5.1.5 AGC

1. Adjust RF signal generator for about a 1 kHz tone and 1000 μV output.

2. Adjust volume control so that the VTVM reads +5 dB (1.4 volts RMS).

3. Decrease RF Signal Generator to 1 μV.

4. Audio output should decrease no more than 13 dB (.3 volts RMS). Failure of the AGC circuit Q11, Q7, Q8, and Q9 would cause overloading on strong signals, or in the case of a failure of Q11 or its circuit would cause a very long recovery time from a strong signal.

   AGC is applied to the first IF and thereby using this as a DC amplifier to the RF stage.

5.1.6 BEAT-FREQUENCY OSCILLATOR (BFO) AND RING MODULATOR DETECTOR (RMD)

NOTE: Any defects in this circuit will affect both transmit and receive.

1. Measure the BFO drive voltage at the center arm of the ring modulator detector potentiometer, R58 with RF probe.

2. Drive voltage should be about 5 volts RMS (this reading will depend on the loading of your probe and meter).

3. A failure of Q13 or Q14 would cause low or no drive voltage and SSB signals received would be garbled. Also the transmitter would be inoperative if this section was out.

4. If a diode is shorted or open in the RMD the set will still receive but with somewhat reduced output. In the case of a shorted diode the output will appear distorted on the scope. In the case of an open diode the output will be undistorted but reduced. With two diodes open the output would be greatly reduced or off completely. In either case the unit would not transmit.

NOTE: If components are replaced, refer to the Alignment section for proper adjustment of the ring modulator detector or the carrier oscillator.

5.1.7 IF AMPLIFIER AND CRYSTAL FILTER

The signal from the receive frequency converter goes through the 8.75 MHz crystal filter, then to the IF section.

1. Set RF signal generator for about a 1000 Hz tone and 1 μV input.

2. Output measured at the speaker terminals at full volume should be at least +10 dB (2.5 volts RMS).

3. If the output is low check the voltages and circuitry of Q18 and Q19. Low output could also be caused by a defect in the RF amp or receive frequency converter sections.

NOTE: If there is a defect in the 2nd IF the unit will still transmit normally. The 1st IF is used on both transmit and receive.

5.1.8 RF AMPLIFIER AND 27 MHz FILTER

1. Use the same test procedure used for the IF amplifier when testing the RF amplifier and 27 MHz filter.

2. The AGC to this stage is applied from the 1st IF amplifier using it as a DC amplifier for the AGC.

3. The signal from the antenna connection goes through the 27 MHz bandpass filter and the diode antenna switch before getting to T1, the RF amplifier input.

4. Check voltages and circuitry to determine defective parts.

5.1.9 RECEIVE FREQUENCY CONVERTER; LOCAL OSCILLATOR AND TRIPLER

Oscillator measurements are made with an RF probe, which can be made as shown in test connection Figure 5.

