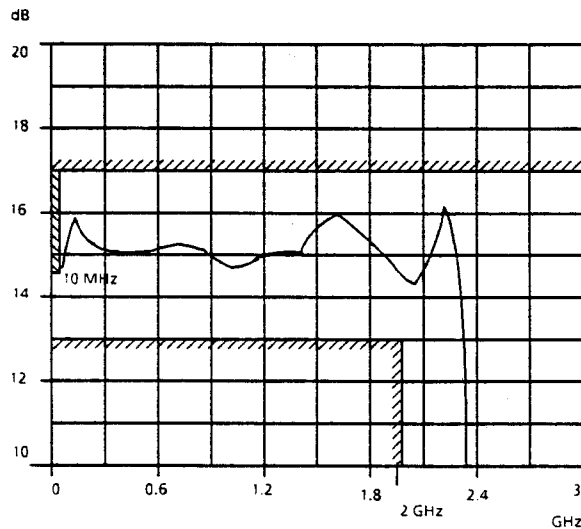


Bild 5-4 $|S_{21}|$ typische Kurve und Toleranzfeld

5.2.4 Prüfen des Ausgangsverstärkers

5.2.4.1 Prüfen des Frequenzgangs

- Eine Frequenz < 1 GHz einstellen.
- Netzwerkanalysator an den Verstärkereingang X240 und an den Ausgang X242 anschließen.
- $|S_{21}|$ und $|S_{11}|$ nach Bild 5-4 und 5-5 prüfen.
- Eine Frequenz > 1 GHz einstellen.
- Messung mit Eingang X241 wiederholen.

Meßanordnung:

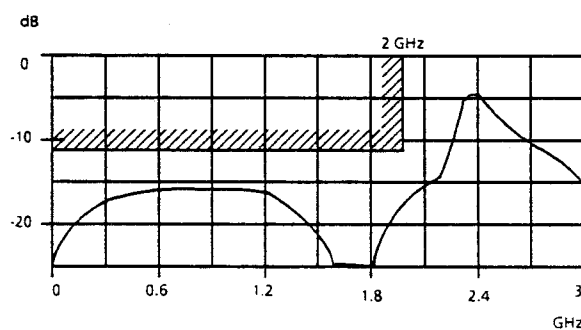
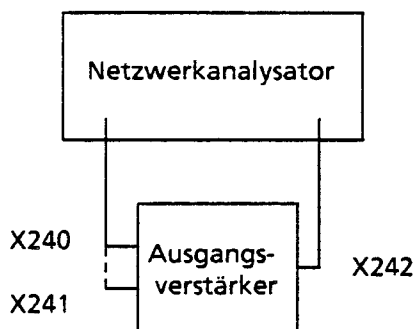


Bild 5-5 $|S_{11}|$ typische Kurve und Toleranzfeld

5.2.4.2 Prüfen des Oberwellenabstands

- Spektrumanalysator an die Geräte-RF-Buchse anschließen. Pegel auf + 13 dBm stellen.
- Grundwellenpegel kontrollieren. Im Frequenzbereich $0.1 \text{ MHz} \leq f \leq 2 \text{ GHz}$ müssen die Oberwellen k_2 und k_3 einen Abstand $> 30 \text{ dBc}$ haben.

5.2.4.3 Prüfen der Gleichrichterlinearität

Hinweis: Bei offener AM-Regelschleife, z.B. durch Abschrauben des Kabels vom Ausgang X243, kann am Verstärker- ausgang X242 ein HF-Pegel bis zu +23 dBm auftreten!

- Meßadapter, z.B. T-Stück, am Ausgang X243 anbringen, Kabelverbindung wiederherstellen, DC-Voltmeter an Meßadapter anschließen.
- Frequenz auf 10 MHz stellen.
- Pegel auf + 13 dBm einstellen, Spezialfunktion 1 einschalten, Pegel auf Werte nach Tabelle 5-6 einstellen und Spannungswert der Gleichrichtspannung prüfen. (Spezialfunktion 1 = unterbrechungsfreie Pegel-einstellung)

Tabelle 5-6

| Pegeleinstellung | Gleichspannung an X243 |
|------------------|---|
| + 13 dBm | $3.0 \text{ V} \leq U_{13} \leq 3.4 \text{ V}$ |
| + 7 dBm | $0.49 \cdot U_{13} \leq U \leq 0.51 \cdot U_{13}$ |
| - 7 dBm | $0.09 \cdot U_{13} \leq U \leq 0.11 \cdot U_{13}$ |

5.2.4.4 Prüfen des Gleichrichtfrequenzgangs

- HF-Leistungsmesser an Geräte-RF-Buchse anschließen.
- Frequenz auf 100 MHz, Pegel auf + 13.0 dBm einstellen.
- Im Frequenzbereich $8 \text{ MHz} \leq f \leq 2 \text{ GHz}$ darf der am Leistungsmesser gemessene Pegel um max. $\pm 0.5 \text{ dB}$ von + 13 dBm abweichen.

5.3 Fehlersuche

Gerätefehler, deren Ursache in der "Frequenzerweiterung" liegen kann, sind z.B.:

- kein Ausgangspegel bei $f > 1$ GHz: Filtermodul, Pinschalter
- kein Ausgangspegel: Verstärkerstufen, Detektor
- falscher Ausgangspegel: Detektor, AP-Regelung
- unzureichender Nebenwellenabstand: Filtermodul, Pinumschalter
- unzureichender Oberwellenabstand: Verstärkerstufen, AP-Regelung
- zu hohes Breitbandrauschen: Verstärkerstufen
- schlechte AM-Eigenschaften: Kompensationsdioden, AP-Regelung

Zuerst sind die Schnittstellendaten der Steuerplatte zu prüfen.

5.3.1 Steuerplatte

Kabel an X2 und X4 abziehen, Leerlaufspannungen an den Komparatorausgängen prüfen.

| Pin | Name | Zustand | Leerlaufspannung |
|------|-----------|--------------------------|---|
| X2.1 | FI2ON-12N | D10/Q4 = L D10/Q4 = H | $12\text{ V} < U$ $U < -11\text{ V}$ |
| X2.2 | FI3ON-12N | D10/Q5 = L D10/Q5 = H | $12\text{ V} < U$ $U < -11\text{ V}$ |
| X2.3 | FI1ON-12N | D10/Q3 = L D10/Q3 = H | $12\text{ V} < U$ $U < -11\text{ V}$ |
| X4.1 | HF1ON-15P | D10/Q2 = H D10/Q2 = L | $12\text{ V} < U$ $U < -12\text{ V}$ |
| X4.2 | HF1ON-15N | D10/Q1 = H D10/Q1 = L | $12\text{ V} < U$ $U < -12\text{ V}$ |

5.3.2 Filtermodul

HF-Eigenschaften nach 5.2.3 prüfen. Bei den Betriebszuständen Filter1-ON, Filter2-ON und Filter 3-ON müssen folgende Spannungswerte am Kabel W232 zu messen sein:

H entspricht einem Bereich von $0.7\text{ V} \leq U \leq 1\text{ V}$
 L entspricht einem Bereich von $-15.2\text{ V} \leq U \leq -12\text{ V}$

| Pin | Filter1-ON | Filter2-ON | Filter3-ON |
|--------|------------|------------|------------|
| W232/1 | H | L | H |
| W232/2 | H | H | L |
| W232/3 | L | H | H |

5.3.3 Ausgangsverstärker

Frequenz auf 100 kHz stellen, Eingang X240 mit 50 Ohm abschließen, Deckel abschrauben, Spannungen an den Durchführungsfiltern prüfen:

| | |
|--------------|--|
| 06, 08, 010: | $3\text{ V} \leq U \leq 8\text{ V}$ |
| 07, 09: | $12.7\text{ V} \leq U \leq 13.1\text{ V}$ |
| 011: | $19\text{ V} \leq U \leq 20\text{ V}$ |
| 012: | $-30\text{ mV} \leq U \leq 150\text{ mV}$ |
| 013: | $-250\text{ mV} \leq U \leq -50\text{ mV}$ |
| 016: | $12\text{ V} \leq U \leq 15.2\text{ V}$ |
| 017: | $-15.2\text{ V} \leq U \leq -12\text{ V}$ |

Die Spannung an der Verbindung Pinumschalter-Vorstufe beträgt $-4\text{ V} \leq U \leq -3.5\text{ V}$ unabhängig von der Schaltererstellung.

Die Übertragungskette von X241 bis X243 kann z.B. mit einem HF-Voltmeter oder einem Oszilloskop getestet werden.

Bei $f = 100\text{ kHz}$ gelten folgende Betriebsspannungsverstärkungen der Einzelstufen, wenn X243 mit 50 Ohm abgeschlossen ist:

| | |
|----------------|-----------|
| Pinumschalter: | $v = 0.8$ |
| Vorstufe: | $v = 4$ |
| Treiberstufe: | $v = 3$ |
| Endstufe: | $v = 1$ |
| Detektor: | $v = 0.5$ |

5.3.4 HF-Pegel bei offener AM-Regelschleife

Löst man die Verbindung W12 an X243 am Ausgangsverstärker, erhält man den maximalen HF-Pegel, der vom Ausgangsteil über die Kabel W13 für $f < 1\text{ GHz}$ und W14 für $f \geq 1\text{ GHz}$ geliefert wird:

| Meßstelle | HF-Pegel an 50 Ohm | |
|-----------|------------------------|---------------------------|
| | für $f < 1\text{ GHz}$ | für $f \geq 1\text{ GHz}$ |
| X240 | 5 ... 10 dBm | - |
| X230 | - | 5 ... 10 dBm |
| X231 | - | 2 ... 7 dBm |
| X241 | - | 2 ... 7 dBm |
| X242 | 18 ... 23 dBm | 15 ... 23 dBm |

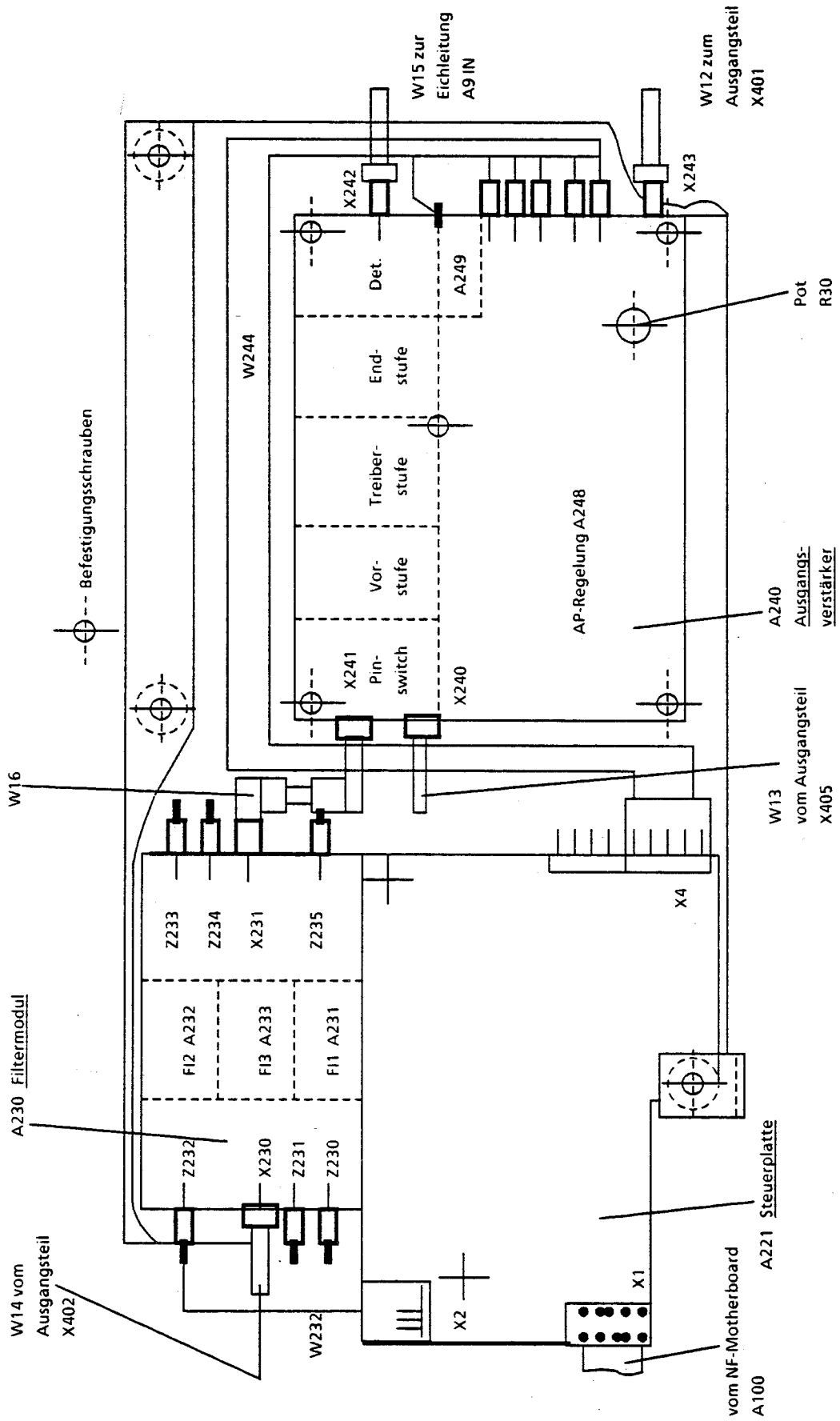


Bild 5-7 Lageplan der Baugruppen der Frequenzerweiterung 2 GHz



ROHDE & SCHWARZ

SERVICE DOCUMENTS

Frequency Extension 2 GHz

843.3273.02

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5 Service Manual for Frequency Extension

5.1 Function Description

(See circuit diagrams 843.3309 S (control board), 843.3450 S (output amplifier), 843.3550 S (filter module) and block diagram 5-1).

The RF signals coming from the output stage module are directly applied to the input switch of output amplifier in the frequency range $0.1 \text{ MHz} \leq f < 1000 \text{ MHz}$ and via filter module in the frequency range $1000 \text{ MHz} \leq f \leq 2000 \text{ MHz}$. Subsequently, the RF signal is amplified by 14 dB.

For level control and amplitude modulation, the output signal is rectified and the control voltage taken out. On the control board, the switching signals required for this purpose are decoded from the serial interface to the microprocessor and stored.

5.1.1 Filter Module

The module contains three electronically switchable bandpass filters for suppression of the subharmonics and high-order harmonics contained in the doubler spectrum. The bandpass filters and the preceding and subsequent pin diode switches are implemented on ceramic substrates using thin-film technology.

5.1.2 Output Amplifier

The output amplifier contains 6 thin-film modules A242 to A246, A249 and the PCB A248.

The inputs X240 and X241 are connected to the preamplifier stage A243 via pin switch A242. The input signal is further amplified in driver stage A244 and final stage A245 and taken to detector module A246. There, the RF signal is rectified with V502. The RF voltage is available at output socket X242 with an internal resistance of 50Ω . Pin diode V500 protects the final stage and the detector from positive voltage peaks which enter the amplifier from the RF output X242.

The "operating point control" board contains 3 current sources V5, V15, V25 for impressing the collector current of the RF transistors in preamplifier, driver and final stage, as well as V1, V10, V20 for controlling the respective collector voltages.

The rectified voltage coming from the detector module is applied to output X243 via N41.

The thin-film module A249 contains 2 diodes for temperature compensation and linearization of the rectified voltage.

5.1.3 Control Board

The control board contains the microprocessor interface. The serially incoming data are stored in D10. The HCMOS levels are converted to the required levels using N30 and N90 as well as the subsequent buffer transistors.

