
INSTRUCTION MANUAL
MODEL 4101
AUTOMATIC
MODULATION METER

WAVETEK[®] INDIANA, INC.

5808 CHURCHMAN, P.O. BOX 190

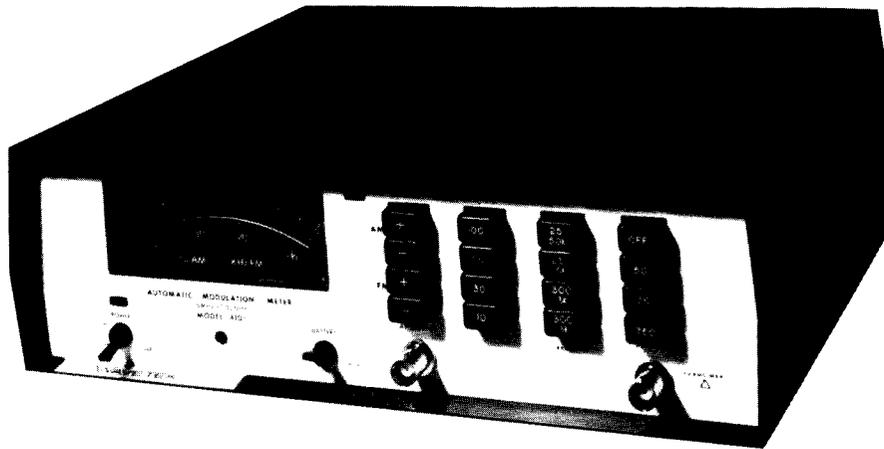
BEECH GROVE, INDIANA 46107

317-787-3332

(TOLL FREE OUTSIDE INDIANA)

1-800-428-4424

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SCOPE OF THIS MANUAL

This manual provides descriptive material and instructions for the installation, operation, maintenance, and repair of the WAVETEK Model 4101 Automatic Modulation Meter.

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SECTION 1

GENERAL INFORMATION

1.1 INTRODUCTION

The Wavetek Model 4101 is a compact, fully automatic modulation meter designed to make rapid and accurate modulation measurements when testing communications transceivers and other similar equipment. It is capable of comprehensive analysis of both amplitude and frequency modulated signals.

Model 4101 features exceptionally wide coverage of both

carrier frequency (1.5 MHz to 2.0 GHz) and level (3 mV to 1 V) with no user adjustments. The front-panel controls are simple and self-explanatory. Selection of function, meter range, filter, and de-emphasis is made via pushbuttons.

In addition to providing extreme ease of operation, the compact, lightweight Model 4101 features a rechargeable battery option (six hour operating time), making it an ideal instrument for assessing modulation performance in either the laboratory or the field.

1.2 SPECIFICATIONS

1.2.1 RF INPUT

Frequency Range	1.5 MHz to 2.0 GHz
Input Level Range	
Specified	10 mV to 1 V
Operational	3 mV to 1 V
Maximum	1 Watt (7 VRMS)
Input Impedance	50 ohms

1.2.2 FM MEASUREMENT

Modulation Frequency Range	25 Hz to 50 kHz
Deviation Ranges	1, 3, 5, 10, 30, 50 & 100 kHz Measurements of positive and negative deviation and difference can be made
Accuracy at 1 kHz modulation rate	\pm (2% of FS + 2% of reading + residual FM)
Residual FM	< 20 Hz for carrier frequencies up to 100 MHz. Above 100 MHz, increases linearly with frequency (20 Hz/100 MHz)
De-Emphasis	Selectable 50, 75, 750 μ sec or off. Time constant accuracy = \pm 5%.
Modulation Frequency Response referenced to 1 kHz	
25 Hz – 50 kHz FILTER	\pm .5 dB in band
25 Hz – 15 kHz FILTER	\pm .5 dB in band
300 Hz – 3 kHz	-3 dB \pm .5 dB at band limits

1.2.3 AM MEASUREMENT

Modulation Frequency Range	25 Hz to 50 kHz
AM Ranges	10, 30, 50, and 100% Measurements of peak, trough or difference can be made
Accuracy at 1 kHz modulation rate	\pm (2% of FS +2% of reading + residual AM)
Residual AM	< .5% with 15 kHz bandwidth selected

1.2.4 SIGNAL OUTPUTS**IF Output**

Connector	Rear-panel BNC
Frequency	\sim 420 kHz
Level	100 mV into 50 ohms

AF Output

Connector	Front-panel BNC
Level	.5 VRMS at 1 kHz modulation frequency equals meter FS on any range
Frequency Response	Controlled by selected filter (see AM and FM frequency response)

Output Impedance 600 ohms

Distortion

FM	< 1% for 50 kHz deviation at 1 kHz modulating frequency
AM	< 1% for 80% AM at 1 kHz modulating frequency

1.2.5 GENERAL

Power Requirements	100, 120, 220 or 240 VAC, +5% -10%, 48 to 400 Hz, 5 VA maximum
Dimensions And Weight	Width 28.6 cm (11 ¼ in) Height 10.2 cm (4 in) Depth 26.7 cm (10 ½ in) Weight 2.7 kg (6 lbs)

1.2.6 ENVIRONMENTAL

Specifications apply over the temperature range of from 15° C to 30° C (operational from 0° C to 40° C)
Storage Temperature Range is -20° C to +65° C
Maximum relative humidity is 95% at 30° C

1.3 OPTIONS

BA-1	Internal Nickel/Cadmium battery provides approximately 6 hours operating time, recharging time is \sim 14 hours.
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1.4 ACCESSORIES

Furnished With Instrument	Instruction Manual Detachable Line Cord (NEMA 5-15P) Fuse for 220/240 VAC operation
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Available At Extra Cost	Rack Mount Kit K015
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2.1 INTRODUCTION

This section provides installation and operating instructions for the Wavetek Model 4101. The instructions include information on mechanical installation, electrical installation, front-and-rear-panel features, and operating procedure.

2.2 MECHANICAL INSTALLATION

2.2.1 INITIAL INSPECTION

After unpacking the instrument, visually inspect external parts for damage to buttons, connectors, surfaces, etc. The shipping container and packing material should be saved in case it is necessary to reship the unit.

2.2.2 DAMAGE CLAIMS

If the instrument has been damaged in transit, notify the carrier and either the nearest Wavetek area representative or the factory in Indiana.

Retain shipping carton and packing material for the carrier's inspection.

The local representative or the factory will immediately arrange for replacement or repair of your instrument without waiting for damage claim settlements.

2.2.3 RACK MOUNTING

The Model 4101 may be mounted in a standard 19" rack using the K015 Rack Mount Kit (see Figure 2-1). Table 2-1 lists the parts in the kit.

To mount the unit, fasten the mounting pieces (B) to the bottom tray (C) using 6-32 x 3/8 screws (E). Put the instrument on the tray with the feet in the holes. Fasten the top tray (A).

2.3 ELECTRICAL INSTALLATION

The Model 4101 operates from supply voltages of 100, 120, 220, or 240 VAC, +5% - 10%. Nominal line voltage is selected by a printed-circuit card in the fuseholder. To change the voltage selection (refer to Figure 2-4):

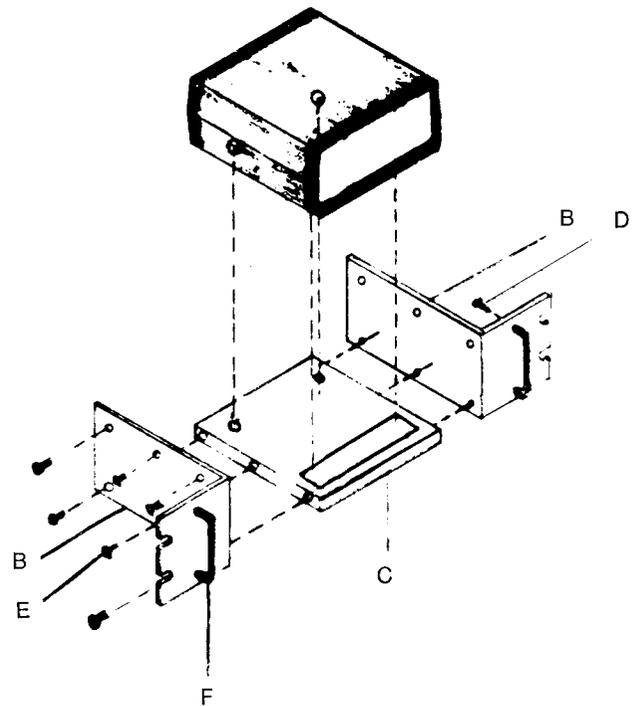
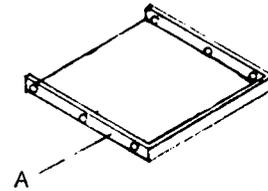


Figure 2-1. K015 Rack Mount Assembly

Table 2-1. K015 Rack Mount Kit

		Quan.	Wavetek P/N
A	Top Tray	1	1410-00-1130
B	Rack Mount	2	1410-00-1110
C	Bottom Tray	1	1410-00-1120
D	Screw, 10-32 x 1/2	4	2810-18-0208
E	Screw, 6-32 x 3/8	12	2810-17-6106
F	Handle	2	2810-07-0001

