MODEL 920

STANDARD DEVIATION METER

INSTRUCTION MANUAL

AUTOMATED INDUSTRIAL ELECTRONICS CORP.
MEASUREMENTS

BATESBURG SOUTH CAROLINA

MODEL 920

STANDARD DEVIATION METER

OPERATING INSTRUCTIONS

Printed in U.S.A.

AUTOMATED INDUSTRIAL ELECTRONICS CORP.
MEASUREMENTS DIVISION
Batesburg, S. C. 29006 (803) 532-9256

TABLE OF CONTENTS

FOREWORD

Additional information with regard to the applications and maintenance of this equipment will be available from time to time. Users of the Model 920 Standard Deviation Meter are urged to discuss their problems with us and to suggest such modifications as might make the instrument more adaptable to their special requirements.

Whenever possible, maintenance difficulties should be reported to MEASUREMENTS before proceeding with the actual repairs. Through our familiarity with the instrument, we are in a position to suggest the most expedient and accurate repair procedure.

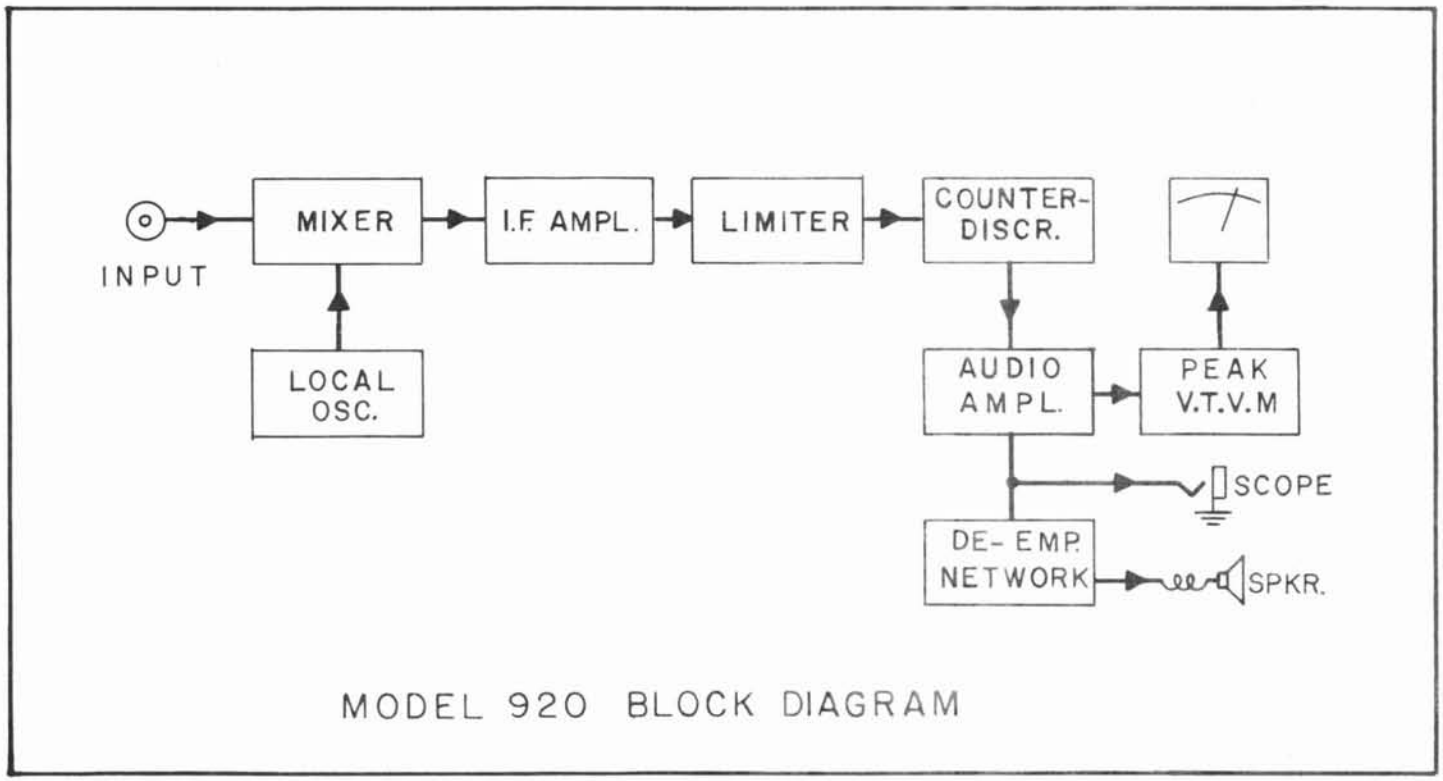
Your Model 920 Standard Deviation Meter has been designed and manufactured to the highest standards of instrument quality. With reasonable care, many years of trouble-free service can be expected of it.

Engineering Department

MEASUREMENTS

AUTOMATED INDUSTRIAL ELECTRONICS CORP.
10 Granite Street
Batesburg, S. C. 29006

Figure 1. Front View of the Model 920 Standard Deviation Meter



MODEL 920 BLOCK DIAGRAM

SECTION I

INTRODUCTION

A. SCOPE OF MANUAL

a. This manual describes the operation of the Model 920 Standard Deviation Meter for measuring peak deviation of F. M. transmitters. To insure optimum performance, instructions for field maintenance are included, along with a list of replaceable parts.

SECTION II

DESCRIPTION AND DATA

A. GENERAL

a. The Model 920 Deviation Meter is designed to accurately measure the peak frequency deviation of frequency modulated communication transmitters.

The Model 920 contains an accurate, linear, counter-type discriminator and a reliable peak reading voltmeter.

