

F.G. **MASON**
ENGINEERING INC.

MINI-PROBE RECEIVER
MODEL MPR-1b

1700 POST ROAD FAIRFIELD CONNECTICUT 06430
Telephone 203-255-3461

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APPENDIX A MINI-PROBE RECEIVER MODEL MPR-1b

Special Requirements for this Model MPR-1b Receiver

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I. SPECIFICATIONS

1.) General Description:

The model MPR-1b is a portable, battery operated, miniature, modular, radio receiver consisting of basic unit with plug in tuner modules, frequency counter, and visual display unit. It may be operated inside coat pocket with hearing aid type earphone.

2.) Configuration:

- 2.1 Basic Unit: (Model B-8) contains IF amplifiers, subcarrier detectors, crystal filters, audio amplifier, batteries, signal level indicator, and all other circuits; compartment for one tuning unit required for complete receiver without visual display. Size: 4.1 x 6.4 x 17.8 cm. (1 5/8 x 2 1/2 x 7 inches.)
- 2.2 Tuning Modules: (Model TMPR-1 thru 11) contain RF filters, local oscillator, mixer, frequency dial, and plugs into basic unit. Size: 2.6 x 5 x 6.7 cm. (1 x 2 x 2 5/8 inches). Tuner #11 is (1 x 2 x 4 3/4 inches) 2.6 x 5 x 9.5 cm.)
- 2.3 Visual display unit: Size: (1 5/8 x 2 1/2 x 7 inches) 4.1 x 6.4 x 17.8 cm. Displays frequency vs. amplitude of signals received.
- 2.4 Digital Frequency display counter: 4 digit display of true RF and subcarrier frequency settings. Size: 4.1 x 3.2 x 17.8 cm. (1 5/8 x 1 1/4 x 7 inches.)
- 2.5 Basic Unit, Visual Display and frequency counter plug into portable carrier rack for system operation.

3.) Electrical Specifications:

3.1 MPR-1b - Receiver Section (including tuners)

3.1.1 RF Tuning Range = 20 KHz to 10 GHz
Useful to 20 GHz

3.1.2 Sensitivity for 6 DB $\frac{s+n}{n}$
for RF 20 KHz/1 GHz = 3 uv or less
for RF 1 GHz/10 GHz = 10 uv or less

3.1.3 IF Bandwidths = 7 KHz (crystal filter)
90 KHz (crystal filter)
1 MHz

- 3.1.4 Tuning Motion: 6 Revolutions of tuning knob for each of 10 tuners. Slip clutch employed to prevent damage at end of travel. TMR-11 Tuner has 20 turns.
- 3.1.5 Dials: 360 Degree Rotary barrel type dials employed on each tuner. Tuner #11 has a multi turn dial.
- 3.1.6 Fine Tuning: Provides a minimum of 2% of tuner frequency tuning motion, except on Tuner #11.
- 3.1.7 Batteries: Sufficient for 2 hours of operation. Standard 9 volt battery (5 each) employed. These batteries also supply the S-8 visual monitor and FC-5 frequency counter.
- 3.1.8 Detectors: AM, FM, CW, Subcarrier AM, Subcarrier FM.
- 3.1.9 Signal strength indicator:
Column of 20 light emitting diodes indicate relative field strength of signal received.
- 3.1.10 Spurious response rejection:
RF 20 KHz/1 GHz = 30 DB or more
RF 1/10 GHz image, 2nd & 3rd harmonic no rejection
RF 1/10 GHz all others = 30 DB
Internally generated spurious response: None
- 3.1.11 Outputs:
- Audio (earphone level)
- Signal meter
- Visual display unit outlets include detect out, sweep signal input, subcarrier detect out, subcarrier sense.
- External power socket (+ 18 volts) (+ 9 volts)
- Antenna
- Frequency display program and local oscillator signal outlets.
- 3.1.12 Antennas: Whip antenna and microwave antenna mount on case of receiver for use in the portable mode. Other external antennas are provided such as a long wire and telecom adapters.
- 3.1.13 Controls:
Tuning (6 revolutions/tuner)
Fine Tuning (3/4 revolution)
Power Switch (selects internal batteries/OFF/External supply)
IF Gain (3/4 revolution, 50 dB attenuation min.)
Detector (AM/FM)
Audio volume (3/4 revolution)

Function Switch:

- 1.) Narrow Bandwidth
 - 2.) Medium Bandwidth
 - 3.) Subcarrier FM detection
 - 4.) Subcarrier AM detection
 - 5.) Wide Bandwidth
- Subcarrier Frequency Tuning (0 to 300 KHz)

3.1.14 Subcarrier Detection:

Subcarrier operation is selected by the function switch positions 3 (FM) and 4 (AM). When in either of these positions all readouts, except the signal level meter, switch to subcarrier including audio output, visual scope display, and frequency meter. The wide bandwidth of the primary IF is automatically selected and the primary detector is manually selected with the "AM/-FM switch.

3.1.15 Subcarrier IF Bandwidth: 10 KHz (IF section ceramic filter)

3.1.16 Subcarrier Tuning: (0 - 300 KHz) useful down to 15 KHz

3.2 Miniature Probe Display (Model S-8)

3.2.1 Screen Size: 3.9 x 2.9 cm. ($1\frac{1}{2}$ x $1\frac{1}{8}$ inches)

3.2.2 Displays frequency base (up to 5 MHz) vs amplitude of signals received up to 1.6 GHz RF. 1.6 to 10 GHz up to 50 MHz displayed. In subcarrier mode, displays frequency base (up to full 300 KHz) vs amplitude of subcarriers.

3.2.3 Resolution 7 KHz, 90 KHz and 1 MHz depending on position of receiver bandwidth selected. 10 KHz in subcarrier mode.

3.2.4 Front Panel Controls:

Power (ON/OFF)

Sweepwidth (frequency dispersion)

Vertical Gain

Sweep rate (Fast/Slow)

Sweep ON/OFF

3.2.5 Unit is powered from the Basic Unit (B-8) batteries. It is powered by power mains when B-8 is connected to the PS-11A power supply.

