

DX HANDY MX-6S

OPERATING MANUAL

ADVANCED ELECTRONIC APPLICATIONS, INC.

Advanced Electronic Applications, Inc  
P.O. Box C-2160  
Lynnwood, WA 98036-0918  
Tel. (206) 775-7373

TABLE OF CONTENTS

OVERVIEW....	1
ACCESSORIES.....	1
SPECIFICATIONS	2
4.0 SETTING UP YOUR DX HANDY.....	3
4.1 Battery Installation.....	3
4.2 Recharging NiCad Batteries.....	4
4.3 Operating from an External Power Source.....	4
4.4 Attaching the Antenna.....	5
CONTROLS AND INDICATORS.	6
6.0 OPERATION.....	9
6.1 Receiving.....	9
6.2 Transmitting.....	10
6.3 Operating Hints.....	11
7.0 OPTIONAL CRYSTAL INSTALLATION.....	11
7.1 Installing Range Crystals.....	11
APPENDIX A SCHEMATIC AND BLOCK DIAGRAMS.....	13

## LIMITED WARRANTY

ADVANCED ELECTRONIC APPLICATIONS, INC. warrants to the original purchaser that this product shall be free from defects in material or workmanship for ninety days from the date of original purchase. In order to obtain warranty service: (1) Complete and mail the warranty registration card within 10 days to Advanced Electronic Applications, Inc., and (2) Send written notification to the address below or telephone as soon as possible after discovering a possible defect:

Advanced Electronic Applications, Inc.  
Attention: Service Department  
2006 - 196th S.W.  
Lynnwood, WA 98036

The written notification must include a copy of the invoice. Include a description of the defective part or condition, with details of the electrical connections to associated equipment and list such equipment. Please enclose your name, phone number, and address. Shipping charges for any parts or units submitted for replacement under this warranty must be paid by the purchaser.

Correct maintenance, repair and use are important to insure proper performance from this product. Carefully read the Instruction Manual. This warranty does not apply to any defect AEA determines is caused by (1) improper maintenance or repair, including the installation of parts or accessories that do not conform to the quality and specification of the original parts; (2) misuse, abuse, neglect, or improper installation; (3) accidental or intentional damage. The field installation of circuits or batteries according to the instructions in the manual will not nullify this warranty.

All implied warranties, if any, terminate ninety days from the date of original purchase. AEA is not responsible for damage to other equipment or property or any other consequential or incidental damage of any kind whether based on contract, negligence, or strict liability. Maximum liability shall not, in any case, exceed the purchase price of the unit.

The foregoing constitutes AEA's entire obligation with respect to this product. The original purchaser and any user or owner shall have no other remedy and no claim for incidental or consequential damages. Some states do not allow limitations of how long an implied warranty lasts or do not allow the exclusion of incidental or consequential damages, therefore, the above limitations and exclusions may not apply to you.

This warranty gives specific legal rights. You may also have other rights which vary from state to state.

**VHF 6-Meter Handheld:**

The DX Handy tm model MX-6S is a SSB/CW handheld transceiver that covers two 50 KHz segments of the 50.0 - 51.0 MHz amateur band.

**Frequency Coverage:**

The DX Handy is equipped with two crystals for operation from 50.1 to 50.15 MHz (Switch position A), and 50.2 to 50.25 MHz (position B). The "A" range covers the lower 50 KHz of the Phone band including the 50.11 MHz calling frequency. The "B" range is higher in the band, and may also be used for Phone.

**Dual Modes:**

The DX Handy can be operated in either Upper Sideband (USB) or CW. Operating mode is selected with a bottom mounted slide switch.

**Dual Power Source:**

The DX Handy can be powered by either 6 AA dry cell batteries (included) or optionally 7 AA NiCads can be installed. An external 9.5 VDC regulated power supply can operate the transceiver as well. **WARNING! DO NOT OPERATE THE DX HANDY FROM 12 VOLTS DC. THIS WILL DAMAGE THE TRANSCEIVER AND VOID THE WARRANTY.**

**S/RF Meter:**

A Signal strength and RF output meter is included to help in giving signal reports, and provide a relative indication of output power.

**Receiver Incremental Tuning:**

A Top mounted Receiver Incremental Tuning (RIT) knob allows the fine tuning of stations without changing your transmit frequency.

**External Speaker and Microphone Jacks:**

External Speaker and Microphone Jacks are provided.

**Built in CW Key:**

A top mounted momentary switch can be used to key CW, or an external key may be connected through a bottom mounted miniature phone jack.

**2.0 ACCESSORIES**

The DX Handy comes with a few accessories to improve operation.

- |                  |  |
|------------------|--|
| 1. Batteries     | 6 AA dry cells are included.   |
| 2. Dummy Battery | A Dummy Battery is necessary when 6 Carbon or Alkaline batteries (1.5 V/cell) are used.  |
| 3. DC Power Cord | A DC Power/Charging cord is included.<br><b>WARNING! DO NOT OPERATE THE DX HANDY FROM 12 VOLTS DC. THIS WILL DAMAGE THE TRANSCEIVER AND VOID THE WARRANTY.</b> |
| 4. Whip Antenna  | A telescoping whip antenna is included   |
| 5. Counterpoise  | A 4'-8" Counterpoise wire is included.   |

### 3.0 SPECIFICATIONS

#### General

Frequency Coverage: Any two 50 KHz segments in the 50.0 - 51.0 MHz Amateur Band (50.10-50.15 and 50.20-50.25 MHz supplied)

Frequency Control: VXO provides 50 KHz of continuous tuning with a single crystal