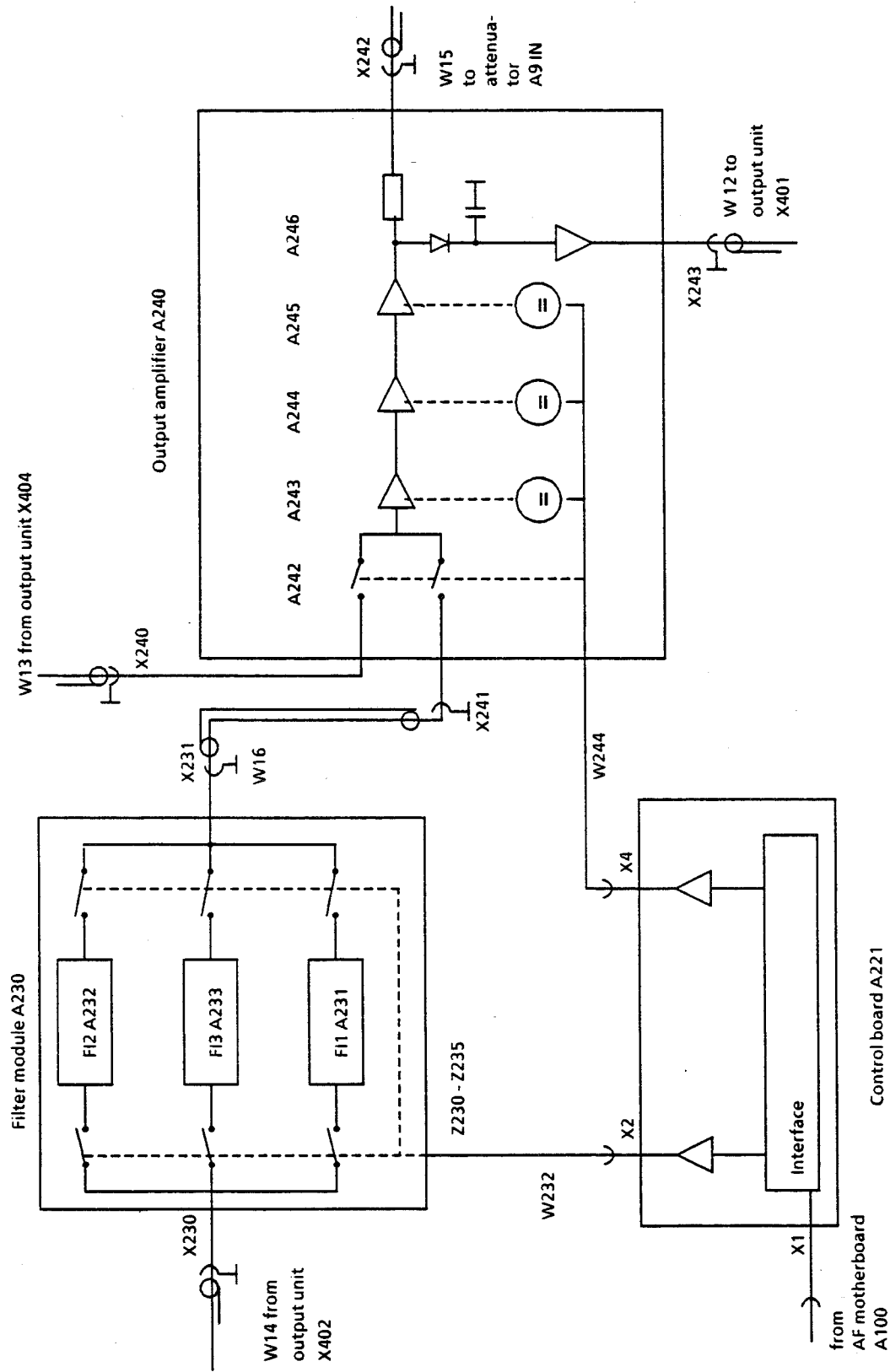


Fig. 5-1 Block diagram of frequency extension 2GHz

5.2 Checking and Adjustment

5.2.1 Level Adjustment

Using potentiometer R30 in the output amplifier, the minimum level is set in the frequency range $f > 8$ MHz with electronic level reduction:

- Set frequency to 500 MHz, level to + 13 dBm.
- Switch on special function 53.
- Connect power meter to RF socket, note level display P_{ref} or switch to relative display.
- Switch on special function 54. This reduces the generator level by exactly 25 dB.
- Use R30 to adjust to a level of $P_{nom} = (P_{ref} - 25 \text{ dB}) \pm 0.5 \text{ dB}$ on the power meter.

5.2.2 Checking the Control Board

Check the interface data according to Table 5-2 in the respective frequency ranges:

Frequency and level range designations:

Frequency range FB1: $0.1 \text{ MHz} \leq f < 1000 \text{ MHz}$

Frequency range FB2: $1000 \text{ MHz} \leq f \leq 1260 \text{ MHz}$

Frequency range FB3: $1260 \text{ MHz} < f \leq 1590 \text{ MHz}$

Frequency range FB4: $1590 \text{ MHz} < f \leq 2000 \text{ MHz}$

Level H: $3.5 \text{ V} \leq V \leq 5.2 \text{ V}^*)$

L: $0 \text{ V} \leq V \leq 1.5 \text{ V}^*)$

H1: $12 \text{ V} \leq V \leq 15.2 \text{ V}$

L1: $-15.2 \text{ V} \leq V \leq -12 \text{ V}$

H2: $0.7 \text{ V} \leq V \leq 1 \text{ V}$

L2: $-15.2 \text{ V} \leq V \leq -12 \text{ V}$

X: H or L

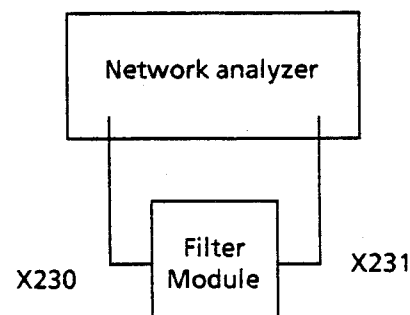
*) HCMOS level)

Table 5-2

| Test point | FB1 | FB2 | FB3 | FB4 |
|------------|-----|-----|-----|-----|
| D10/Q1 | L | H | H | H |
| D10/Q2 | H | L | L | L |
| D10/Q3 | L | H | L | L |
| D10/Q4 | L | L | H | L |
| D10/Q5 | L | L | L | H |
| D10/Q6 | X | X | X | X |
| D10/Q7 | X | X | X | X |
| D10/Q8 | X | X | X | X |
| X2.1 | H2 | H2 | L2 | H2 |
| X2.2 | H2 | H2 | H2 | L2 |
| X2.3 | H2 | L2 | H2 | H2 |
| X4.1 | H1 | L1 | L1 | L1 |
| X4.2 | L1 | H1 | H1 | H1 |

5.2.3 Checking the Filter Module

Test setup:



Unscrew cables W232 at X230 and W16 at X231. For this purpose, the filter module must be unscrewed from the mounting plate.

In order to switch on the filter to be measured, set a frequency between f_u and f_o on the instrument. Check the passband curve using a scalar network analyzer.

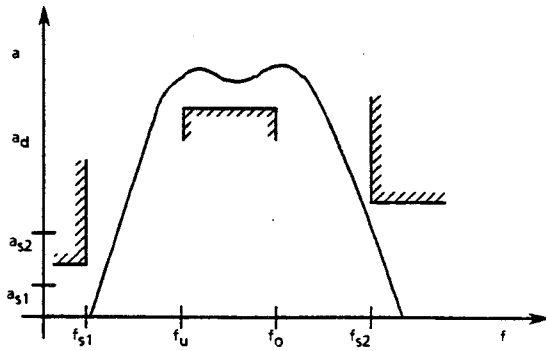


Fig. 5-3 Filter passband curve

Frequency in MHz, level in dB relative to level at X230:

| Filter | f_{s1} | f_u | f_o | f_{s2} | a_d | a_{s1} | a_{s2} |
|--------|----------|-------|-------|----------|-------|----------|----------|
| 1 | 630 | 1000 | 1260 | 1500 | -5.5 | -35 | -27 |
| 2 | 795 | 1260 | 1590 | 1890 | -5.0 | -35 | -30 |
| 3 | 1060 | 1590 | 2000 | 2385 | -5.0 | -35 | -30 |

Unscrew cables W13 at X240, W16 at X241, W15 at X242 and W12 at X243. In order to loosen cable W16, the output amplifier must be unscrewed from the mounting plate. The locations of the screws are shown in Fig. 5-7.

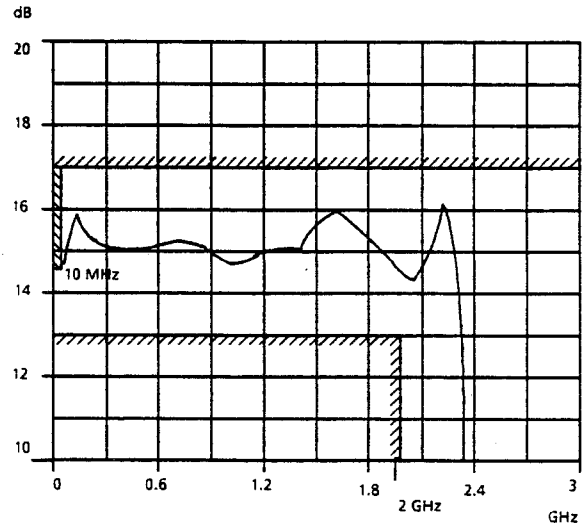


Fig. 5-4 $|S_{21}|$ Typical curve and tolerance field

5.2.4 Checking the Output Amplifier

5.2.4.1 Checking the Frequency Response

- Set a frequency < 1 GHz.
- Connect network analyzer to amplifier input X240 and output X242.
- Check $|S_{21}|$ and $|S_{11}|$ according to Figs. 5-4 and 5-5.
- Set a frequency > 1 GHz.
- Repeat the measurement for input X241.

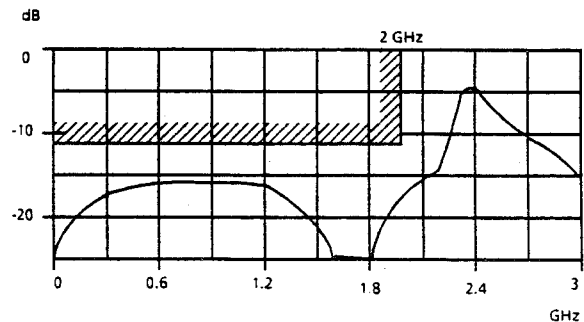
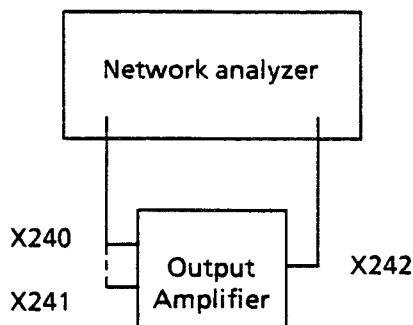


Fig. 5-5 $|S_{11}|$ Typical curve and tolerance field

Test setup:



5.2.4.2 Checking the Harmonic Suppression

- Connect spectrum analyzer to RF socket. Set level to +13 dBm.
- Check level of fundamental. The harmonics d2 and d3 must be spaced >30 dBc apart in the frequency range $0.1 \text{ MHz} \leq f \leq 2 \text{ GHz}$.

5.2.4.3 Checking the Rectifier Linearity

Note: If the AM control loop is open, e.g. after unscrewing the cable at output X243, an RF level of up to +23 dBm may occur at amplifier output X242!

- Attach test adapter, e.g. T-piece, to output X243. Reconnect the cable, connect DC voltmeter to test adapter.
- Set frequency to 10 MHz.
- Set level to +13 dBm, switch on special function 1, set level to values specified in Table 5-6 and check value of rectified voltage. (Special function 1 = non-interrupting level setting)

Table 5-6

| Level setting | DC voltage at X243 |
|---------------|--|
| +13 dBm | $3.0 \text{ V} \leq V_{13} \leq 3.4 \text{ V}$ |
| +7 dBm | $0.49 * V_{13} \leq V \leq 0.51 * V_{13}$ |
| -7 dBm | $0.09 * V_{13} \leq V \leq 0.11 * V_{13}$ |

5.2.4.4 Checking the Rectifier Frequency Response

- Connect RF power meter to RF socket.
- Set frequency to 100 MHz and level to +13.0 dBm.
- The level measured using the power meter must not deviate by more than $\pm 0.5 \text{ dB}$ from +13 dBm.

5.3 Troubleshooting

Instrument errors that may originate from the frequency extension:

- No output level at $f > 1$ GHz: Filter module, pin switch
- No output level: Amplifier stages, detector
- Wrong output level: Detector, operating point control
- Insufficient spurious frequency suppression: Filter module, pin switch
- Insufficient harmonic suppression: Amplifier stages, operating point control
- Excessive broadband noise: Amplifier stages
- Poor AM characteristics: Balancing diodes, operating point control

The interface data of the control board must be checked first.

5.3.1 Control Board

Remove cables from X2 and X4. Check open-circuit voltages at comparator outputs.

| Pin | Name | Status | Open-circuit voltage |
|------|-----------|--------------------------|---|
| X2.1 | FI2ON-12N | D10/Q4 = L D10/Q4 = H | $12\text{ V} < V$ $V < -11\text{ V}$ |
| X2.2 | FI3ON-12N | D10/Q5 = L D10/Q5 = H | $12\text{ V} < V$ $V < -11\text{ V}$ |
| X2.3 | FI1ON-12N | D10/Q3 = L D10/Q3 = H | $12\text{ V} < V$ $V < -11\text{ V}$ |
| X4.1 | HF1ON-15P | D10/Q2 = H D10/Q2 = L | $12\text{ V} < V$ $V < -12\text{ V}$ |
| X4.2 | HF1ON-15N | D10/Q1 = H D10/Q1 = L | $12\text{ V} < V$ $V < -12\text{ V}$ |

5.3.2 Filter Module

Check the RF characteristics according to section 5.2.3. In the operating modes Filter1-ON, Filter2-ON and Filter3-ON, the following voltage values must be measured on cable W232:

H corresponds to the range $0.7\text{ V} \leq V \leq 1\text{ V}$
 L corresponds to the range $-15.2\text{ V} \leq V \leq -12\text{ V}$

| Pin | Filter1-ON | Filter2-ON | Filter3-ON |
|--------|------------|------------|------------|
| W232/1 | H | L | H |
| W232/2 | H | H | L |
| W232/3 | L | H | H |

5.3.3 Output Amplifier

Set the frequency to 100 kHz, terminate input X240 with 50 Ω , unscrew the cover, check the voltages at the lead-through filters:

06, 08, 010: $3\text{ V} \leq V \leq 8\text{ V}$
 07, 09: $12.7\text{ V} \leq V \leq 13.1\text{ V}$
 011: $19\text{ V} \leq V \leq 20\text{ V}$
 012: $-30\text{ mV} \leq V \leq 150\text{ mV}$
 013: $-250\text{ mV} \leq V \leq -50\text{ mV}$
 016: $12\text{ V} \leq V \leq 15.2\text{ V}$
 017: $-15.2\text{ V} \leq V \leq -12\text{ V}$

The voltage at the connection between pin switch and preamplifier stage is $-4\text{ V} \leq V \leq -3.5\text{ V}$, independent of the switch position.

The transmission path from X241 to X243 can be checked e.g. using an RF voltmeter or an oscilloscope.