- 3.2.6 All connections are made through the rear 9 pin connector.
- 3.2.7 Internal Controls:
 - Intensity
 - Focus
 - Horizontal position
 - Astigmatism
 - Vertical Centering
 - Vertical Balance
- 3.3 Miniature Frequency Counter (Model FC-5)
 - 3.3.1 Displays RF frequency of the MPR-1b up to 1600 MHz
 - 3.3.2 Displays Subcarrier frequency of MPR-1b to 300 KHz (automatically when receiver in subcarrier mode)
 - 3.3.3 Display: 4 digit $\frac{1}{4}$ inch high LCD display
 - 3.3.4 Resolution: from 100 Hz to 100 KHz depending on tuner used. (Maximum resolution obtained when switched to add extra last digit, drops first digit)
 - 3.3.5 Reads frequency tuned directly (all frequency offsets internally programmed)
 - 3.3.6 Size: 7 x 1 $\frac{5}{8}$ x 1 $\frac{1}{4}$ inches.
 - 3.3.7 Mounting: Mounts between receiver and scope display in carrier pack with display on same surface as scope screen. All connections made through back panel connection.
 - 3.3.8 Power: Is powered from either (B8) internal batteries or external supply as selected by the basic receiver power switch.
 - 3.3.9 Lamp: Internal back lighting can be activated by FC5 power switch for low light level conditions.
 - 3.3.10 Controls: Power:(ON/OFF/Lamp) Resolution : (x 1/ x 10)
- 3.4 Main Frame: The purpose of the main frame (also referred to as the carrier) is to hold and interconnect the Basic Receiver, Scope Display, and frequency counter in a convenient manner to be portable or table top operated as a complete system.
 - 3.4.1 Loudspeaker: contains small ($1\frac{1}{2}$ " dia.) speaker for audio feed-back microphone location technique. (When earphones are connected, the speaker is disabled.)

- 3.4.2 **External Power:** a connector is provided on the main frame to interconnect the AC supply (Model PS-11A) to all MPR-1 circuits. This connector may also be used to connect external batteries.
- 3.4.3 **Antenna mounts:** The adjustable antenna mount accepts the whip antenna and the microwave antenna for bench top or hand carry operation.
- 3.4.4 **Handle:** The main frame handle is 2 way adjustable to act as a bench prop, handle and tuner retainer/control protector when being hand carried.
- 3.4.5 **Component Mounting:** Each of the 3 components (Basic Receiver, Frequency Counter, and Scope Display) independently plug in and are thumbscrew fastened to the frame. The basic receiver is required but the other two are optional for system operation.

II. OPERATING INSTRUCTIONS

1.) Pocket Operation

1.1 Pocket Operation - General

By "pocket operation" we are referring to the most portable minimum size configuration of the MPR-1b allowing use while being carried in an outside or inside coat pocket. This leaves hands free allowing unobtrusive radio monitoring and transmitting source location.

1.2 Battery Installation

First remove B-8 basic unit from the carrying frame, if it is so mounted, by backing out bottom thumbscrew and pulling B-8 forward to disengage it from the rear connectors. Then remove two small thumbscrews located on each side of the rear battery cover of the B-8. If there are old batteries inside, pull string loop attached to battery printed circuit board holder to remove old batteries. Now snap the batteries off the board by carefully prying them toward the top edge of the board, not in the long direction of the board. Snap 5 new batteries in place observing the polarity signs on the board. Use only 9 volt batteries having the same physical size and connectors as the following partial list of manufacturers' and model numbers.

Eve ready	E146X	Mercury	*
Mallory	MN1604	Alkaline	*
Eve ready	216	Carbon	
Eve ready	N88	Nicad Rechargeable	

* Preferred for longest runningtime.

Some Nicad rechargeable batteries even when fully charged will deliver less than the 7.5 volts minimum required to operate the MPR-1b. Read battery labels before using. Some low cost carbon batteries will give the least running time.

If only 3 batteries are available or a lighter weight is desired, snap the 3 batteries in position numbers 1, 2 and 4. Unit may also operate on only 2 batteries in position numbers 3 and 5 and adding a jumper wire from the plus terminal of position 4 to the plus terminal of position 1. When using less than 5 batteries, place paper, cotton or cloth wad (non conducting) to fill in unused spaces to prevent loosening of batteries. Install batteries in B-8 by sliding the pack into the B-8 with the battery board on the left as you face the opening so that the printed connector is aligned with the socket visible inside. Now replace cover and thumbscrews. An extra battery board is provided in case snaps become loose

or corroded. This extra board can be preloaded with batteries to facilitate a quick reload if necessary. Always store preloaded pack or loose batteries so that they cannot short out by accident in the carrying case. It is highly recommended that all batteries be removed from radio equipment when not in use to prevent corrosive leakage damage and accidental drainage.

1.3 Pocket Operation

Only the basic B-8 unit, one tuning unit, one antenna and earphone are used. The receiver is activated by a Tuner/Power interlock switch that automatically turns power on when tuner is inserted.

Place the power switch to "int". A few "S" meter lamps will light. Select tuner unit that covers the frequency range desired. Insert tuner carefully in front opening of B-8 so that panel markings are "right side up". When the tuner is correctly engaged, its panel is almost flush (except for TMPR-11) with the B-8 front face. The tuner knob and dial can be used as a handle to insert and withdraw the tuner. The tuner is held in by the connector and side spring tension only. Be careful not to drop tuner out by rough handling. Connect short wire or other antenna to the antenna connector on the front of the B-8. Connect the earphone to the phone jack also on front of B-8. Set controls as follows:

IF Gain: Maximum clockwise. Back off counter clockwise if "S" meter is off scale to observe level changes.

AM/FM: To match modulation of incoming signal. If unknown, place in position that gives least audio distortion. If searching, set to AM up to 35 MHz (T1, 2, 3, 4) then FM to 1.6 GHz (T5, 6, 7, 8) and AM then to 10 GHz (T11).

Function: Generally position 1 (7 KHz) BW to an RF of 40 (T1, 2, 3, 4); position 2 (90 KHz BW) to an RF of 625 (T5, 6, 7, 8, 9) and position 5 (1000 KHz BW) to 10 GHz RF (10A, 10, 11). Use position 3 and 4 for subcarrier FM and AM.

Volume Control: Set for earphone level desired.

Tuner Knob: Adjust tuner knob by rotating until desired frequency is indicated on the dial. Tune signal in for maximum "S" meter reading (most lamps lit). Fine adjustment may be made by rotating the "Fine Tune" control.

If a subcarrier signal transmitter is to be located, set function switch to S. C. AM or S. C. FM and the AM/FM switch to AM or FM such that the combination results in the highest audio output of the subcarrier. Make sure RF "S" meter is peaked and that the subcarrier is tuned in with the subcarrier frequency control (0 to 300 KHz).

Now place unit in inside or outside jacket or coat pocket and walk in direction which increases the sound level and the "S" meter of the signal. As you approach the transmitting source, the sound may reach a constant limited level and all of the lamps of the "S" meter may be lit. At this point reduce the "IF" gain by rotating the control counter clockwise until "S" meter is at $\frac{1}{2}$ scale or less and proceed to move in a direction to increase the "S" meter level again. Repeat this procedure until transmitting source is found physically. It may be necessary to retune the tuner frequency to keep signal on peak adjustment.

2.) Man-Pack Operation

2.1 Man-Pack Operation - General

Man-Pack or carry operation is like the pocket operation except that the equipment is carried in hand or worn on a belt or shoulder strap rather than in a pocket. Also the visual display unit as well as the receiver are used allowing more sophisticated signal searching and analysis at the expense of a larger but still portable size. The frequency counter is also carried in this mode.