The highly stable conversion oscillator allows measurement at frequencies from 25 to 1000 MHz with low inherent residual frequency modulation and maximum freedom from drift. To extend the useful range of the instrument below 25 MHz, an external oscillator may be used to heterodyne transmitter frequencies to the 100 kHz intermediate frequency.

A discriminator output is available from the two front panel jacks labeled SCOPE and SPKR. The output from the SPKR. jack includes a 750 micro-second de-emphasis network which allows the Model 920 Deviation Meter to be used as a standard receiver meeting the requirements of EIA Standard RS-152-A. Considerable care was taken in the manufacture of the Model 920 to insure low inherent noise and distortion compatible with the EIA Standard. The SPKR. jack provides a convenient source for measurements of distortion and noise, or it may be used to drive the 8 ohm speaker provided in the front panel cover.

The SCOPE output jack provides a linear output from the discriminator, and therefore noise and distortion measurements may be made without the de-emphasis network.

The output of both the SPKR jack and the SCOPE jack may be viewed on an oscilloscope.

B. TECHNICAL CHARACTERISTICS

a. Carrier Frequency Range: 25-1000 MHz (25-50 MHz local oscillator provides useful harmonics to 1000 MHz.)

b. Sensitivity: 25 millivolts at frequencies to 500 MHz; 50 millivolts to frequencies of 1000 MHz.

c. Residual Frequency Modulation: Less than 100 Hz at 500 MHz.

d. Input Impedance: Nominally 50 ohms.

e. Deviation Ranges: 0 to 2 kHz, 0 to 6 kHz, 0 to 20 kHz.

f. Deviation Accuracy: ±3% of full scale.

g. Modulation Frequency Response: Flat from 100 Hz to 8 kHz.

h. Input Gain Control: Linear taper potentiometer provides 26 db of attenuation.

i. Maximum Power Input: 200 milliwatts.

j. Speaker Output: Provides a 750 micro-second de-emphasis network. This jack may be used to drive the 8 ohm speaker provided in the front cover. The level of de-emphasized audio output may be adjusted with the AUDIO LEVEL control.

k. SCOPE Output: Provides a linear audio output from an emitter follower.

l. Power Supply: A well-regulated power supply operates off a 115 volt 50-60 Hz line. Provision is also made for battery operation. Three Eveready rechargeable batteries #563 or their equivalent may be used. Nine "D" size cells may also be used. Maximum power consumption is 3 watts.

C. DESIGN FEATURES

a. The Model 920 Standard Deviation Meter is a completely self-contained solid state unit which is portable, accurate, and simple to operate.

b. Measurements are easily read on a large, linear, taught-band panel meter.

c. An extremely stable local oscillator provides useful harmonics up to 1000 MHz. This oscillator is completely shielded to minimize residual noise.

d. For maximum portability the Model 920 may be powered from batteries, (nominally 13.5 volts) or from a 115 volt 50-60 Hz power line.

e. When the Model 920 Standard Deviation Meter is operated from the AC power line, a well-regulated and well-filtered D.C. power supply provides good stability and low residual hum and noise.

f. A charging circuit is provided to recharge rechargeable batteries up to their nominal voltage.

g. Three deviation ranges from 0 to 2 kHz, 0 to 6 kHz, and 0 to 20 kHz are provided.

h. SPKR Output is provided along with an 8 ohm speaker mounted in the front cover. The speaker output includes a 750 micro-second de-emphasis network, and a level control.

i. SCOPE Output is available from a front panel jack. This output is linear and may be viewed on an oscilloscope.

j. A deviation (+) (-) switch allows the measurement of peak deviation on both sides of the carrier.

D. COMPONENTS SUPPLIED

a. The following is included with each shipment:

1 Model 920 Standard Deviation Meter

Approx. Weight (less batteries)	10 lbs.
Height	9"
Width	7"
Depth	8-1/2"
Volume	.3 cu. ft.

1 Cover with speaker
1 Power Cord
1 Manual of Operating and Maintenance Instructions
1 Antenna

E. PACKAGING

	Domestic	Export
Approx. Weight (less batteries)	13 lbs.	25 lbs.
Length	13"	21"
Width	10"	13"
Depth	12"	16"
Volume	.9 cu.ft.	2.5 cu. ft.

For export the Model 920 is packed in a wooden shipping container.

SECTION III

CONTROL FUNCTIONS

A. POWER

a. The three position POWER SELECT switch located on the back of the 920 selects either AC Line Operation, Battery Operation or Battery Charge position.

b. The ON-OFF switch on the front panel controls the application of bias voltage to the circuits of the Model 920.

c. The fuses located in the back of the instrument protect against overload.

B. INPUT GAIN CONTROL

a. This is a linear potentiometer which adjusts the gain of the signal applied to the metering circuits. Approximately 26 db attenuation is possible.

C. LOCAL OSCILLATOR TUNING

a. This dial controls the tuning of the local oscillator which operates between 25-50 MHz. The local oscillator has useful harmonics to 1000 MHz and is mixed with the incoming signal to produce the 100 kHz intermediate frequency.

D. FINE TUNING

a. This control permits extremely fine electronic adjustment of the local oscillator frequency to facilitate tuning.

E. METER RANGE SWITCH

a. This switch selects the meter function as described in the following:

1. BAT: In this position the meter checks the D.C. supply voltage necessary for accurate operation. If the POWER SELECT switch SW3 is in the A.C. position the meter indicates the rectified and filtered A.C. voltage. This reading should be somewhere in the portion of the meter marked BAT.

If the POWER SELECT switch is in the BAT position, the meter indicates the battery voltage. The battery voltage should indicate three quarter scale or greater. A line indicating minimum battery voltage is marked on the meter scale. If the battery voltage is low, the batteries should be recharged as per instructions Section IV Paragraph C.