Frequency Stability: Within +/- 500 Hz. from a cold start

Antenna: 50 Ohms Unbalanced, BNC connector

Power Requirement: 8.4 - 9.0 VDC  
(Included) 6 - AA Dry Cells (1.5 Volt/cell) = 9.0 VDC  
(Optional) 7 - AA NiCads (1.2 Volt/cell) = 8.4 VDC

Current Drain: Receiving - Approx. 70 mA  
Transmitting - Approx. 400 mA

Dimensions: (W) 66mm x (H) 39mm x (D) 142 mm

Weight: 710 Grams (1 lb. 9 oz.) with batteries and antenna

#### Transmitter

Output Power: Approximately 1 Watt at 9.0 VDC

Emission Modes: A3J (USB) and A1A (CW)

Spurious Emissions: More than 60 dB down

#### Receiver

Sensitivity: less than 0.5 uV for 15 dB S/N

Intermediate Frequency: 11.2735 MHz

#### Controls and Indicators

On/Off Volume Control: Top mounted Potentiometer

Receiver Incremental Tuning: (RIT) Top mounted Potentiometer with center off detent position

Frequency: Top mounted 50 KHz VXO tuning

Frequency Range: Top mounted 2-position switch

Noise Blanker: Top mounted On/Off switch

S/RF Meter: Top mounted S/RF meter

Built in CW Key: Top mounted momentary switch

External Speaker Output: Top mounted 1/16" phone jack

External Microphone Input: Top mounted 1/8" phone jack

Antenna Connector: Top mounted Female BNC

Transmit Indicator: Top mounted Transmit LED

Push-To-Talk: Side mounted momentary switch

External Power: Bottom mounted 2.1 mm coaxial

External Key Input: Bottom mounted 1/8" phone jack

Mode Selector Switch: Bottom mounted 2-position switch

Charge/External Power: Bottom mounted 2-position switch selecting 12 VDC charging, or 9.5 VDC external power function

Specifications are based on 50.0 to 50.3 MHz operation, and are subject to change without notice or obligation.

Please take a little time to read through this section so that you become familiar with the basic features of the DX Handy. Spending a little time here could also save you from a costly mistake that could damage your handheld.

### **Battery Installation**

To install batteries in the DX Handy, simply remove the rear cover of the transceiver by taking out the screw as shown below in Figure 4-1. This will expose the internal battery tray which holds up to seven AA cells. Read the next paragraph if you are installing carbon or alkaline batteries. Skip the next paragraph if you are installing (optional) rechargeable NiCad cells.

**AA Carbon (included) or Alkaline (1.5 Volt) cell installation:**  
When using carbon or alkaline cells, only 6 cells are required for an operating voltage of 9 volts. Install the 6 batteries carefully observing the polarity indicated on the battery tray. This should leave one extra space for the dummy battery which must be installed. Carefully replace the back cover and secure it with the screw removed above. **DO NOT INSTALL SEVEN 1.5 VOLT CELLS IN YOUR DX HANDY. THIS COULD DAMAGE THE TRANSCEIVER.**

**AA NiCad (1.2 volt) cell (user supplied) installation:**  
AA size NiCad batteries may be purchased many places including Radio Shack under their part number 23-125. Seven cells are required to produce 8.4 volts which will operate the transceiver at a slightly reduced power level. Simply install all seven cells carefully observing the polarity indicated on the battery tray. Be careful not to lose the "Dummy" battery which is necessary when 1.5 volt cells are used. Replace the back cover and secure it with the screw removed above. See the section on Battery Charging on the next page.

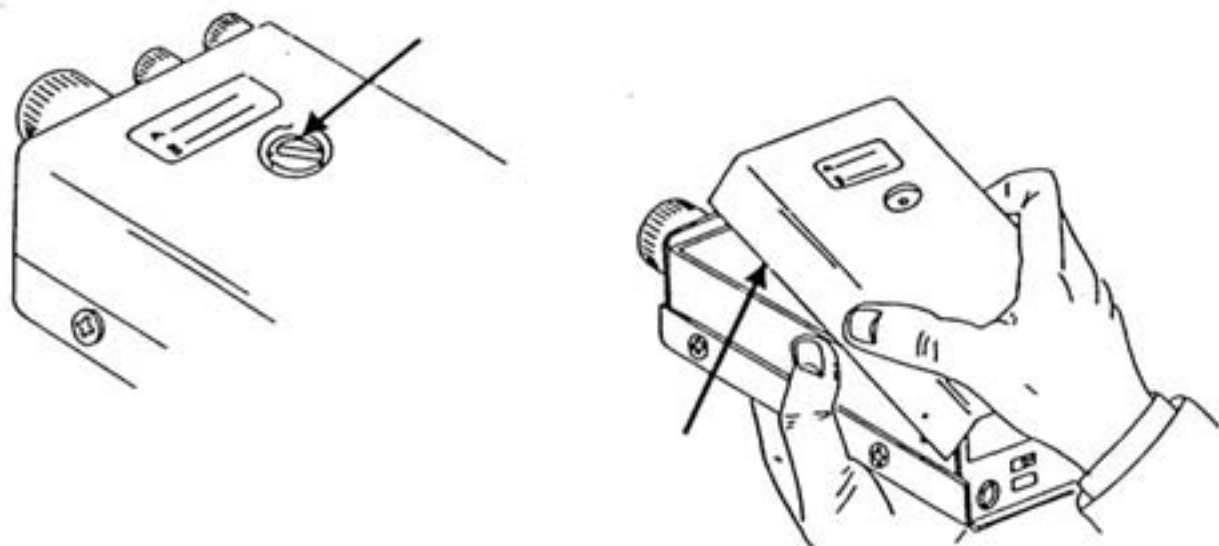


Figure 4-1: Removing the back cover for battery installation

## 4.2 Charging NiCad Batteries

Rechargeable batteries may be charged without removing them from the transceiver. The DX Handy must first be switched OFF to prevent damage to the transceiver.