1. Injection at the mixer base (Q16) is about .1 volts RMS.

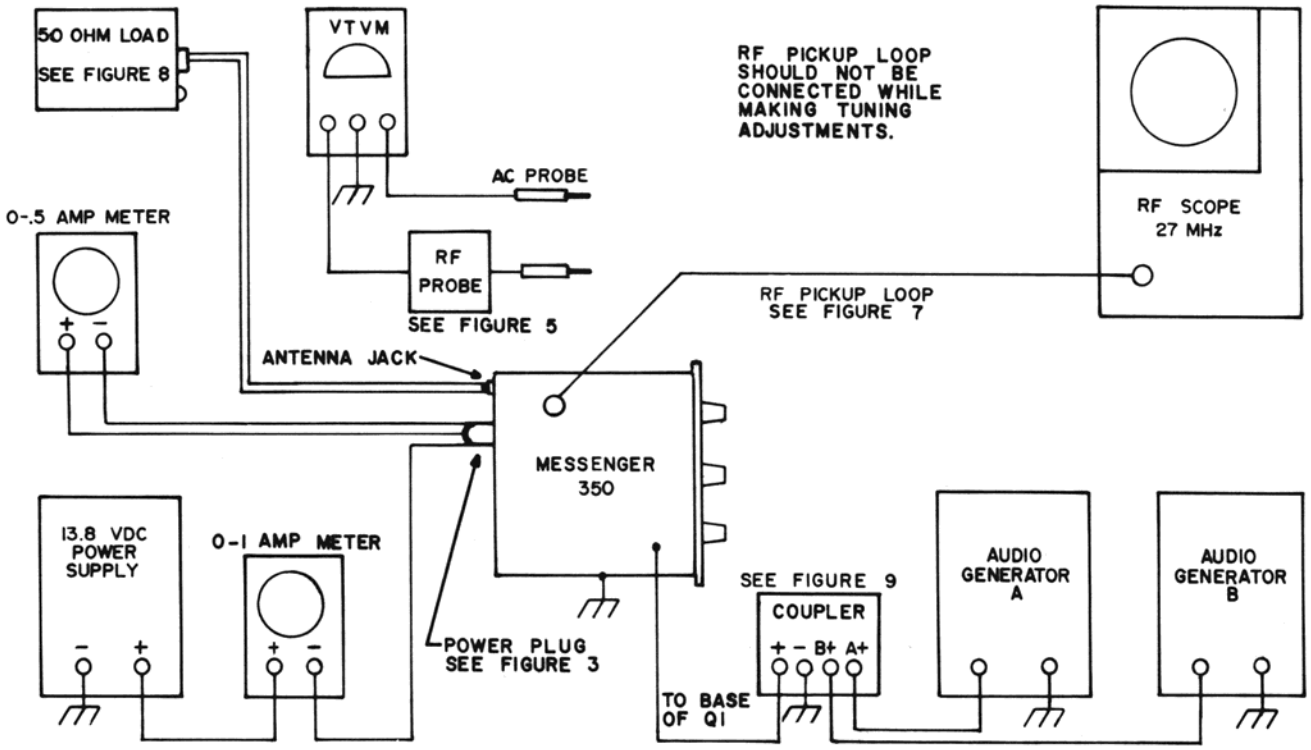


FIGURE 6

TRANSMITTER TEST CONNECTIONS

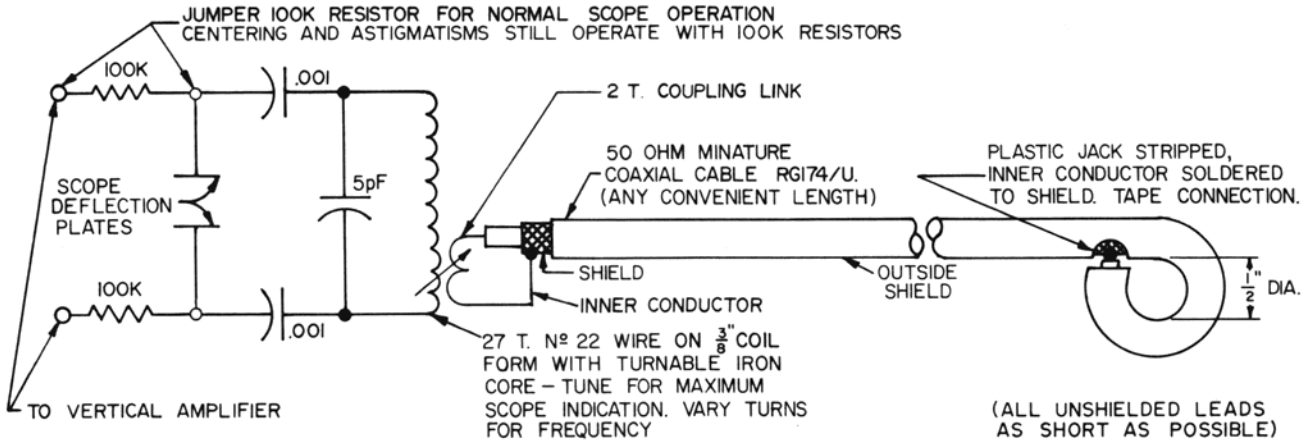


FIGURE 7

OSCILLOSCOPE RF PICK-UP LOOP AND METHOD OF CONNECTION

2. Oscillator voltage measured at the oscillator base is about 0.4 volts RMS (this reading depends on how active the crystals are).