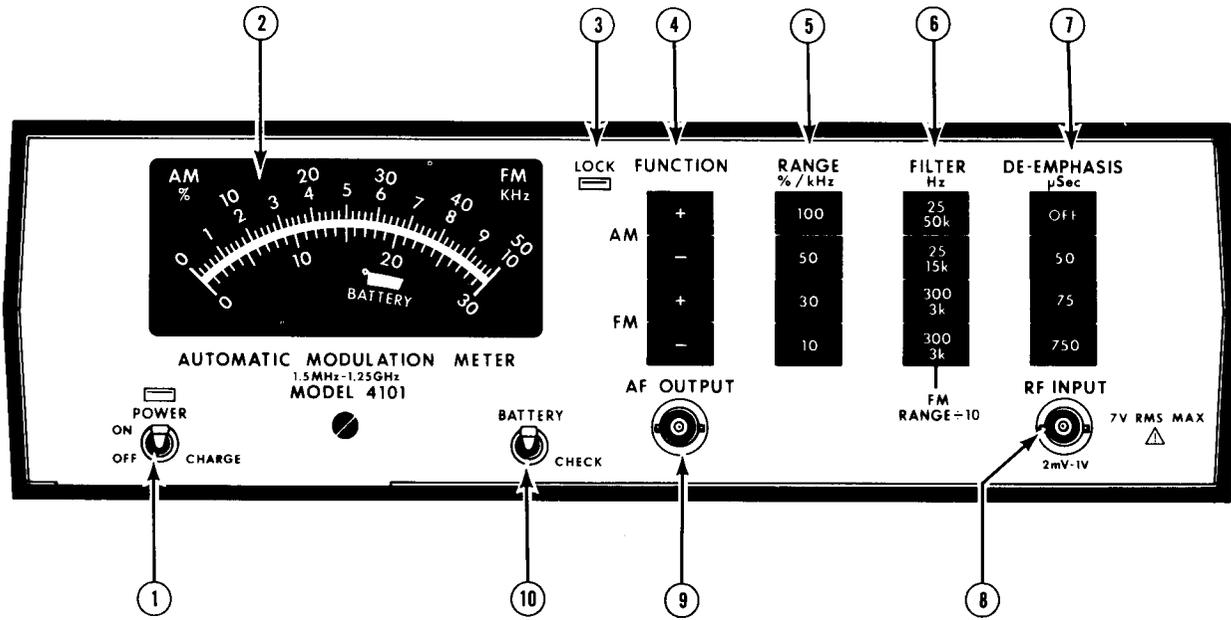


Figure 2-2. Front Panel

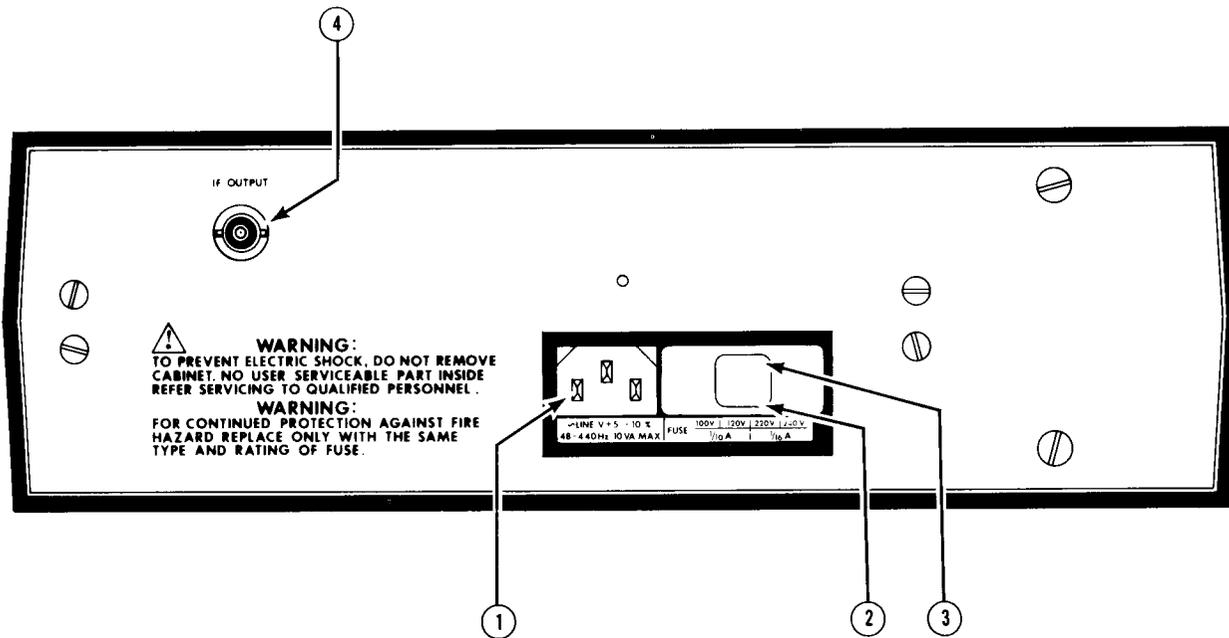


Figure 2-3. Rear Panel

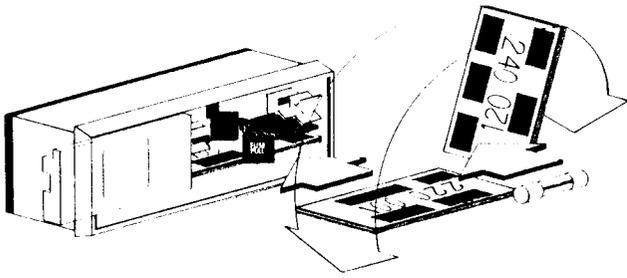


Figure 2-4. Line Voltage Selection

Remove the line cord and slide the window all the way to the left. Remove the fuse by pulling the lever. Remove the voltage-selector card. Orient the voltage-selector card so that the desired voltage is in the upper left and push the card firmly into the slot. Swing the lever to the right and check that the selected voltage is visible. Replace the fuse, slide the window to the right, and replace the line cord.

NOTE

Check that the fuse is the proper value for the selected voltage (see Section 2.5).

2.4 FRONT PANEL DESCRIPTION

- (1) POWER switch applies DC power from the Power Supply to the rest of the instrument.
- (2) METER indicates modulation level (and battery condition if BA-1 is installed).
- (3) LOCK lamp indicates that the RF input is within allowable frequency and level ranges.
- (4) FUNCTION pushbuttons select the type of modulation to be measured.
- (5) RANGE pushbuttons select the METER scale to be read.
- (6) FILTER pushbuttons select the range of modulation frequencies to be included in the measurement. The bottom pushbutton also divides the RANGE pushbutton selection by a factor of 10 when in FM function.
- (7) DE-EMPHASIS pushbuttons select a time constant to compensate for pre-emphasis, if any, of an FM transmitter. (OFF should be selected for AM measurements.)
- (8) RF INPUT connector accepts the signal to be measured.
- (9) AF OUTPUT connector provides access to the audio signal (after filter and de-emphasis) from which the measurement is made.

- (10) BATTERY CHECK switch enables battery condition to be checked if BA-1 is installed (instrument must be unplugged to make battery check).

2.5 REAR PANEL DESCRIPTION

- (1) Connector for AC line cord.
- (2) Voltage selector card. Voltage selected should be visible when card is in place.
- (3) Fuse. 1/10 A for 100/120 VAC; 1/16 A for 220/240 VAC.
- (4) IF OUTPUT connector provides connection to 420 kHz IF signal.

2.6 OPERATION

Turn the POWER switch on and connect the RF source to the RF INPUT connector. No warmup is necessary. The LOCK lamp should light, indicating that the Model 4101 has locked on to the signal and is operating properly. If the LOCK lamp is not on, the METER will not register.

CAUTION

The maximum safe input level is 1 W (7 VRMS). Maximum operating input is 20 mW (1 VRMS). When testing transmitters, use a power attenuator to reduce the power to the operating range.

Select a function (AM + or -, FM + or -). The + function measures AM peaks or positive FM deviation; the - function measures AM troughs or negative FM deviation. If both AM + and AM - are pressed the METER will indicate the difference between peak and trough; if FM + and FM - are both pressed, the difference between plus and minus deviation will be indicated.

Select a range (10%, 30%, 50%, and 100% AM full-scale, 10 kHz, 30 kHz, 50 kHz, and 100 kHz peak FM deviation), FM deviation ranges of 1 kHz, 3 kHz, 5 kHz, and 10 kHz are available by pushing the FM ÷ 10 button in the FILTER column.

Select a modulation-frequency filter. The top button, 25 Hz to 50 kHz, gives the full range of the instrument, while 25 Hz to 15 kHz and 300 Hz to 3 kHz decrease the bandwidth. To minimize the effects of noise, it is recommended that the minimum bandwidth which does not interfere with modulation be used.

The bottom 300 - 3K button divides the selected FM range by 10. The ranges then become 1 kHz, 3 kHz, 5 kHz, and 10 kHz. If AM + or AM - is selected both 300 - 3K buttons have the same effect.

Select de-emphasis. When measuring AM, select OFF. If an FM source has pre-emphasis, select the matching time constant.

LOCK AND UNLOCK

The Model 4101 will automatically lock on to the highest-level signal in its range, as long as that signal is at least 10 dB above any other. The lock circuit will track a slowly sweeping signal.

Overmodulation or 100% AM may cause the Model 4101 to unlock or fail to lock.

IF AND AF OUTPUTS

The IF OUTPUT connector on the rear panel brings out the 420 kHz IF signal at 100 mV level into 50 ohms. The AF OUTPUT connector on the front panel brings out the filtered audio signal. Full scale on the METER corresponds to 0.5 VRMS at 1 kHz into 600 ohms.

BATTERY OPERATION

The optional battery will power the instrument for about 6 hours. Recharging requires about 14 hours. Full charge rate occurs when the Model 4101 is plugged in but not turned on. When the unit is turned on, the charge rate is a trickle. Battery charge may be checked by pressing the momentary BATTERY CHECK switch with the instrument unplugged. The METER should read in the BATTERY arc.

SECTION 3

THEORY OF OPERATION

3.1 INTRODUCTION

This section presents a block diagram analysis of the Wavetek Model 4101 to enable the reader to get an overall view of the instrument. The circuit descriptions are referenced to the block diagrams of Figures 3-1 and 3-2, and the schematics in Section 6 of this instruction manual.

3.2 RF ASSEMBLY

3.2.1 LOCAL OSCILLATOR

The local oscillator (L.O.) is a low-noise, source-coupled Colpitts comprised of Q63 and its associated circuitry. The tank circuit formed by CR1, CR2, and T4 sets the L.O. frequency between 1.85 and 3.0 MHz, with the exact frequency being determined by the loop integrator output voltage on C45. Drive amplifier Q64 through Q68 amplifies the L.O. output. Step-recovery diode CR3 and differentiator L6 convert the amplified RF signal to a pulse train of 250 psec pulses.

3.2.2 SAMPLING MIXER

The pulse train from the pulse generator instantaneously unbalances the bridge formed by CR4 through CR6, allowing samples of the RF input to reach buffer Q1. The sampling mixer is very linear and is tolerant to overloading.

3.2.3 IF AMPLIFIER

The output from buffer Q1 is passed through a low-pass filter (L2/C5/C6/C7) to remove harmonics and spurious signals, and is applied through Q2 (AGC) to the input of IF amplifier Q3 through Q10. The IF amplifier output is split into two signals; one from Q9 for the frequency lock circuit, the other from Q10 for AM/FM detection.

3.2.4 AM DETECTOR

The IF output from Q10 is sent through a 420 kHz band-pass filter (which can also pass all relevant modulation sidebands) to the AM detector consisting of Q12, Q13, and Q14. This is a very linear active mean detector. The detector outputs appear as current sources of opposite polarity; one from Q12 for AGC, the other from Q14 as the AM signal. The signal from Q14 is buffered by AM buffer Q15 and sent to the AF Assembly as detected AM.

A portion of the filtered IF is taken off prior to the AM detector, and is amplified (by Q11) and sent to the rear-panel IF OUTPUT connector.