If X243 is terminated with 50 Ω , the operating voltage gains of the individual stages at $f = 100\text{ kHz}$ are as follows:

Pin switch: $g = 0.8$
 Preamplifier stage: $g = 4$
 Driver stage: $g = 3$
 Final stage: $g = 1$
 Detector: $g = 0.5$

5.3.4 RF Level with Open AM Control Loop

By loosening the connection W12 at X243 on the output amplifier, the maximum RF level is obtained which is delivered by the output section via cable W13 for $f < 1\text{ GHz}$ and W14 for $f \geq 1\text{ GHz}$:

| Test point | RF level into 50 Ω | |
|------------|---------------------------|---------------------------|
| | for $f < 1\text{ GHz}$ | for $f \geq 1\text{ GHz}$ |
| X240 | 5 to 10 dBm | - |
| X230 | - | 5 to 10 dBm |
| X231 | - | 2 to 7 dBm |
| X241 | - | 2 to 7 dBm |
| X242 | 18 to 23 dBm | 15 to 23 dBm |

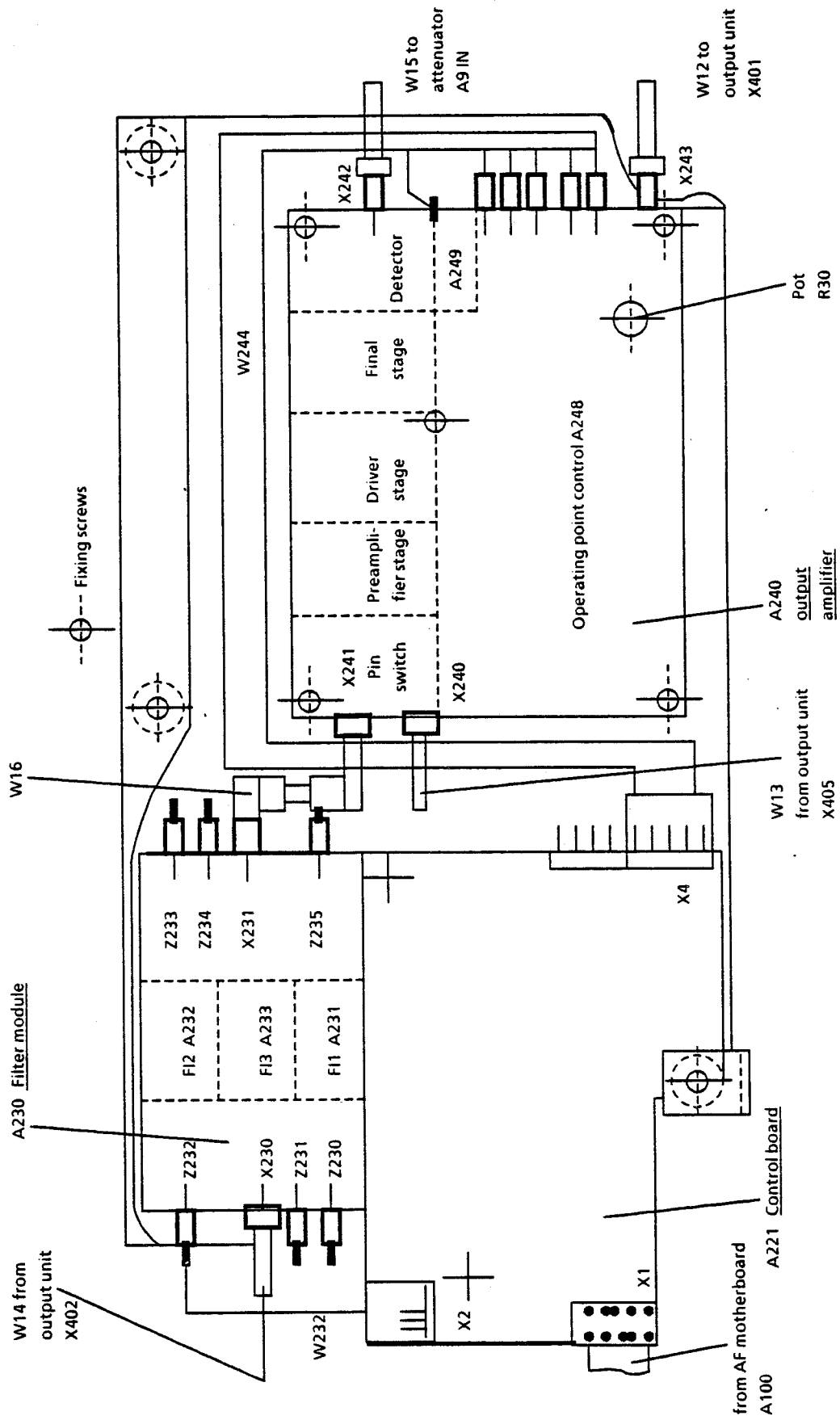


Fig. 5-7 Layoutplan of modules of frequency extension 2GHz



ROHDE & SCHWARZ

Schaltteillisten

Stromläufe

Bestückungspläne

Part lists

Circuit diagrams


Components plans

Listes des pièces détachées

Schémas de Circuit

Plans des composants


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in | |
|--|---|-------------------------|---------------------------------------|---------------------------------------|------------------------------|-------------------|
| A221 | ED STEUERPLATTE CONTROL BOARD | 0843.3309.02 | | | | |
| A230 | BD FILTERMODUL FILTERMODULE | 0843.3550.02 | | | | |
| A240 | BD AUSGANGS-VERSTAERKER OUTPUT AMPLIFIER | 0843.3450.02 | | | | |
| W16 | DW HF-KABEL RF-CABLE | 0843.3415.00 | | | | |
| MEZ15 | 790 3PLU | ÄI | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  ROHDE & SCHWARZ | 04 | 03.05.99 | ZE ERWEITERUNG-2GHZ EXTENSION-2GHZ | 0843.3273.01 SA | 1- | |

095.0026-0693


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| C10 | CK 10NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2869.00 | ROEDERSTEI | MKT 1826-310-014W | |
| C30 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C31 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C32 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C33 | CK 10NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2869.00 | ROEDERSTEI | MKT 1826-310-014W | |
| C40 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C60 | CK 10NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2869.00 | ROEDERSTEI | MKT 1826-310-014W | |
| C61 | CK 10NF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2869.00 | ROEDERSTEI | MKT 1826-310-014W | |
| D10 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| N30 | BO MC1558JG 2X OPAMP OPERATIONAL AMPLIFIER | BO 0275.0816.00 | TEXAS | MC1558JG | |
| N90 | BO LM124J 4XLP OPAMP OPERATIONAL AMPLIFIER | 0300.6353.00 | NSC | LM124J | |
| R10 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R11 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R30 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | |
| R31 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | |
| R32 | RL 0,60W 2,43KOHM+-1%TK50 RESISTOR | RL 0083.0884.00 | RESISTA | MK2 | |
| R40 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R41 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R60 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R70 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R80 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| V30 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V31 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | |
| V40 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V41 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | |
| V60 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V61 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | |
| V62 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V70 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V71 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | |
| V72 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V80 | AK BCY59IX N 45V 200MA TRANSISTOR | AK 0010.5163.00 | VALVO | BCY59IX | |
| V81 | AK BCY79IX P 45V 200MA TRANSISTOR | AK 0010.3777.00 | VALVO | BCY79IX | |
| V82 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| X1 | DY BUCHSENEINHEIT CONNECTOR UNIT | 0843.3396.00 | | | |
| X2 | FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR | FP 0243.3578.00 | BERG_ELEKT | 75168-113-36 | |

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|---|----------|----|------------|------------------------------------|------------------------|----------------|
| MEZ15 | 790 3PLU | ÄI | Datum Date | Schalttailliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | | 04 | 03.05.99 | ED STEUERPLATTE CONTROL BOARD | 0843.3309.01 SA | 1+ |


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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in | |
|--|--|-------------------------|----------------------------------|---------------------------------------|------------------------------|-------------------|
| X4 | 4-POLIG FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 7-POLIG | FP 0243.3578.00 | BERG_ELEKT | 75168-113-36 | | |
| MEZ15 | 790 3PLU | ÄI | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  ROHDE & SCHWARZ | 04 | 03.05.99 | ED STEUERPLATTE CONTROL BOARD | 0843.3309.01 SA | 2- | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in | |
|---|---|-------------------------|----------------------------|---|------------------------------|-------------------|
| A241 | DT E.-SUBST.O,63X17,4X4,0 DUENNSCHICHT SPEZIAL-TEIL THINFILM SPECIAL-PART ZUEGH.STROML./CIRC.DIAGRAM 843.3450 S | 0843.3844.00 | | | | |
| A242 | BD PIN-SCHALTER PIN-SWITCH DUENNSCHICHT SPEZIAL-TEIL THINFILM SPECIAL-PART ZUEGH.STROML./CIRC.DIAGRAM 843.3450 S | 0843.3638.02 | | | | |
| A243 | BD VORSTUFE PRE-AMPLIFIER DUENNSCHICHT SPEZIAL-TEIL THINFILM SPECIAL-PART ZUEGH STROML./CIRC.DIAGRAM 843.3450 S | 0843.3609.02 | | | | |
| A244 | BD TREIBER DRIVER DUENNSCHICHT SPEZIAL-TEIL THINFILM SPECIAL-PART ZUEGH.STROML./CIRC.DIAGRAM 843.3450 S | 0843.3644.02 | | | | |
| A245 | BD ENDSTUFE POWER AMPLIFIER DUENNSCHICHT SPEZIAL-TEIL THINFILM SPECIAL-PART ZUEGH.STROML./CIRC.DIAGRAM 843.3450 S | 0843.3615.02 | | | | |
| A246 | BD DETEKTOR(SMH) DETECTOR DUENNSCHICHT SPEZIAL-TEIL THINFILM SPECIAL-PART ZUEGH.STROML./CIRC.DIAGRAM 843.3450 S | 0843.3596.02 | | | | |
| A247 | DT E.-SUBSTR.O,63X4,1X3,9 DUENNSCHICHT SPEZIAL-TEIL THINFILM SPECIAL-PART ZUEGH.STROML./CIRC.DIAGRAM 843.3450 S | 0920.0204.00 | | | | |
| A248 | ED AP-REGELUNG WP-CONTROL ZUEGH.STROML./CIRC.DIAGRAM 843.3450 S | 0843.3350.02 | | | | |
| A249 | BD KOMP.-DIODEN(SMH) COMPENSATION DIODES DUENNSCHICHT SPEZIAL-TEIL THINFILM SPEC.PART ZUEGH.STROML./CIRC.DIAGR. 843.3450 S | 0843.4105.02 | | | 0843.3350.01 | |
| C1 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | 0843.3350.01 | |
| C5 | CE 1,0UF+-20%50V 4X 8TA ELECTROLYTIC CAPACITOR | CE 0006.3001.00 | SPRAGUE | 150D105X0050A2 | 0843.3350.01 | |
| C10 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | 0843.3350.01 | |
| C15 | CE 1,0UF+-20%50V 4X 8TA ELECTROLYTIC CAPACITOR | CE 0006.3001.00 | SPRAGUE | 150D105X0050A2 | 0843.3350.01 | |
| C20 | CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8521.00 | MURATA | GRM42-6X7R103K 50PT | 0843.3350.01 | |
| C25 | CE 1,0UF+-20%50V 4X 8TA ELECTROLYTIC CAPACITOR | CE 0006.3001.00 | SPRAGUE | 150D105X0050A2 | 0843.3350.01 | |
| C30 | CE 1,0UF+-20%50V 4X 8TA ELECTROLYTIC CAPACITOR | CE 0006.3001.00 | SPRAGUE | 150D105X0050A2 | 0843.3350.01 | |
| C32 | CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR | CC 0099.8438.00 | MURATA | GRM42-6 X7R 102 K50 | 0843.3350.01 | |
| C41 | CC 22PF+-1%50V NPO 1206 CERAMIC CHIP CAPACITOR | CC 0099.8396.00 | MURATA | GRM42-6COG 220F50ZPT | 0843.3350.01 | |
| C50 | CE 2,2UF+-20%50V RD4X5 ELEKTROLYTIC CAPACITOR NUR VAR/ONLY MOD: 04 | 0803.0944.00 | NAT_PANASO | ECE-A1HKS-2R2 | | |
| C100 | CE 1UF+-10%35V TANTALUM SMD-CAPACITOR | 0843.3221.00 | SPRAGUE | 195D 105 X9 035 D2 | 0843.3638.01 | |
| C101 | CC 10NF+-10% 50V HDK 0504 CAPACITOR | 0093.2180.00 | TEKELEC | 630 R11 X 103 KP | 0843.3638.01 | |
| C200 | CE 1UF+-10%35V TANTALUM SMD-CAPACITOR | 0843.3221.00 | SPRAGUE | 195D 105 X9 035 D2 | 0843.3609.01 | |
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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| C201 | CC 3,3PFO,25PF NPO 0805 CERAMIC CHIP CAPACITOR | CC 0099.8273.00 | PHILIPS_CO | 2222 861 12338 | 0843.3609.01 |
| C202 | CE 1UF+-10%35V TANTALUM SMD-CAPACITOR | 0843.3221.00 | SPRAGUE | 195D 105 X9 035 D2 | 0843.3609.01 |
| C203 | CE 1UF+-10%35V TANTALUM SMD-CAPACITOR | 0843.3221.00 | SPRAGUE | 195D 105 X9 035 D2 | 0843.3609.01 |
| C300 | CC 100PF+-10%50V NPO 0504 CAPACITOR | 0093.2144.00 | TEKELEC | 101 R11N 101 KP | 0843.3644.01 |
| C301 | CC 5,1PFO,25PF50V NPO0504 CAPACITOR | 0093.3663.00 | TEKELEC | 101R11N(L)5R1CP | 0843.3644.01 |
| C302 | CC 5,1PFO,25PF50V NPO0504 CAPACITOR | 0093.3663.00 | TEKELEC | 101R11N(L)5R1CP | 0843.3644.01 |
| C303 | CC 4,3PFO,25PF NPO 0805 CAPACITOR | CC 0093.5643.00 | MURATA | GRM40COG4R3C50PT | 0843.3644.01 |
| C304 | CC 18NF+-10% X7R 0805 CERAMIC CHIP CAPACITOR | CC 0099.8380.00 | VITRAMON | VJ0805Y183KXAT | 0843.3644.01 |
| C305 | CE 1UF+-10%35V TANTALUM SMD-CAPACITOR | 0843.3221.00 | SPRAGUE | 195D 105 X9 035 D2 | 0843.3644.01 |
| C400 | CC 47PF+-10%50V NPO 0504 CAPACITOR | 0093.2121.00 | TEKELEC | 101 R11 N 470 KP | 0843.3615.01 |
| C401 | CC 2,0PF+-10%50V NPO 0504 CAPACITOR | 0093.3686.00 | TEKELEC | 101 R11N 2ROC P | 0843.3615.01 |
| C402 | CC 4,3PFO,25PF NPO 0805 CAPACITOR | CC 0093.5643.00 | MURATA | GRM40COG4R3C50PT | 0843.3615.01 |
| C403 | CC 18NF+-10% X7R 0805 CERAMIC CHIP CAPACITOR | CC 0099.8380.00 | VITRAMON | VJ0805Y183KXAT | 0843.3615.01 |
| C404 | CE 680 NF+-10%50V TA-CHIP TANTALUM CHIP CAPACITOR | 0803.1092.00 | SPRAGUE | 195 D 684 X 9050 D2 | 0843.3615.01 |
| C405 | CE 680 NF+-10%50V TA-CHIP TANTALUM CHIP CAPACITOR | 0803.1092.00 | SPRAGUE | 195 D 684 X 9050 D2 | 0843.3615.01 |
| C500 | CC 1NF+-10%50V1KHDK 0504 CAPACITOR | 0093.2215.00 | TEKELEC | 630 R11W 102 KP | 0843.3596.01 |
| C501 | CX 100PF+-20%100VTK50 CHIP MIS CAPACITOR | 0093.4460.00 | ALPHA_IND | SC 9103-479 | 0843.3596.01 |
| C504 | CC 15PF+-5%50V NPO 0504 CAPACITOR | 0093.2721.00 | TEKELEC | 101 R11 N 150 JP | 0843.3596.01 |
| L100 | LD FERRITSPULE COIL | 0843.3944.00 | | | 0843.3638.01 |
| L101 | LD FERRITSPULE COIL | 0843.3944.00 | | | 0843.3638.01 |
| L102 | LD FERRITSPULE COIL | 0843.3944.00 | | | 0843.3638.01 |
| L200 ..202 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3609.01 |
| L203 | LD 330 UH 10% 10R2 0,1A CHOKE | 0249.8888.00 | JAHRE | 71.20-3300K | 0843.3609.01 |
| L204 | LD FERRITSPULE COIL | 0843.3944.00 | | | 0843.3609.01 |
| L205 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3609.01 |
| L300 ..303 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3644.01 |
| L304 | LD FERRITSPULE COIL | 0843.3944.00 | | | 0843.3644.01 |
| L305 | LD 330 UH 10% 10R2 0,1A CHOKE | 0249.8888.00 | JAHRE | 71.20-3300K | 0843.3644.01 |
| L400 ..402 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3615.01 |
| L403 | LD FERRITSPULE COIL | 0843.3944.00 | | | 0843.3615.01 |
| L404 | LD 330 UH 10% 10R2 0,1A CHOKE | 0249.8888.00 | JAHRE | 71.20-3300K | 0843.3615.01 |
| L510 | LD 100UH 10% 0,06A 1210 SMD-INDUCTOR | LD 0007.9261.00 | SIEMENS | B82422-A1104-J(K)100 | 0843.3596.01 |
| N32 | BO MC1558JG 2X OPAMP OPERATIONAL AMPLIFIER | BO 0275.0816.00 | TEXAS | MC1558JG | 0843.3350.01 |
| N41 | BO LF156J FET OPAMP OPERATIONAL AMPLIFIER | BO 0645.7251.00 | ANALOG_DEV | PM156Z | 0843.3350.01 |
| 0203 | VL GLASDURCHF. 18 X 4 FEED-THROUGH | VL 0062.7080.00 | ELECTROVAC | A2.311.100*450-*0 | 0843.3609.01 |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| 0303 | VL GLASDURCHF. 18 X 4 FEED-THROUGH | VL 0062.7080.00 | ELECTROVAC | A2.311.100*450-*0 | 0843.3644.01 |
| 0403 | VL GLASDURCHF. 18 X 4 FEED-THROUGH | VL 0062.7080.00 | ELECTROVAC | A2.311.100*450-*0 | 0843.3615.01 |
| 0505 | VL GLASDURCHF. 18 X 4 FEED-THROUGH | VL 0062.7080.00 | ELECTROVAC | A2.311.100*450-*0 | 0843.3596.01 |
| R1 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R2 | RL 0,60W 39,2KOHM+-1%TK50 RESISTOR | RL 0083.1745.00 | RESISTA | MK2 | 0843.3350.01 |
| R5 | RL 0,60W 16,20 OHM+-1%TK50 RESISTOR | RL 0082.9059.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R6 | RL 0,60W 16,20 OHM+-1%TK50 RESISTOR | RL 0082.9059.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R7 | RG 215 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8961.00 | ROEDERSTEI | D25 | 0843.3350.01 |
| R8 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R9 | RL 0,60W 13,3KOHM+-1%TK50 RESISTOR | RL 0082.2577.00 | RESISTA | MK2 | 0843.3350.01 |
| R11 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R12 | RL 0,60W 39,2KOHM+-1%TK50 RESISTOR | RL 0083.1745.00 | RESISTA | MK2 | 0843.3350.01 |
| R15 | RL 0,60W 16,20 OHM+-1%TK50 RESISTOR | RL 0082.9059.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R16 | RL 0,60W 16,20 OHM+-1%TK50 RESISTOR | RL 0082.9059.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R17 | RG 215 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8961.00 | ROEDERSTEI | D25 | 0843.3350.01 |
| R18 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R19 | RL 0,60W 13,3KOHM+-1%TK50 RESISTOR | RL 0082.2577.00 | RESISTA | MK2 | 0843.3350.01 |
| R21 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | 0843.3350.01 |
| R22 | RL 0,60W 47,5KOHM+-1%TK50 RESISTOR | RL 0083.1800.00 | RESISTA | MK2 | 0843.3350.01 |
| R24 | RL 0,60W 82,5 OHM+-1%TK50 RESISTOR | RL 0082.9707.00 | RESISTA | MK2 | 0843.3350.01 |
| R25 | RL 0,60W 82,5 OHM+-1%TK50 RESISTOR | RL 0082.9707.00 | RESISTA | MK2 | 0843.3350.01 |
| R26 | RL 0,60W 82,5 OHM+-1%TK50 RESISTOR | RL 0082.9707.00 | RESISTA | MK2 | 0843.3350.01 |
| R27 | RG 215 OHM+-1%TK100 1206 CHIP RESISTOR | 0006.8961.00 | ROEDERSTEI | D25 | 0843.3350.01 |
| R28 | RL 0,60W 2,74KOHM+-1%TK50 RESISTOR | RL 0083.0926.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R29 | RL 0,60W 16,9KOHM+-1%TK50 RESISTOR | RL 0083.1451.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R30 | RS 0,5W100KOHM+-10%10X10X CERMET POTENTIOMETER T | RS 0087.7583.00 | BOURNS | 3386F | 0843.3350.01 |
| R31 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | 0843.3350.01 |
| R32 | RG 2,0 KOHM+-1%TK100 1206 RESISTOR CHIP | RG 0007.5737.00 | PHILIPS_CO | RC02 | 0843.3350.01 |
| R34 | RL 0,60W 681 KOHM+-1%TK50 RESISTOR | RL 0083.2735.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R35 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | 0843.3350.01 |
| R40 | RL 0,60W 681 KOHM+-1%TK50 RESISTOR | RL 0083.2735.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R41 | RL 0,60W 68,1 OHM+-1%TK50 RESISTOR | RL 0082.9636.00 | RESISTA | MK2 | 0843.3350.01 |
| R42 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | 0843.3350.01 |
| R43 | RL 0,60W 681 KOHM+-1%TK50 RESISTOR | RL 0083.2735.00 | PHILIPS_CO | MRS 25 | 0843.3350.01 |
| R100 . . 102 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3638.01 |
| R200 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3609.01 |
| R201 | XX ENTHALTEN IN INCLUDED IN | | | | 0843.3609.01 |