3. RF voltage measured at the tripler collector (Q22) is about 1.0 - 1.4 volts RMS.

   NOTE: These readings in parts 1, 2, and 3 depend a lot on the loading of the probe and meter; some indication of RF voltage will indicate that it is functioning.

4. Also check DC voltages and the circuitry to determine defective parts.

   NOTE: A defect in the local oscillator or tripler would disable the radio on both transmit and receive.

5.1.10 NOISE SILENCER

The noise silencer will detect a difference in noise conditions other than noise levels. For example, good spark plugs must be used in the vehicle or excessive burning at the plug gaps will generate a long noise burst resulting in audible noise from the Messenger "350". If excess noise is a problem, the following check list should be helpful:

1. Does the antenna have sufficient bandwidth?

2. Is the VSWR less than 1.5:1?

3. Is the 50 ohm transmission line in good condition and stay clear of all ignition cables?

4. Are the spark plugs properly gaped and in good condition? Are they of the specific type recommended for the engine?

5. Are all ignition connections, cables, and points clean and in satisfactory condition. All new American cars are now equipped with TVRS cable with resistance built-in to reduce ignition noise. When installing the Messenger "350" in a vehicle without TVRS cables, it may be necessary to install resistor spark plugs, TVRS cable, or suppressors depending on the overall condition of the elements previously mentioned.

If the above conditions are all satisfactory, continue with the Trouble Shooting as follows:

1. Adjust receiver for .75 volts output with 1 μV RF input and NOISE SILENCER on.

2. Hold noise generator ON. Audio output should not exceed 1.5 V.

3. Connect scope or AC VTVM to the collector of Q17 (noise amplifier). With noise generator on 2-3 V Peak, negative pulses should appear. These negative pulses turn off diode D17 during noise pulses and disconnects the input of the crystal filter during noise pulses.

   NOTE: If the above conditions are not met, check voltages and circuitry of Q17 back to D11 and D12 which are the noise detectors.

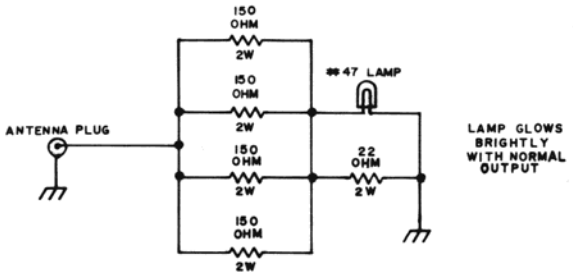


FIGURE 8

50 OHM DUMMY LOAD WITH POWER INDICATOR

5.2 TRANSMITTER CIRCUITS

5.2.1 EQUIPMENT REQUIRED

1. 50 Ω dummy load. (See Figure 8).

2. 0-500 mA meter for checking PA collector current.

3. VTVM with RF probe Heath V-7 or equivalent.

4. 2 audio signal generators, Heath IG-72 or equivalent.

5. RF Scope. Any scope with the simple tuned circuit (see Figure 7) added and fed directly to the Vertical plates.

6. 13.8 V, 1 amp power supply.

5.2.2 PRELIMINARY CHECKS

1. Connect dummy load and wattmeter to antenna terminals and 0-500 mA meter to pins 5 and 6 of power connector, Figure 3.

2. Key transmitter, there should be no output indicated on the wattmeter and idling collector current of the PA should be 40 mA. If output is indicated on the wattmeter, an unbalance of the RMD is indicated and that section should be checked.

3. Connect AF generators to base of Q1 as shown in Figure 9.

4. Key microphone and adjust one audio generator at 600 Hz for 360 mA collector current. Adjust the other audio generator, at 2600 Hz, for optimum crossover as indicated on the RF Scope. Output should appear undistorted.