NOTE: Do not attempt to recharge non-rechargeable batteries.

2. TUNE: In this position the meter will peak when the local oscillator is adjusted to produce a 100 kHz beat with the incoming signal.

3. 20 kHz, 6 kHz, or 2 kHz; these positions select the desired meter deviation range.

4. CAL 1: This position is used only when checking the discriminator.

5. CAL 2: This position is used to check the gain of the audio amplifier.

F. AUDIO SPKR: This front panel jack provides a low impedance output for speaker connections. This output circuit contains a 750 micro-second de-emphasis network.

G. AUDIO LEVEL: Controls the output level from the SPKR jack.

H. SCOPE: A front panel jack which provides a linear audio output.

I. + DEVIATION - : This switch allows the measurement of deviation on both sides of the carrier.

SECTION IV

POWER SUPPLY

A. BATTERY OPERATION

a. The Model 920 may be used with three #563, 4.5 volt rechargeable Eveready batteries or their equivalent, or with nine standard "D" cells.

The following procedure should be followed to battery operate the Model 920:

1. Disconnect the A.C. power cord.

2. Slide the power select switch on the back of the instrument to the BAT position.

3. Rotate the METER RANGE switch SW1 on the front panel to BAT. If the meter reads above the three quarter scale as indicated by the BAT marking on the meter, then there is sufficient battery voltage for accurate operation.

4. If the meter reads below the BAT mark then the batteries should be replaced or recharged to insure accurate operation.

B. A.C. OPERATION

a. The Model 920 may be operated from a 115 volt 50-60 Hz source of line voltage as follows:

1. Connect the line cord provided with the Model 920 between the connector on the back of the case and the A.C. plug.

2. Slide the POWER SELECT switch SW3 located on the back of the case to the A.C. position. The instrument is now ready for operation.

C. BATTERY RECHARGING PROCEDURE

CAUTION

Do not attempt to recharge non-rechargeable batteries.

a. The Model 920 has a built-in charging circuit for maximum convenience in recharging run down batteries.

If the BAT check position indicates that the battery voltage is low connect the Model 920 to the A.C. power line and switch the POWER SELECT switch SW3 on the back of the instrument to the CHARGE position. The batteries are now being charged. It is not necessary to have the front panel POWER switch in the ON position to charge batteries.

A full scale meter reading in the BAT check position indicates that the batteries are charged to their nominal voltage of 13.5 volts. This is the ideal maximum voltage to which the batteries should be charged.

An overnight charge is recommended. However, a longer charge will not harm the instrument although the useful battery life may be shortened. The actual number of hours necessary to recharge the batteries is dependent on the battery voltage at the start of the charge and the number of times that the batteries have been recharged previously.

SECTION V

OPERATION

A. DEVIATION MEASUREMENTS

The following procedures are identical for either battery or A.C. operation.

NOTE: When first making deviation readings where signal strength is unknown, it is best to loosely couple to the transmitter under test or to use an external attenuator. This procedure protects the mixer diode CR4 from overloads.

a. Place the METER RANGE switch in the TUNE position and rotate the LOCAL OSCILLATOR TUNING to obtain a peak meter reading. This will be obtained whenever the local oscillator (fundamental or harmonic frequency) is exactly 100 kHz away from the input frequency. When the transmitter frequency is between 25 and 50 MHz, the fundamental frequency of the local oscillator is used. When the transmitter is above 50 MHz, harmonics of the local oscillator will produce the desired 100 kHz difference frequency. The following chart lists dial readings that may be used at various mobile transmitter frequencies.

Mobile Transmitter Frequency (MHz)	Model 920 (±100 kHz)	Harmonic
25 to 50	25 to 50	Fundamental
50 " 54	25 " 27	2nd
129 " 141	43 " 47	3rd
141 " 150	47 " 50	3rd
150 " 160	37.5" 40	4th
160 " 174	40 " 43.5	4th
396 " 432	44 " 48	9th
432 " 450	48 " 50	9th
450 " 470	45 " 48	10th
874 " 912	46 " 48	19th
912 " 950	48 " 50	19th
950 " 960	47.5" 48	20th

b. Adjust INPUT GAIN to bring meter pointer within blue area of the scale. If necessary, reduce coupling to the transmitter under test, or use an external attenuator to allow peaking in the blue area.

NOTE: When using harmonics of the local oscillator, always use the highest frequency setting of the dial (lowest harmonic) for maximum sensitivity.

c. Place METER RANGE switch in either 20 kHz, 6 kHz, or 2 kHz position and read deviation directly on meter scale. If the local oscillator frequency is below the signal frequency, the meter will indicate deviation on the high side of carrier, when the (+) (-) switch is in (+) position. (Peak

deviation is equal to one half the sum of the (+) and (-) deviation readings.) Unequal positive and negative readings indicate modulation asymmetry.

B. DISTORTION MEASUREMENTS

a. Tune the Model 920 to the transmitter signal as described in SECTION V, Paragraph A, then connect a suitable distortion meter to the SCOPE jack.

Inherent distortion in the Model 920 is normally less than one percent of the 10 kHz deviation level.

C. NOISE MEASUREMENTS

a. Residual carrier noise may be measured by connecting a high impedance audio frequency voltmeter to the SCOPE jack. The inherent noise of the Model 920 is approximately -45 db at 150 MHz, standardized at 10 kHz deviation, and at 1 kHz modulating frequency.

NOTE: Both distortion and noise measurement may be made at the SPKR jack if it is desired to make the measurements through a 750 micro-second de-emphasis network. In this case the audio level control should not be turned up so high that clipping takes place.