3.2.5 AGC

The automatic gain control (AGC) circuit consists of an AGC integrator and Q2, the stage preceding the IF amplifier. In the AGC integrator, one of the AM detector current sources (from Q12) is applied to C22. DC current source Q17/Q18 provides a reference. If the IF signal level is not correct, the DC component of the source from the AM detector will not balance with the AGC reference current, and C22 will either charge or discharge. The voltage on C22 is also applied to the gate of Q2, thus controlling its gain and so the IF amplifier input level.

The voltage on C22 is also sent to the AGC comparator formed by Q20 and Q21. This comparator determines if the AGC voltage is within its allowable range, and produces a detected voltage (via CR12) for use in the lock drive circuit.

3.2.6 FM DETECTOR

The signal from Q13 in the AM detector is split and fed into the FM detector (Q25 through Q29 and Q32). The

FM detector is a highly linear pulse integrator, which operates by generating a fixed pulse of charge for each IF cycle and then integrating the charges.

Two outputs of opposite polarity are produced, with the appropriate polarity selected by the FM phase switch (triggered by the bistable circuit in the frequency lock circuitry). The selected signal is then sent to the AF Assembly as detected FM.

3.2.7 FREQUENCY LOCK

The limiting amplifier formed by Q41/CR24/CR25/CR26 clips the signal from Q9 in the IF amplifier to produce an essentially constant-amplitude signal which is fed into unity gain inverting amplifier Q42. The limiting and inverting amplifier outputs are both fed into a phase switch circuit (Q43/CR27/CR28) and a phase shift network (T3/C33). The output of the phase shift network, along with one of the inputs (via the phase switch), is applied to a phase detector. The phase detector is balanced when its inputs are 90° out of phase, which occurs at the resonant frequency (chosen to be 420 kHz) of the phase shift network. If the phase detector is not balanced (i.e., the IF deviates from 420 kHz), an error signal is applied to the loop integrator (which operates in a manner similar to the AGC integration described in Section 3.2.5), and thus to the local oscillator in order to correct the IF. The polarity of the error signal is determined by the state of the phase switch, which selects which amplifier output to apply to the phase detector input.

The loop integrator output is applied to the local oscillator to tune the L.O. frequency such that the IF is 420 kHz. If the loop integrator output (L.O. control input) exceeds its allowable range, the lock comparator (Q53/Q54/Q59) activates a monostable circuit (Q46/Q47), which generates a command to reset the loop integrator via integrator reset circuit Q48/Q49/Q50/CR29/CR30. The monostable output also triggers a bistable circuit, which reverses the polarity of the phase switch, thus reversing the direction of the L.O. frequency correction induced by the phase detector via the loop integrator. In this way, lock is achieved for any frequency within the instrument operating range, as the L.O. will be driven by the loop integrator to a frequency which will produce an IF of 420 kHz, and will be maintained ("locked") at that frequency as long as the RF input frequency does not change.

The bistable circuit also triggers the FM phase switch to ensure that the sense of the detected FM is correct.

The lock detector (CR14) monitors the phase shift network output. The detected signal from CR14, along with the AGC comparator output from CR12, triggers the lock driver (CR13/Q22/Q23) to turn on the front-panel LOCK lamp.

3.3 AF AND PANEL ASSEMBLIES

For simplicity in description, the AF Assembly, the Front Panel Assembly, and the Rear Panel Assembly will all be covered in this section.

3.3.1 AF SIGNAL FLOW

The detected AM and FM signals from the RF Assembly are applied to the AM switch (Q201 through Q208). The two sections are enabled by the negative lock signal from the RF Assembly. When AM is selected via the front-panel FUNCTION switch, CR201 is grounded via the FUNCTION switch, turning Q205 on. This action applies $\sim +12$ V to the bases of Q206 and Q207, turning Q206 on and Q207 off. Q206 thus shunts the detected FM to ground, while Q207 keeps FET switch Q208 turned off. Q201 is also turned off by the ~ 12 V signal applied through CR202. This allows the normal negative biasing on the bases of Q202 and Q203 to turn them off and on, respectively, thus turning on FET switch Q204 to send the detected AM to the 60 kHz filter/amplifier.

When FM is selected, a positive voltage is applied through CR203 to turn off Q205. This allows Q201 to turn on, which then turns Q202 on (shunting the detected AM to ground) and Q203 off (turning off FET switch Q204). Since Q205 is turned off, Q206 is turned off and Q207 is turned on. FET switch Q208 is thus turned on (by Q207) to send the detected FM to the 60 kHz filter/amplifier.

Q209 through Q212 comprise the 60 kHz filter/amplifier. This is an active three-pole filter with a gain of 5. The filter output is then either connected directly to the gain switched amplifier or switched (via Q213 activated by the bottom FILTER pushbutton) through a X10 amplifier and 3.5 kHz filter (Q214/Q215), before being sent to the gain switched amplifier.

The gain switched amplifier is a shunt-feedback type, comprised of Q221 through Q228. RANGE switch S401 controls the gain by activating Q221, Q223, Q225, and Q227, thus switching in the appropriate shunt-feedback values. The overall gain of the amplifier when the 100 RANGE pushbutton is depressed is 1.

The gain switched amplifier is followed by a 15 kHz filter (Q229/Q230/Q231) which is disabled via Q227/Q228 when the 25 - 50k RANGE pushbutton is depressed. This filter is followed by a 25 Hz high-pass filter (C222/C223/R277/R278), and a 60 kHz low-pass filter (C224/C225/Q232/Q233/R278/R279).

The AF signal is then sent to a 300 Hz to 3 kHz bandpass filter (IC401 and associated components) which is switched in or out of the circuit by the FILTER pushbutton switches.

From there, the signal is sent to the DE-EMPHASIS push-button switches for application of the appropriate time constant. A sample of the de-emphasized signal is sent to the AF OUTPUT connector.

Finally the processed signal is sent to the peak (Q234 through Q237) and trough (Q238 through Q241) detectors. These are opposite polarity detectors, with the peak and trough values of the AF signal detected and stored as voltages on C227/Q237 and C228/Q238, respectively. These voltages are then applied through the FUNCTION switch to the meter drive circuit (CR403 through CR406) for indication on the front-panel METER.

3.3.2 POWER SUPPLY

The rear-panel transformer supplies ~ 15 VAC to diode bridge CR301. The unregulated rectified outputs from CR301 are then applied through the POWER switch to Zener diode CR304. FET Q301 functions as a voltage-variable resistor to maintain a constant current through CR304. The +6.25 V level at CR304 is fed into a non-

inverting operational amplifier (formed by IC300A and Q302) with a gain of ~ 1.9, thus producing a regulated output of +12 V. R308 and CR305 assist during power-up to get the regulator functioning.

The -12 V regulated voltage is produced in a similar manner, except that the input to the inverting operational amplifier (IC300B/Q303) is the +12 V regulated voltage, and the operational amplifier itself has a gain of 1.

When the BA-1 Battery Option is installed, the battery output is used as the unregulated voltage. When the instrument is plugged in, the battery is charged through DS1 and DS2, CR302 and CR303 providing protection.

When the momentary BATTERY TEST switch is pushed, the unregulated voltage lines are applied to the METER to provide an indication of battery strength. The instrument must be unplugged to obtain an accurate battery reading. If the instrument is not unplugged, the rectified AC will peg the METER.