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|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| R202 | LEITERPLATTE/PCB RL 0,40W 220 OHM2% UNGEW. RESISTOR | RL 0092.5991.00 | DRALORIC | SMA 0204 | 0843.3609.01 |
| R203 | RL 0,40W 680 OHM2% UNGEW. RESISTOR | RL 0092.6052.00 | DRALORIC | SMA 0204 | 0843.3609.01 |
| R300 ..303 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3644.01 |
| R304 | RL 0,40W 470 OHM2% UNGEW. RESISTOR | RL 0092.6030.00 | DRALORIC | SMA 0204 | 0843.3644.01 |
| R305 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3644.01 |
| R306 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3644.01 |
| R307 | RK HEISSEL 1KOHM,5% 0.7W THERMISTOR | 0843.4905.00 | SIEMENS | Q63082-M2102-J | 0843.3644.01 |
| R400 ..403 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3615.01 |
| R404 | RL 0,40W 1,0KOHM2% UNGEW. RESISTOR | RL 0092.6075.00 | DRALORIC | SMA 0204 | 0843.3615.01 |
| R405 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3615.01 |
| R406 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3615.01 |
| R407 | RL 0,60W 2,0KOHM+-1%TK50 RESISTOR | RL 0083.0826.00 | RESISTA | MK2 | 0843.3615.01 |
| R408 ..411 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3615.01 |
| R500 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3596.01 |
| R502 ..506 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3596.01 |
| R510 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | 0843.3596.01 |
| V1 | AK BCX71J P 45V 200MA TRANSISTOR | AK 0007.2096.00 | VALVO | BCX71J GEGURTET | 0843.3350.01 |
| V2 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0843.3350.01 |
| V5 | AK BCX68-16 N 20V 1 A TRANSISTOR | AK 0801.8383.00 | SIEMENS | BCX 68-16 (-C1865) | 0843.3350.01 |
| V6 | AK BCX71J P 45V 200MA TRANSISTOR | AK 0007.2096.00 | VALVO | BCX71J GEGURTET | 0843.3350.01 |
| V7 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0843.3350.01 |
| V10 | AK BCX71J P 45V 200MA TRANSISTOR | AK 0007.2096.00 | VALVO | BCX71J GEGURTET | 0843.3350.01 |
| V12 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0843.3350.01 |
| V15 | AK BCX68-16 N 20V 1 A TRANSISTOR | AK 0801.8383.00 | SIEMENS | BCX 68-16 (-C1865) | 0843.3350.01 |
| V16 | AK BCX71J P 45V 200MA TRANSISTOR | AK 0007.2096.00 | VALVO | BCX71J GEGURTET | 0843.3350.01 |
| V17 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0843.3350.01 |
| V20 | AK BCX71J P 45V 200MA TRANSISTOR | AK 0007.2096.00 | VALVO | BCX71J GEGURTET | 0843.3350.01 |
| V22 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0843.3350.01 |
| V25 | AK BCX68-16 N 20V 1 A TRANSISTOR | AK 0801.8383.00 | SIEMENS | BCX 68-16 (-C1865) | 0843.3350.01 |
| V26 | AK BCX71J P 45V 200MA TRANSISTOR | AK 0007.2096.00 | VALVO | BCX71J GEGURTET | 0843.3350.01 |
| V27 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0843.3350.01 |
| V30 | AE BZX79/B5V6 0,5W ZDI ZENER DIODE | AE 0012.5254.00 | VALVO | BZX79B5V6 | 0843.3350.01 |
| V31 | AE BZX79/B5V6 0,5W ZDI ZENER DIODE | AE 0012.5254.00 | VALVO | BZX79B5V6 | 0843.3350.01 |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| V32 | AX BAT62 40V SCHOTTKY DIODE DIE | 0850.6416.00 | SIEMENS | BAT62 NACH R&S ZCHG. | 0843.4105.01 |
| V41 | AX BAT62 40V SCHOTTKY DIODE DIE | 0850.6416.00 | SIEMENS | BAT62 NACH R&S ZCHG. | 0843.4105.01 |
| V50 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | 0843.3350.01 |
| V100 ..103 | AX MA47389 PINDI.CHIP PIN DIODE CHIP | 0093.2744.00 | MA-COM | MA47389 | 0843.3638.01 |
| V104 | AX 1N4448 DIODE CHIP DIODE CHIP | 0093.2067.00 | TELEFUNKEN | 1N4448 | 0843.3638.01 |
| V105 | AX 1N4448 DIODE CHIP DIODE CHIP | 0093.2067.00 | TELEFUNKEN | 1N4448 | 0843.3638.01 |
| V200 | AK HXTR5104SEL N 24V TRANSISTOR | 0339.8805.00 | HEWLETT_PA | QXTR-5760 | 0843.3609.01 |
| V300 | AK HXTR5104SEL N 24V TRANSISTOR | 0339.8805.00 | HEWLETT_PA | QXTR-5760 | 0843.3644.01 |
| V400 | AK HXTR5104SEL N 24V TRANSISTOR | 0339.8805.00 | HEWLETT_PA | QXTR-5760 | 0843.3615.01 |
| V500 | AX 5082-0030 PINDI.CHIP PIN DIODE CHIP | 0093.4124.00 | HEWLETT_PA | 5082-0030 | 0843.3596.01 |
| V501 | AE BZV55/C6V8 0,5W ZDI ZENER DIODE | AE 0006.9868.00 | PHILIPS | BZV55/B6V8 | 0843.3596.01 |
| V502 | AX BAT62 40V SCHOTTKY DIODE DIE | 0850.6416.00 | SIEMENS | BAT62 NACH R&S ZCHG. | 0843.3596.01 |
| W16 | DY KABEL W16 CABLE | 0843.4040.00 | | | |
| W69 | NUR VAR/ONLY MOD: 04 DY KABEL W69 CABLE W69 | 0843.4086.00 | | | |
| W244 | NUR VAR/ONLY MOD: 03 DY KABEL W244 CABLE | 0843.3338.00 | | | |
| | NUR VAR/ONLY MOD: 02 | | | | |
| X240 | FJ EINBAUBUCHSE SYST.SMA CONNECTOR SMA | FJ 0911.0357.00 | SUHNER | 22 SMA-50-0-17/111NH | |
| X241 | FJ EINBAUBUCHSE SYST.SMA CONNECTOR SMA | FJ 0911.0357.00 | SUHNER | 22 SMA-50-0-17/111NH | |
| X242 | FJ EINBAUBUCHSE SYST.SMA CONNECTOR SMA | FJ 0911.0357.00 | SUHNER | 22 SMA-50-0-17/111NH | |
| X243 | FJ EINBAUST.H.DICHT SMC CONNECTOR SMC | FJ 0210.6378.00 | BINDER | 941-0 84 0005 00 02 | |
| Z100 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3638.01 |
| Z101 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3638.01 |
| Z200 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3609.01 |
| Z201 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3609.01 |
| Z240 ..244 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | |
| Z300 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3644.01 |
| Z301 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3644.01 |
| Z400 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3615.01 |
| Z401 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3615.01 |
| Z500 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | 0843.3596.01 |

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| MEZ15 | 790 3PLU | ÄI | Datum Date | Schaltteilliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | ROHDE & SCHWARZ | 35 | 03.05.99 | BD AUSGANGS-VERSTAERKER OUTPUT AMPLIFIER | 0843.3450.01 SA | 5- |

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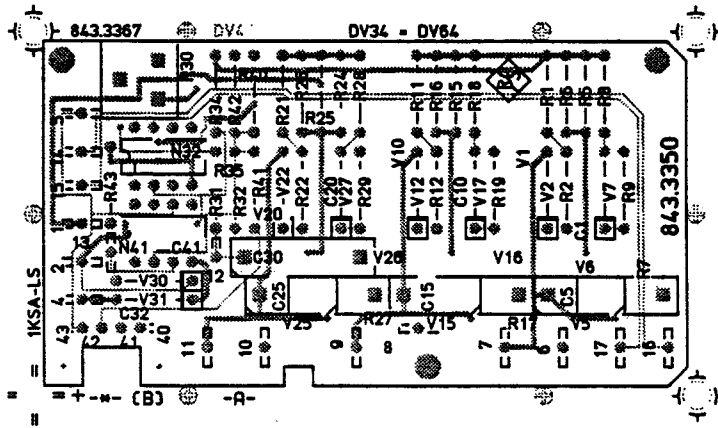
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|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| A231 | DT SUBSTRAT BP1 DUENNSCHICHT SPEZ.TEIL THIN-FILM SPEC.PART ZUEGH.STROML./CIRC.DIAGRAM 843.3550 S | 0843.3650.00 | | | |
| A232 | DT SUBSTRAT BP2 DUENNSCHICHT SPEZ.TEIL THIN-FILM SPEC.PART ZUEGH.STROML./CIRC.DIAGRAM 843.3550 S | 0843.3673.00 | | | |
| A233 | DT SUBSTRAT BP3 DUENNSCHICHT SPEZ.TEIL THIN-FILM SPEC.PART ZUEGH.STROML./CIRC.DIAGRAM 843.3550 S | 0843.3696.00 | | | |
| C1 ..18 | CC 150PF 10%100V NPO 0504 CAPACITOR | 0093.3392.00 | TEKELEC | 101 R11 N 151 KP | |
| L1 ..14 | LD 47NH 10%OR08 1,3A 1010 CHIP-COIL | 0920.0033.00 | STETTNER | 5501 4702200 | |
| R1 ..4 | XX ENTHALTEN IN INCLUDED IN LEITERPLATTE/PCB | | | | |
| V1 ..18 | AX MA47389 PINDI.CHIP PIN DIODE CHIP | 0093.2744.00 | MA-COM | MA47389 | |
| Z230 ..235 | LD TIEFPASSFILTER LOWPASS FILTER | 0843.3950.00 | | | |

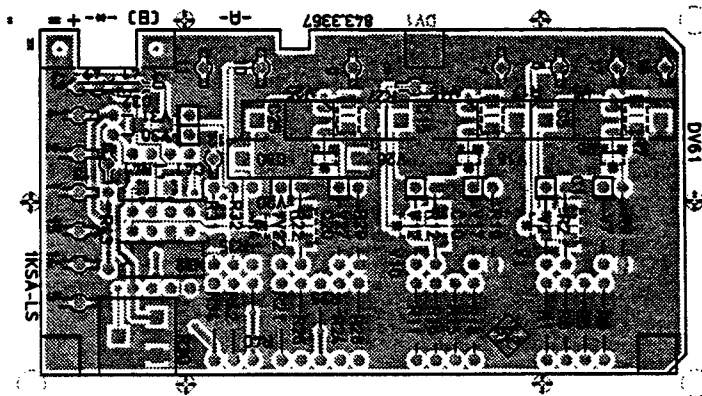
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|  | ROHDE & SCHWARZ | 08 | 03.05.99 | BD FILTERMODUL FILTERMODULE | 0843.3550.01 SA | 1- |

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Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



Ansicht und Leitungsführung Lötseite
View of tracks on solder side



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Inerzu HVC 290)



ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

VARIANTENERKLÄRUNG / VERSION
VAR 02 - GRUNDAUSFÜHRUNG / BASIC MODEL

| | | | | | | | | | |
|-----------|----------------------|-----|------|--------------------------|-------|-----------------------|----------------------|----------|--|
| | | | | Maße ohne Toleranzangabe | | Maßstab 1 : 1 | | | |
| | | | | | | Halbzeug, Werkstoff | | | |
| | | | | 1KSA | Tag | Name | Benennung | | |
| | | | | Bearb | 07.87 | LS | AP - REGELUNG | | |
| | | | | Gepr. | | | OPERATING POINT CTRL | | |
| | | | | Norm | | | Z | | |
| | | | | | | Zeichn.-Nr | | Blatt-Nr | |
| | | | | | | 843.3350.01 ED | | 3 | |
| And Zust. | Anderungs-Mitteilung | Tag | Name | zu Gerät SMH | | reg. i. V. 843.3009 V | | erste Z | |
| | | | | | | | | v Bi | |

SO-Projektion
Methode E





ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Option "Reference Oscillator, OCXO"

SMG-B1 802.0005.02

Printed in West Germany

ENGLISH SERVICE MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5.1 **Funktionsbeschreibung**

(Hierzu Stromläufe 802.0005 S und 802.0028 S)

Die Option "Reference Oscillator OCXO", SMG-B1 besteht im wesentlichen aus einem Baustein B1, der einen 10-MHz-Quarzoszillator mit Thermostat enthält. Die Referenzfrequenz steht an X101 mit TTL-Pegel zur Verfügung (mit FRN-Loop als Last ≈ 500 mV_{SS}). Um das Thermostat zu überwachen, ist eine Kontrollspannung herausgeführt, die vom Spannungsfolger N1 entkoppelt wird. Über die Spannungsstabilisierung V1,2 wird der Quarzoszillator in der Betriebsart REF EXT ausgeschaltet.