SECTION VI

MAINTENANCE

A. GENERAL PRECAUTIONS

a. The purpose of this section is to acquaint operating and maintenance personnel with procedures for making certain adjustments that may be necessary after critical parts are replaced.

b. It should be noted that most of the field replaceable parts are available from MEASUREMENTS. Please refer to MEASUREMENT's part numbers when ordering. The adjustment procedures outlined in this section should be carefully followed. When the described test equipment is not available, it would be advisable to return the Model 920 to MEASUREMENTS for repair.

B. BATTERY INSTALLATION

a. Remove the four screws from the sides of the back portion of the case. These screws are located, one on each side, approximately 2-1/2" in from the back of the instrument.

b. Remove the back portion of the instrument and disconnect the power connector.

c. Remove the battery hold down strap mounted with four screws to the bottom and side of the back of the case.

d. Install batteries being sure to observe polarity as indicated by the markings on the battery holder.

e. Reassemble the back cover of the instrument.

C. REMOVING THE INSTRUMENT FROM THE CASE

a. Disconnect the power cord from the rear of the case and lift the front cover from the hinges.

b. Lay the instrument on its back and remove the four screws located on the center lines and nearest the outside edge of the front panel.

c. Lift the instrument out of its case being careful not to hit the function switch or any of the printed circuit boards.

D. DISTORTION ADJUST

a. Remove the instrument from its case.

b. Connect an audio oscillator set at approximately 1 kHz to the single terminal cinch strip located on the back chassis of the Model 920.

c. Switch the METER RANGE switch to the CAL 2 position.

d. Adjust the audio oscillator output for a full scale reading on the Model 920.

e. Connect SCOPE output of the Model 920 to the input of a distortion analyzer and adjust R100 for minimum distortion.

E. FILTER TERMINATION ADJUST

a. Connect an audio oscillator to the single terminal cinch strip located on the back chassis.

b. Monitor the output of the audio oscillator with an oscilloscope or VTVM.

c. Set the audio oscillator at 400 Hz and adjust the output voltage for a full scale reading on M1.

d. Keeping the audio oscillator output constant set the audio frequency to 6 kHz and adjust R136 for a full scale reading on M1.

e. Repeat procedures c and d until the same reading can be obtained on M1 at both frequencies.

F. DIVIDER ADJUST

a. Connect an audio oscillator set at approximately 1000 Hz to the wiper of deck E on SW1. (Deck E is located farthest from the front panel.)

b. Switch the METER RANGE switch to the 20 kHz position.

c. Connect an oscilloscope or VTVM to the junction of R80 and R82 is one tenth the voltage as measured at the output of the audio oscillator.

G. METER ADJUST

a. Switch the METER RANGE switch to the CAL 2 position.

b. Connect an audio oscillator set at approximately 1000 Hz to the single terminal cinch strip located on the back of the mounting chassis.

c. Set the output of the audio generator to 4 volts "peak-to-peak".

d. Adjust meter adjust potentiometer R96 for full scale deflection as viewed on meter M1.

H. DISCRIMINATOR ADJUST

a. Connect a 100 kHz ±1% oscillator to the input connector of the Model 920.

b. Place METER RANGE switch in the TUNE position, and adjust the signal strength to bring the meter pointer to the blue area of the scale.

c. Place METER RANGE switch in CAL 1 position. The meter should indicate full scale deflection. If necessary adjust R73 to bring the meter reading to full scale.

NOTE: The above adjustments "E" through "H" may effect each other and should be double checked for any slight readjustments that are necessary.

I. POWER OVERLOADS (MIXER DIODE CR4) REPLACEMENT

If the input to the Model 920 exceeds approximately 200 milliwatts, there is danger that mixer diode CR4 may be damaged.

Mixer diode CR4 may be replaced as follows:

1. Remove the instrument from its case.

2. Remove the pulse network printed circuit board mounted on the right side of the Model 920 from its connector.

3. Remove the four screws holding the shield plate of the local oscillator board which is mounted underneath the pulse network board.

4. Refer to the printed circuit board layout of the local oscillator board and remove mixer diode CR4 from the diode "snap clips".

5. "Snap in" the replacement diode being sure to observe the correct polarity.

6. Reassemble the Model 920.

SECTION VII

STORAGE AND SHIPMENT

A. STORAGE

a. Remove dust from controls and outer surface of instrument with a clean rag.

b. Wrap instrument in heavy wrapping paper and seal seams with gummed tape or similar adhesive.

c. Store in a dry place. If excessive humidity is unavoidable, the wrapped instrument should be placed in a moisture-proof bag with a sufficient quantity of drying agent, such as silica gel, to insure a dry atmosphere. When the use of bag and desiccant is necessary, the instrument should be checked at six-month intervals to determine the effectiveness of the seal.

B. SHIPMENT

a. Wrap the instrument with heavy wrapping paper and seal seams with gummed tape or similar adhesive.

b. Place in fibre-board carton or wooden box large enough to permit at least three inches of excelsior or similar packing material between the instrument and sides of the box. For export packing the instrument must be wrapped in water-proof paper and the seams sealed with waterproof glue or similar sealing compound before being placed in a wooden box.