To charge the batteries, simply slide the bottom mounted External P.S. switch to the CHARGE position, and connect a 12 volt DC power source as shown in Figure 4-2 below. The power source may be connected through the supplied cable, or an optional AC-1 charging unit may be purchased from your AEA dealer. The red wire of the cable is connected to the center pin which is positive. NiCad battery charging time should be 12-15 hours.

Make sure that you DO NOT connect 12 volts DC to the transceiver unless BOTH the transceiver is OFF, and the External P.S. switch is in the CHARGE position.

Damage to the transceiver may result if applied voltage exceeds 9.5 volts DC while the power switch is turned on. To operate the transceiver from external power, see section 4.3 before connecting an external power supply.

Before charging, always be certain that the batteries installed are rechargeable NiCad cells. Attempting to charge carbon or alkaline batteries can cause them to leak or even explode.



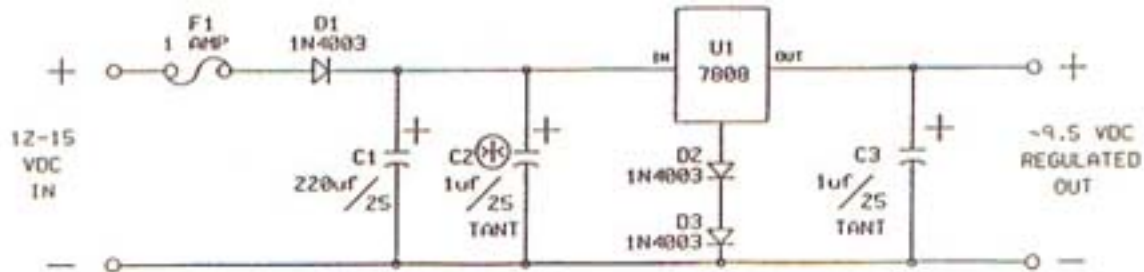
Figure 4-2: Plugging in external power to charge NiCad batteries.

## 4.3 Operating From an External Power Source

The DX Handy may be operated from an external 9.5 Volt DC power supply. Extreme caution must be observed that the applied voltage does not exceed 9.5 VDC when the transceiver is ON. Exceeding this value may damage the DX Handy and void the warranty.

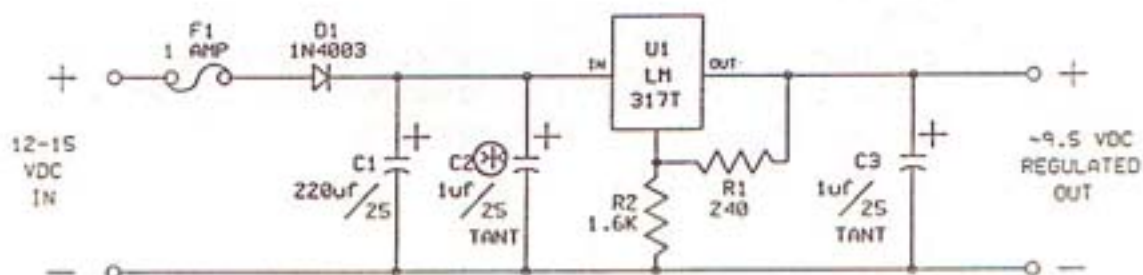
A voltage regulator can be built to obtain 9.5 VDC from a vehicle or 12 volt power supply to operate the transceiver. Two schematic diagrams of 9.5 VDC regulator circuits are shown in figures 4-3 and 4-4 on the following page.

Either of the following two circuits will regulate 12 or 13.8 VDC down to 9.5 VDC. In either circuit, make sure that C2 is mounted as close to the regulator IC as possible.



C1	220 uf/25 V	Electrolytic	F1	1 Amp In-line Fuse
C2-C3	1.0 uf/25 V	Tantalum	U1	7808 Positive 8 Volt Regulator
D1-D3	1N4003 or Equiv.	1 Amp Diode		

Figure 4-3: 9.5 VDC Regulator Circuit #1



C1	220 uf/25 V	Electrolytic	R1	240 Ohm 5% 1/4 Watt
C2-C3	1.0 uf/25 V	Tantalum	R2	1,600 Ohm 5% 1/4 Watt
D1	1N4003 or Equiv.	1 Amp Diode	U1	LM317T Positive Voltage Regulator
F1	1 Amp In-line Fuse			

Figure 4-4: 9.5 VDC Regulator Circuit #2

\* Make sure that capacitor C2 is mounted as close to U1 as possible.

#### 4.4 Attaching the Antenna

A standard female BNC antenna connector is mounted on top of the DX Handy so either the included whip antenna, or a high performance base or mobile antenna may be attached.

Attaching the telescoping whip antenna:

To attach the whip antenna, simply hold the transceiver in an upright position and slide the whip antenna over the BNC connector on the top of the transceiver. Gently turn the connector 1/4 turn clockwise to secure the antenna.

Attaching a base or mobile antenna:

A standard BNC male connector may be connected to the DX Handy to attach an external base or mobile antenna. An adapter may also be purchased to adapt the BNC connector on the DX Handy to an SO-239 connector (Radio Shack Part # 278-120) which is more common on base or mobile transceivers.