2.2 Setup of Main Frame Carrier

Setting up the main frame carrier. (Refer to diagram #1)

The purpose if the carrier is to join the basic receiver (B-8) with the visual display unit (S-8), frequency counter (FC-5), and various antennas so that the system may be conveniently carried about. First install fresh batteries in basic unit (B-8) as per paragraph 1.2. To mount the basic (B-8) unit in the carrier, place it in the left side and slide it back such that the rear blue connector mates with the corresponding connector of the carrier. Thumbscrew on bottom of (B-8) should fit through large portion of "key hole" in frame, slide back, and tighten. The basic unit is now fully mounted. Next mount the visual display and frequency counter unit in the same manner on the right side and center of the carrier. Next adjust the handle by loosening the wing nuts on each side of the carrier and swing it a round to the front so that when it is held by the handle it hangs down with controls up. Tighten right hand thumbscrew only Now rotate "U" shaped antenna

mounting bracket located under left hand wing nut until the antenna mounting screw points toward the handle. Tighten left hand thumbscrew. Next thread on the whip antenna to this screw by carefully rotating it clockwise. Now connect the wire from the antenna bracket to the antenna connector on the front of the basic unit. If other antennas such as the short or long wire are to be used, connect them directly to the basic receiver and disregard direction of the antenna bracket but be sure to tighten the left hand thumbscrew to hold the handle in place. If the T-11 microwave unit is to be used, remove whip antenna and rotate antenna bracket so that the side opposite the screw faces the "S" meter surface of the B-8. Now mount the triangular microwave antenna on the bracket with the thumbscrew provided so that the antenna protrudes away from the left side of the carrier. Then attach microwave antenna cable protruding from the front of the T-11 tuner to the antenna with the matching gold connectors. For added convenience and equipment safety in hand held operations, loosen handle wing nuts after tuner has been inserted and slide handle up very close to tuner knob and retighten handle. Unit may now be tuned and held "single handed" and Tuner cannot accidentally fall out.

The antenna connector on the B-8 is inactive when the T-11 Tuner is used so that the other antennas may be left connected or removed. The carrier is now ready to be carried in hand. See special operating instructions for the T-11 Tuner.

The receiver section (B8 and tuner selected) are operated in the same manner as described in paragraph 1.3. The visual display unit (S-8) and frequency counter (FC-5) are powered from the batteries in the basic receiver section. The basic receiver is switched on and off when a tuner is inserted and withdrawn operating an internal interlocking switch. When the tuner is mounted in the basic unit the visual display unit may now be switched on by the power switch on the S-8 front panel. The S-8 should only be turned on when needed to conserve battery power. To operate the S-8, turn the power, on, switch the sweep switch to on and set the lower knob with the horizontal arrows maximum clockwise. This will provide the maximum sweep width (dispersion) of the display. Now set the knob with the vertical arrows clockwise until noise (grass) appears on the base line. As the tuner frequency control is adjusted the incoming signals will appear on the display, and a buzzing noise will occur in the phones. Set the signal to be investigated on the center dot marker of the S-8 base line. Place the switch marked F-S (Fast-Slow) in "S" position and the audio in the earphones should become clear enough to identify. If not, turn sweep off with the sweep ON-OFF switch. The signal pattern displayed will change in width and direction depending

on the position of the bandwidth switch of the basic unit. The fast position of the F-S switch speeds up the number of scans per second for a brighter pattern, however the audio becomes intelligible.

The purpose of the display unit is to aid in signal searching, identification, and relative level indication. It is also an aid to following signals that are drifting or moving with frequency and is especially useful when operating the T-11 microwave tuner since a slight drift or movement in frequency of either the transmitter or receiver will cause loss of audio and "S" meter indication. When the sweep is in "OFF" position the display becomes a time base display showing the post detection signal. The time base is not adjustable. In RF bands that are very crowded with signals, back off the sweepwidth control (lower control with horizontal arrows) to spread signals out on base line.

When basic receiver function switch is in a subcarrier position, the scope display automatically displays subcarrier frequency signals in the same manner as when in RF positions. The base line dispersion will cover the total subcarrier tuning range of 0 to 300 KHz if the subcarrier center frequency is set to 150 KHz and the sweepwidth control is maximum. The signal indication will be very narrow at full sweepwidth, therefore it is suggested that the sweepwidth control be set at about $\frac{1}{2}$ maximum for better visibility of the signal. When the display is set to cover the zero frequency or cross over point, an internally generated signal is displayed and should not be construed as an incoming signal.

The carrier also has a small loudspeaker internally mounted. If the earphones are removed the audio will be heard from this loudspeaker instead of the phones. The main purpose of the speaker is to locate transmitting microphones by the feed-back technique. The hidden microphone picks up the speaker sound and starts up a howling sound in the same manner as a maladjusted public address system.

- 2.3 To operate the Frequency Counter (FC-5) switch the power switch to "ON" or "Lamp". (The lamp position should only be used in very low ambient light conditions for observation of the L. C. D. display since it draws more power from the battery.) Switch the resolution switch to "X1" position. The frequency counter will now read directly the radio frequency tuned by the tuner selected. The tuner plugged in will automatically program the counter for proper IF offset and scale. All tuner frequencies operate the counter except the T-11 tuner (1.6/10 GHz). When the basic receiver function switch is set to a

subcarrier function, the frequency counter automatically reads the subcarrier frequency setting (0 to .3 MHz). All readings are in megahertz including the subcarrier therefore strict attention must be paid to the decimal point position. Example: 0.070 Megahertz may also be thought of as 70 Kiloherzt. If the subcarrier or the TMR-1 tuner are tuned "below zero" (when the local oscillator crosses the IF) the counter will read the complimentary number such as 99.99. This tuner position is meaningless and is to be avoided. The "X10" resolution position is used when an additional significant digit of frequency accuracy is desired. In this position the first digit is lost and a least significant digit is gained. The counter "gate time" is several seconds in this mode therefore allow 5 seconds for the reading to settle down. The first several readings may be inaccurate. The "X10" resolution position is usually used to read the frequency of a signal already centered accurately by the operator. (Use minimum bandwidth and RF meter to center accurately). For greatest frequency counter accuracy, shut the scope sweep off, since when it's on the counter must average the frequencies scanned causing some minor errors and erratic readings of the last digit. As with the scope display, do not turn the counter on when using batteries unless needed. The FC-5 may cause a spurious response. Turn it off if this is suspected.

3.) Table Top Operation

3.1 Table Top Operation in General

When the MPR is used in an initial countermeasures search to scan all frequency bands, table top operation is preferred since each tuning head must be mounted sequentially in the B-8. Table top operation allows hands to be free to change tuners. Also it allows the AC power of the building to be used instead of batteries.