SECTION VIII

TABLE OF REPLACEABLE PARTS

Model 920 Standard Deviation Meter

Symbol	Meas. Part No.	Description		
Capacitors				
C1	H-5515	Ceramic Feed-thru	1 K mmf GMV	
2	H-5515	" "	" " "	
3	H-6663-3	" Tubular	5 mmf ±10%	
4	H-6663-5	" "	15 " "	
5	H-6619-9	" Disc	.001 mf "	
6	H-8445	Variable; Air Dielectric	2 sections	
7	H-8454-9	Mica	220 mmf ±10%	100V
8	H-6663-3	Ceramic Tubular	5 mmf ±10%	
9	H-5580	" Feedthru	55 mmf	
C10	H-6619-9	" Disc	.001 mf ±10%	
C20	H-7886-8	Mylar	.01 mf ±20%	
21	H-7887-6	Electrolytic	10 mf	25V
22	H-7886-7	Mylar	.1 mf ±20%	
23	H-7886-8	"	.01 mf ±20%	
24	H-7886-8	"	" " "	
26	H-7887-6	Electrolytic	10 mf	25V
27	H-7886-7	Mylar	.1 mf ±20%	
28	H-7886-8	"	.01 mf ±20%	
29	H-7886-8	"	" " "	
30	H-7887-6	Electrolytic	10 mf	25V
31	H-7886-7	Mylar	.1 mf ±20%	
32	H-7886-8	"	.01 mf ±20%	
33	H-7886-7	"	.1 mf ±20%	
34	H-7887-6	Electrolytic	10 mf	25V
35	H-7886-7	Mylar	.1 mf ±20%	
36	H-7886-7	"	" " "	
37	H-7886-7	"	" " "	
38	H-7887-6	Electrolytic	10 mf	25V
39	H-7886-7	Mylar	.1 mf ±20%	
41	H-8454-7	Mica	68 mmf ±10%	100V
60	H-8454-9	Mica	220mmf ±10%	100V
61	H-8454-9	"	" " "	"

Symbol	Meas. Part No.	Description		
C62	H-7513-3	Electrolytic	50 mf	15V
63	H-8454-10	Mica	47 mmf	
64	H-7886-1	Mylar	.22 mf ±20%	
65	H-6663-4	Ceramic Tubular	10 mmf ±10%	
66	H-7513-3	Electrolytic	50 mf	15V
67	H-7886-1	Mylar	.22 mf ±20%	
68	H-8454-8	Mica	150mmf ±10%	100V
69	H-7513-3	Electrolytic	50 mf	15V
80	H-7887-6	Electrolytic	10 mf	25V
81	H-6671-9	Ceramic	68 mmf ±10%	NPO
90	H-7887-10	Electrolytic	250 mf	12V
91	H-7887-8	"	50 mf	12V
92	H-6619-5	Ceramic Disc	2.2Kmmf	GMV
93	H-7887-8	Electrolytic	50 mf	12V
94	H-6618-5	Ceramic Disc	2.2Kmmf	GMV
95	H-7887-9	Electrolytic	100 mf	12V
96	H-7887-7	"	50 mf	12V
97	H-6619-5	Ceramic Disc	2.2Kmmf	GMV
98	H-7887-7	Electrolytic	25 mf	25V
99	H-7886-7	Mylar	.1 mf ±20%	
C100	H-7886-7	"	" " "	
101	H-6663-5	Ceramic Disc	15 mmf ±10%	
102	H-7513-19	Electrolytic	2 mf	50V
103	H-8123-5	Ceramic Disc	470mmf ±10%	
104	H-7887-9	Electrolytic	25 mf	25V
105	H-7886-7	Mylar	.1 mf ±20%	
106	H-7887-7	Electrolytic	25 mf	25V
C120	H-7513-20	Electrolytic	1000mf	25V
121	H-7513-20	"	" "	"
130	H-6619-9	Ceramic Disc	.001mf ±10%	
131	H-6619-9	" "	" " "	
132	H-7886-8	Mylar	.01 mf ±20%	
133	H-7513-19	Electrolytic	2 mf	50V
134	H-7886-8	Mylar	.01 mf ±20%	
135	H-7886-8	"	.01 mf ±20%	
136	H-7886-8	"	" " "	
137	H-7886-8	"	" " "	
138	H-7886-8	"	" " "	

Model 920 Standard Deviation Meter

Symbol	Meas. Part No.	Description		
C139	H-7886-7	Mylar	.1 mf ±20%	
140	H-8454-11	Mica	270mmf ±10%	100V
141	H-7886-8	Mylar	.01 mf ±20%	
142	H-7886-8	"	" " "	
CR1		Diode	V12E	
2		"	1N5235A	
3		"	1N273	
4		"	1N82	
5	H-8117	Rectifier	2F4	
6	H-8117	"	"	
CR20		Diode	1N273	
21		"	"	
CR60		Diode	1N273	
61		"	1N914	
62		"	1N270	
CR80		Diode	1N270	
CR130		Diode	1N5237B	
131		"	1N270	
132		"	"	
Fuses				
F1	H-8498-16	MDV	1/8 amp.	slo blow
F120	H-8498-17	AGC	1/2 amp.	
Connectors				
J1		Connector		UG-909/U
3	H-8500	Socket		
4	H-7761	Jack Scope		
5	H-7761	Jack Speaker		
Coils				
L1	H-6688-2	R. F. Oscillator coil		

Model 920 Standard Deviation Meter

Symbol	Meas. Part No.	Description
L2	H-5744	R. F. Choke
20	H-5744	" "
130	H-7170	Filter Coil
131	H-8509	Variable Inductor
Meter		
M1	H-8496	Meter & Bezel
Receptacles		
P1	H-8085	Plug
3	H-8501	"
5	H-8504	"
6		Part of W1
7		" "
Transistors		
Q1		2N2369
20		2N4123
21		"
22		"
23		"
24		"
25		"
26		"
27		"
Q60		2N4123
61		"
63		"
64		"
Q90		2N4123
91		"
92		"
93		"
Q130		2N5294
131		"
132		2N3905
133		2N4123