## CONTROLS AND INDICATORS

The following describes the Controls and indicators of the DX Handy as shown in Figure 5-1 and on the following page.

### **Tuning Knob**

Adjusts the operating frequency of the DX Handy. Continuously adjusts the transmit and receive frequency of the DX Handy over a 50 KHz range.

### **A-B Range Switch**

Selects one of two 50 KHz tuning ranges in the 50.0 to 51.0 MHz amateur band. As supplied, range A is 50.10 - 50.15 MHz and range B is 50.20 - 50.25 MHz. Do not operate in the lower 5 KHz of the phone band unless you have verified the calibration against a frequency standard.

### **Power Switch and Volume Control**

Turning this knob completely counterclockwise turns the power off. Advancing the knob clockwise turns the power ON, and then begins to increase the volume. Do not charge the internal batteries with this switch in the ON position.

### **SEND LED**

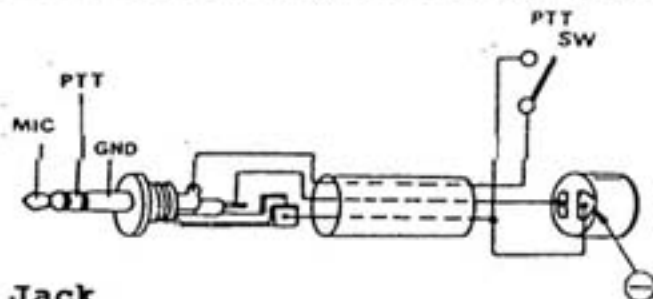
In SSB, this LED will light when the PTT switch is depressed. In CW, the LED will light when both the PTT switch is enabled and the CW key is depressed.

### **CW Microswitch Key**

This switch can be used as a CW key in portable operation, or an external key or keyer may be plugged into the KEY jack on the bottom of the transceiver. Push To Talk must be activated before operating the CW key.

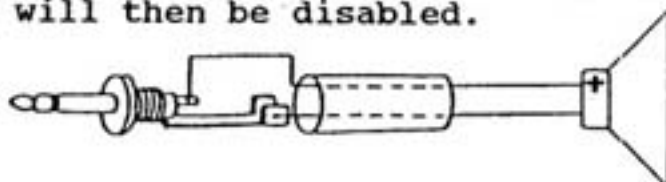
### **External Microphone Jack**

An external electret microphone with Push To Talk may be wired to this jack as shown below. This plug must be a 3-conductor miniature phone plug which may be purchased from Radio Shack under their part number 274-284. The internal microphone is disabled when an external microphone is attached.



### (7) **External Speaker Jack**

An external speaker or earphone may be connected here using a 2-conductor sub-miniature phone plug as diagrammed below. The internal speaker will then be disabled.



### BNC Antenna Connector

A BNC antenna connector is provided for attaching the portable whip antenna (Included). An external 6-meter, 50 Ohm antenna may be connected here as described in section 4.4.

### Push To Talk (PTT) Switch

Pressing this switch places the DX Handy into Transmit. When operating in voice (USB) simply press this switch and speak into the Microphone. In CW operation, press this switch before keying CW with the internal microswitch or an external key.

### Internal Speaker and Microphone

The internal speaker and microphone are located behind the grill. The Microphone is located in the upper-right hand corner of the grill.

### Receiver Incremental Tuning (RIT) Control

This potentiometer allows the adjustment of the receive frequency of the DX Handy. The RIT has a tuning range of approximately plus or minus 2.5 KHz from center.

### Noise Blanker Switch

Turns On and Off the receive Noise Blanker in the DX Handy. When ON, the Noise Blanker reduces or suppresses pulse type noise, such as that caused by automobile ignition systems.

### Signal Strength/RF Output Power Meter

In Receive, this meter shows the strength of a signal. In Transmit, the meter reads relative power output.