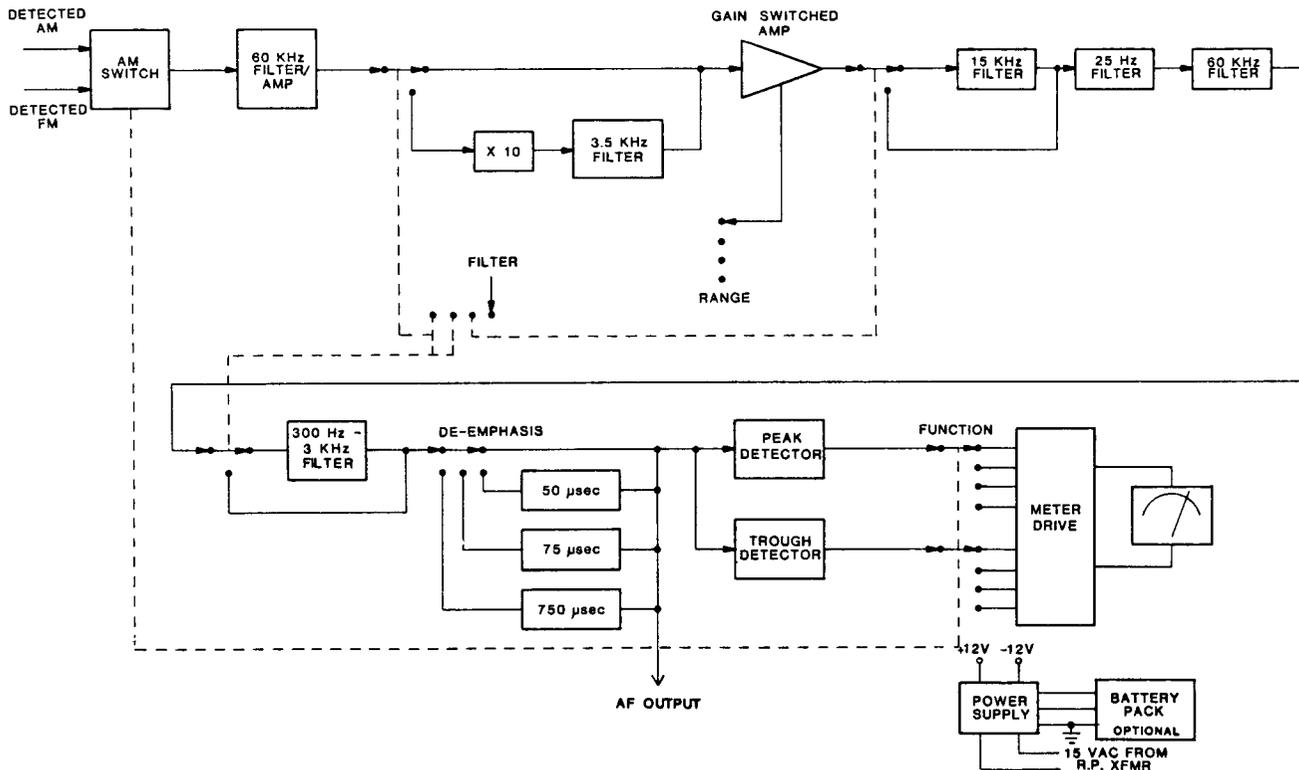


Figure 3-1. AF Assembly Block Diagram

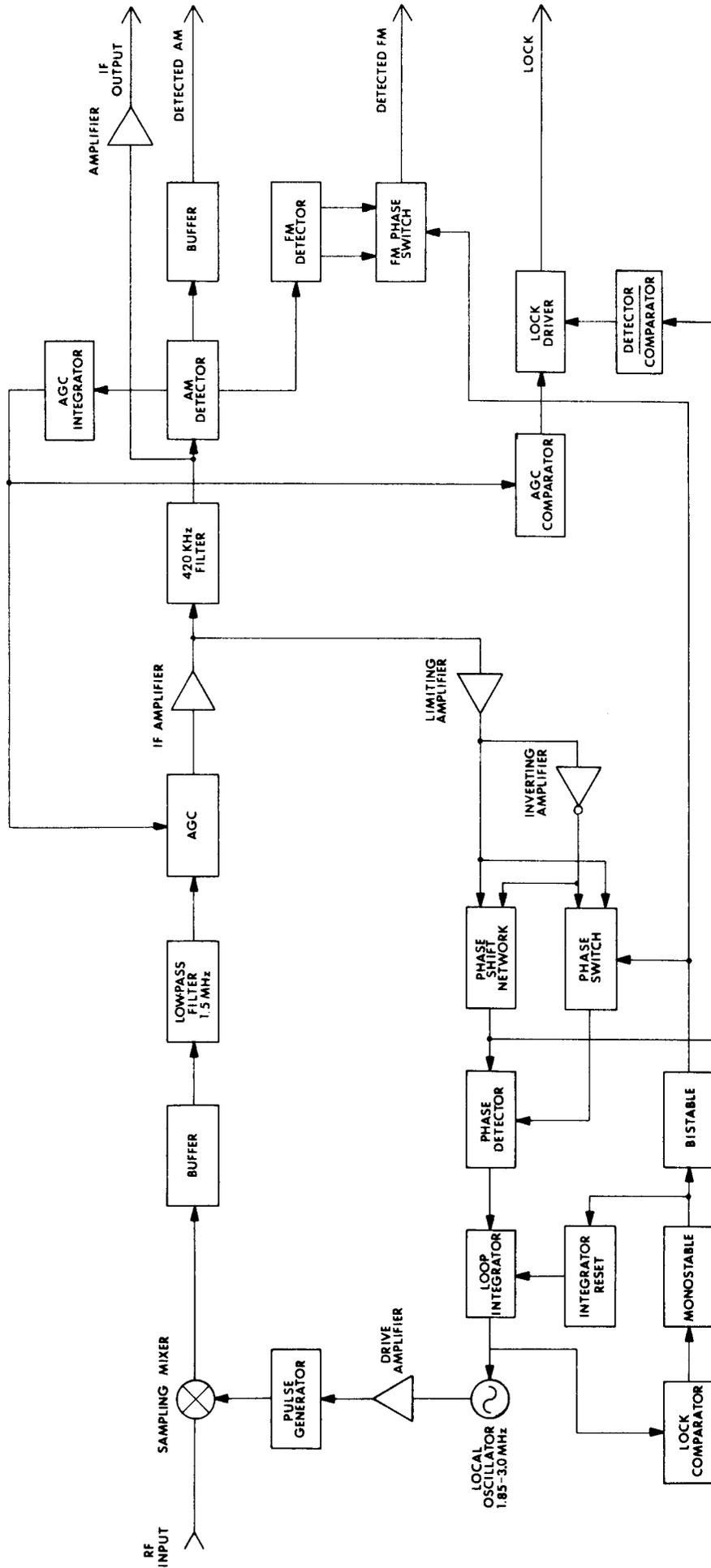


Figure 3-2. RF Assembly Block Diagram

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SECTION 4
MAINTENANCE

4.1 INTRODUCTION

This section provides information for calibrating, troubleshooting, and servicing the Model 4101 Automatic Modulation Meter.

4.2 SERVICE INFORMATION

4.2.1 DISASSEMBLY

CABINET REMOVAL

Turn the instrument upside down. Remove four screws from the bottom and lift off the lower half of the cabinet. Lift the chassis out of the upper cabinet half.

ASSEMBLY REMOVAL

There are two main assemblies in the Model 4101, stacked between the chassis side rails. The AF (upper) Assembly contains the audio-frequency section, the peak/trough detector, and the power supply. The RF (lower) Assembly contains the RF/IF section and the AM and FM detectors (demodulators).

To remove an assembly, turn the chassis so that the assembly to be removed is on top. Remove the four screws holding the cover and remove the cover. Disconnect any plug-in cables and harnesses, being careful not to bend the pins on the connectors. Remove the four screws holding the assembly to the side rails and lift out the assembly. The printed-circuit board can be removed from the assembly frame by removing four screws, but this should not be necessary unless components are to be replaced.

FRONT-PANEL PC BOARD REMOVAL

Remove the AF and RF assemblies and unsolder the METER leads. Turn the chassis upside down and unsolder the lead from the AF OUTPUT connector. Remove the four screws holding the PC board to the front panel.

NOTE

Removing the nuts connecting the front panel to the chassis rails is not recommended due to the risk of damage to the studs, which are integral parts of the front panel.

Each assembly is reinstalled by reversing the removal procedure.

4.2.2 CALIBRATION/SERVICE CONFIGURATION

Remove the chassis from the cabinet and remove the RF and AF Assembly covers. Remove the RF Assembly and invert it. Place the assembly on the right side of the chassis with the components up and the DIP connector toward the front. Using two of the assembly mounting screws, fasten the RF Assembly to the right side rail so that it projects to the right side of the chassis. Reconnect the ribbon harness and the two coaxial cables to the assembly.

This configuration preserves both electrical and mechanical integrity, while allowing access to all components and adjustments.

4.3 PERFORMANCE TEST

The only performance testing necessary or meaningful for the Model 4101 is a measurement of a known modulated signal.

To conduct a test, connect the Model 4101 and a digital modulation meter to an RF source using a "tee" connector (refer to Table 4-1). Set the RF source controls for the desired modulation and read the modulation directly on the digital modulation meter. Then read the modulation on the Model 4101. It should agree with the digital modulation meter within accuracy specifications (refer to Section 1.2).

As many points as desired within the range of the Model 4101 may be tested. If the Model 4101 readings are not within accuracy specifications, perform the calibration procedure in Section 4.4.

TABLE 4-1. RECOMMENDED TEST EQUIPMENT

EQUIPMENT	CRITICAL SPECIFICATION	RECOMMENDED
RF Source	Frequency range compatible with Model 4101; 90% AM; 100 kHz FM deviation	Wavetek 3010
Digital Voltmeter	4 ½ digit	Fluke 8012A
Oscilloscope	DC coupled	Wavetek 1901C
Function Generator	1.5 to 4 MHz (continuous control)	Wavetek 182A
Audio Source	1 kHz, low distortion	Wavetek 182A
Frequency Counter	To 1 MHz; resolution 100 Hz	HP 5381A
Digital Modulation Meter	Accuracy $\pm (1\% + 1 \text{ digit})$; Frequency range compatible with Model 4101	HP 8901A

4.4 CALIBRATION

The following procedure assumes that the unit is working normally. If it is not, see Section 4.4, Troubleshooting. Table 4-1 lists recommended test equipment.

4.4.1 RF ASSEMBLY CALIBRATION

Set all adjustments shown in Figure 4-1 except R114 to mid-range. Set R114 fully ccw, then turn cw $\sim 15^\circ$. Connect the function generator to the oscilloscope vertical input and set the oscilloscope vertical sensitivity to 0.1 V/division. Adjust the function generator for 0.3 V_{pp} at ~ 1.3 MHz output.

IF OUTPUT FREQUENCY

Connect the function generator to the Model 4101 RF INPUT connector. Set the oscilloscope sensitivity to 5 V/division. Connect the oscilloscope vertical input to TP5 (VCO voltage) and the frequency counter to the rear-panel IF OUTPUT connector.

Increase the function generator frequency slowly. The TP5 voltage measured by the oscilloscope will decrease for a while. When it starts to increase, back the frequency off to the low-voltage point (approximately 2.3 MHz). Disconnect the oscilloscope and record the IF output frequency. Reconnect the oscilloscope and increase the function generator frequency. The voltage at TP5 will increase, then decrease. Set the frequency to the next low-voltage point (approximately 3.2 MHz). Disconnect the oscilloscope, and record the IF output frequency. Add the two recorded frequencies and divide by 2. Adjust R110 to set the IF output to this frequency (approximately 420 kHz).

Set the function generator frequency to 2 MHz and re-connect the oscilloscope to TP5. Increase the function generator frequency until the DC voltage reaches a peak (2 to 3 MHz). Disconnect the oscilloscope and record the IF output frequency. Reconnect the oscilloscope and increase the frequency until the voltage reaches a second peak (approximately 3.2 MHz). Disconnect the oscilloscope and record the IF output frequency. Add the two recorded frequencies and divide by 2. Adjust R109 to set the IF output to this frequency. Since R110 and R109 interact, repeat the above procedure until the IF output frequency is between 400 and 440 kHz, with a maximum of 1 kHz difference between the two peak-voltage frequencies and 1 kHz between the two low-voltage frequencies, and a maximum of 10 kHz between averages of the peak-voltage frequencies and the low-voltage frequencies.

Connect the oscilloscope to TP1, the AGC voltage. Connect the RF source to the Model 4101 RF INPUT connector. Set the RF source frequency to 3 MHz and the output level to .003 VRMS. Reduce the RF source output level until the front-panel LOCK lamp goes out. This should occur at a level between 1 and 2 mVRMS. Increase the level slowly until the voltage on the oscilloscope begins to rise and the LOCK lamp comes on. Adjust R114 until the LOCK lamp goes out, then back it off until the lamp just comes on. Set the frequency to 1.5 MHz. The LOCK lamp should remain on. Set the frequency to 3 MHz. Increase the output level to +13 dBm. The LOCK lamp should remain on.

Set the modulation frequency to 1 kHz, the mode to FM, and the deviation to 100 kHz. Connect the oscilloscope to the front-panel AF output. Set the oscilloscope vertical sensitivity to 0.1 V/division. Set the Model 4101 to measure AM 10%, and adjust R113, T2, and T3 for minimum voltage on the oscilloscope.

4.4.2 AF ASSEMBLY

NOTE

It is assumed that the RF Assembly has been previously calibrated. Refer to Figure 4-2 for AF Assembly adjustment locations.

With the Model 4101 turned off, adjust the screw on the meter face to mechanically zero the needle. Set the Meter Balance adjustment, R282, to mid-range. Set the 10 kHz Lo Range adjustment, R237, fully cw, then ccw 1/8 turn.