3.2 Table Top Setup

Mount the basic unit (B-8) frequency counter (FC-5) and visual display unit (S-8) in the main frame as per paragraph 2.2. Now loosen both handle wing nuts and swing handle down to act as a prop to raise the front panel face off the table to a convenient angle. Tighten the right hand wing nut only. Then adjust the antenna bracket on the left side so that the antenna mount screw points up vertically. Mount the whip antenna or microwave or long wire antennas as per paragraph 2.2. To operate receiver on AC power mains, first set PS-11A power supply line switch to the proper AC voltage (115-230). To do this set the switch to 115 or 230 according to the local voltage. Now plug the modular phone plug into the rear

socket of the carrier. Make sure its key is in the correct position and that the plug latch snaps in place. Plug AC plug into wall outlet using appropriate foreign adapters. A few "S" meter lights should light when a tuner is plugged in. Be sure to set power switch of the basic receiver on "EXT" for AC operation. If it is on "internal" the batteries will be used.

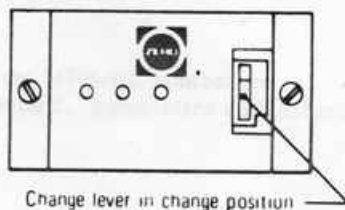
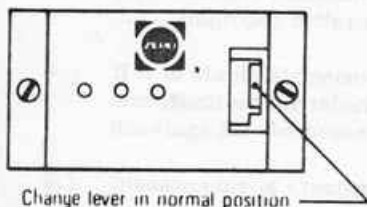
A convenient set up when table space is limited is to set the main assembly in its attache' case pocket propped up with the handle and moved forward enough to plug power supply cable in back. The power supply can then remain in its' pocket and tuners are readily accessible.

3.3 Table Top Operation

Table top operation is the same as previously described for the carrier operation except that the long wire antenna may be used conveniently for the lower frequencies to 100 MHz.

4.) Repacking for Transportation or Storage

Leave basic unit, frequency counter and visual display unit mounted in the carrier but remove the tuner, antennas and power supply plugs. Place the carrier in the matching cut out of the case foam insert. (This cut out precludes leaving a tuner mounted thereby eliminating the problem of accidentally leaving the batteries switched on.) Place all other parts in their matching pockets. Place small accessory parts in plastic pouch before putting them in the accessory pocket. The microwave antenna may be stored in the lid pocket of the attache' case. The combination lock of the attache' case may be changed according to the following instructions:



This product comes to you equipped with the latest development in a keyless security lock.

It is set at the factory to open at 000. You may leave it at this setting if you wish and always open the case by turning the dials to 000 or you can set YOUR OWN SECRET COMBINATION on the three dials in the following manner:

STEP 1 Looking at the back of the

lock inside the case, you will see the change lever extending from the body of the lock.

STEP 2 Now move the change lever so that it hooks in behind the notch or change position in the opening of the lock case (please refer to illustration). Leave it in this position while you follow step 3.

STEP 3 Turn the dials to your own secret number and mark the number

down in some place where you can refer to it (in case you forget the number.)

STEP 4 Without disturbing the setting of the dials, move the change lever back to its original (normal) position. Make sure you have done this before closing case and using lock. Your lock will now open only at your own secret combination. If you want to change to a new combination, simply repeat steps 2, 3, & 4.

III. MAINTENANCE, CALIBRATION AND REPAIR

- 1.) It is highly recommended that should malfunction occur, the entire system with all components be returned to F. G. Mason Engineering, Inc., 1700 Post Road, Fairfield, Conn. 06430 for repair and calibration.
- 2.) If this is inconvenient, then only the component requiring repair need be returned. The malfunctioning component may be determined best by substituting known functioning components if a second system is available. If not and test instruments are not available try to test by tuning into known broadcast stations.
- 3.) There should be some signals on each tuner band except the microwave area. If only one tuner seems to be bad, that tuner only requires repair. If all tuners are low in sensitivity or out, then the trouble is in the B-8 basic unit 23.5 MHz IF section.
- 4.) If poor or no sensitivity occurs with all tuning heads make sure first that operating instructions have been followed carefully. The following is a list of common operator errors:
 - a.) PS-11A line switch not set to local voltage.
 - b.) Connectors not fully engaged. Tuner not fully inserted, earphone connector loose, etc.
 - c.) I. F. Gain control not maximum.
 - d.) Bandwidth and AM/FM switch improperly set.
 - e.) Antenna not connected. Wrong antenna connected.
 - f.) Batteries exhausted.
 - g.) Battery connectors corroded or loose.
 - h.) Improper batteries.
- 5.) If it is absolutely necessary to field repair the MPR-1b, contact the manufacturer for information as per paragraph 2. Schematics and pictorial drawings may be ordered.
- 6.) Disassembly of Components
 - 6.1 Tuners TMPR-1 thru TMPR-10

Remove screw located at the rear of the tuner with the large diameter head near to the connector. Leave other screw in place. Carefully pull cover off tuner by holding knobs in one hand and remove cover with other. Cover should be pulled away from front panel. Now remove spring clip holding inner cover in place. Inner cover may now be removed from tuner. Reassemble tuner in the same manner. To adjust the dial, back out the dial set screw located at the end of the dial label. Rotate tuner knob to the stop position and force dial drum in direction for dial correction. Retighten set screw.

6.2 B-8 Basic Unit

Proper electrical alignment of the B-8 should be done in the laboratory. However, the B-8 may be field aligned without test instruments by removing the top panel (6 small screws) and adjusting the 7 cores exposed. This is not recommended for non-technical operators.

- a.) Set up complete system (ph. 3)
- b.) Using antenna and local signal tune in signal on the T-6 (75-130) MHz.
- c.) Center signal on signal display in fast sweep position. (If using local signal make sure it's one that has no interfering adjacent signal.) Use narrow filter position (1) to center.
- d.) Now switch to wide position (5) and adjust the 4 cores (in close proximity on the right hand side near center front to back) for peaking signal on scope. Back IF gain down to 'S' meter $\frac{1}{2}$ scale if level too high.
- e.) Now switch to medium bandwidth (2), FM, and tune in a local FM station centering it accurately with scope display on sweep. Now switch off sweep and adjust very carefully the core (right hand side near L.E.D. meter) for best sound.
- f.) Now switch to subcarrier FM and set subcarrier tuning knob to full counterclockwise (zero frequency reading). Frequency counter should read 0.000. If it is between 0.010 and 9.990 do not adjust core (left side towards rear). If it is further off, adjust this core until it falls within this range.
- g.) Now tune in subcarrier transmission and adjust the core left side near L.E.D. meter for best sound. Also the right hand core near the L.E.D. meter may be re-peaked for maximum subcarrier signal level display on scope.

First, remove batteries as per paragraph II, 1.2. Remove 4 small screws below separation line on the left side of the B-8. Do not remove other screws from this surface. On the right hand surface remove 2 screws located on the upper cover towards the front. Now remove 2 screws located just under the separation line remaining. Do not remove other screws from this surface or the bottom or rear surfaces. Now pull upper and lower portions apart. A small screwdriver may be necessary to pry the units apart. The upper and lower internal parts are now exposed but joined together with a cable harness.