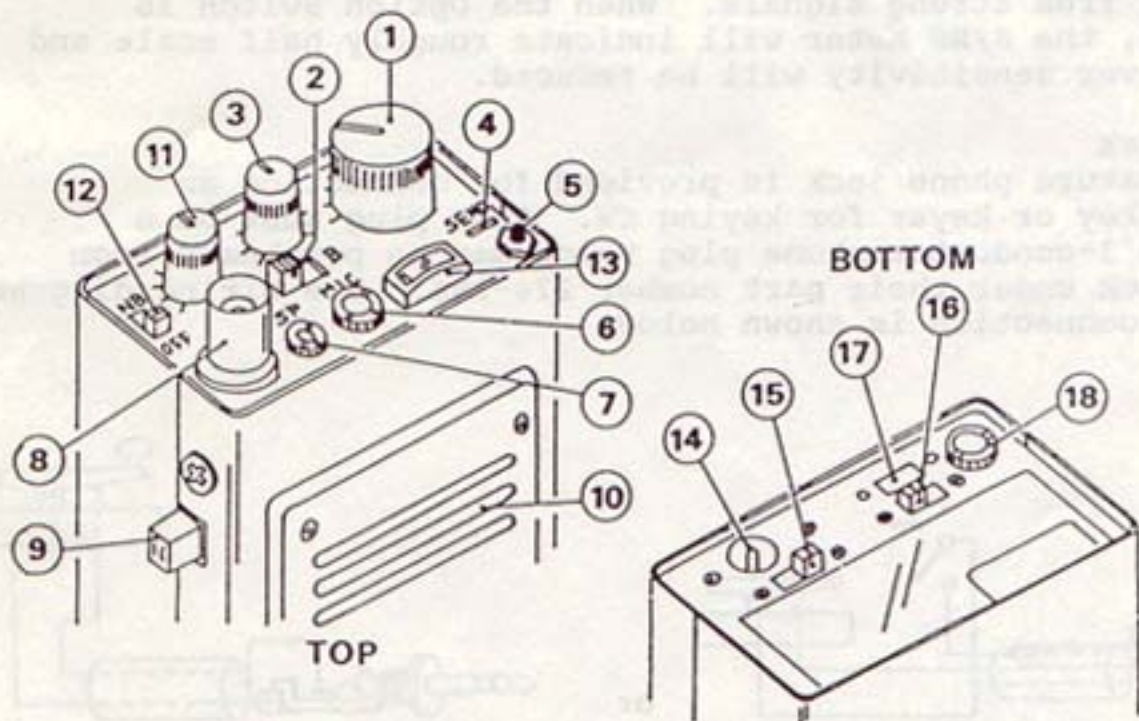


Figure 5-1: DX Handy Controls and Indicators

The following descriptions refer to the controls and jacks located on the bottom of the DX Handy as shown above in Figure 5-1.

#### External Power/Charge Jack

This connector allows 9.5 VDC to be applied to the DX Handy for powering the transceiver when the Function switch is in the BATT position. The same jack can be used to charge optional NiCad batteries from 12 VDC. Extreme care must be taken not to turn the transceiver ON when 12 VDC is applied to this jack. This will damage the transceiver and void the warranty. See sections 4.2 and 4.3 before attempting to charge or power the transceiver.

#### External Power Supply Function Switch

This switch controls whether or not the batteries will be charged with external power from the External Power/Charge Jack. When this switch is in the CHARGE position, internal NiCad batteries may be charged from an external 12 VDC. When this switch is in the BATT position, the internal batteries are bypassed and the transceiver may be operated from 9.5 VDC. Do not under any circumstances turn on the power switch or attempt to operate the DX Handy from 12 VDC.

#### (16) Mode Switch

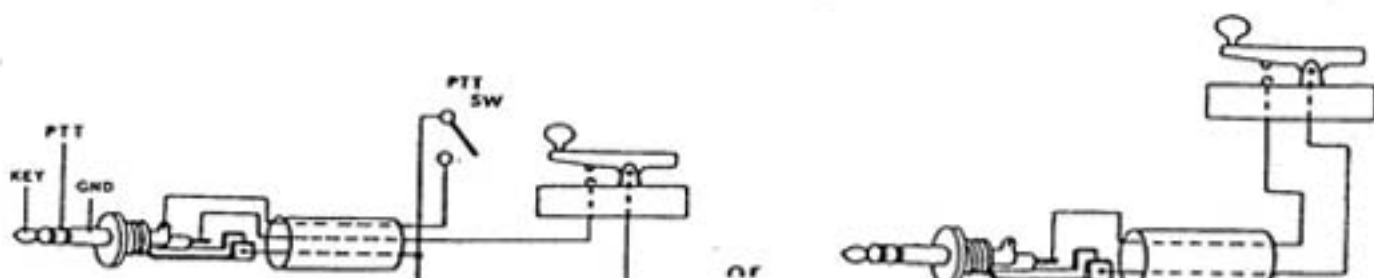
Selects between Single Sideband, and CW operation. When the switch is in the SSB position, Upper Sideband Operation is selected. When the switch is in the CW position, Morse Code operation is selected.

#### (17) Spare Switch/RF Attenuator

This switch allows the DX Handy to better handle and be protected from strong signals. When the Option Switch is turned ON, the S/RF Meter will indicate roughly half scale and the receiver sensitivity will be reduced.

#### CW Key Jack

This miniature phone jack is provided for connecting an external key or keyer for keying CW. This plug must be a miniature 3-conductor phone plug which may be purchased from Radio Shack under their part number 274-284. The wiring diagram for this connection is shown below.



## OPERATION

Before turning the transceiver on, verify the following:

1. Make sure that the batteries have been installed correctly as described in section 4.1.
2. Make sure that the whip antenna has been attached as described in section 4.4.

Set the controls and switches as follows before operation:

N.B. (Noise Blanker) Switch	----- OFF
RIT (Receiver Incremental Tuning)	----- 12 O'Clock detent position
Band A-B Switch	----- A Position
VXO Frequency Knob	----- Desired Frequency
Charge/Battery Function Switch	----- BATTERY Position
SSB/CW Mode Switch	----- SSB Position

### Receiving

Carefully extend the whip antenna to its full length, and then turn the transceiver on by rotating the ON/OFF-Volume knob clockwise. Adjust the volume control knob for a comfortable listening level.

The DX Handy covers two segments of the phone (SSB) portion of the 6-meter band. The U.S. frequency allocations for mode are listed below for your information.

#### CW (Morse Code)

Technician and above      50.00 - 50.10 MHz

#### SSB (Voice)

Technician and above      50.10 - 54.00 MHz

The 6-meter band is capable of long distance communication during times of good propagation. We are currently in a propagation upswing with the maximum expected to occur around the year 1991. As a rule, propagation will get better and better in the 6-meter band as the year 1991 approaches.

With the Band A-B Switch in the A-position, the DX Handy may be tuned from 50.10 to 50.15 MHz. This is part of the 6-meter phone (SSB). By tuning the VXO frequency knob carefully, you may hear other voice signals if the band is "Open", or if there is local activity. The frequency 50.11 MHz has been designated as the national calling frequency and is a good place to start listening.

If no activity is heard, a contact may be solicited by transmitting a "CQ" message.