Select FM-, 100 kHz range, 25 Hz - 15 kHz filter, and de-emphasis OFF via the front-panel pushbuttons. Connect the RF source and digital modulation meter to the Model 4101 RF INPUT connector using a "tee" connector and turn the Model 4101 POWER switch on. Set the RF source modulation frequency to 1 kHz and adjust the deviation of the RF source for a full-scale reading on the METER. Connect the digital voltmeter to TP1 and adjust R292 for a reading of 5.0 VDC. Depress the FM+ FUNCTION pushbutton. Adjust the deviation of the RF source for a full-scale reading on the METER. Connect the DVM to TP2 and adjust R288 for a reading of 5.0 VDC.

Set the digital modulation meter to read -peak and the deviation of the RF source to 100 kHz. Adjust R112 in the RF Assembly for a full-scale reading on the METER. Set the Model 4101 and the digital modulation meter to read -peak. Without changing the deviation of the FM source, adjust the Meter Balance adjustment, R282, to make the Model 4101 reading equal to the digital modulation meter reading. Repeat the above procedure until the Model 4101 readings agree with the digital modulation meter readings for both + and - peaks.

Set the Model 4101 and the digital modulation meter for FM+, 25 - 15 kHz filter, 10 kHz range, and no de-emphasis. (This is the normal 10 kHz range.) Set the deviation of the RF source for a reading of 10 kHz on the digital modulation meter and set R246 for a full-scale reading on the Model 4101 METER. Depress the Model 4101 100 kHz RANGE pushbutton and the FM RANGE ÷ 10 pushbutton. (This is the expanded 10 kHz range.) Switch in a 300 - 3 kHz filter on the digital modulation meter. Adjust R237 until the Model 4101 reading agrees with the digital modulation meter reading. Set both meters to read FM+, 25 - 15K filter, 100 kHz range, and no de-emphasis, and check that the Model 4101 reading matches the digital modulation meter reading. If it does not, repeat the above procedure until it does.

Set the Model 4101 and the digital modulation meter to read 25 - 15 kHz filter, FM + 30 kHz, and no de-emphasis. Set the deviation of the RF source for a reading of 30 kHz

on the digital modulation meter and adjust R253 for a full-scale reading on the Model 4101 METER. Set the Model 4101 to the 50 kHz range. Set the RF source for 50 kHz deviation on the digital modulation meter and adjust R160 for a full-scale reading on the Model 4101 METER. Set both meters to read AM+, 25 - 15 kHz filter, 100% range, and no de-emphasis. Set the RF source for 90% AM on the digital modulation meter and adjust R111 in the RF Assembly for a reading of 90% on the Model 4101 METER.

4.5 TROUBLESHOOTING

Effective troubleshooting requires a thorough understanding of the block diagrams and circuit description located in Section 3 of this manual; then the Calibration Procedures in Section 4 will aid in localizing the trouble symptom to a particular assembly. Once this has been accomplished, the assembly or board can be replaced, or repaired with aid of the proper schematic and parts layout diagram. In general, it is preferable to replace a defective assembly or PC board.

Equipment troubles are frequently due simply to improper control settings; therefore, before engaging in a troubleshooting procedure, be sure front-panel controls are set in proper operating position. Refer to the operating instructions in Section 2 of this manual for a complete explanation of each control's function along with typical operating instructions.

After verifying that the trouble is not improper setting of the controls or test setup, make a thorough visual inspection of the instrument for such obvious defects as loose or missing screws, broken wires, defective sockets, loose harnesses, and burned or broken components.

If a problem is not visually detected, check for proper Power Supply voltages. If these are correct, proceed to troubleshoot through the circuitry starting at a known proper signal (the input signal) and proceeding through the circuitry a step at a time until the problem is located.

This whole procedure can be considerably shortened by first isolating the suspected fault into as small a section as possible before starting the step by step probing of elements. For instance, if the AF output of the unit seems to be operating properly but the METER isn't reading correctly, the problem must lie between the two in either the detector portion of the AF Assembly, the connection between the Front Panel Board and the AF Assembly, or in the METER itself. Thus, this amount of thought has probably eliminated 95% of the circuitry in the unit.

After localizing the problem, voltage and resistance checks will help locate the defective component.

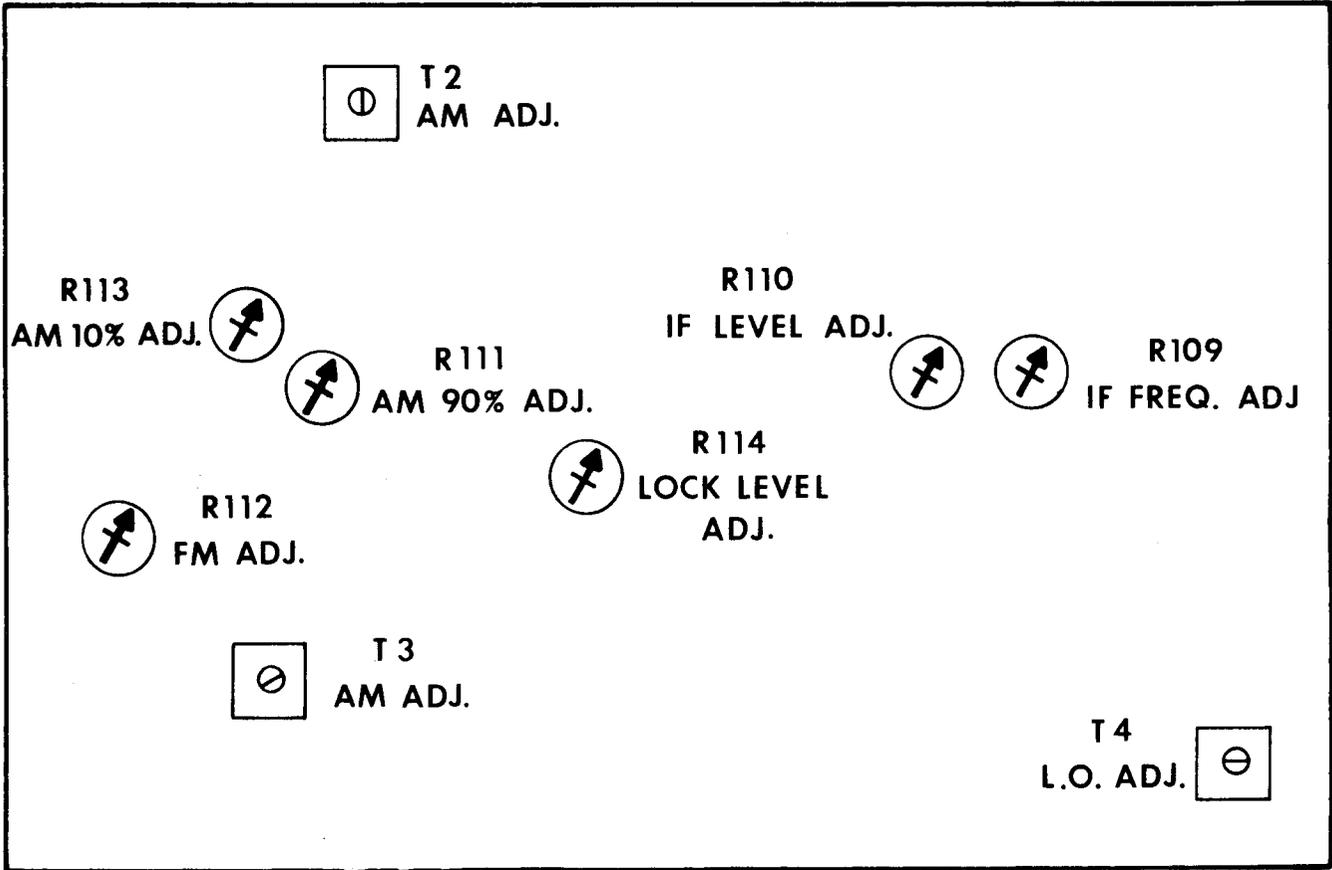


Figure 4-1. RF Assy Controls

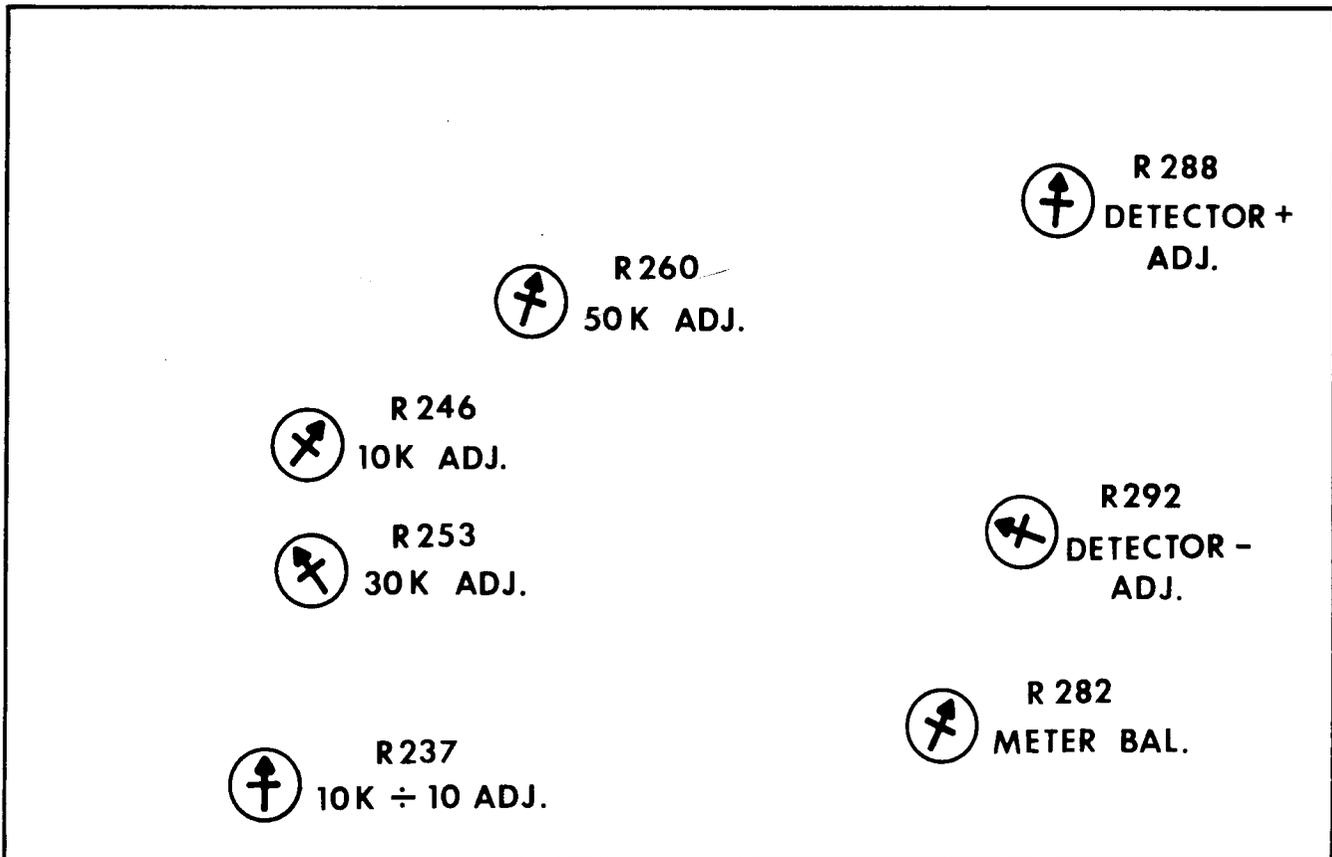


Figure 4-2. AF Assy Controls

SECTION 5

REPLACEABLE PARTS

5.1 INTRODUCTION

This section contains lists of all replaceable parts for the instrument.