Model 920 Standard Deviation Meter

Symbol	Meas. Part No.	Description			
Switches					
SW1	H-8426	Meter Range			
2	H-7749	Deviation			
3	H-8506	Power Select			
4	H-8075	Power			
Transformer					
T1	H-8447	Transformer			
Cable					
W1	H-7746	Cord; Power, includes P6 & P7			
Resistors					
R1	H-8431-154	Fixed Comp.	150 K	±10%	1/4W
2	H-8431-473	" "	47 K	"	"
3	H-8431-183	" "	18 K	"	"
4	H-8497-103	Variable	10 K	±20%	1/2W
5	H-8431-472	Fixed Comp.	4.7 K	±10%	1/4W
6	H-8431-101	" "	100 ohms	±10%	"
7	H-8431-101	" "	" "	"	"
8	H-8431-823	" "	82 K	±10%	"
9	H-8431-471	" "	470 ohms	±10%	"
R10	H-8431-680	" "	68 "	"	"
11	H-8450-510	" "	51 "	± 5%	"
12	H-8450-511	" "	510 "	"	"
20	H-8431-333	Fixed Comp.	33 K	±10%	1/4W
21	H-8431-222	" "	2.2 K	"	"
22	H-8431-562	" "	5.6 K	"	"
23	H-8431-331	" "	330 ohms	"	"
24	H-8431-102	" "	1 K	"	"
25	H-8431-101	" "	100 ohms	"	"
26	H-8431-333	" "	33 K	"	"
27	H-8431-562	" "	5.6 K	"	"
28	H-8431-222	" "	2.2 K	"	"
29	H-8431-331	" "	330 ohms	"	"
30	H-8431-333	" "	33 K	"	"

Model 920 Standard Deviation Meter

Symbol	Meas. Part No.	Description			
R31	H-8431-562	Fixed Comp.	5.6 K	±10%	1/4W
32	H-8431-101	" "	100 ohms	"	"
33	H-8431-222	" "	2.2 K	"	"
34	H-8431-333	" "	33 K	"	"
35	H-8431-331	" "	330 ohms	"	"
36	H-8431-562	" "	5.6 K	"	"
37	H-8431-222	" "	2.2K	"	"
38	H-8431-331	" "	330 ohms	"	"
39	H-8431-101	" "	100 "	"	"
40	H-8431-333	" "	33 K	"	"
41	H-8450-622	" "	6.2 K	± 5%	"
42	H-8431-122	" "	1.2 K	±10%	"
43	H-8431-151	" "	150 ohms	"	"
44	H-8431-102	" "	1 K	"	"
45	H-8431-333	" "	33 K	"	"
46	H-8450-622	" "	6.2 K	± 5%	"
47	H-8431-122	" "	1.2 K	±10%	"
48	H-8431-101	" "	100 ohms	"	"
49	H-8431-101	" "	" "	"	"
50	H-8431-682	" "	6.8 K	"	"
51	H-8431-332	" "	3.3 K	"	"
52	H-8431-222	" "	2.2 K	"	"
53	H-8431-223	" "	22 K	"	"
54	H-8431-330	" "	33 ohms	"	"
55	H-8431-681	" "	680 "	"	"
56	H-8431-153	" "	15 K	"	"
60	H-8431-681	" "	680 ohms	"	"
61	H-8431-223	" "	22 K	"	"
62	H-8431-153	" "	15 K	"	"
63	H-8431-222	" "	2.2 K	"	"
64	H-8431-151	" "	150 ohms	"	"
65	H-8431-102	" "	1 K	"	"
66	H-8431-473	" "	47 K	"	"
67	H-8431-273	" "	27 K	"	"
68	H-8431-473	" "	47 K	"	"
69	H-8431-101	" "	100 ohms	"	"
70	H-8431-102	" "	1 K	"	"
71	H-8431-183	" "	18 K	"	"
72	H-8431-102	" "	1 K	"	"
73	H-8061-101	Variable Comp.	100 ohms	±20%	3/8W

Model 920 Standard Deviation Meter

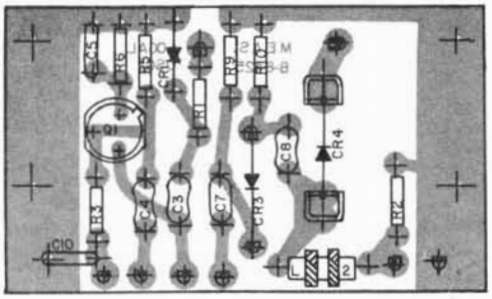
Symbol	Meas. Part No.	Description			
R74	H-8431-561	Fixed Comp.	560 ohms	±10%	1/4W
75	H-8431-151	" "	150 "	"	"
R80	H-6686-18	Fixed Comp.	900 ohms	± 1%	1/2W
81	H-6686-17	" "	666 "	"	"
82	H-6686-15	" "	111 "	"	"
83	H-6686-16	" "	500 "	"	"
84	H-8450-303	" "	30 K	± 5%	1/4W
85	H-8497-103	Variable "	10 K	±20%	1/2W
86	H-8497-102	" "	1 K	"	"
90	H-8061-502	Variable Comp.	5 K	±20%	3/8W
91	H-8431-333	Fixed "	33 K	±10%	1/4W
92	H-8431-681	" "	680 ohms	"	"
93	H-8450-752	" "	7.5 K	± 5%	"
94	H-8431-820	" "	82 ohms	±10%	"
95	H-8431-333	" "	33 K	"	"
96	H-8061-251	Variable "	250 ohms	±20%	3/8W
97	H-8450-752	Fixed "	7.5 K	± 5%	1/4W
98	H-8450-431	" "	430 ohms	"	"
99	H-8431-680	" "	68 "	±10%	1/4W
R100	H-8061-253	Variable "	25 K	±20%	3/8W
101	H-8450-431	Fixed "	470 ohms	±10%	1/4W
102	H-8431-223	" "	22 K	"	"
103	H-8431-682	" "	6.8 K	"	"
104	H-8431-820	" "	82 ohms	"	"
105	H-8431-681	" "	680 "	"	"
106	H-8431-680	" "	68 "	"	"
107	H-8431-391	" "	390 "	"	"
108	H-8431-103	" "	10 K	"	"
109	H-8450-753	" "	75 K	"	"
110	H-8431-103	" "	100 K	"	"
111	H-8431-122	" "	1.2 K	"	"
112	H-8431-100	" "	10 ohms	"	"
120	H-3734-150	" "	15 ohms	"	2W
121	H-3730-390	" "	39 ohms	"	1W
130	H-6692B2803F	" "	280 K	± 1%	1/2W
131	H-8431-181	" "	180 ohms	±10%	1/4W
132	H-8450-911	" "	910 "	± 5%	"
133	H-8431-101	" "	100 "	±10%	"