5. Input current should be .7-.8 A at 13.8 VDC.

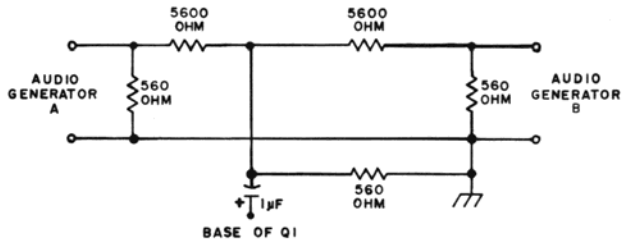


FIGURE 9
AUDIO GENERATOR COUPLER
FOR TWO TONE TEST

5.2.3 AUDIO SECTION

1. Connect one of the AF generators to the base of Q1 through a 1 μF capacitor as shown in Figure 2. Set the level at .025 volts RMS, 600 Hz.

2. Connect AC VTVM to the base of Q2 between C9 and L2.

3. Meter should read between .75 - .85 volts RMS and should be undistorted on the scope.

NOTE: If Output is low or distorted check the circuitry and voltages of Q1 and Q2.

5.2.4 CARRIER OSCILLATOR AND RING MODULATOR

1. Check for oscillator operation by connecting the RF probe to the center arm of the BAL-R pot, R58.

2. A reading of about .5 volts RMS is normal. This can vary depending on the probe and meter used. If no voltage is present in either the L or U sideband position check Q13 and Q14. If voltage is present in one position only, check the crystal and circuitry of the one that is not operating.

3. Set audio generator as in step one of Section 5.2.3.

4. Key the transmitter.

5. Check the ring modulator output between C47 and D15 with the RF probe. There should be no output unless the audio generator is on and connected, or the mike is talked into. Maximum reading should be about .15 volts RMS. If there is a continuous output, even on receive, check D5 - D8 for shorts; if there is continuous small output and also not much output when the mike is talked into, check D5 - D8 for being open.

5.2.5 IF AMPLIFIER AND 8.75 MHz FILTER

1. From the output of the ring modulator the signal goes through C47, diode switches D15 and D13, through C61, and D17 to the crystal filter.

2. Connect the audio generator as in step 1 of Section 5.2.3.

3. Key the transmitter.

4. With the proper level at the output of the ring modulator there should be about .1 volts RMS at the base of Q18, the IF amplifier as checked with the RF probe.