For an assembly containing one or more subassemblies, the assembly list appears first, and is followed by the subassembly lists.

The lists appear in the following order.

PARTS LIST	ASSEMBLY
1010-00-0186	4101
1111-00-0111	CABINET
1118-00-0057	RF ASSY
1118-00-0058	AF ASSY
1218-00-1120	AF PC ASSY
1118-00-0060	R.P. ASSY
1219-00-0215	XFMR ASSY
1118-00-0059	F.P. ASSY
1218-00-1130	F.P. PC ASSY

5.2 MANUFACTURERS CODE

The following code is used on the parts lists to identify the manufacturer.

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
ZA1	RF ASSY,4101	1118-00-0057	W-I	1118-00-0057	1.000
ZA2	AF ASSY,4101	1118-00-0058	W-I	1118-00-0058	1.000
ZA3	FP ASSY,4101	1118-00-0059	W-I	1118-00-0059	1.000
ZA4	RP ASSY,4101	1118-00-0060	W-I	1118-00-0060	1.000
ZA5	CABINET, 4101	1111-00-0111	W-I	1111-00-0111	1.000
WAVETEK PARTS LIST		TITLE MOD METER, 4101	ASSEMBLY NO. 1010-00-0186		REV
			PAGE: 1		

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
F1-220	FUSE, 1/16 A, TD	MDL 1/16	BUS	2410-05-1012	1.000
F18	DIP JUMPER,14 PIN	CA14-0023	CW/AL	6011-60-0010	1.000
WAVETEK PARTS LIST		TITLE CABINET, 4101	ASSEMBLY NO. 1111-00-0111		REV
			PAGE: 1		

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
1	PC BOARD ASSY	PCB252-302	SAYR	3010-51-0001	1.000
WAVETEK PARTS LIST		TITLE RF ASSY,4101	ASSEMBLY NO. 1118-00-0057		REV
			PAGE: 1		

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
ZA1	AF PC ASSY,4101	1218-00-1120	W-I	1218-00-1120	1,000
WAVETEK PARTS LIST		TITLE AF ASSY,4101	ASSEMBLY NO. 1118-00-0058		REV A
			PAGE: 1		

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
C201 C202 C222 C223	CAP,FILM,250V,.047UF	818347254	REI	1510-60-9473	4,000
C203 C210 C211 C220 C224	CAP,CER,5%,470PF	C315C471J1G5CA	UNCAR	1510-12-5471	5,000
C204 C217 C219	CAP,CER,5%,330PF	C315C331J2G5CA	UNCAR	1510-12-5331	3,000
C205 C206 C208 C216 C218	CAP,MON,50V,100PF	RA50-101JA	MURGA	1510-11-8101	5,000
C207	CAP,DISC,1KV,.01UF	56A-S10	SPR	1510-10-1103	1,000
C209 C226 C228 C230 C231 C304 C305	CAP,TANT,25V,10UF	T368B106H025AS	UNCAR	1510-24-4100	7,000
C212 C221 C225	CAP,MON,50V,33PF	RA50-330JA	MURGA	1510-11-8330	3,000
C213	CAP,TANT,15V,47UF	T368C476015AS	UNCAR	1510-24-5470	1,000
C214 C215	CAP,DISC,1KV,20PF	60C06200J	MDC	1510-10-0200	2,000
C227 C229 C303	CAP,TANT,35V,1UF	T368A105M035AS	UNCAR	1510-24-3109	3,000
C301 C302	CAP,ELEC,35V,470UF	CAE470-35V	CAPAR	1510-24-6471	2,000
CR200 CR201 CR202 CR203 CR204 CR205 CR206 CR207 CR208 CR209 CR210	DIODE,SIGNAL	1N4148	T-I	4807-01-0914	11,000
CR301	DIODE BRIDGE	FW-50	MAL	4806-02-0005	1,000
CR302 CR303	DIODE,RECT,400V	1N4004	P-C	4806-01-4004	2,000
WAVETEK PARTS LIST		TITLE AF PC ASSY,4101	ASSEMBLY NO. 1218-00-1120		REV A
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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
CR304	DIODE,ZENER,6V	IN825	SIEM	4801-01-0825	1,000
CR305 CR306	DIODE,ZENER,12V	HW12B	MSP	4801-02-0003	2,000
DS1 DS2	LAMP,T-1 3/4,B1-PIN	7360	SYL	2410-02-0009	2,000
IC300	DUAL OP AMP,RAYTHEON IC000-027	RC4558NB-RAY	RAY	7000-45-5801	1,000
J01	IC SKT,PC,14 PIN MC000-073	C931402	T-I	2112-00-0011	1,000
J02	IC SKT,16 PIN MC000-074	D1LB-16P-108	BURND	2112-00-0012	1,000
P04 P05	HEADER,4-PIN STRT REF:2112-07-0000	MC000-097	W-I	2112-07-0015	2,000
P03	HEADER,11-PIN,STR. REF:2112-07-0000	2112-07-0016	W-I	2112-07-0016	1,000
Q201 Q202 Q205 Q207 Q211 Q213 Q214 Q219 Q220 Q221 Q222 Q223 Q224 Q225 Q226 Q227 Q229 Q230 Q232 Q234 Q235 Q236 Q237	XSTOR,PNP	BC212B	SGS-A	4902-00-2120	23,000
Q202 Q206 Q209 Q210 Q212 Q215 Q217 Q218 Q228 Q231 Q233 Q238 Q239 Q240 Q241	XSTOR,NPN	BC182B	SGS-A	4902-00-1820	15,000
WAVETEK PARTS LIST		TITLE AF PC ASSY,4101	ASSEMBLY NO. 1218-00-1120		REV A
			PAGE: 2		

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
Q204 Q208 Q216	FET	U1897E	NAT	4902-01-8970	3,000
Q301	TRANSISTOR	2N4303	SIEM	4901-04-3030	1,000
Q302	TRANS QB000-022	MJE252	MOT	4902-00-2520	1,000
Q303	TRANS QB000-023	MJE242	MOT	4902-00-2420	1,000
R201 R202 R218 R219	RES,MF,1/8W,1%,8.25K	MF55K-8.25K	ASE	4701-03-8251	4,000
R203 R207 R234 R242 R249 R256 R262	RES,C,1/4W,5%,47K	CF1/4-47K	ASE	4700-15-4702	7,000
R204 R210 R235 R245 R252 R259 R308 R309	RES,C,1/4W,5%,10K	CF1/4-10K	ASE	4700-15-1002	8,000
R205 R206 R213 R214 R229 R243 R244 R250 R251 R257 R258 R263	RES,C,1/4W,5%,5.6K	CF1/4-5.6K	ASE	4700-15-5601	12,000
R208 R209 R221 R240 R265 R274 R285 R287 R289 R293 R295	RES,C,1/4W,5%,22K	CF1/422K	ASE	4700-15-2202	11,000
R211 R212	RES,C,1/4W,5%,180K	CF1/4-180K	ASE	4700-15-1803	2,000
R215 R216 R222 R224 R239 R264 R280	RES,C,1/4W,5%,100K	CF1/4-100K	ASE	4700-15-1003	7,000
R217 R271 R277	RES,C,1/4W,5%,390K	CF1/4-390K	ASE	4700-15-3903	3,000
WAVETEK PARTS LIST		TITLE AF PC ASSY,4101	ASSEMBLY NO. 1218-00-1120		REV A
			PAGE: 3		