Model 920 Standard Deviation Meter

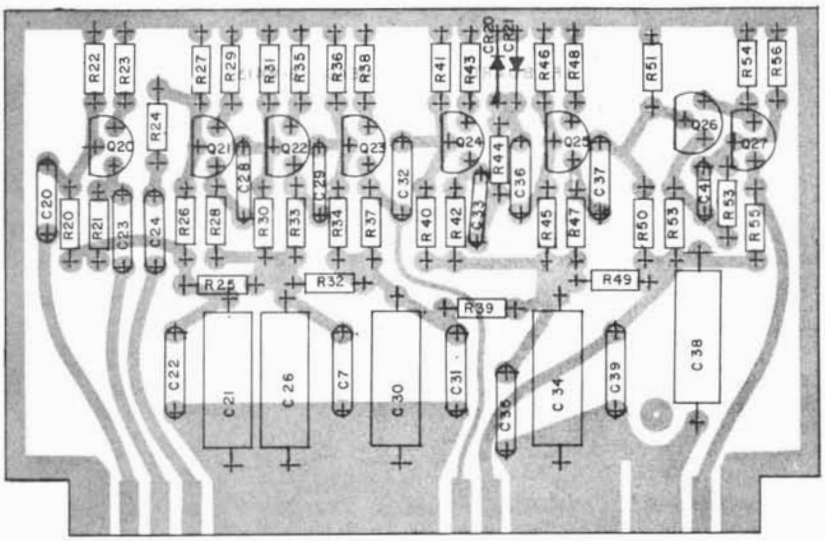
Symbol	Meas. Part No.	Description			
R134	H-8450-301	Fixed Comp.	300 ohms	± 5%	1/4W
135	H-8431-101	" "	100 "	±10%	"
136	H-8495-102	Variable "	1 K	±20%	3/8W
137	H-8495-103	" "	10K	"	"
138	H-8431-123	Fixed Comp.	12 K	±10%	1/4W
139	H-8450-113	" "	9.1 K	± 5%	"
140	H-8431-561	" "	560 ohms	±10%	"
141	H-8450-510	" "	51 "	± 5%	"
142	H-8431-331	" "	330 "	±10%	"
143	H-8431-153	" "	15 K	"	"
144	H-8450-432	" "	4.3 K	± 5%	"
145	H-8450-333	" "	33 K	"	"
146	H-8431-561	" "	560 ohms	±10%	"
147	H-8450-164	" "	160 K	± 5%	"
IC90		MC-1306P Audio Output Stage			

Miscellaneous

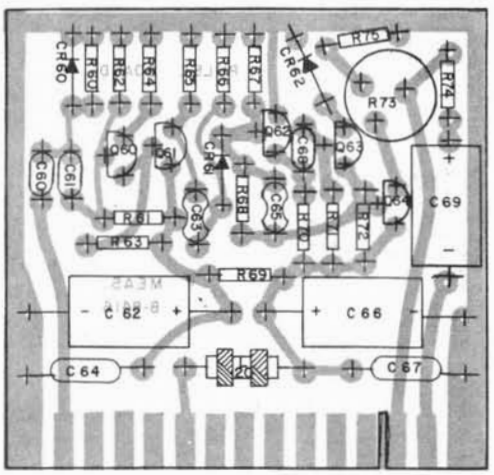
H-8086-6	Vernier Drive Knob
H-8086-7	Fine Tuning Knob
H-8086-7	Audio Level Knob
H-8086-7	R.F. Gain Knob
H-8086-1	Meter Range Knob
H-8096	Front Cover Assy. w/Speaker
H-8411	I.F. P.C. Bd., Assy.
H-8414	Pulse Network P.C. Bd., Assy.
H-8417	Audio P.C. Bd., Assy.
H-8420	Filter P.C. Bd., Assy.
H-8423	Local Osc., P.C. Bd., Assy.
H-8510	Speaker 8 ohms .2W
H-8463	Antenna