For further access of the electronic components in the upper portion remove the 6 screws holding the inner cover on. This cover may now be removed exposing the underside of the IF amplifier printed circuit board and controls. Inductor tuning cores may be adjusted through the holes in the printed circuit board through which the cores may be seen. Do not attempt to make any adjustments without proper instrumentation, schematic diagrams and instructions. The battery compartment and tuner compartments and their associated connectors are accessible in this configuration. Repairs or replacements of these components in the lower portion of the B-8 may be made by removing the 2 mounting brackets held in by screws in the cover located on the bottom and side surfaces. Also the interlocking micro switches that tuner insertion activate may be adjusted for proper action. Reassemble unit by following the disassembly instructions in reverse order. When assembling upper and lower portions of the B-8, be sure that no wires are pinched or being cut and that the alignment tabs are all in proper position.

6.3 S-8 Visual Display Unit

To adjust internal controls, remove 4 small screws from top panel and remove panel. The control potentiometers are now accessible and are identified by the cover graphics nearby. CAUTION HIGH VOLTAGE MAY EXIST ON SOME OF THESE CONTROLS. Use an insulated screwdriver or turn scope off, adjust, and turn on again to check adjustment. All of these potentiometers are 20 turn type with slip clutches at travel limits.

Adjust base line position as follows:

- a.) Rotate vert. gain control on face of S-8 fully counter-clockwise (min. gain.)
- b.) Using insulated screwdriver adjust base line vert. pos. " until base line is at bottom of CRT screen.

Adjust R. F. Gain as follows:

- a.) Remove antenna connector so that no signal is present.
- b.) Insert tuner #6 into B-8.
- c.) Now adjust vertical gain control to full clockwise maximum.
- d.) Now set the potentiometer labeled RF gain such that noise appears just above the original base line near the bottom of the screen, with the function switch of the basic unit on position 1.

- e.) Now switch the bandwidth switch on the basic unit through positions 1, 2, and 5 making sure that some noise always appears near the bottom of the screen. This completes the adjustment for vertical positioning and gain.

Adjust S. C. Gain as follows:

- a.) Place function switch in position 3.
- b.) Set the potentiometer labeled S. C. Gain such that noise appears on the base line at the bottom of the screen.
- c.) Rotate function switch thru all five positions. Noise should be seen on the screen for all five positions of the function switch. It may be necessary to adjust the vert. gain control on the face of the B-8 if too much noise appears in some positions. The unit is now ready to operate.

If further adjustment or repair is required, proceed to dismantle as follows:

- a.) Remove 4 top panel screws and top panel.
- b.) Remove 5 nuts holding the controls on front panel and remove front panel.
- c.) Now remove the 2 screws nearest the rear on the left side of the box. These are long 2-56 screws. Remove remaining screws from top and bottom of box and pull the left and right box covers apart. A screwdriver may be necessary to pry them apart.
- d.) The cable with the blue plug may now be removed from the right hand P. C. board, to facilitate tube or transistor replacement.
- e.) If further dismantling is required the PC boards may be removed by removing their associated mounting screws.
- f.) The CRT socket bracket may also be removed.
- g.) Reassemble in reverse order of disassembly. Remember to replace the long 2-56 screws in the holes on the left cover towards the rear. These must be fed through the brass PC board standoffs and into the threads of the CRT bracket. It helps to position these 2 screws first when remounting the 2 covers.

- h.) Make sure when replacing the control nuts that the controls do not rotate causing wire breakage.
- i.) Also be careful not to pinch or cut wires while covers are being reassembled.
- j.) DANGER: HIGH VOLTAGE (1200 volts) exists in the wiring of this unit and is exposed when the covers are removed.

6.4 FC-5 Frequency Counter.

The FC-5 has no internal adjustments. To replace components dismantle as follows:

- a.) Remove 4 top panel screws and panel.
- b.) Remove 2 upper front panel screw and 2 control nuts and remove front panel.
- c.) Now remove remaining top and bottom screws and pull left and right covers apart. A screwdriver may be needed to pry them apart. The display and resolution control will remain with the right cover. The power switch and rear plug will remain with the left cover. The male/male jumper between the 2 boards may remain in either socket. Be sure you do not bend these pins when separating the 2 halves.
- d.) The 2 PC boards may be removed from their covers by removing the 4 mounting screws and the rear plug screws and nuts and the resolution control nut.
- e.) If the display must be replaced, remove the 3 3-56 flat head screws from the clear plastic LCD retainer and remove display. The display itself is further contained within a molded box with 2 "zebra" contact strips. Observe carefully the dismantling of this assembly before attempting re-assembly. Note polarity of pin alignment. Important: be sure the PC board contacts are absolutely free of dirt and moisture when reassembly is made. Do not tighten 3 retaining screws too tight but evenly causing a slight bow in the clear plastic retainer.
- f.) Removal and replacement of IC's can cause bent and damaged pins. Appropriate care must be taken.
- g.) When re-engaging the 2 halves of the box make sure the male/male jumper is properly aligned.

Special Operating Instructions for the TMR-11 Tuner 1.6-10 GHz

- 1.) See paragraph 2.2 for setup of the tuner and antenna.
- 2.) This tuner operates on fundamental second and third harmonic of the local oscillator. This means that as the dial is turned across the tuning range of 1.6 to 3.3 GHz (Band 1) the tuner will also be tuning across 3.2 to 6.6 (Band 2) and 4.8 to 10 GHz (Band 3) at the same time. Since very few signals are transmitted above 1 GHz, the few signals that may be encountered can easily be identified.
- 3.) Place bandwidth in 1000 KHz, and use AM detect. Tune slowly across the band. DO NOT FORCE KNOB AGAINST STOPS AT EITHER END OF BAND. This may damage the mechanism. When a signal is heard and it is necessary to identify its frequency, proceed as follows:
- 4.) Any signal picked up by the T-11 will appear twice within a close spacing. These are the fundamental and image frequencies. The spacing between them indicates the harmonic of the local oscillator being used to mix with the incoming signal. The operator need know only the upper most dial reading of the pair of signals and the signal spacing to determine the unknown frequency as follows.
- 5.) Fundamental band (1.6-3.3 GHz) - Scan the band starting at the top of the dial 3.3 GHz and go down. Note the dial reading "a" where the signal first appears. Then tune to the next lower signal "b". If "b" is about 2 1/2 division (47 MHz) down from "a" on the dial go to table #1 in this manual. Find your "a" reading in column "a" and the true frequency in column "f". The dial and the tables have been calibrated every 20 MHz. Greater accuracy is unlikely. The true reading is determined from the formula:

$$\text{True signal frequency} = \text{Dial reading "a"} - .0235 \text{ GHz}$$
- 6.) 2nd Harmonic Band (3.2-6.6 GHz) - Proceed as in paragraph 3. If the "b" reading is about 1 1/4 divisions (23 MHz) from the "a" reading then go to table #2 to find the true frequency. This table is based on the formula:

$$\text{True signal frequency} = [(\text{Dial reading "a"}) \times 2] - .0235$$
- 7.) 3rd Harmonic Band (4.8-10 GHz) - Proceed as in ph. 3. If the "b" reading is about 2/3 of a division (16 MHz) from the "a" reading, go to table 3 to find the true frequency. This table is based on the formula:

$$\text{True signal frequency} = [(\text{Dial reading "a"}) \times 3] - .0235$$
- 8.) Because of the overlap of the second and third harmonic bands (4.8 to 6.6 GHz), dial readings below 2.2 are not tabulated in table 3. If a pair of signals below 2.20 with 2/3 div. spacing are detected go higher on the dial to find the same pair with 1 1/4 div. spacing (band 2).