5.2 **Prüfen und Abgleichen**

Prüfen der Temperaturüberwachung

- An X100.A5 ein Voltmeter anschließen.
- Die Spannung muß nach dem Einschalten der Baugruppe ca. 4 V, nach 4 Minuten (bei 25° C) gleich 6 V $\pm 0,2$ V sein.

Prüfen des Ausgangssignals

- Mit Oszilloskop Signal an X101 messen.
- Sollpegel: 10 MHz, TTL ohne Last.

Prüfen der Abschaltung

- +5 V aus einem Netzgerät an X100.B4 anlegen.
- Das Ausgangssignal an X101 muß auf 0 V zurückgehen.

Abgleich der Referenzfrequenz

- Das Gerät 15 Minuten warmlaufen lassen.
- Frequenzzähler an X101 anschließen (Frequenzgenauigkeit $< 10^{-8}$).
- Mit dem Abgleichtrimmer an B1 auf 10 MHz ± 1 Hz abgleichen.

5.3 Schnittstellen

Analoge Schnittstellen

| Anschluß | Funktion | Frequenz | Pegel |
|-----------------|--|--------------|------------|
| X101 X100.A5 | 10-MHz-Ausgang Thermostat- überwachung | 10 MHz DC | TTL 6 V |

Digitale Schnittstellen

| Anschluß | Funktion | Bemerkung |
|----------|--------------|-----------------|
| X100.B4 | OCXO ein/aus | 0 $\hat{=}$ ein |



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Reference Oscillator Option OCXO

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Circuit diagrams
Component layout diagrams

5.1 Function Description

(See circuit diagrams 802.0005 S and 802.0028 S)

The reference oscillator module OCXO, SMG-B1 is essentially made up of the component B1 which contains a 10 MHz crystal oscillator with thermostat. The reference frequency is available at X101 with a TTL level (with FRN loop as load ≈ 500 mV_{pp}). In order to monitor the thermostat, a control voltage is available which is decoupled from the voltage follower N1. The crystal oscillator is switched off in the REF EXT mode via the voltage stabilization V1, 2.

5.2 Checking and Adjustments

Checking the temperature monitoring

- Connect a voltmeter to X100.A5.
- The voltage must be approx. 4 V after switching on the module and 6 V ± 0.2 V after 4 minutes (at 25 °C).

Checking the output signal

- Measure the signal at X101 using an oscilloscope.
- Correct level: 10 MHz, TTL without load.

Checking the switch-off

- Connect +5 V from a power supply unit to X100.B4.
- The output signal at X101 must return to 0 V.

Adjusting the reference frequency

- Warm-up the unit for 15 min.
- Connect frequency meter counter to X101 (frequency accuracy $< 10^{-8}$).
- Adjust with trimmer on B1 to 10 MHz ± 1 Hz.

5.3 Interfaces

Analog interfaces


| Connection | Function | Frequency | Level |
|-----------------|--|--------------|------------|
| X101 X100.A5 | 10-MHz output Thermostat monitor | 10 MHz DC | TTL 6 V |

Digital interfaces

| Connection | Function | Remarks |
|------------|-------------|---------|
| X100.B4 | OCXO on/off | 0 = on |


Schaltheillisten
Stromläufe
Bestückungspläne
Part lists
Circuit diagrams
Components plans
Listes des pièces détachées
Schémas de Circuit
Plans des composants

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in | |
|---|--|-------------------------|----------------------------|---------------------------------------|------------------------------|-------------------|
| A10 | ED REFERENCE OSCILLATOR ANBIETEN: SMG-B1 (ROBERT) NUR VAR/ONLY MOD: 02 | 0802.0028.02 | | | | |
| A10 | ED REFERENCE OSCILLATOR NUR VAR/ONLY MOD: 04 | 0802.0028.04 | | | | |
| W8 | DV HF-KABEL W8 RF CABLE W8 | 0802.0063.00 | | | | |
| MEZ15 | 790 3PLU | ÄI | Datum Date | Schalttailliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  ROHDE & SCHWARZ | 06 | 03.05.99 | SMG-B1 REFERENCE OSCILLAT | 0802.0005.01 SA | 1- | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| B1 | EO 10MHZ-QU.OSZ.OCXO 12V 10MHZ CRYSTAL OSCILLATOR NUR VAR/ONLY MOD: 02 | 0803.8980.00 | QUARZKERAM | 2100T-S151 (H) | |
| B1 | EO 10MHZ-QU.OSZ.OCXO 12V 10MHZ CRYSTAL OSCILLATOR NUR VAR/ONLY MOD: 04 | 0803.8945.00 | QUARZKERAM | 2100T-S155 | |
| C1 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C2 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C3 | CE 22UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7433.00 | PHILIPS_CO | 2222 116 90111 | |
| C5 | CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR | CE 0022.8185.00 | KEMET | T340 A105M040 AS | |
| C6 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C8 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| L1 | LD 1,20UH10%0,180HMO,620A CHOKE | LD 0067.2870.00 | DALE | IM2 | |
| N1 | BO LF411CN FET OPAMP OPERATIONAL AMPLIFIER | 0349.3058.00 | NSC | LF411CN | |
| R1 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R2 | RL 0,60W 825 OHM+-1%TK50 RESISTOR | RL 0082.2502.00 | RESISTA | MK2 | |
| R3 | RL 0,60W 6,81KOHM+-1%TK50 RESISTOR | RL 0082.2560.00 | RESISTA | MK2 | |
| R4 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R5 | RL 0,60W 4,75KOHM+-1%TK50 RESISTOR | RL 0083.1097.00 | PHILIPS_CO | MRS 25 | |
| R9 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| V1 | AL BD679 NPN 80V DARL TRANSISTOR | 0339.4139.00 | SIEMENS | BD679 | |
| V2 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| X99 | DY BUCHSENEINHEIT CONNECTOR UNIT | 0802.0140.00 | | | |
| X101 | FJ EINBAUSTECKER F.GS SMB ANGLE CONNECTOR | FJ 0602.8804.00 | ROSENBERGE | 59S-206-400-D3 | |

| | | | | | | |
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SERVICEUNTERLAGEN

Option "AF Synthesizer"

SMG-B2 802.0405.02

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5.1 Funktionsbeschreibung

(Hierzu Stromlauf 802.0411 S und Bild 5-1)

Die Option "AF Synthesizer" enthält einen digitalen NF-Generator sowie die Umschaltung für die AM- und FM-Betriebsart einschließlich einer Pegelüberwachung für externe Modulationssignale.

5.1.1 NF-Generator

Der digitale NF-Generator ist im Frequenzbereich 1 Hz...100 kHz einstellbar. Dabei beträgt die Auflösung 1 Hz bis 10 kHz und 10 Hz bis 100 kHz.

Kernstück des Synthesizers ist das Gate-Array D10, welches einen 20-bit-Addierer, einen 10:1-Teiler für die Taktfrequenz sowie eine Schnittstelle für die serielle Datenübertragung enthält. Mit einer Taktfrequenz von 1,04858 MHz wird dort ein Inkrement I addiert. Die höherwertigen 12-bit des Addierers stellen die Adressen für das Sinus-EPROM D20 dar. In diesem sind die Amplitudenwerte einer Periode der Sinusschwingung mit 12-bit-Auflösung gespeichert, wobei sich die niederwertigen 4 bit im oberen und die höherwertigen 8 bit im unteren Teil des Adreßbereichs befinden. D30 und D35 dienen zum Zwischenspeichern der Daten. Der nachfolgende D/A-Wandler D40 erzeugt nun ein treppenförmiges Sinussignal, dessen Einschwingvorgänge durch die anschließende Sample-and-Hold-Schaltung unterdrückt werden. Der aktive Tiefpaß N80 mit einer umschaltbaren Grenzfrequenz von 22 kHz und 110 kHz glättet das Ausgangssignal und unterdrückt die Taktfrequenz.

Aus der gewünschten NF-Frequenz für f_{AF} bestimmt sich das Inkrement I des Addierers nach folgender Formel:

$$I = f_{AF} \text{ [Hz]}.$$

Für den AF-Ausgang kann der Pegel mit einem 10-bit-D/A-Wandler D210 von 1...1000 mV mit einer Auflösung von 1 mV eingestellt werden. Das Datenwort P für den gewünschten Pegel U ergibt sich nach folgender Formel:

$$P = U_{AF} \text{ [mV]}.$$

5.1.2 AM-/FM-Betriebsarteinstellung

Der Eingangswiderstand für die externen Modulationseingänge kann mit den Brücken X10 bzw. X11 von 100 k Ω auf 600 Ω umgeschaltet werden. Für externe Modulationssignale sind zwei Überwachungsschaltungen vorgesehen, die aus einem Verstärker N110II, N150II mit nachfolgendem Spitzenwertgleichrichter bestehen. Die Gleichspannung wird zur Auswertung an den Rechner weitergeleitet.

Mit den FET-Schaltern D165, D170 bzw. D120, D130 kann zwischen den Betriebsarten AM INT/FM INT, AM EXT AC/FM EXT AC, AM EXT DC/FM EXT DC, AM/FM-Mischmodulation und AM/PM bzw. FM/FSK umgeschaltet werden. Bei den letzten beiden Betriebsarten wird mit N185 bzw. N145 das ansteuernde TTL-Signal in eine Spannung von 0/-1,41 V bzw. +1,41/-1,41 V umgewandelt.

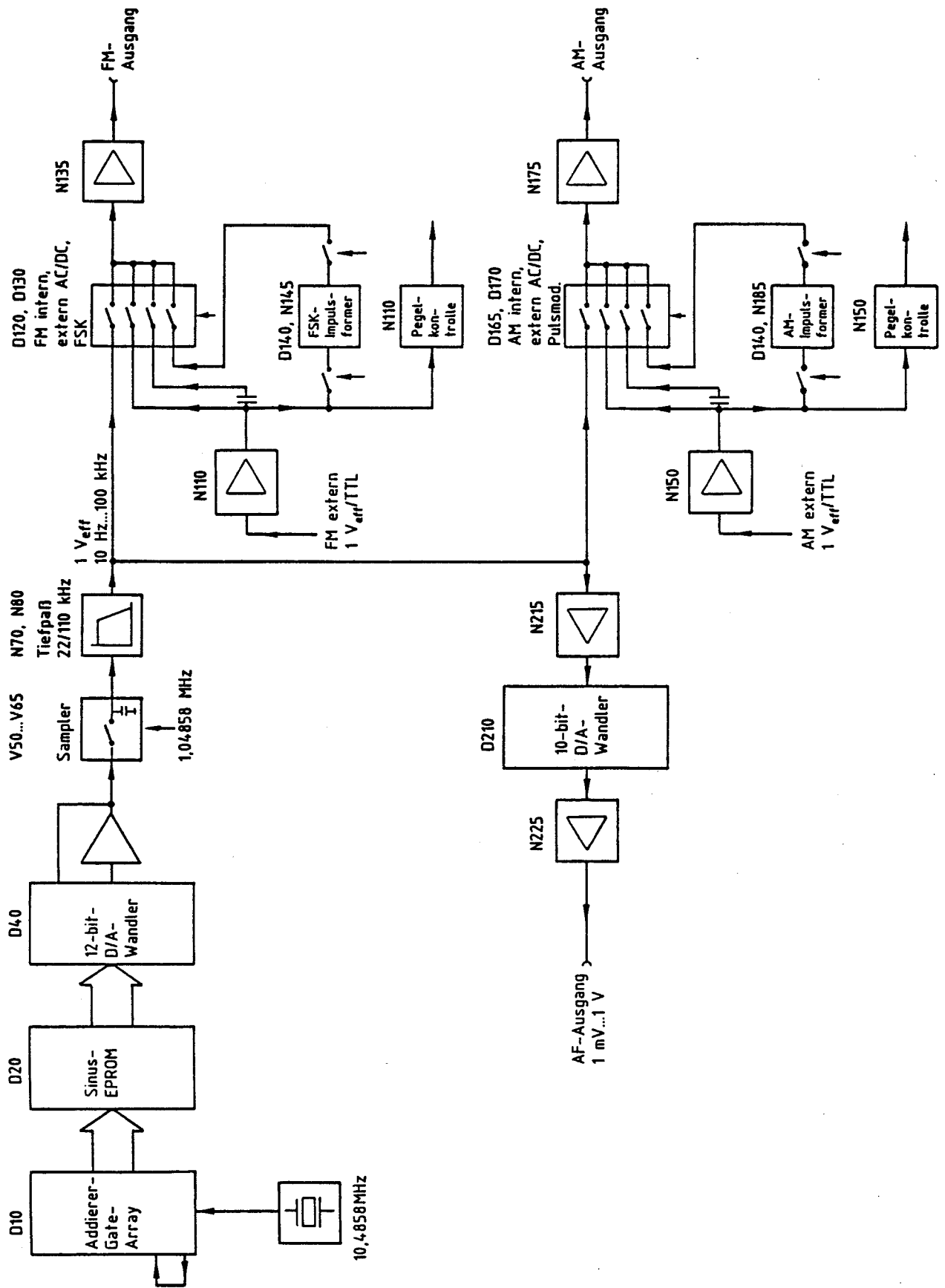


Bild 5-1 Blockschaltbild AF Synthesizer

5.2 Prüfen und Abgleichen

5.2.1 Prüfen der Addierstufen

→ Das Ausgangssignal des Addierers D10 nach Tabelle 5-1 prüfen.

Tabelle 5-1

| Frequenzeinstellung/ f_{AF} | Meßpunkt | Periodendauer/ μs |
|-------------------------------|----------|---------------------------|
| 1 Hz | D10.15 | 488 |
| 2 Hz | D10.15 | 244 |
| 4 Hz | D10.15 | 122 |
| 8 Hz | D10.15 | 61 |
| 16 Hz | D10.16 | 61 |
| 32 Hz | D10.17 | 61 |
| 64 Hz | D10.19 | 61 |
| 128 Hz | D10.20 | 61 |
| 256 Hz | D10.21 | 61 |
| 512 Hz | D10.22 | 61 |
| 1,024 kHz | D10.23 | 61 |
| 2,048 kHz | D10.24 | 61 |
| 4,096 kHz | D10.25 | 61 |
| 8,192 kHz | D10.26 | 61 |
| 16,384 kHz | D10.27 | 61 |
| 32,768 kHz | D10.27 | 30,5 |
| 65,536 kHz | D10.27 | 15,25 |

5.2.2 Abgleich des NF-Pegels (R60)

→ NF-Voltmeter ($R_i > 1 \text{ M}\Omega$) mit Adapterkabel aus Servicekit an X13 anschließen.

→ Bei $f_{AF} = 1 \text{ kHz}$ mit R60 auf $1000 \pm 1 \text{ mV}$ abgleichen.

5.2.3 Prüfen des Frequenzgangs und des Klirrfaktors

- NF-Analysator (bzw. NF-Voltmeter und Klirrfaktormesser) mit Serviceadapterkabel an X13 anschließen.
- Bei verschiedenen NF-Frequenzen Frequenzgang und Klirrfaktor prüfen.

Tabelle 5-2

| Einstellung f_{AF}/kHz | $\Delta U/\%$ | $k/\%$ |
|------------------------------------|---------------|--------|
| 1 | <0,1 | <0,05 |
| 8 | <1,5 | <0,05 |
| 12 | <1,5 | <0,05 |
| 16 | <1,5 | <0,05 |
| 19,9 | <1,5 | <0,05 |
| 20,1 | <2,5 | <0,1 |
| 40 | <2,5 | <0,1 |
| 50 | <2,5 | <0,1 |
| 60 | <2,5 | <0,1 |
| 70 | <2,5 | <0,1 |
| 80 | <2,5 | <0,1 |
| 90 | <2,5 | <0,1 |
| 99,99 | <2,5 | <0,1 |

5.2.4 Einstellen des externen AF-Ausgangs (R217)

- NF-Voltmeter an Buchse X2 (AF) anschließen.
- Bei $f_{AF} = 1 \text{ kHz}$ und $U_{AF} = 1000 \text{ mV}$ mit R217 auf $1000 \pm 6 \text{ mV}$ abgleichen.