## 6.2 Transmitting

Before Transmitting it is important to be aware of the phone and CW portions of the band as listed above. Never transmit voice (SSB) in the CW portion of the band. This should not be a problem with the standard crystals included with your 6-meter DX Handy. It is also a good idea not to operate in the lower 5 KHz of the phone band (A position) unless you have checked the calibration of your DX Handy against a frequency standard. Morse code may be transmitted anywhere in the 6-meter band, although the convention is to send CW in the part below 50.1 MHz.

If you tune across the band, and do not hear anyone, you may want to "Call CQ". CQ is derived from "Seek You", and is a general call to any radio amateur, letting him know that you want to talk.

To call "CQ" in voice, first make sure you are on the frequency you desire. The frequency 50.11 (BAND switch in the A position) is a good choice if not occupied. Then press and hold the Push To Talk button in and say "CQ CQ CQ CQ CQ 6-METERS, CQ CQ CQ CQ CQ 6-METERS CQ CQ CQ CQ CQ 6-METERS, THIS IS (your callsign) CALLING CQ AND LISTENING FOR A CALL". At this point you should release the PTT button, and listen for any responses.

As you listen for responses to your "CQ" it is a good idea to use the Receiver Incremental Tuning (RIT) control to tune in any stations heard. This way, you will not affect your transmit frequency as you tune-in a station that is responding to your call.

It is not critical exactly how you call "CQ", the idea is to let others know you are wanting to talk. You may have to repeat the call many times to get a response. You may also want to give your callsign more than one time, or say it phonetically to help those receiving it distinguish letters that sound alike.

If the band is not open, it can be very difficult to find someone to talk to, but don't let this worry you. When propagation is good, and the band is "Wide open", there can be so many good signals, that it is hard to find a clear frequency. Long distance 6-meter band communications simply depends on the propagation conditions.

If you desire to talk to a station in Morse Code make sure that you change the Mode switch to CW.

Here again you may call a "CQ", or of course answer a CQ from another station.

A typical "CQ" call in CW goes something like the following:

CQ CQ CQ CQ CQ DE (your callsign sent 3 times) AR

At this point you should again listen for any responses. When listening for responses from a "CQ" it is helpful to adjust the RIT which allows the tuning of only the receiver.

## Operating Hints

A few Operating Hints can make using the DX Handy more fun.

An RF Ground, or counterpoise Wire has been included to improve the performance of the telescopic whip antenna. To attach the wire, simply remove the rear panel screw as shown in figure 4-1 and secure the solder lug to the DX Handy with this screw. The ground wire is NOT designed to be used while in motion. We only recommend that the wire be attached when operating from a "Relatively fixed" location.

The number of signals on the 6-meter band is greatly influenced by radio propagation, that is the ability of the Ionosphere to reflect radio signals back towards earth at a distant location. As a rule, propagation on 6-meters is better during the day, especially when the value of the Solar Flux is very high.

The Solar Flux is a measure of solar activity (Sun Spots) and is recorded and updated daily. It can be heard at 18 minutes after the hour on WWV at 5, 10 and 15 MHz for those who have access to a short wave receiver. Other propagation information can be found in Amateur publications, which give monthly trends and predicted times of good propagation.

It is important to remember that just because no signals are heard, does not mean the band is not open. Listening carefully or calling a quick "CQ" or two, can bring results even if no other signals are heard on the band.

### 7.0 OPTIONAL CRYSTAL INSTALLATION

Additional crystals may be ordered for other ranges of the 6-meter band. Each single crystal allows transmit and receive operation in a 50 KHz segment of the band between 50.0 and 51.0 MHz.

The cost of the range crystals at this time is predicted at \$15.00 each, and there is a \$5.00 shipping charge per order. At this time A.E.A. is not certain what other ranges will be available. Please contact us at the number listed at the front of this manual for 6-meter crystal information and an order form when available.

#### Installing Range Crystals

The Range Crystals are located on the printed circuit board immediately below the speaker. To gain access to the crystals, the front half of the case must be removed as described and shown on the following page.

1. Remove the 4 screws and plastic washers that hold the front panel on the DX Handy as shown below in Figure 7-1.
2. Carefully lift the front panel away from the transceiver starting at the bottom of the panel. Be careful not to strain the wires attached to the speaker and microphone.
3. After lifting the the front panel away from the transceiver, you should see the crystals near the top of the handheld.
4. The crystal for position A is located on the left side (closest to the antenna connector) and the B position is located on the right (closest to the S/RF meter).
5. To remove the crystal you want to change, carefully rock the crystal back and forth while pulling up gently.
6. To install the new crystal, simply press it gently into the holder. Crystals are not polarity sensitive, so it makes no difference which way you install them.
7. Replace the front panel of the DX Handy and install the 4 screws and plastic washers removed in step 1.
8. You may wish to fill out the rear panel frequency range label to help you remember what frequency ranges are installed.