- 9.) If signals are found near the top of the dial with less than 2/3 div. spacing, the signal is above 10 GHz. Again start at the top of the dial 3.3 and work down. To determine the frequency record the dial reading "a" of the uppermost pair of closely spaced signals (less than 2/3 division apart). Now tune dial down to the NEXT PAIR of closely spaced signals and record the upper most dial reading "c" of this pair of signals. The true frequency is then determined by the formula:

$$\text{True RF frequency} = \left(\frac{ac}{a-c} \right) - .0235$$

When signals are above 10 GHz they will appear many times on the dial. The above formula applies to any ADJACENT PAIRS of these signals.

Example: Upper most of a pair reads 2.92 on the dial (reading "a")
upper most of the next lower pair reads 2.50 on the dial (reading "c").

$$\text{Then RF} = \left[\frac{(2.9)(2.5)}{2.9-2.5} \right] - .0235 = 17.36 \text{ GHz}$$

Dial accuracy is such that frequency calculations for signals above 10 GHz may be ± 1 GHz in error.

TABLE 1 - All Frequencies in GHz

Use This Table for Signal Pairs Separated by 47 MHz (2+ division)

Dial Reading	frequency									
"a"	f		a	f		a	f		a	f
1.60	1.58		2.10	2.08		2.60	2.58		3.10	3.08
2	1.60		2	2.10		2	2.60		2	3.10
4	1.62		4	2.12		4	2.62		4	3.12
6	1.64		6	2.14		6	2.64		6	3.14
8	1.66		8	2.16		8	2.66		8	3.16
1.70	1.68		2.20	2.18		2.70	2.68		3.20	3.18
2	1.70		2	2.20		2	2.70		2	3.20
4	1.72		4	2.22		4	2.72		4	3.22
6	1.74		6	2.24		6	2.74		6	3.24
8	1.76		8	2.26		8	2.76		8	3.26
1.80	1.78		2.30	2.28		2.80	2.78		3.30	3.28
2	1.80		2	2.30		2	2.80		2	3.30
4	1.82		4	2.32		4	2.82		4	3.32
6	1.84		6	2.34		6	2.84		6	
8	1.86		8	2.36		8	2.86		8	
1.90	1.88		2.40	2.38		2.90	2.88			
2	1.90		2	2.40		2	2.90			
4	1.92		4	2.42		4	2.92			
6	1.94		6	2.44		6	2.94			
8	1.96		8	2.46		8	2.96			
2.00	1.98		2.50	2.48		3.00	2.98			
2	2.00		2	2.50		2	3.00			
4	2.02		4	2.52		4	3.02			
6	2.04		6	2.54		6	3.04			
8	2.06		8	2.56		8	3.06			

TABLE 2 - All Frequency Readings in GHz

Use This Table if Signal Pairs are 23.5 MHz Apart (1+ divisions)

dial reading "a"	frequency "f"	dial reading "a"	frequency "f"	dial reading "a"	frequency "f"	dial reading "a"	frequency "f"
1.60	3.18	2.00	3.98	2.50	4.98	3.00	5.98
2	3.22	2	4.02	2	5.02	2	6.02
4	3.26	4	4.06	4	5.06	4	6.06
6	3.30	6	4.10	6	5.10	6	6.10
8	3.34	8	4.14	8	5.14	8	6.14
1.70	3.38	2.10	4.18	2.60	5.18	3.10	6.18
2	3.42	2	4.22	2	5.22	2	6.22
4	3.46	4	4.26	4	5.26	4	6.26
6	3.50	6	4.30	6	5.30	6	6.30
8	3.54	8	4.34	8	5.34	8	6.34
1.80	3.58	2.20	4.38	2.70	5.38	3.20	6.38
2	3.62	2	4.42	2	5.42	2	6.42
4	3.66	4	4.46	4	5.46	4	6.46
6	3.70	6	4.50	6	5.50	6	6.50
8	3.74	8	4.54	8	5.54	8	6.54
1.90	3.78	2.30	4.58	2.80	5.58	3.30	6.58
2	3.82	2	4.62	2	5.62	2	6.62
4	3.86	4	4.66	4	5.66	4	6.66
6	3.90	6	4.70	6	5.70		
8	3.94	8	4.74	8	5.74		
		2.40	4.78	2.90	5.78		
		2	4.82	2	5.82		
		4	4.86	4	5.86		
		6	4.90	6	5.90		
		8	4.94	8	5.94		

TABLE 3

Use This Table if the Signal Pairs are 16 MHz Apart (1- division)

Dial "a"	frequency "f"	Dial "a"	frequency "f"	Dial "a"	frequency "f"	Dial "a"	frequency "f"
2.20	6.58	2.50	7.48	2.80	8.38	3.10	9.28
2	6.64	2	7.54	2	8.44	2	9.34
4	6.70	4	7.60	4	8.50	4	9.40
6	6.76	6	7.66	6	8.56	6	9.46
8	6.82	8	7.72	8	8.62	8	9.52
2.30	6.88	2.60	7.78	2.90	8.68	3.20	9.58
2	6.94	2	7.84	2	8.74	2	9.64
4	7.00	4	7.90	4	8.80	4	9.70
6	7.06	6	7.96	6	8.86	6	9.76
8	7.12	8	8.02	8	8.92	8	9.82
2.40	7.18	2.70	8.08	3.00	8.98	3.30	9.88
2	7.24	2	8.14	2	9.04	2	9.94
4	7.30	4	8.20	4	9.10	4	10.00
6	7.36	6	8.26	6	9.16		
8	7.42	8	8.32	8	9.22		

HEAD-PHONES

M.P.R. TUNER # 11
(MICRO-WAVE)