5.2.5 Prüfen des externen AF-Ausgangs

- NF-Voltmeter an Buchse X2 anschließen.
- Für verschiedene AF-Pegel und $f_{AF} = 1$ kHz die Ausgangsspannung messen.

Tabelle 5-3

| Einstellung SMG U_{AF}/mV | Pegel/mV |
|--------------------------------|----------|
| 512 | 512 ±2 |
| 256 | 256 ±2 |
| 128 | 128 ±1 |
| 64 | 64 ±1 |
| 32 | 32 ±0,5 |
| 16 | 16 ±0,5 |
| 8 | 8 ±0,5 |
| 4 | 4 ±0,5 |
| 2 | 2 ±0,5 |
| 1 | 1 ±0,5 |

5.2.6 Prüfen der AM-/FM-Pegelüberwachung

- NF-Generator 1 kHz, 1 V_{eff} an Buchse X3 (AM EXT) anschließen.
Die Gleichspannung an P16 soll 2,5 ±0,03 V betragen.

Die FM-Pegelüberwachung wird entsprechend geprüft.



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SERVICE DOCUMENTS

AF Synthesizer Option

SMG-B2 802.0405.02

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Component lists
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5.1 Function Description

(See circuit diagram 802.0411 S and Fig. 5-1)

The AF synthesizer option contains a digital AF generator and the selector for AM/FM mode including level monitoring for external modulation signals.

5.1.1 AF Generator

The digital AF generator can be adjusted in the frequency range from 1 Hz to 100 kHz. The resolution is 1 Hz up to 10 kHz and 10 Hz up to 100 kHz.

The main component of the synthesizer is the gate array D10 which contains a 20-bit adder, a 10:1 divider for the clock frequency and an interface for serial data transmission. An increment I is added at the gate array at a clock frequency of 1.04858 MHz. The most significant 12 bits of the adder represent the addresses for the sine EPROM D20 which stores the amplitudes of one cycle of the sine wave with a resolution of 12 bit. The least significant 4 bits are located in the upper part of the address area and the most significant 8 bits in the lower part. D30 and D35 are used for intermediate storage of the data. The subsequent D/A converter D40 then generates a staircase sine wave signal whose transient is suppressed by the subsequent sample-and-hold circuit. The active lowpass N80 with a selectable cut-off frequency of 22 kHz and 110 kHz smoothens the output signal and suppresses the clock frequency.

The increment I of the adder is determined from the desired AF frequency for f_{AF} according to the following formula:

$$I = f_{AF} \text{ [Hz]}$$

The level for the AF output can be adjusted from 1 to 1000 mV with a resolution of 1 mV using a 10-bit D/A converter D210. The data word p for the required level V is produced according to the following formula:

$$P = U_{AF} \text{ [mV]}$$

5.1.2 AM/FM Mode Setting

The input resistance for the external modulation inputs can be switched over from 100 k Ω to 600 Ω using the jumpers X10 and X11. Two monitoring circuits are provided for external modulation signals and consist of an amplifier N110II, N150II with subsequent peak-value rectifier. The rectified voltage is passed on to the controller for evaluation.

The FET switches D165, D170 or D120, D130 can be used to switch between the modes AM INT/FM INT, AM EXT AC/FM EXT AC, AM EXT DC/FM EXT DC, AM/FM mixed modulation and AM/PM or FM/FSK. In the latter two cases the controlled TTL signal is converted into a voltage of 0/-1.41 V or +1.41/-1.41 V using N185 or N145.

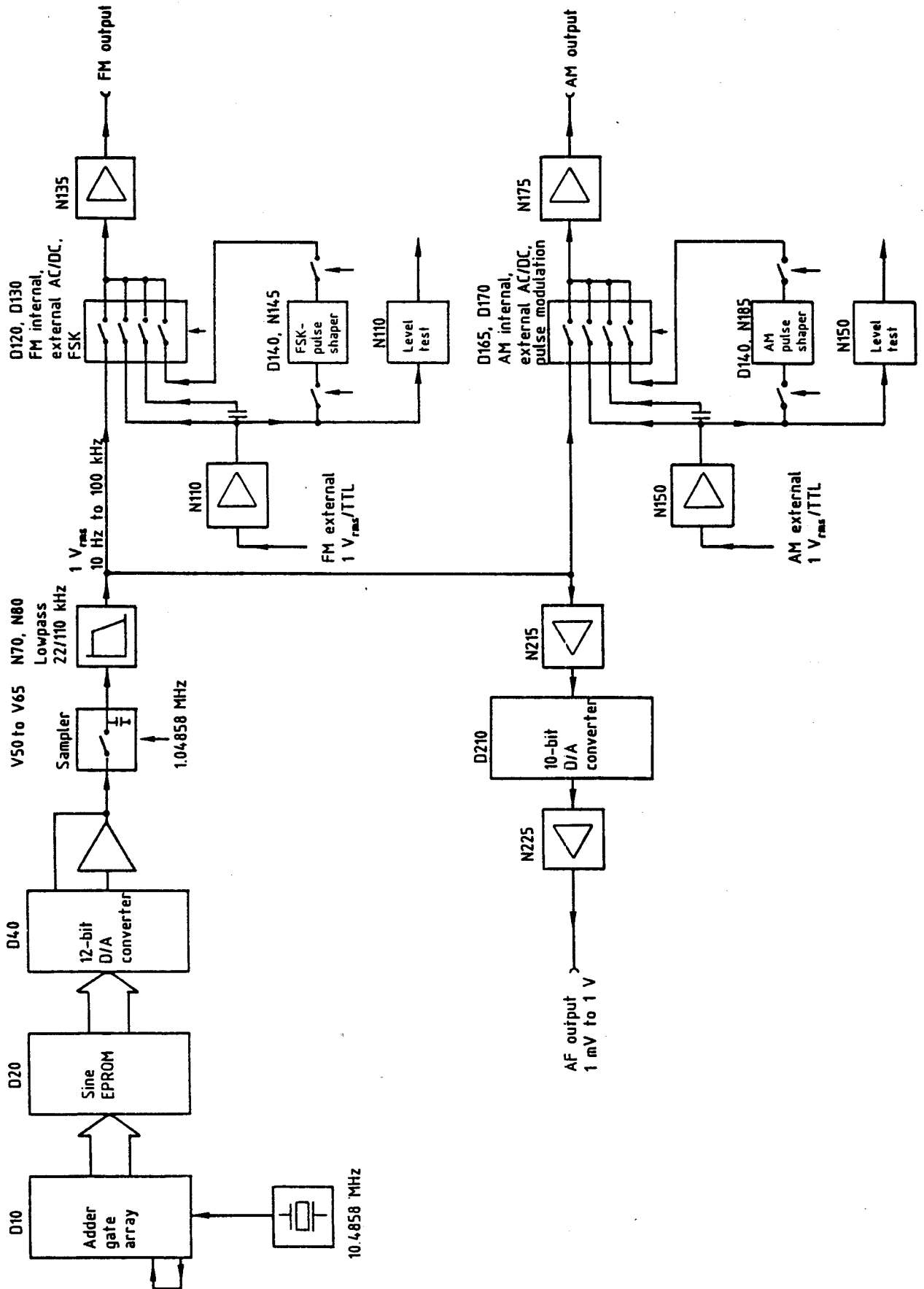


Fig. 5-1 Block diagram of AF synthesizer

5.2 Checking and Adjustments

5.2.1 Checking the Adding Stages

→ Check the output signal from adder D10 according to Table 5-1.

Table 5-1

| Frequency setting/ f_{AF} | Test point | Periode/ μs |
|-----------------------------|------------|------------------|
| 1 Hz | D10.15 | 488 |
| 2 Hz | D10.15 | 244 |
| 4 Hz | D10.15 | 122 |
| 8 Hz | D10.15 | 61 |
| 16 Hz | D10.16 | 61 |
| 32 Hz | D10.17 | 61 |
| 64 Hz | D10.19 | 61 |
| 128 Hz | D10.20 | 61 |
| 256 Hz | D10.21 | 61 |
| 512 Hz | D10.22 | 61 |
| 1.024 kHz | D10.23 | 61 |
| 2.048 kHz | D10.24 | 61 |
| 4.096 kHz | D10.25 | 61 |
| 8.192 kHz | D10.26 | 61 |
| 16.384 kHz | D10.27 | 61 |
| 32.768 kHz | D10.27 | 30.5 |
| 65.536 kHz | D10.27 | 15.25 |

5.2.2 Adjustment of the AF Level (R60)

→ Connect AF voltmeter ($Z_{out} > 1 M\Omega$) to X13 using the adapter cable from the service kit.

→ With $f_{AF} = 1 \text{ kHz}$ adjust to $1000 \pm 1 \text{ mV}$ using R60.

5.2.3 Checking the Frequency Response and the Distortion

- Connect the AF analyzer (or AF voltmeter and distortion meter) to X13 using the service adapter cable.
- Check the frequency response and distortion at various AF frequencies.

Table 5-2

| Setting f_{AF}/kHz | $\Delta V/\%$ | $d/\%$ |
|--------------------------------|---------------|--------|
| 1 | <0.1 | <0.05 |
| 8 | <1.5 | <0.05 |
| 12 | <1.5 | <0.05 |
| 16 | <1.5 | <0.05 |
| 19.9 | <1.5 | <0.05 |
| 20.1 | <2.5 | <0.1 |
| 40 | <2.5 | <0.1 |
| 50 | <2.5 | <0.1 |
| 60 | <2.5 | <0.1 |
| 70 | <2.5 | <0.1 |
| 80 | <2.5 | <0.1 |
| 90 | <2.5 | <0.1 |
| 99.99 | <2.5 | <0.1 |

5.2.4 Adjustment of External AF Output (R217)

- Connect AF voltmeter to connector X2 (AF).
- With $f_{AF} = 1 \text{ kHz}$ and $V_{AF} = 1000 \text{ mV}$ adjust to $1000 \pm 6 \text{ mV}$ using R217.

5.2.5 Checking the External AF Output

- Connect AF voltmeter to connector X2.
- Measure the output voltage at various AF levels and $f_{AF} = 1$ kHz.

Table 5-3

| SMG setting V_{AF}/mV | Level/mV |
|----------------------------|----------|
| 512 | 512 ±2 |
| 256 | 256 ±2 |
| 128 | 128 ±1 |
| 64 | 64 ±1 |
| 32 | 32 ±0.5 |
| 16 | 16 ±0.5 |
| 8 | 8 ±0.5 |
| 4 | 4 ±0.5 |
| 2 | 2 ±0.5 |
| 1 | 1 ±0.5 |

5.2.6 Checking the AM/FM Level Monitoring

- Connect AF generator with 1 kHz, 1 V_{rms} to connector X3 (AM EXT). The DC voltage at P16 should be 2.5 ± 0.03 V.

Test the FM level monitoring in a similar manner.



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Schalteillisten

Stromläufe

Bestückungspläne

Part lists

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Listes des pièces détachées


Schémas de Circuit

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|--|-------------------------|----------------------------|----------------------------|------------------------------|
| B1 | EQ 10,485800MHZ CL30HC43U QUARTZ CRYSTAL UNIT | 0091.8345.00 | PHILIPS | N. R&S SACHNUMMER | |
| C1 | CC 56PF+-2%5X6NPO CAPACITOR | CC 0087.6512.00 | PHILIPS_CO | 2222 678 | |
| C2 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C3 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C4 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C5 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C6 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C7 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C8 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C9 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C10 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C11 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C12 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| C13 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | |
| .. 16 | | | | | |
| C17 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C20 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | |
| C25 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C30 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C35 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C40 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C41 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C42 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C45 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C47 | CC 82PF+-2%6X7NPO CAPACITOR | CC 0087.6535.00 | PHILIPS_CO | 2222 678 10 829 | |
| C48 | CC 56PF+-2%5X6NPO CAPACITOR | CC 0087.6512.00 | PHILIPS_CO | 2222 678 | |
| C49 | CC 6,8PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6406.00 | PHILIPS_CO | 2222 678 | |
| C51 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C53 | CC 6,8PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6406.00 | PHILIPS_CO | 2222 678 | |
| C61 | CC 10PF+-0,25PF3X4N750 CAPACITOR | CC 0087.6787.00 | PHILIPS_CO | 2222 678 57109 | |
| C64 | CC 220PF+-2%6X7N750 CAPACITOR | CC 0087.6941.00 | PHILIPS_CO | 2222 678 58221 | |
| C66 | CC 6,8PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6406.00 | PHILIPS_CO | 2222 678 | |
| C70 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C71 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C72 | CK 4,7NF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR | CK 0283.1701.00 | SIEMENS | B33531-A5472-F | |
| C73 | CK 18NF+-1%63V7,50AX13 KP CAPACITOR | CK 0099.1933.00 | SIEMENS | B33531-A5183-F | |
| C74 | CK 330PF+-1%63V6,3X11 KP PLASTC-FOIL CAPACITOR | CK 0283.1647.00 | SIEMENS | B33531-A5331-F | |
| C75 | CK 4,7NF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR | CK 0283.1701.00 | SIEMENS | B33531-A5472-F | |
| C76 | CK 18NF+-1%63V7,50AX13 KP CAPACITOR | CK 0099.1933.00 | SIEMENS | B33531-A5183-F | |

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|------------------|---|----------------------|-------------------------|-------------------------|---------------------------|
| C77 | CK 330PF+-1%63V6,3X11 KP PLASTC-FOIL CAPACITOR | CK 0283.1647.00 | SIEMENS | B33531-A5331-F | |
| C78 | CC 5,6PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6393.00 | PHILIPS_CO | 2222 678 | |
| C79 | CC 2,7PF+-0,25PF3X4NPO CERAMIC CAPACITOR | CC 0087.6358.00 | PHILIPS_CO | 2222 678 | |
| C80 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C81 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C83 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C101 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C102 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C103 | CK 220NF+-5%63VRD3,5H9MKT CAPACITOR | CK 0099.2952.00 | SIEMENS | B 32 529-A224-J | |
| C105 | CC 150PF+-2%6X9N150 CAPACITOR | CC 0087.6735.00 | PHILIPS_CO | 2222 678 34151 | |
| C109 | NUR VAR/ONLY MOD: 04 CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C111 | CE 10UF+-20% 63V RM5BIPOL ELECTROLYTIC CAPACITOR | CE 0008.9742.00 | PHILIPS_CO | 2222 036 92103 | |
| C120 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C121 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C122 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C130 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C131 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C132 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C133 | CC 4,7PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6387.00 | PHILIPS_CO | 2222 678 | |
| C134 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C135 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C140 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C144 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C145 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C146 | CC 470PF+-10%3X4R2000 CAPACITOR | CC 0087.6993.00 | PHILIPS_CO | 2222 630 51471 | |
| C149 | CC 1,8NF+-10%4X5R2000 CAPACITOR | CC 0087.7054.00 | PHILIPS_CO | 2222 630 01182 | |
| C150 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C151 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | |
| C152 | CK 220NF+-5%63VRD3,5H9MKT CAPACITOR | CK 0099.2952.00 | SIEMENS | B 32 529-A224-J | |
| C160 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C161 | CE 10UF+-20% 63V RM5BIPOL ELECTROLYTIC CAPACITOR | CE 0008.9742.00 | PHILIPS_CO | 2222 036 92103 | |
| C165 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C166 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C167 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C170 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C171 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | |
| C172 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |
| C175 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | |