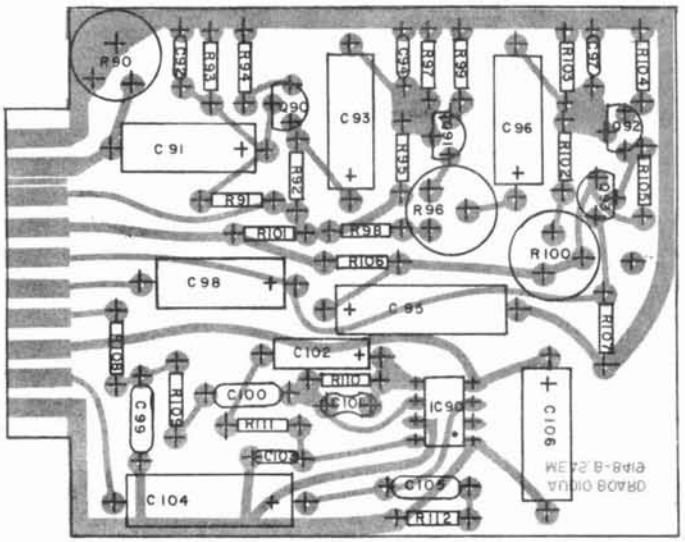
LOCAL OSC.
PR. CIR. BOARD



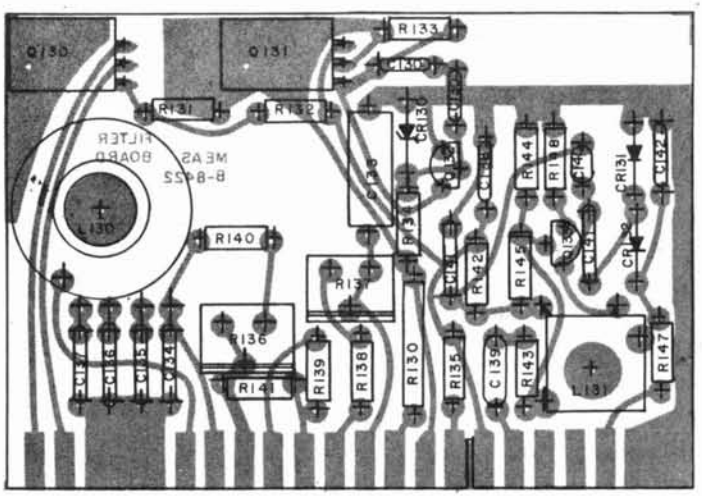
I. F.
PR. CIR. BOARD



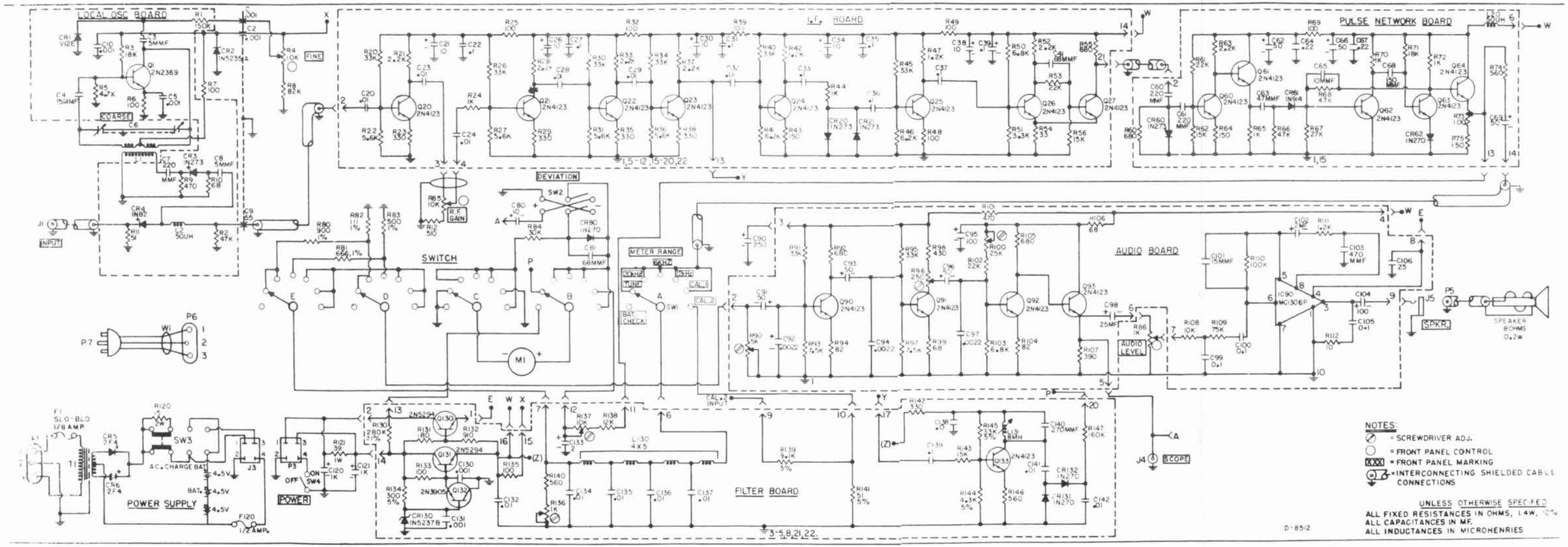
PULSE NETWORK
PR. CIR. BOARD



AUDIO
PR. CIR. BOARD



FILTER
PR. CIR. BOARD


LOCAL OSC BOARD
COARSE
FINE
INPUT
SWITCH
METER RANGE
DEVIATION
R.F. GAIN
I.F. BOARD
PULSE NETWORK BOARD
AUDIO BOARD
AUDIO LEVEL
SPKR.
SPEAKER 8OHMS 0.2W
POWER SUPPLY
POWER
FILTER BOARD
SCOPE
P6
P7
F1 SLO-BLO 1/8 AMP
F120 1/2 AMP.
AC CHARGE BAT
BAT.
4.5V
NOTES:
= SCREWDRIVER ADJ.
= FRONT PANEL CONTROL
XXX = FRONT PANEL MARKING
= INTERCONNECTING SHIELDED CABLE CONNECTIONS
UNLESS OTHERWISE SPECIFIED
ALL FIXED RESISTANCES IN OHMS, 1/4W, 10%
ALL CAPACITANCES IN MF.
ALL INDUCTANCES IN MICROHENRIES
D-8512