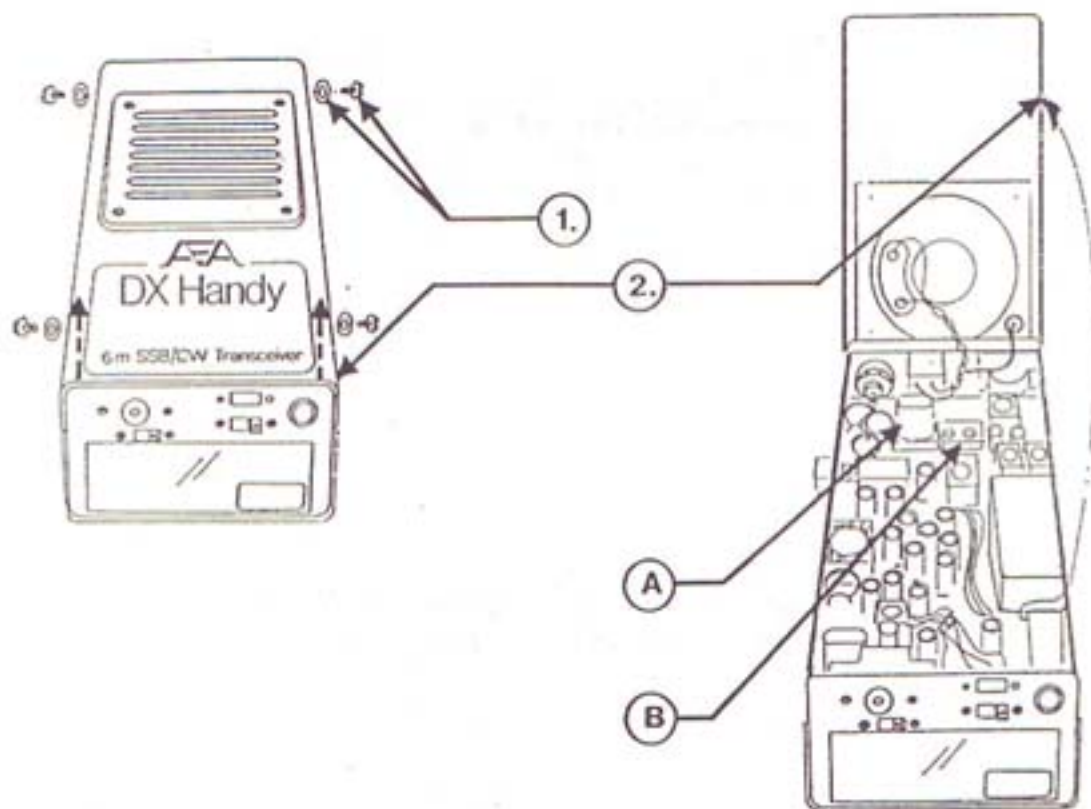
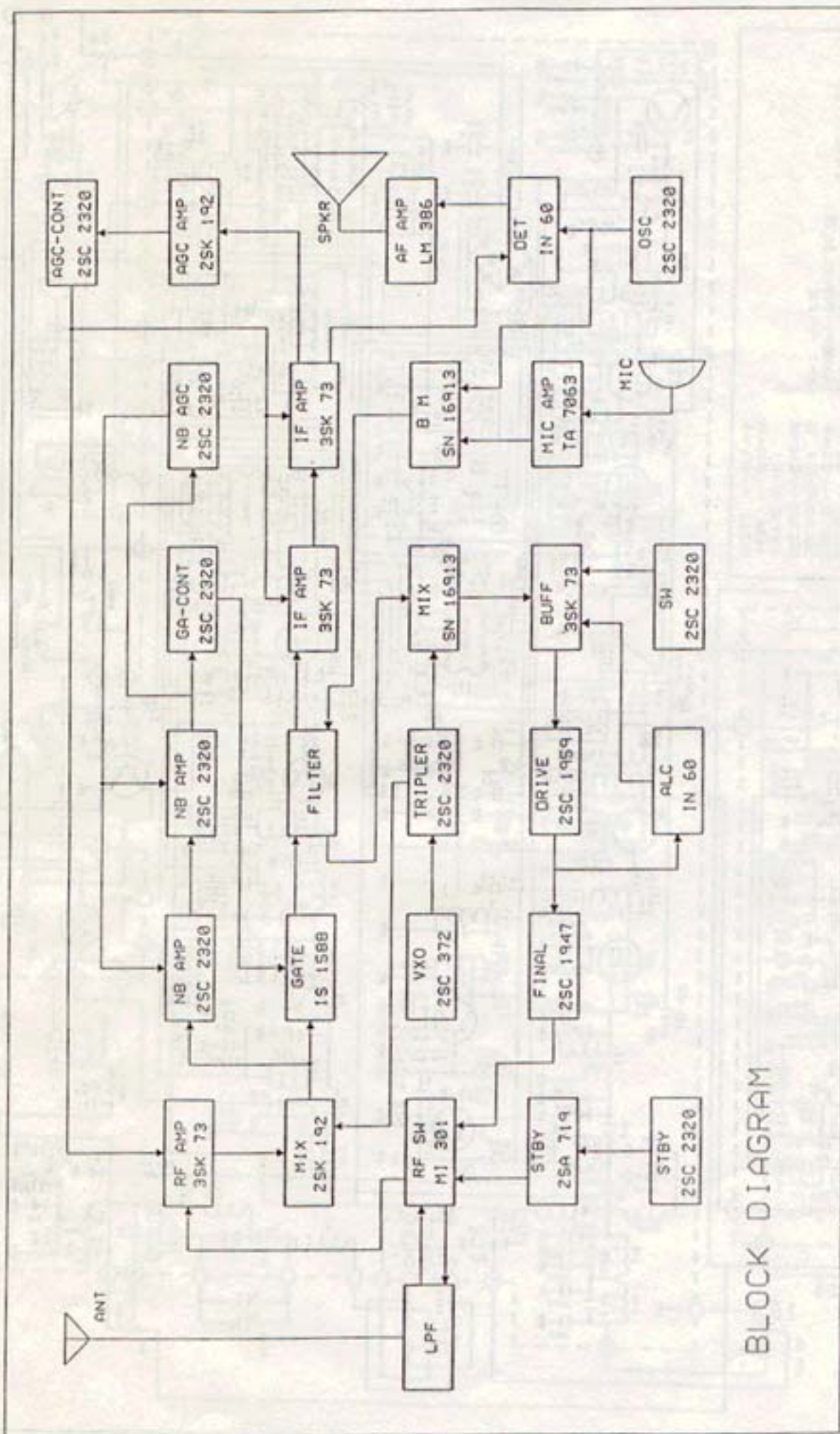


Figure 7-1 Removing the front panel to change Range Crystals.