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|---|---|----------------------|-------------------------|------------------------------------|---------------------------|----------------|
| C178 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C179 | CC 4,7PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6387.00 | PHILIPS_CO | 2222 678 | | |
| C182 | CC 3,3PF+-0,25PF3X4NPO CAPACITOR | CC 0087.6364.00 | PHILIPS_CO | 2222 678 | | |
| C185 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C186 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C205 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C210 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C215 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C216 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C220 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C221 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C223 | CC 15PF+-2%3X4NPO CAPACITOR | CC 0087.6441.00 | PHILIPS_CO | 2222 678 | | |
| C230 | CK 100NF+-5%63VRD2,5H7MKT CAPACITOR | CK 0099.2930.00 | SIEMENS | B 32 529-C104-J | | |
| C232 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | | |
| C233 | CC 100PF+-2%6X9NPO CAPACITOR | CC 0087.6541.00 | PHILIPS_CO | 2222 678 | | |
| C240 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | | |
| C241 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | | |
| C242 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | | |
| C245 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | | |
| C246 | CE 47UF+-20%63V RM5 ELECTROLYTIC CAPACITOR | 0008.7440.00 | PHILIPS_CO | 2222 116 90112 | | |
| C247 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | | |
| C250 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | | |
| C251 | CE 100UF+-20%35V RM5 ELECTROLYTIC CAPACITOR | 0008.7510.00 | PHILIPS_CO | 2222 116 90042 | | |
| C252 | CC 10NF-20+50%7X8R4000 CAPACITOR | CC 0087.7525.00 | VALVO | 2222 640 51103 | | |
| D5 | BL PC74HCTOOP 4X2IN.NAND QUAD 2-INPUT NAND GATE | 0571.3394.00 | PHILIPS_SE | (PC)74HCT00(N) | | |
| D10 | BG CLA2116 ADDER1 ASIC GATE ARRAY | 0801.8183.00 | PLESSEY | CLA2116 | | |
| D20 | BC SOFTW.N.BESTUECKUNGSPSPL SOFTW. SEE COMPONENTSPLAN 802.0411 BP | 0092.9574.90 | | | | |
| D25 | BL MM74HC175N 4XD-FF CL. QUAD D-FLIP-FLOP | 0099.9528.00 | PHILIPS_SE | (PC)74HC175N(P) | | |
| D30 | BL MM74HC175N 4XD-FF CL. QUAD D-FLIP-FLOP | 0099.9528.00 | PHILIPS_SE | (PC)74HC175N(P) | | |
| D35 | BL MM74HC273N 8XD-FF/REG OCTAL D-FLIPFLOP | 0099.9611.00 | PHILIPS_SE | (PC)74HC273N(P) | | |
| D40 | BJ DAC80-CPI-I 1X12B-DAC D/A-CONVERTER | 0300.6330.00 | BURR_BROWN | DAC80CBI-I | | |
| D45 | BL SN74LS123N 2/MONOFLOP IC MONOFLOP SN74LS85N | 0235.8468.00 | TEXAS | SN74LS123N | | |
| D120 | BS DG211CJ 4X ANALOGSCH ANALOG SWITCH | 0801.8260.00 | SILICONIX | DG211CJ | | |
| D130 | BS DG211CJ 4X ANALOGSCH ANALOG SWITCH | 0801.8260.00 | SILICONIX | DG211CJ | | |
| D140 | BL MM74HC132N 4X2IN.NAND QUAD 2INP.NAND SCHMITT TR | 0099.9557.00 | PHILIPS_SE | (PC)74HC132N(P) | | |
| D165 | BS DG211CJ 4X ANALOGSCH ANALOG SWITCH | 0801.8260.00 | SILICONIX | DG211CJ | | |
| D170 | BS DG211CJ 4X ANALOGSCH ANALOG SWITCH | 0801.8260.00 | SILICONIX | DG211CJ | | |
| D200 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | | |
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|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| D205 | BL PC74HC4094P 8ST.SH.REG | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D210 | 8-STAGE SHIFT&STORE REG. BJ AD7533CQ 1X10B-DAC D/A-CONVERTER | BJ 0300.8740.00 | ANALOG_DEV | AD7533CQ(CD) | |
| D225 | BL MM74HC4051N 8CH.AN.MUX | 0099.9670.00 | PHILIPS | (PC)74HC4051N(P) | |
| D230 | 8CH.ANALOG MUX/DEMUX BL PC74HC4094P 8ST.SH.REG | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D235 | 8-STAGE SHIFT&STORE REG. BL PC74HCT00P 4X2IN.NAND QUAD 2-INPUT NAND GATE | 0571.3394.00 | PHILIPS_SE | (PC)74HCT00(N) | |
| L7 | LD 10 UH 10% 3R3 144 MA CHOKER | LD 0026.4184.00 | DALE | IM2 | |
| L240 | LD 1,20UH10%,180HMO,620A CHOKER | LD 0067.2870.00 | DALE | IM2 | |
| L245 | LD 1,20UH10%,180HMO,620A CHOKER | LD 0067.2870.00 | DALE | IM2 | |
| L250 | LD 1,20UH10%,180HMO,620A CHOKER | LD 0067.2870.00 | DALE | IM2 | |
| N60 | BO LF411CN FET OPAMP OPERATIONAL AMPLIFIER | 0349.3058.00 | NSC | LF411CN | |
| N70 | BO LF411CN FET OPAMP OPERATIONAL AMPLIFIER | 0349.3058.00 | NSC | LF411CN | |
| N80 | BO SE5534AFE LN OPAMP OPERATIONAL AMPLIFIER | 0301.3335.00 | SIGNETICS | SE5534AFE | |
| N90 | BO RC4558DN 2X OPAMP OPERATIONAL AMPLIFIER | BO 0475.1672.00 | TEXAS_INST | RC4558P | |
| N110 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N132 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N145 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N150 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N175 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N185 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| N215 | BO LF411CN FET OPAMP OPERATIONAL AMPLIFIER | 0349.3058.00 | NSC | LF411CN | |
| N220 | BO LF411CN FET OPAMP OPERATIONAL AMPLIFIER | 0349.3058.00 | NSC | LF411CN | |
| P1 | VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| ..7 | WIRE-WRAP PIN | | | | |
| P10 | VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| ..13 | WIRE-WRAP PIN | | | | |
| P15 | VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| ..18 | WIRE-WRAP PIN | | | | |
| P20 | VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| | WIRE-WRAP PIN | | | | |
| P21 | VL WIRE-WRAP PIN L=11,6 | 0088.4542.00 | DUPONT CON | 75403-003 | |
| | WIRE-WRAP PIN | | | | |
| R1 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R3 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R4 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R5 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R7 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R8 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R9 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R10 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R11 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R13 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R15 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalt in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|-------------------------|
| R20 | RL 0,60W 1,0 OHM+-1%TK50 METALFILMRESISTOR | RL 0099.7860.00 | ROEDERSTEI | MK2 | |
| R45 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R46 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R47 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R48 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R49 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R50 | RL 0,60W 825 OHM+-1%TK50 RESISTOR | RL 0082.2502.00 | RESISTA | MK2 | |
| R51 | RL 0,60W 221 OHM+-1%TK50 RESISTOR | RL 0083.0084.00 | PHILIPS_CO | MRS 25 | |
| R52 | RL 0,60W 825 OHM+-1%TK50 RESISTOR | RL 0082.2502.00 | RESISTA | MK2 | |
| R53 | RL 0,60W 3,92KOHM+-1%TK50 RESISTOR | RL 0083.1039.00 | PHILIPS_CO | MRS 25 | |
| R54 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R55 | RL 0,60W 562 OHM+-1%TK50 RESISTOR | RL 0083.0461.00 | RESISTA | MK2 | |
| R60 | RS 0,3W 1KOHM+-10% CERMET TRIMMING POTENTIOMETER | RS 0006.6681.00 | BECKMAN | 67 W | |
| R61 | RL 0,60W 750 OHM+-1%TK50 RESISTOR | RL 0082.2360.00 | ROEDERSTEI | MK2 | |
| R62 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R63 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R64 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R65 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R66 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R70 | RL 0,60W 681 OHM+-1%TK50 RESISTOR | RL 0083.0490.00 | RESISTA | MK2 | |
| R71 | RL 0,35W1,93KOHM+-0,1%T25 RESISTOR | RL 0083.9698.00 | DRALORIC | SMA0207 | |
| R72 | RL 0,35W1,87KOHM+-0,1%T25 RESISTOR | RL 0083.9669.00 | DRALORIC | SMA0207 | |
| R73 | RL 0,35W1,87KOHM+-0,1%T25 RESISTOR | RL 0083.9669.00 | DRALORIC | SMA0207 | |
| R74 | RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R75 | RL 0,35W412 OHM+-0,1%TK25 RESISTOR | RL 0083.8404.00 | DRALORIC | SMA0207 | |
| R76 | RL 0,35W402 OHM+-0,1%TK25 RESISTOR | RL 0083.8385.00 | DRALORIC | SMA0207 | |
| R77 | RL 0,35W397 OHM+-0,1%TK25 RESISTOR | RL 0083.8379.00 | DRALORIC | SMA0207 | |
| R78 | RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R80 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R83 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R84 | RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R90 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | |
| R91 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R101 | RL 0,35W52,3KOHM+-0,1%T25 RESISTOR | RL 0084.4448.00 | RUF | BPO207 | |
| R102 | RL 0-OHM-WIDERST. 0204 O-OHM RESISTOR | RL 0069.0000.00 | DRALORIC | OMA 0204 | |
| R102 | NUR VAR/ONLY MOD: 02 43 RL 0,60W 215 OHM+-1%TK50 RESISTOR | RL 0083.0078.00 | PHILIPS_CO | MRS 25 | |
| R103 | NUR VAR/ONLY MOD: 04 RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R104 | RL 0,60W 604 OHM+-1%TK50 RESISTOR NUR VAR/ONLY MOD: 02 43 | RL 0082.2425.00 | RESISTA | MK2 | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| R104 | RL 0,60W 392 OHM+-1%TK50 RESISTOR NUR VAR/ONLY MOD: 04 | RL 0082.2183.00 | RESISTA | MK2 | |
| R105 | RL 0,60W 1KOHM+-1%TK50 RESISTOR NUR VAR/ONLY MOD: 02 43 | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R105 | RL 0,60W 787 OHM+-1%TK50 RESISTOR NUR VAR/ONLY MOD: 04 | RL 0083.0549.00 | RESISTA | MK2 | |
| R106 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R107 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R108 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R109 | RL 0,35W4,99KOHM+-0,1%T25 RESISTOR | RL 0084.2480.00 | DRALORIC | SMA0207 | |
| R110 | RL 0,35W 1 KOHM+-0,1%TK25 RESISTOR | 0083.9146.00 | DRALORIC | SMA0207 | |
| R111 | RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R112 | RL 0,35W100KOHM+-0,1%TK25 RESISTOR | RL 0084.4983.00 | DRALORIC | SMA0207 | |
| R115 | RL 0,60W 33,2KOHM+-1%TK50 RESISTOR NUR VAR/ONLY MOD: 04 | RL 0083.1674.00 | RESISTA | MK2 | |
| R120 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R121 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R122 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R123 | RL 0,35W2,49KOHM+-0,1%T25 RESISTOR | RL 0083.9900.00 | DRALORIC | SMA0207 | |
| R124 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R125 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R126 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R127 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R140 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R141 | RL 0,35W8,06KOHM+-0,1%T25 RESISTOR | RL 0084.2880.00 | DRALORIC | SMA0207 | |
| R142 | RL 0,35W10,1KOHM+-0,1%T25 RESISTOR | RL 0084.3070.00 | DRALORIC | SMA0207 | |
| R143 | RL 0,35W10,1KOHM+-0,1%T25 RESISTOR | RL 0084.3070.00 | DRALORIC | SMA0207 | |
| R144 | RL 0,35W2,71KOHM+-0,1%T25 RESISTOR | RL 0083.9975.00 | DRALORIC | SMA0207 | |
| R145 | RL 0,60W 1,50KOHM+-1%TK50 RESISTOR | RL 0083.0732.00 | PHILIPS_CO | MRS 25 | |
| R149 | RL 0,35W2,21KOHM+-0,1%T25 RESISTOR | RL 0083.9800.00 | DRALORIC | SMA0207 | |
| R150 | RL 0-OHM-WIDERST. 0204 O-OHM RESISTOR | RL 0069.0000.00 | DRALORIC | OMA 0204 | |
| R151 | RL 0,35W52,3KOHM+-0,1%T25 RESISTOR | RL 0084.4448.00 | RUF | BPO207 | |
| R152 | RL 0,60W 1MOHM+-1%TK50 RESISTOR | RL 0082.7862.00 | RESISTA | MK2 | |
| R153 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R154 | RL 0,35W604 OHM+-0,1%TK25 RESISTOR | RL 0083.8727.00 | DRALORIC | SMA0207 | |
| R155 | RL 0,35W100KOHM+-0,1%TK25 RESISTOR | RL 0084.4983.00 | DRALORIC | SMA0207 | |
| R156 | RL 0,35W4,99KOHM+-0,1%T25 RESISTOR | RL 0084.2480.00 | DRALORIC | SMA0207 | |
| R157 | RL 0,35W 1 KOHM+-0,1%TK25 RESISTOR | 0083.9146.00 | DRALORIC | SMA0207 | |
| R160 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |
| R161 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R162 | RL 0,60W 100KOHM+-1%TK50 RESISTOR | RL 0082.1764.00 | RESISTA | MK2 | |

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|------------------|--|----------------------|-------------------------|-------------------------|---------------------------|
| R163 | RL 0,60W 22,1KOHM+-1%TK50 RESISTOR | RL 0083.1545.00 | RESISTA | MK2 | |
| R166 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R167 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R168 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R169 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R175 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R176 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R177 | RL 0,35W4,70KOHM+-0,1%T25 RESISTOR | RL 0084.2439.00 | DRALORIC | SMA0207 | |
| R178 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R180 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R182 | RL 0,35W25,8KOHM+-0,1%T25 RESISTOR | RL 0084.3858.00 | DRALORIC | SMA0207 | |
| R183 | RL 0,35W10,0KOHM+-0,1%T25 RESISTOR | RL 0084.3064.00 | DRALORIC | SMA0207 | |
| R184 | RL 0,35W10,0KOHM+-0,1%T25 RESISTOR | RL 0084.3064.00 | DRALORIC | SMA0207 | |
| R185 | RL 0,35W1,50KOHM+-0,1%T25 RESISTOR | RL 0083.9481.00 | DRALORIC | SMA0207 | |
| R215 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R216 | RL 0,60W 2,21KOHM+-1%TK50 RESISTOR | RL 0082.2477.00 | RESISTA | MK2 | |
| R216 | NUR VAR/ONLY MOD: 02 RL 0,60W 5,49KOHM+-1%TK50 RESISTOR | RL 0083.1139.00 | RESISTA | MK2 | |
| R216 | NUR VAR/ONLY MOD: 04 RL 0,60W 4,42KOHM+-1%TK50 RESISTOR | RL 0083.1074.00 | RESISTA | MK2 | |
| R217 | NUR VAR/ONLY MOD: 43 RS 0,5W100 OHM+-10%10X10X CERMET POTENTIOMETER T | RS 0247.7984.00 | BI_TECHNOL | 72PM | |
| R217 | NUR VAR/ONLY MOD: 02 RS 0,5W200 OHM+-10%10X10X CERMET POTENTIOMETER T | RS 0087.7554.00 | BI_TECHNOL | 72PM | |
| R218 | NUR VAR/ONLY MOD: 04 43 RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R221 | RL 0,60W 10,0 OHM+-1%TK50 RESISTOR | RL 0082.8852.00 | PHILIPS_CO | MRS 25 | |
| R225 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R226 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R232 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| V1 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| V8 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V10 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V50 | AK BF374 N 25V 100MA TRANSISTOR | 0377.3859.00 | MOTOROLA | BF374 | |
| V52 | AK BF374 N 25V 100MA TRANSISTOR | 0377.3859.00 | MOTOROLA | BF374 | |
| V55 | AK BC337-40 N 45V 800MA TRANSISTOR | 0303.9524.00 | ITT | BC337-40 | |
| V65 | AM 2N4857A N-D 40V JFET FET | 0092.9422.00 | PHILIPS_SE | 2N4857(A) | |
| V80 | AM 2N4857A N-D 40V JFET FET | 0092.9422.00 | PHILIPS_SE | 2N4857(A) | |
| V81 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V82 | AM 2N4857A N-D 40V JFET FET | 0092.9422.00 | PHILIPS_SE | 2N4857(A) | |
| V83 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |

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|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| V90 | AM 2N4857A N-D 40V JFET FET | 0092.9422.00 | PHILIPS_SE | 2N4857(A) | |
| V91 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V101 | AE 5082-2810 SCHOTTKY DIODE | 0012.9389.00 | HEWLETT_PA | 5082-2810 GEGURTET | |
| V104 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V105 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V140 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V141 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V145 | AE BZX55/B5V1 0,5W ZDI ZENER DIODE | AE 0262.5837.00 | TELEFUNKEN | BZX55B5V1 | |
| V150 | AE 5082-2800 SCHOTTKY DIODE | 0012.9066.00 | HEWLETT_PA | 5082-2800 | |
| V154 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V155 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V180 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| V181 | AD 1N4448 75V UDI DIODE | AD 0012.0700.00 | PHILIPS_SE | 1N4448 " | |
| X1 | FP STECKERLEISTE 32POL. MULTIPOINT CONNECTOR | FP 0514.4550.00 | SIEMENS | V42254-B1200-B641 | |
| X10 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X11 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |
| X13 | VL WIRE-WRAP PIN L=11,6 WIRE-WRAP PIN | 0088.4542.00 | DUPONT CON | 75403-003 | |

Wir uns alle rechtig vor.

| | | | | | | |
|--|----------|----|---------------|---------------------------------------|-------------------------|-------------------|
| MEZ 15 | 790 3PLU | Äl | Datum Date | Schalttailliste für Parts list for | Sachnummer Stock No. | Blatt-Nr. Page |
|  | | 31 | 03.05.99 | ED AF-SYNTHESIZER | 0802.0411.01 SA | 8- |

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ROHDE & SCHWARZ

SERVICEUNTERLAGEN

Option "X-Ausgang"

SMG-B3 801.9609.02

Printed in West Germany

ENGLISH SERVICE MANUAL FOLLOWS FIRST COLOURED DIVIDER

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5.1 Funktionsbeschreibung

(Hierzu Stromlauf 801.9621 S)

Die Option "X-Ausgang" erzeugt beim Sweepablauf am Ausgang "X-Axis" eine Spannungsrampe von 0 V bis 10 V. Dieses Signal wird mit einem 10-bit-D/A-Wandler (D1) erzeugt. Die Ansteuerung des D/A-Wandlers erfolgt vom Mikroprozessor über die serielle Schnittstelle. Die Daten werden in den Schieberegistern D10 und D15 gespeichert. Das Signal "Z-Axis" wird vom Schieberegister D15 abgenommen.