5. Checking with the RF probe there should be 3.5 volts RMS at the output of the 1st IF (check between R87 and D21).

6. If the output is low check voltages and circuitry of the crystal filter and Q18.

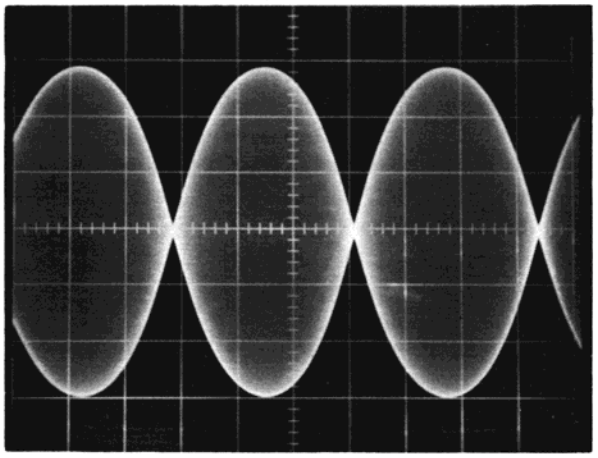
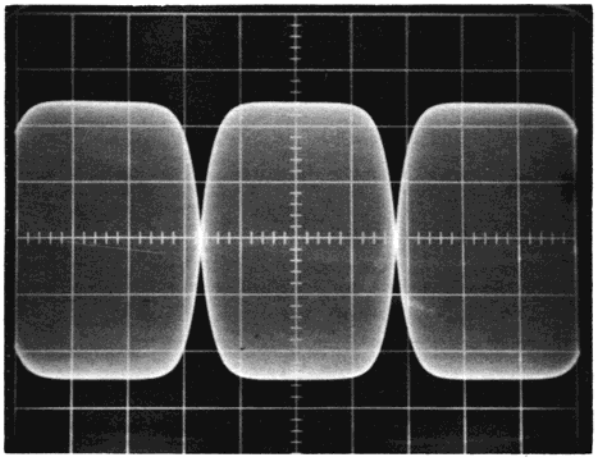
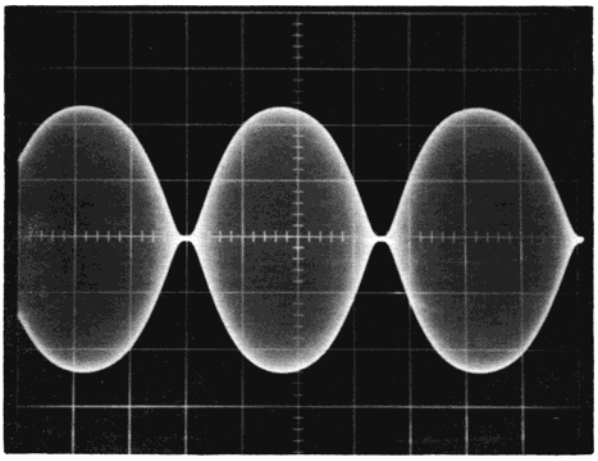
WAVEFORM CLASSIFICATION	TWO TONE TEST WAVEFORM
NORMAL UNDISTORTED OUTPUT	
CLIPPING (3rd ORDER DISTORTION) CAUSES: 1. IMPROPER LOADING 2. ALC OUT OR IMPROPERLY SET 3. LOW B+ NOTE: WITH LOW B+ 5th ORDER DISTORTION WILL OCCUR FIRST, WITH MORE MODULATION 3rd ORDER WILL ALSO OCCUR	
POOR CROSSOVER (5th ORDER DISTORTION) CAUSES: 1. LOW BIAS (LOW IDLE CURRENT) 2. LOW B+	