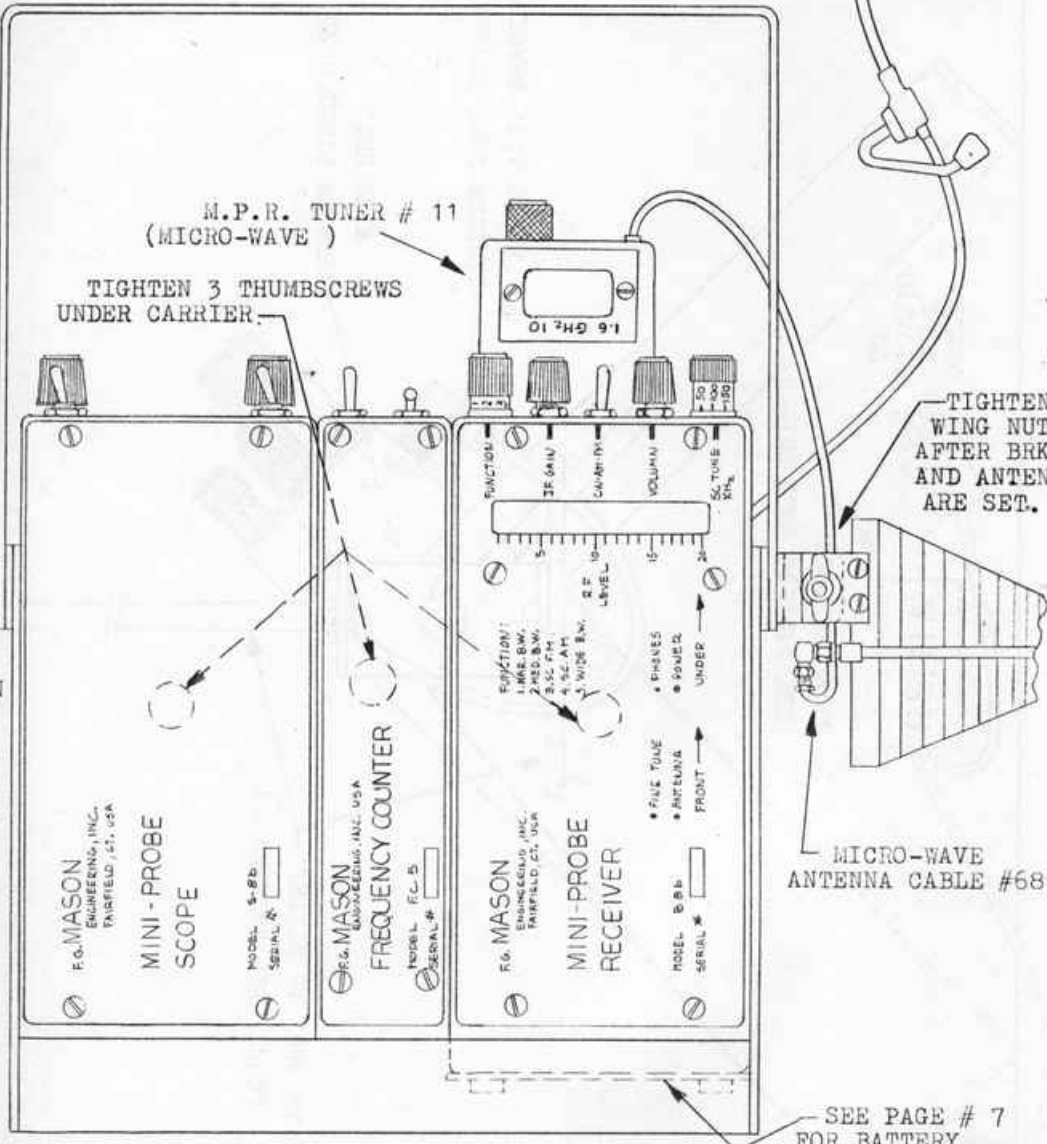
TIGHTEN 3 THUMBSCREWS
UNDER CARRIER.

TIGHTEN
WING NUTS
AFTER BRKT.
AND ANTENNA
ARE SET.

TIGHTEN
WING-
NUT
AFTER
HANDLE
IS SET.

MICRO-WAVE
ANTENNA CABLE #6857

SEE PAGE # 7
FOR BATTERY
INSERTION.