BLOCK DIAGRAM

$X_{TAL} \text{ Freq} = \text{Highest of Freq} - 11.2735$

3

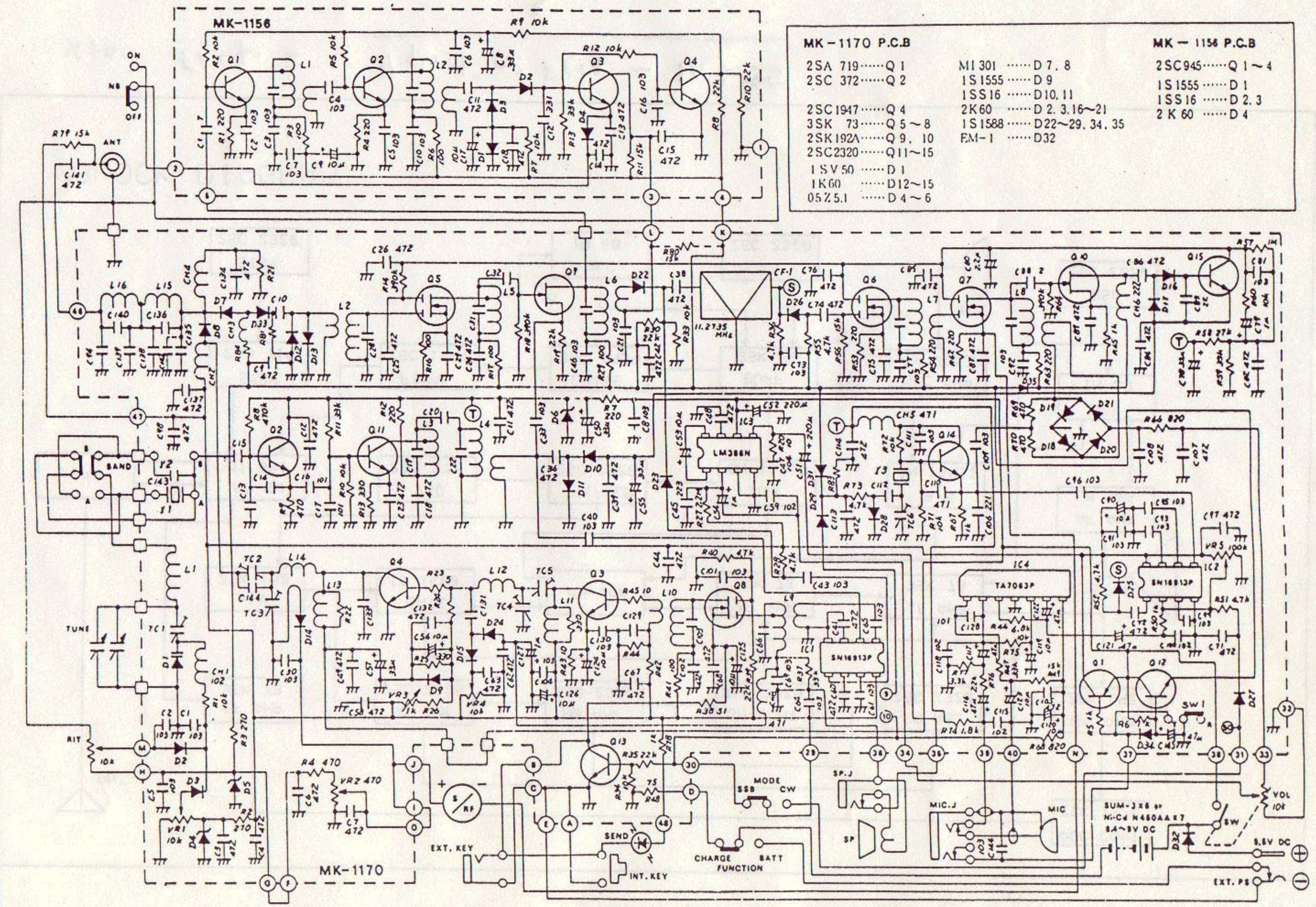
$F_0 = 50.250 - F_c = 12.99216$

$F_0 = 50.100 - F_c = 12.94216$

$F_0 = 50.150 - F_c = 12.95883$

$F_0 = 50.200 - F_c = 12.9755$





MK-1170 P.C.B		MK-1156 P.C.B	
2SA 719.....	Q 1	MI 301 .....	D 7, 8
2SC 372.....	Q 2	1S 1555 .....	D 9
2SC 1947.....	Q 4	1SS 16 .....	D 10, 11
3SK 73.....	Q 5 ~ 8	2K 60 .....	D 2, 3, 16 ~ 21
2SK 192A.....	Q 9, 10	1S 1588 .....	D 22 ~ 29, 34, 35
2SC 2320.....	Q 11 ~ 15	FM-1 .....	D 32
1SV 50 .....	D 1		
1K 60 .....	D 12 ~ 15		
05Z 5.1 .....	D 4 ~ 6		
		2SC 945.....	Q 1 ~ 4
		1S 1555 .....	D 1
		1SS 16 .....	D 2, 3
		2K 60 .....	D 4

SUM-JXB BY  
 NI-Cd N480AAE7  
 8.4~8V DC  
 9.9V DC