FIGURE 10
EXAMPLES OF SINGLE SIDEBAND RF ENVELOPES

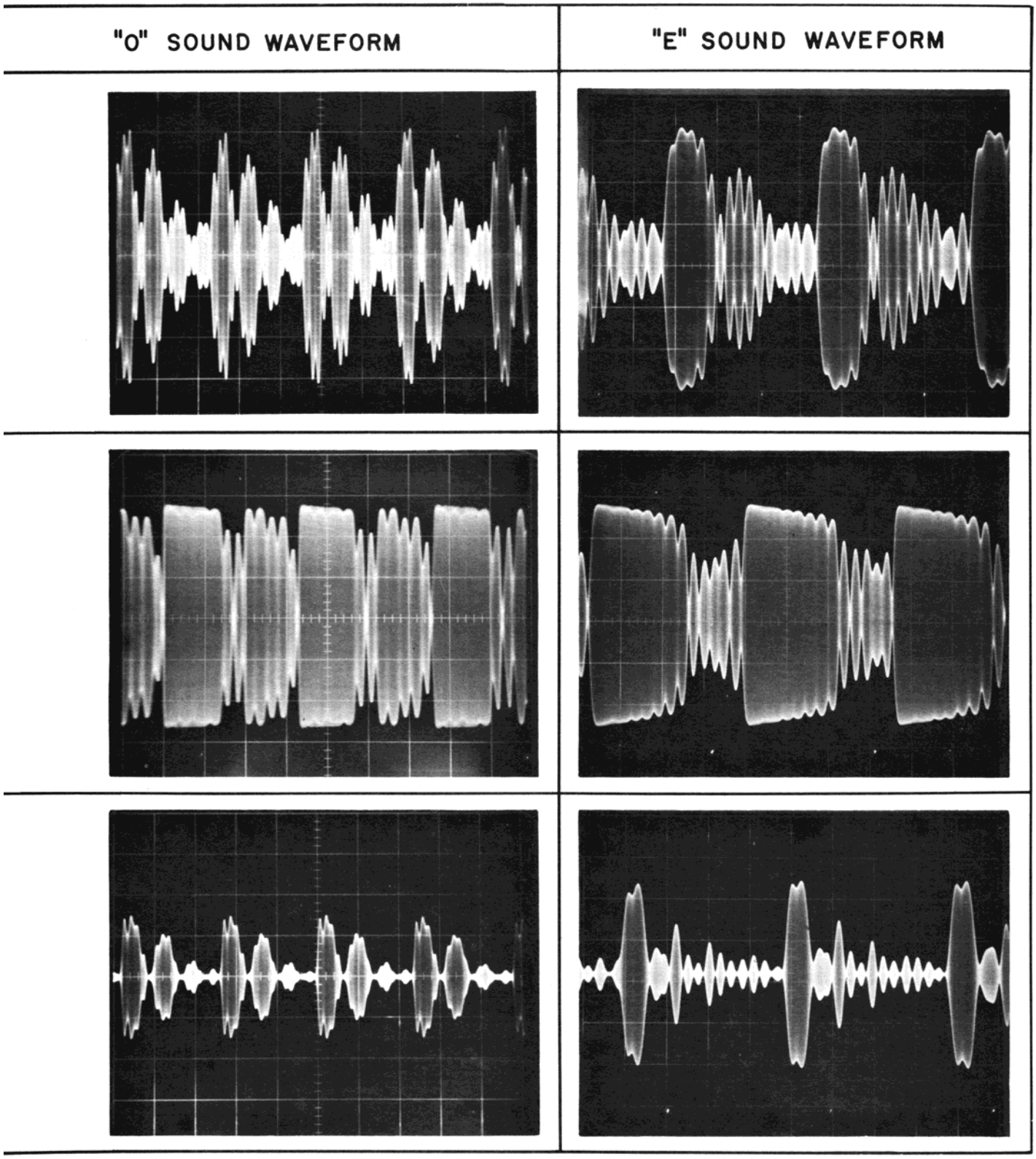


FIGURE 10
EXAMPLES OF SINGLE SIDEBAND RF ENVELOPES

5.2.6 LOCAL OSCILLATOR, FREQUENCY TRIPLER AND TRANSMITTER FREQUENCY CONVERTER

1. Oscillator voltage at oscillator base should be about .4 volts RMS measured with an RF probe (this reading depends on how active the crystals are).

2. Output of the tripler measured at the tripler collector, Q22, with the RF probe should be 1.0 - 1.4 volts RMS (this reading depends on the loading of the RF probe and meter, some indication of RF voltage will indicate that it is functioning).

3. Key the transmitter.

4. With the audio generator turned down and not talking into the mike there should be some indication of injection voltage at the base of Q23, about .02 - .05 volts RMS measured with RF probe.

5. Connect audio generator as shown in step one of Section 5.2.3.

6. Key transmitter and check for RF output at the collector of Q23 with the RF probe. The RF pickup loop from scope can also be used to check the output of Q23 by slipping the loop over L5.

7. Also check DC voltages and circuitry to determine defective parts.

5.2.7 TRANSMITTER INTERMEDIATE PA, RF-PA AND ALC

1. If there is drive at the collector of Q23 and there is no output from the transmitter, check the DC voltages and Q24, Q25 and output circuits.

2. If output seems low or distorted check output waveform by placing RF pickup loop from RF scope over L8. Refer to scope pictures for typical problems, Figure 10.

   NOTE: "E" and "O" sounds shown in Figure 10 were made by singing into mike. For two tone test connection refer to step 3 and 4 of the preliminary check, section 5.2.2.

   Check output power with RF probe or wattmeter. Power output should be at least 1.5 watts average (3.0 watts PEP), RF probe should read about 12.3 V.

3. Idle collector current of RF-PA (Q25) should be 40 mA.

4. A properly working and adjusted ALC should limit PA collector current to 400 mA with the two tone test. This is necessary in order to prevent clipping as shown in the photos of Figure 10.

SECTION VI
ALIGNMENT CHARTS

6.1 GENERAL

The Messenger "350" Citizens Band Single Sideband transceiver is carefully aligned at the factory. Complete realignment is not recommended except by technicians familiar with transistorized Single Sideband transceivers, and who have the necessary test equipment; then only if absolutely necessary. Replacement of defective components in any stage may require realignment of that particular stage only. The following charts are therefore outlined as a guide for necessary alignment required for proper maintenance of the Messenger "350".