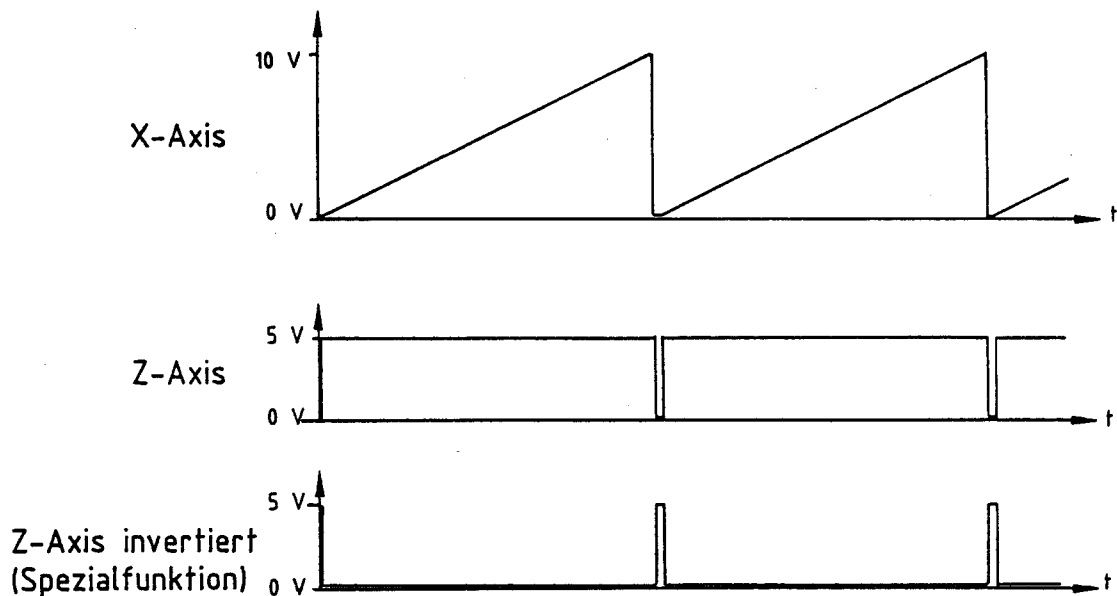
5.2 Prüfung

→ Oszilloskop an den Ausgang "X-Axis" bzw. "Z-Axis" anschließen.

→ Am Gerät folgenden Sweep einstellen:

Startfrequenz = 100 MHz
Stoppfrequenz = 200 MHz
Step = 1 MHz
Time/Step = 10 ms

→ In der Betriebsart Auto-Sweep sind folgende Signale zu sehen:



5.3 Schnittstellen

| Anschluß | Bezeichnung | Bemerkung |
|----------|-------------|---|
| X5 | X-Axis | Spannungsrampe 0...10 V |
| X10 | Z-Axis | Logik-Ausgang, Polarität programmierbar |
| X1.2B | Test | Diagnoseausgang 0...4 V |
| X1.3B | Clock | serielle Schnittstelle |
| X1.4B | Daten | serielle Schnittstelle |
| X1.5B | Strobe | serielle Schnittstelle |



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SERVICE DOCUMENTS

X Output Option

SMG-B3 801.9609.02

Printed in West Germany

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| | Component list |
| | Circuit diagram |
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5.1 Function Description

(See circuit diagram 801.9621 S)

During the sweep, the option "X Output" produces a voltage ramp of 0 V to 10 V at the output "X-Axis". This signal is generated using a 10-bit D/A converter (D1). The D/A converter is driven by the microprocessor via the serial interface. The data are stored in the shift registers D10 and D15. The signal "Z-Axis" is taken from the shift register D15.

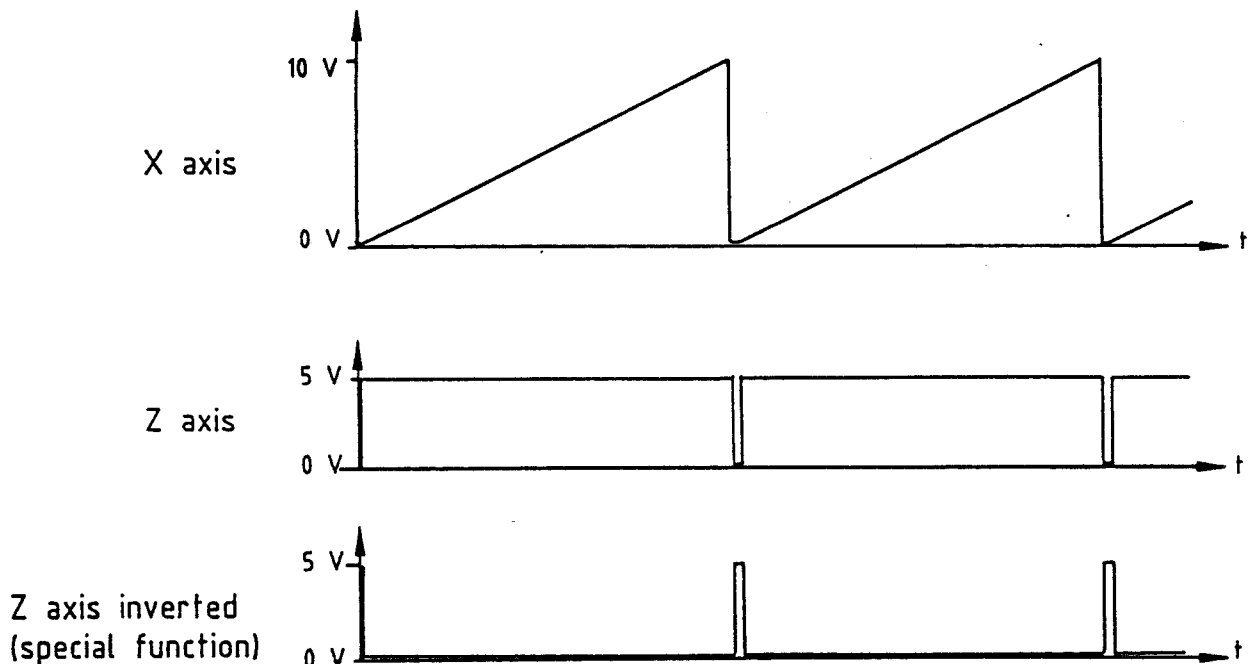
5.2 Checking

→ Connect oscilloscope to the output "X-Axis" or "Z-Axis".

→ Set the following sweep on the instrument:

Start frequency = 100 MHz
 Stop frequency = 200 MHz
 Step = 1 MHz
 Time/step = 10 ms

→ The following signals can be seen in the operating mode auto sweep:




5.3 Interfaces

| Pin | Designation | Remark |
|-------|-------------|-------------------------------------|
| X5 | X-Axis | Voltage ramp 0 to 10 V |
| X10 | Z-Axis | Logic output, polarity programmable |
| X1.2B | Test | Diagnostic output 0 to 4 V |
| X1.3B | Clock | Serial interface |
| X1.4B | Data | Serial interface |
| X1.5B | Strobe | Serial interface |

Schaltteillisten
Stromläufe
Bestückungspläne
Part lists
Circuit diagrams
Components plans
Listes des pièces détachées
Schémas de Circuit
Plans des composants

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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in | |
|--|--------------------------|-------------------------|--|---------------------------------------|------------------------------|-------------------|
| A50 | ED X-AUSGANG X OUTPUT | 0801.9621.02 | | | | |
| W5 | DV KABEL W5 CABLE | 0801.9650.00 | | | 0801.9680.00 | |
| W10 | DV KABEL W10 CABLE | 0801.9667.00 | | | 0801.9680.00 | |
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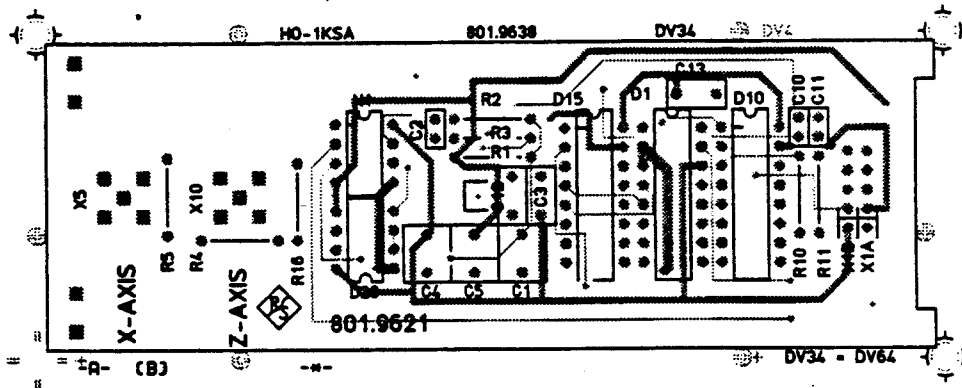
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| Kennz. Comp. No. | Benennung Designation | Sachnummer Stock No. | Hersteller Manufacturer | Bezeichnung Designation | enthalten in contained in |
|---------------------|---|-------------------------|----------------------------|----------------------------|------------------------------|
| C1 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C2 | CC 1NF+-10%63V K2000 CERAMIC CAPACITOR | CC 0022.0784.00 | PHILIPS_CO | 2222 630 | |
| C3 | CK 1ONF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2869.00 | ROEDERSTEI | MKT 1826-310-014W | |
| C4 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C5 | CK 1UF+-5%50V7,5X5,5X10,5 CAPACITOR | CK 0099.2998.00 | SIEMENS | B32529-C5105-J189 | |
| C10 | CC 1OPF+-0,25PF3X4NPO CAPACITOR | CC 0087.6429.00 | PHILIPS_CO | 2222 678 10109 | |
| C11 | CC 1OPF+-0,25PF3X4NPO CAPACITOR | CC 0087.6429.00 | PHILIPS_CO | 2222 678 10109 | |
| C12 | CK 1ONF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2869.00 | ROEDERSTEI | MKT 1826-310-014W | |
| C13 | CK 1ONF+-5%63V RD2,5H7MKT CAPACITOR | CK 0099.2869.00 | ROEDERSTEI | MKT 1826-310-014W | |
| D1 | BJ AD7533CQ 1X10B-DAC D/A-CONVERTER | BJ 0300.8740.00 | ANALOG_DEV | AD7533CQ(CD) | |
| D10 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D15 | BL PC74HC4094P 8ST.SH.REG 8-STAGE SHIFT&STORE REG. | 0099.9711.00 | PHILIPS_SE | (PC)74HC4094N(P) | |
| D20 | BS TL601CP 1X ANALOGSCH ANALOG SWITCH | BJ 0213.4530.00 | TEXAS | TL601CP [MJG] | |
| N1 | BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER | 0356.0521.00 | NSC | LF412CN | |
| R1 | RL 0,60W 5,62KOHM+-1%TK50 RESISTOR | RL 0082.2190.00 | PHILIPS_CO | MRS 25 | |
| R2 | RL 0,60W 12,1KOHM+-1%TK50 RESISTOR | RL 0083.1351.00 | PHILIPS_CO | MRS 25 | |
| R3 | RL 0,60W 15,0KOHM+-1%TK50 RESISTOR | RL 0083.1400.00 | RESISTA | MK2 | |
| R4 | RL 0,60W 10,0KOHM+-1%TK50 RESISTOR | RL 0083.1297.00 | PHILIPS_CO | MRS 25 | |
| R5 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| R10 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R11 | RL 0,60W 1KOHM+-1%TK50 RESISTOR | RL 0082.2160.00 | PHILIPS_CO | MRS 25 | |
| R16 | RL 0,60W 100 OHM+-1%TK50 RESISTOR | RL 0082.6543.00 | PHILIPS_CO | MRS 25 | |
| W1 | DY BUCHSENEINHEIT CABLE | 0801.9709.00 | | | |
| X5 | FJ EINBAUSTECKER F.GS SMB PLUG | FJ 0063.5168.00 | ROSENBERGE | 59S106-400-D3 | |
| X10 | FJ EINBAUSTECKER F.GS SMB PLUG | FJ 0063.5168.00 | ROSENBERGE | 59S106-400-D3 | |

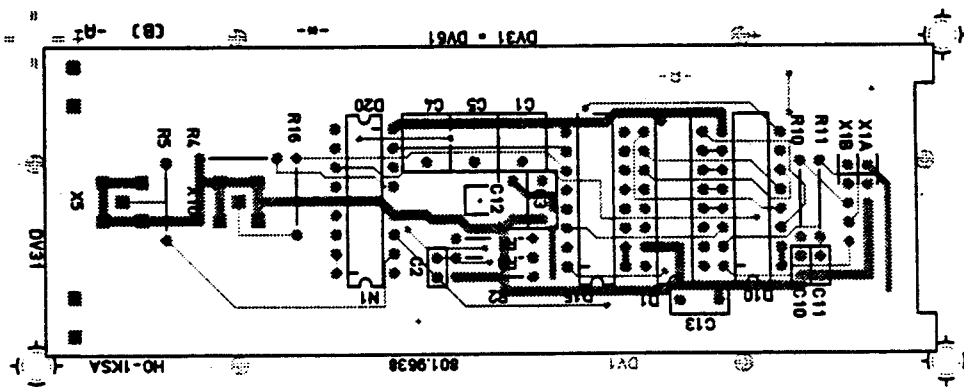
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|  | ROHDE & SCHWARZ | 01 | 03.05.99 | ED X-AUSGANG X OUTPUT | 0801.9621.01 SA | 1- |

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



Ansicht und Leitungsführung Lötseite
View of tracks on solder side



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ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

VARIANTENERKLÄRUNG / VERSION
VAR 02 - GRUNDAUSFÜHRUNG / BASIC MODEL

| | | | | | | | |
|------------|----------------------|-----|--------------------------|----------|------|---------------------|------------|
| A | 04.86 | HO | Maße ohne Toleranzangabe | | | Maßstab 1 : 1 | |
| | | | | | | Halbzeug, Werkstoff | |
| | | | 1KSA | Tag | Name | Benennung | |
| | | | Bearb. | 04.86 | HO | X - AUSGANG | |
| | | | Gepr. | | | Z | |
| | | | Norm | | | | |
| | | | | | | Zeichn.-Nr. | Blatt-Nr. |
| | | | | | | 801.9621.01 | ED |
| And. Zust. | Änderungs-Mitteilung | Tag | Name | zu Gerät | SMG | reg. i. V. | 801.9609 V |
| | | | | | | erste Z. | |