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
R220	RES,C,1/4W,5%,15K	CF1/4-15K	ASE	4700-15-1502	1,000
R223 R226	RES,C,1/4W,5%,4.7K	CF1/4-4.7K	ASE	4700-15-4701	2,000
R225 R275	RES,C,1/4W,5%,1M	CF1/4-1M	ASE	4700-15-1004	2,000
R227	RES,L-A,1/4W,1%,681 RF416-810	MF5C-681	M-E	4741-68-1008	1,000
R228	RES,MF,1/8W,1%,3.32K	MF55K-3.32K	ASE	4701-03-3321	1,000
R230	RES,MF,1/8W,1%,100K	MF55K-100K	ASE	4701-03-1003	1,000
R231 R232	RES,MF,1/8W,1%,274K	MF55K-274K	ASE	4701-03-2743	2,000
R233 R303	RES,MF,1/8W,1%,10K	MF55K10K	ASE	4701-03-1002	2,000
R236 R254	RES,MF,1/8W,1%,1K	MF55K-1K	ASE	4701-03-1001	2,000
R237 R246 R253 R260 R282	POT,500	91ER-500	BEK	4610-01-8501	5,000
R238 R266 R283 R284 R286 R290 R291 R294	RES,MF,1/8W,1%,5.62K	MF55K-5.62K	ASE	4701-03-5621	8,000
R241	RES,C,1/4W,5%,1K	CF1/4-1K	ASE	4700-15-1001	1,000
R247	RES,C,1/4W,5%,390	CF1/4-390	ASE	4700-15-3900	1,000
R248	RES,C,1/4W,5%,820	CF1/4-820	ASE	4700-15-8200	1,000
WAVETEK PARTS LIST		TITLE AF PC ASSY,4101	ASSEMBLY NO. 1218-00-1120		REV A
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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
R255	RES,C,1/4W,5%,100	CF1/4-100	ASE	4700-15-1000	1,000
R261	RES,MF,1/8W,1%,2.49K	MF55K-2.49K	ASE	4701-03-2491	1,000
R267	RES,C,1/4W,5%,3.3K	CF1/4-3.3K	ASE	4700-15-3301	1,000
R268 R269 R270	RES,MF,1/8W,1%,33.2K	MF55K-33.2K	ASE	4701-03-3322	3,000
R272 R273	RES,MF,1/8W,1%,68.1K	MF55K-68.1K	ASE	4701-03-6812	2,000
R276	RES,C,1/4W,5%,120K	CF1/4-120K	ASE	4700-15-1203	1,000
R278	RES,MF,1/8W,1%,15K	MF55K-15K	ASE	4701-03-1502	1,000
R279	RES,MF,1/8W,1%,18.2K	MF55K-18.2K	ASE	4701-03-1822	1,000
R281	RES,C,1/4W,5%,1.8K	CF1/4-1.8K	ASE	4700-15-1801	1,000
R288 R292	POT,5K	91ER-5K	BEK	4610-01-8502	2,000
R302 R305	RES,C,1/4W,5%,1.5K	CF1/4-1.5K	ASE	4700-15-1501	2,000
R304	RES,MF,1/8W,1%,9.09K	MF55K-9.09K	ASE	4701-03-9091	1,000
R306 R307	RES,SET,2-10K,1/8W QTY:2;4701-03-1002	RX000-003	W-I	4789-00-0004	1,000
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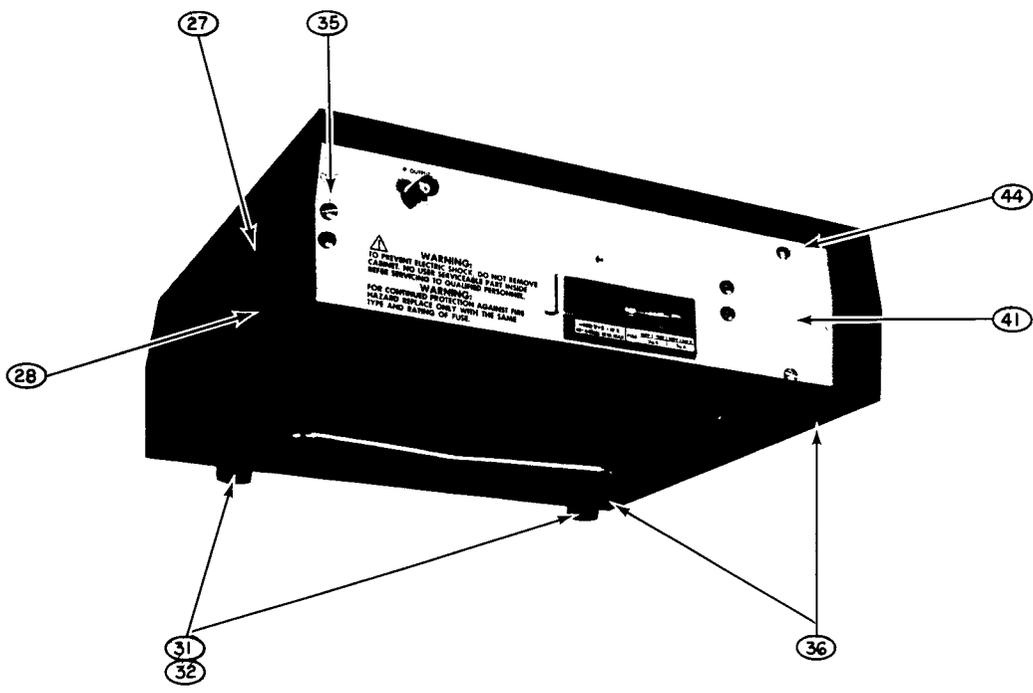
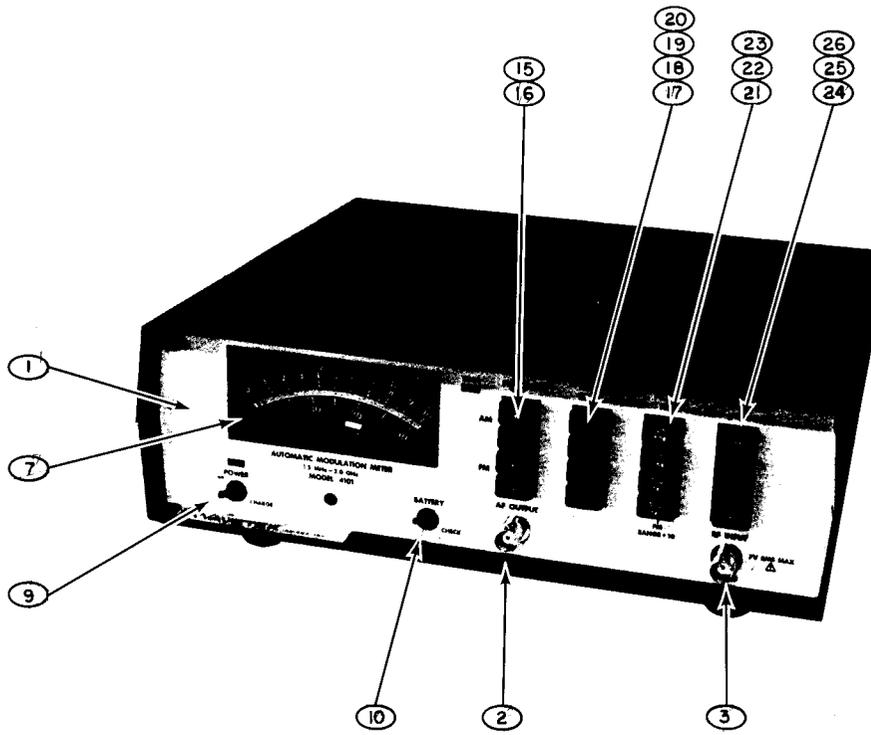
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
F01	FUSE, 1/10 A, TD	MDL 1/10	BUS	2410-05-1013	1.000
P07	FUSEHOLDER/LINE CORD RECEPTACLE	6J1	CCM	2410-05-0017	1.000
W02	CABLE ASSY, 19 IN	WX4101-W2	W-I	1217-80-0056	1.000
ZA01	XFMR ASSY	1219-00-0215	W-I	1219-00-0215	1.000
WAVETEK PARTS LIST		TITLE RF ASSY,4101	ASSEMBLY NO. 1118-00-0060		REV
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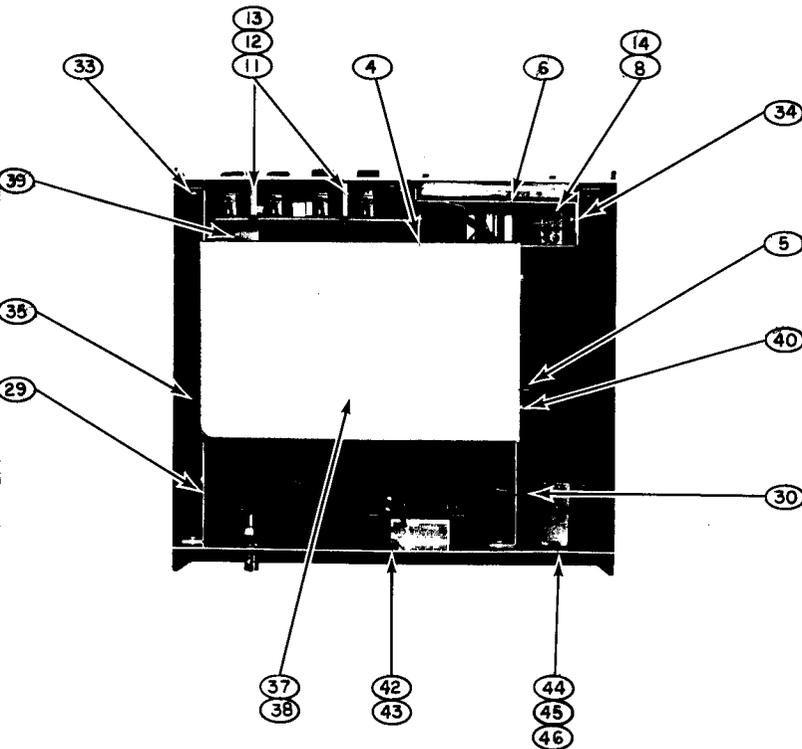
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
1	TERM,MINI-FVMC000-092	47217	BER	2113-20-0001	4.000
J04	HSB,MINI-LATCH,4-PIN MC000-120	65039-033	BER	2113-10-0006	1.000
T01	XFMR, PWR	5610-00-0045	W-I	5610-00-0045	1.000
WAVETEK PARTS LIST		TITLE XFMR ASSY	ASSEMBLY NO. 1219-00-0215		REV
			PAGE: 1		

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
CR401 CR402	LED,RED,RECT	HLMP-0301	H-P	4810-02-0009	2.000
HH1	HARNESS, 4101	WY4101	W-I	1219-00-0213	1.000
J401	CONN,BNC-F,75,PANEL	KC79-167	KTN	2110-01-1009	1.000
M403	METER, 83T, 200 UA, W/SP. SCALE PER B/P	2410-06-0011	W-I	2410-06-0011	1.000
P02	DIP JUMPER, 16 PIN	CA16-0030	CW/AL	6011-60-0011	1.000
R413 R414	RES,MF,1/8W,1%,100K	MF55K-100K	ASE	4701-03-1003	2.000
S405	SWITCH,TOGGLE ST003-006	7201P3NYZQ	C-K	5106-00-0012	1.000
S406	SWITCH, DPDT NOM	7208P3NYZQ-BLK OXIDE	C-K	5109-00-0004	1.000
W01	CABLE ASSY, 12 IN	WX4101-W1	W-I	1217-80-0055	1.000
ZA1	FP PC ASSY,4101	1218-00-1130	W-I	1218-00-1130	1.000
WAVETEK PARTS LIST		TITLE FP ASSY,4101	ASSEMBLY NO. 1118-00-0059		REV A
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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
C401 C402 C403	CAP,FILM,.022 UF	160-.022-K-400C	PLSSY	1510-61-7223	3.000
C404	CAP,FILM,.018 UF	225P18391WD3	SPR	1510-61-7183	1.000
C405 C408	CAP,CER,5%,.047MF	C340C473J165CA	UNCAR	1510-12-6473	2.000
C406	CAP,FILM,.0033 UF	160-.0033K1000C	PLSSY	1510-61-7332	1.000
C407	CAP,FILM,.0047 UF	160-.047K630C	PLSSY	1510-61-7472	1.000
C409	CAP,CER,100V,2700 PF	C321C272J165CA	UNCAR	1510-12-8272	1.000
CR1 CR2 CR3 CR4	DIODE,SIGNAL	1N4148	T-I	4807-01-0914	4.000
IC401 IC402	DUAL OP AMP,RAYTHEGN IC000-027	RC4558NB-RAY	RAY	7000-45-5801	2.000
R401	RES,MF,1/8W,1%,1.4K	MF55K-17.4K	ASE	4701-03-1742	1.000
R402	RES,MF,1/8W,1%,6.81K	MF55K-6.81K	ASE	4701-03-6811	1.000
R403	RES,MF,1/8W,1%,118K	MF55K-118K	ASE	4701-03-1183	1.000
R404 R405 R406	RES,MF,1/8W,1%,4.02K	MF55K-4.02K	ASE	4701-03-4021	3.000
R407	RES,MF,1/8W,1%,15K	MF55K-15K	ASE	4701-03-1502	1.000
R408 R409	RES,MF,1/8W,1%,15.8K	MF55K-15.8K	ASE	4701-03-1582	2.000
R410	RES,C,1/4W,5%,1.5M	CF1/4-1.5M	ASE	4700-15-1504	1.000
WAVETEK PARTS LIST		TITLE FP PC ASSY,4101	ASSEMBLY NO. 1218-00-1130		REV B
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REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY
R411	RES,C,1/4W,5%,1.8K	CF1/4-1.8K	ASE	4700-15-1801	1.000
R412	RES,C,1/4W,5%,820	CF1/4-820	ASE	4700-15-8200	1.000
S401 S402 S403 S404	SWITCH, PB, 4-STA	K40451AALB204MB204C	C-L	5110-00-0022	4.000
WAVETEK PARTS LIST		TITLE FP PC ASSY,4101	ASSEMBLY NO. 1218-00-1130		REV B
			PAGE: 2		