3-PACK CARRIER SET-UP
FOR TUNER T.M.P.R. - 11 MICRO-WAVE

FIG. 2

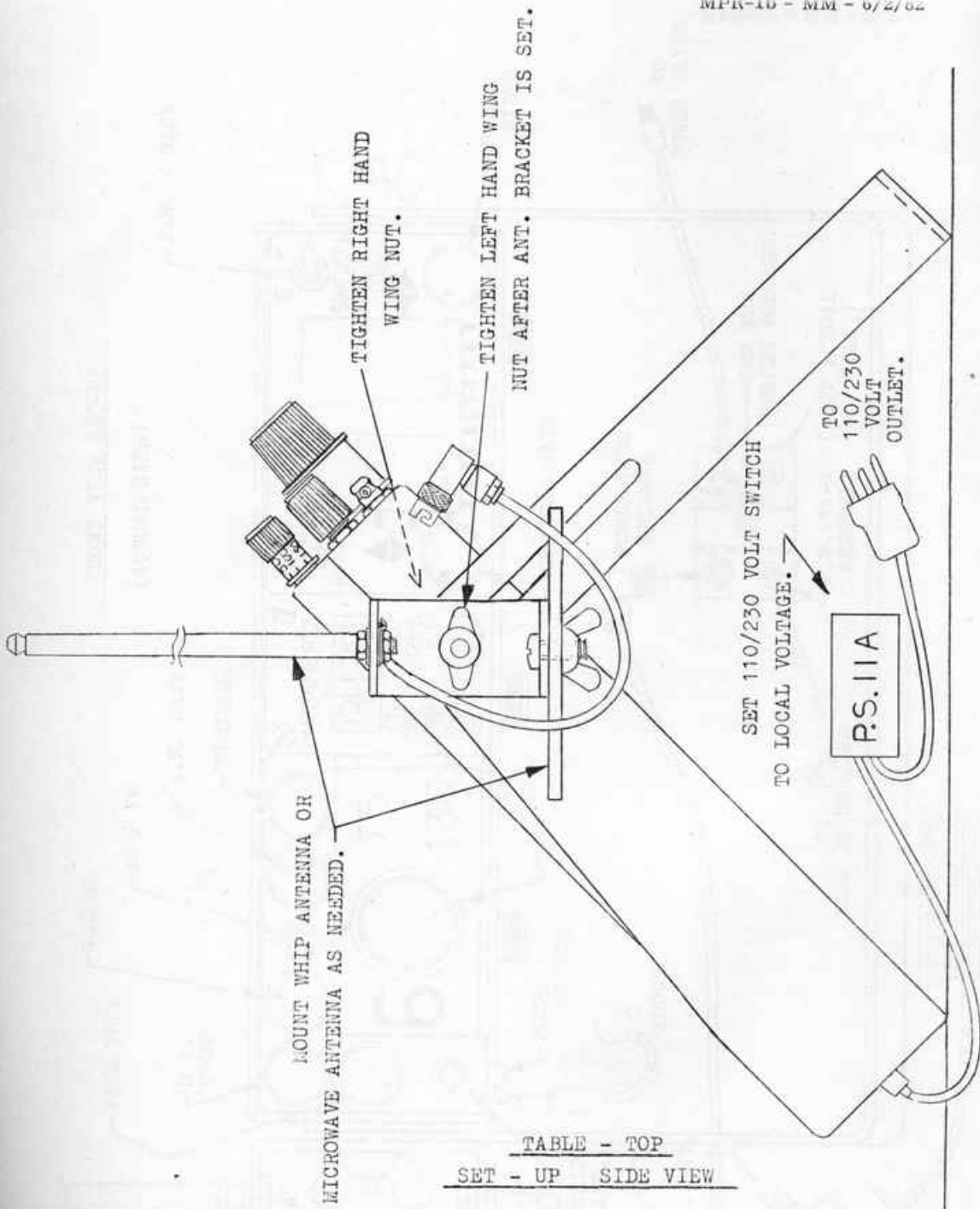
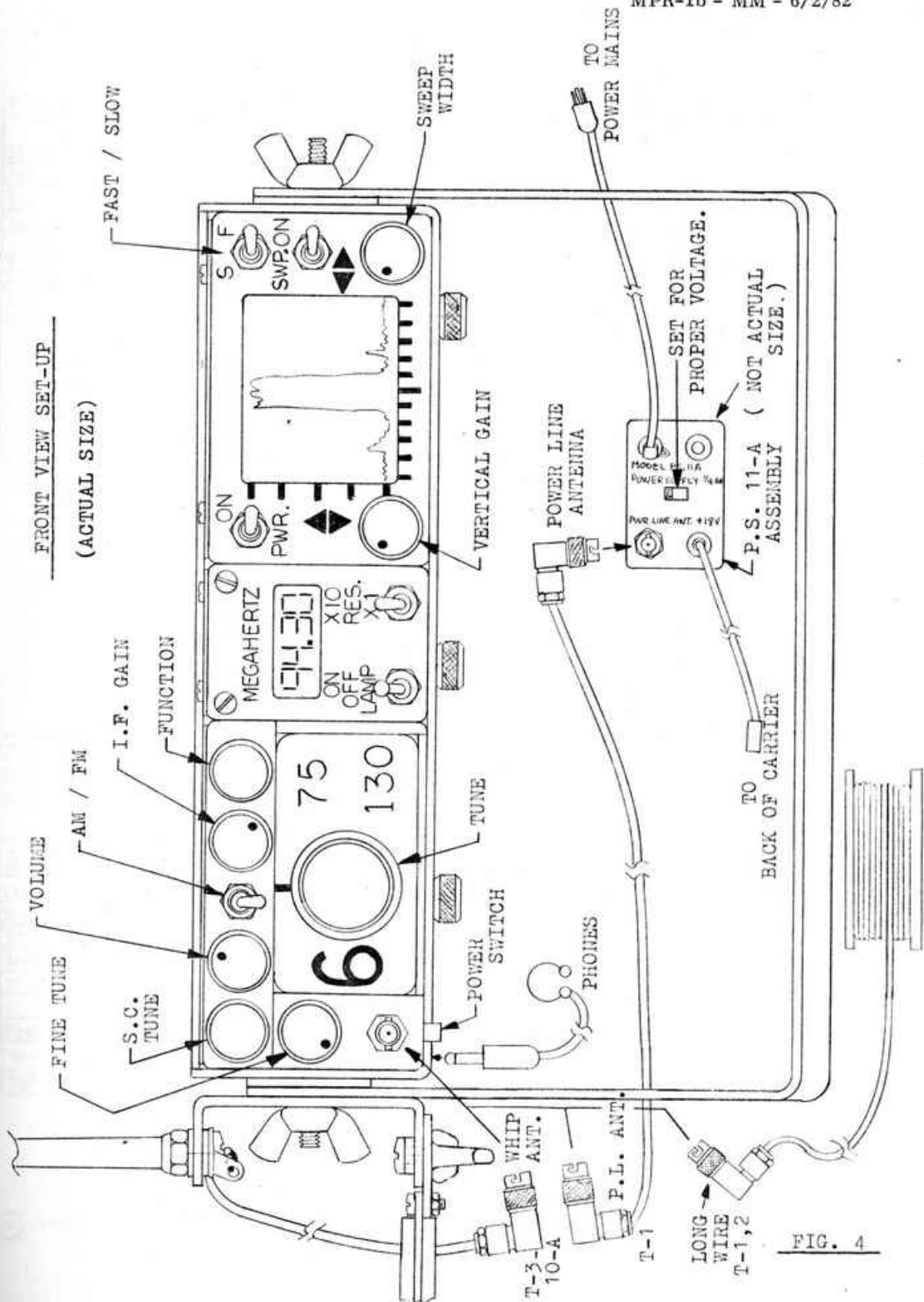


TABLE - TOP
SET - UP SIDE VIEW

FIG. 3



FRONT VIEW SET-UP
(ACTUAL SIZE)

FINE TUNE

AM / FM

I.F. GAIN

FUNCTION

FAST / SLOW

S F

SWRON

SWEEP WIDTH

MEGAHERTZ
74.30
X10
RES.
X1

ON
OFF
LAMP

75

130

TUNE

POWER SWITCH

VERTICAL GAIN

POWER LINE ANTENNA

TO POWER MAINS

SET FOR PROPER VOLTAGE.

P.S. 11-A (NOT ACTUAL SIZE.)

TO BACK OF CARRIER

T-3-10-A WHIP ANT.

P.L. ANT.

T-1

LONG WIRE T-1,2

FIG. 4

COMPONENT CHECK LIST

Part No.	Model No.	Item	Included	Missing	Notes
30543	B-8	Basic MPR			
30545-C	TMPR-1	Tuner .02-5			
30546-C	TMPR-2	Tuner 5-15			
30547-C	TMPR-3	Tuner 15-25			
30548-C	TMPR-4	Tuner 25-40			
30549-C	TMPR-5	Tuner 40-75			
30550-C	TMPR-6	Tuner 75-130			
30551-C	TMPR-7	Tuner 130-230			
30552-C	TMPR-8	Tuner 230-380			
30553-C	TMPR-9	Tuner 380-625			
30590-C	TMPR-10A	Tuner 625-1000			
30554-C	TMPR-10	Tuner 1000-1600			
30557-	TMPR-11	Tuner 1.6-10 GHz			
30595-D	S-8b	Visual Display			
30541	FC-5	Frequency Counter			

ACCESSORIES

Part No.	Quantity	Description			
PWD4163-B	2	Battery Holder			
30412-D	1	PS-11A AC Power Supply			
7838-A	1	Power Adapter 3/2			
R6292-A	1	Whip Antenna - MPR			
30561	1	Microwave Antenna Ass'y.			
6860-A	1	Gator clip Adapter - MPR			
6858-A	1	Ant. Cable Extension comp'l.			
30588-D	1	3-Pack Carrier B8/S8			
30558-A	1	Long Wire Ant. Ass'y.			
30568-A	1	Short Wire Ant. Ass'y.			
30562-A	1	Blocking Capacitor			
7821-A	1	Attache' Case			
7886-A	1	Case Insert - MPR-1			
7887-A	1	- MRP-2			
7967	1	Manual			
7807	1	Headset			
7832	1	Headset Cord			