46	NUT HEX 8-32	2810-14-6100	2
45	B.INT, LOWASHER	2810-24-6000	2
44	SCREW 8-32X5/16	2810-17-6105	2
43	SCREW 6-32X1/8	2810-17-6102	1
42	GROUND LUG #6	2112-03-0009	1
41	REAR PANEL	1410-60-1990	1
40	SCREW 4-40X3/16 BH	2810-17-6107	4
39	GROMMET RUB 1 IN	2810-10-0036	2
38	RF MODULE BOX	1410-60-2190	1
37	MODULE LID	1410-60-2180	1
36	SCREW 8-32X2 D-B	2810-40-8132	4
35	SCREW 6-32X3/16	2810-17-6103	12
34	SCREW 4-40X3/16	2810-17-4103	1
33	NUT- 6 32 X1/4	2810-14-6100	4
32	SCREW 6X20 THD CUT	2810-23-0013	6
31	8" INST. BAIL W/FEET	2810-08-0007	1
30	LEFT MODULE BRKT.	1410-60-2000	1
29	RGHT. MODULE BRKT.	1410-30-2040	1
28	BOTTOM COVER	1410-00-8160	1
27	TOP CASE	1410-00-6140	1
26	BUTTON 750	5110-05-0014	1
25	BUTTON 75	5110-04-0013	1
24	BUTTON OFF	5110-04-0012	1
23	BUTTON 300 3K	5110-04-0011	2
22	BUTTON 25 15K	5110-04-0010	1
21	BUTTON 25 50K	5110-04-0009	1
20	BUTTON 10	5110-04-0008	1
19	BUTTON 30	5110-04-0007	1
18	BUTTON 50	5110-04-0006	2
17	BUTTON 100	5110-04-0005	1
16	BUTTON -	5110-04-0004	2
15	BUTTON +	5110-04-0003	2
14	CLOVERLEAF FTE-12	2112-18-0001	4
13	SCREW 4-40X1/4 BH	2810-17-4104	4
12	WASHER FIBRE, 6	2810-28-0045	8
11	SPACER	2810-02-4113	4
10	SWITCH DPDT MOM.	5109-00-0009	1
9	SWITCH TOGGLE	5106-00-0012	1
8	POWER SWITCH BRKT.	1410-01-2110	1
7	METER	2410-06-0011	1
6	METER BRACKET	1410-30-2420	1
5	GROMMET	2810-10-0002	1
4	GROMMET 1/8 X 11/16	2810-10-0016	1
3	CONN, BNC	2110-01-1007	2
2	CONN, BNC	2110-01-1009	1
1	FRONT PANEL	1410-60-1980	1
ITEM	DESCRIPTION	PART NUMBER	T.Q.

REVISIONS		REVISIONS		WAVETEK INCORPORATED		
ECN'S	BY	ECN'S	BY			
F		A		MODEL 4101 MECHANICAL DRAWN BY: <i>[Signature]</i> DATE: _____ NUMBER: _____ APP'D: _____ DD-62		
G		B				
H		C				
I		D				
J		E				

SECTION 6

SCHEMATICS

6.1 INTRODUCTION

This section contains all schematics for the instrument.

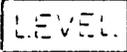
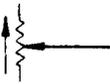
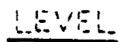
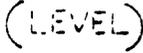
6.2 SCHEMATIC NOTES

The following notes and abbreviations pertain to all sche-

matics. Additional notes pertaining to specific schematics are included on each schematic if required.

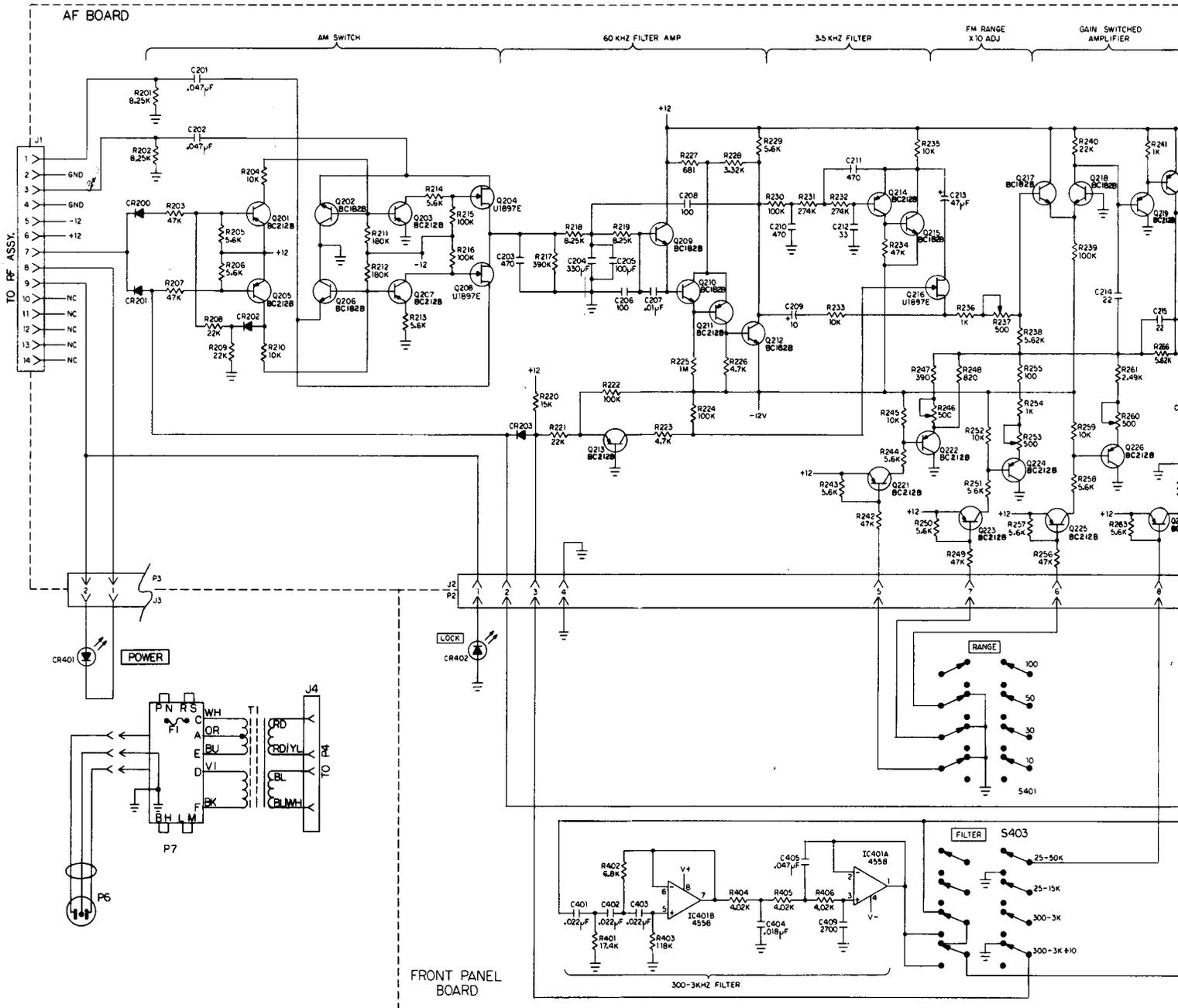
Unless otherwise noted, resistor values are given in ohms, capacitor values are given in pF, and inductor values are given in μH .

SYMBOL NOTES

	Denotes DC voltage reading unless otherwise specified.		Coaxial jack
	Denotes high-impedance crystal detector reading in volts unless otherwise specified.		Coaxial plug
	Denotes 50 ohm crystal detector reading in volts unless otherwise specified.		Coaxial cable
	Signal or voltage source.		Factory adjusted part.
	Connects to indicated signal or voltage source.		Denotes a front-panel device.
	Arrow indicates clockwise rotation of wiper.		Denotes a rear-panel device.
			Denotes a printed circuit board adjustment or accessible module adjustment.
			Denotes an internal module adjustment not accessible without removing module cover.

ABBREVIATION CODE

A	ampere	IF	intermediate frequency	Ω	ohm
AC	alternating current	J	jack	OC	opto-coupler
C	capacitor	K	relay	P	plug
ccw	counterclockwise	kHz	kilohertz	p	peak
CR	diode	$k\Omega$	kilohm	pp	peak-to-peak
CW	continuous wave	kV	kilovolt	pF	picofarad
cw	clockwise	kW	kilowatt	Q	transistor
dB	decibel	L	inductor	R	resistor
dBc	dB referred to carrier	M	meter	RF	radio frequency
dBm	dB referred to 1 mW	MHz	megahertz	RMS	root-mean-square
dBmV	dB referred to 1 mV	$M\Omega$	megohm	R.P.	rear panel
DC	direct current	mA	milliampere	S	switch
DS	indicating device, lamp	mH	millihenry	T	transformer
F	farad	mV	millivolt	T.P.	test point
F.P.	front panel	mW	milliwatt	V	volt
H	henry	μF	microfarad	VA	voltampere
Hz	hertz	μA	microampere	W	watt
IC	integrated circuit	μH	microhenry	X	crystal



MODEL 4101
AF & PANEL ASSYS. REV. 2