6.2 RECEIVER ALIGNMENT

ALIGNMENT	CONNECTIONS AND SETTINGS	ADJUSTMENTS
LSB Carrier Frequency	Connect the frequency meter, frequency counter, or any other appropriate frequency measuring device capable of at least ±300 Hz accuracy to the metal ring on R58, the BAL-R control potentiometer. Loading must not exceed 100 pF or be less than 1000 ohms. The coupling from the resistor, R58, to the measuring device should be through a 100 pF capacitor and a 1000 ohm resistor connected in series. Move the sideband switch to the low sideband position, LSB.	Adjust C36 for 8.7485 MHz. C36 is located in the shielded area on the circuit board. See Figures 11 and 12.
USB Carrier Frequency	Now place the sideband switch to the high sideband position, USB.	Adjust C37, located adjacent to C36, for 8.7515 MHz. See Figures 11 and 12.
Carrier Output	Disconnect the frequency measuring device from R58. Connect an output indicating device at the channel frequency to the antenna terminals. The indicating device may be a receiver with an S-meter, a wattmeter, or any similiar device. A field strength meter could also be used.	Carefully adjust the BAL-R (R58) and BAL-C (C45) for minimum carrier output. See Figures 11 and 12 for locations.
6.2.1 RECEIVER PEAKING The receiving transformers are color coded according to the color and corresponding number scale used for designating resistor values. The colors designate the units digit in the last set of numbers of the part's number. Also for the Messenger "350", the colored dots on the transformer designate the particular number of the transformer such as: Brown = T1, Red = T2, Orange = T3, etc.		
Receiver transformers	Connect a signal generator to the antenna terminals. Measure maximum output by using a voltmeter (AC) connected across the speaker terminals. With the original crystals installed and controls adjusted to receive a signal, inject a weak signal into the antenna terminals.	Peak T1 (antenna transformer), T2 (RF amplifier transformer), T3 (converter transformer), T4 (first IF), and T5 (second IF) for maximum audio output. DO NOT ADJUST T6, THE TRIPLER TRANSFORMER, UNLESS ABSOLUTELY NECESSARY.

ALIGNMENT CHARTS (cont'd)

ALIGNMENT	CONNECTIONS AND SETTINGS	ADJUSTMENTS
Tripler transformer T6.	If adjustment of T6 has become disturbed for some reason, the alignment of T6 is required. Proceed as follows: Apply 13.8 VDC to the Messenger "350". Install a crystal in position A for channel 1, and in position B for channel 22, however, it is not necessary to put the crystals on frequency because the adjustment of T6 can be obtained with the approximate channel frequencies. Connect an AC-VTVM to the center-rear pin of T6.	With the channel switch on position A, adjust both slugs of T6 for maximum output. Do not attempt to peak or spurious transmission will result. With the channel switch in position B, and alternately on position A, adjust both slugs of T6 so that the output is the same on both channels.
AGC Threshold Adjustment	With 13.8 VDC applied to the radio, connect a signal generator to the antenna input connector and an AC-VTVM across the speaker terminals. Set the signal generator for about a 1 kHz beat note at 1000 μV signal level. After tests are complete remove all test equipment leads.	With the volume control pointer straight up and the noise silencer ON, adjust R29 (AGC threshold potentiometer) for 1.5 volts RMS across loudspeaker.
6.3 TRANSMITTER ALIGNMENT		
Transmitter final stage	Connect a 50 ohm wattmeter to the antenna terminals. Be certain the mode switch is in TR position and the channel on position A; the other controls do not matter. Connect a 0 to 500 mA meter between terminals 5 and 6 of the power plug as shown in Figure 3. These terminals are normally jumpered and terminal 5 is plus. Adjust the power supply to 13.8 ±.2 volts for transmitting.	Key the microphone and adjust R112 (PA Bias potentiometer) to 40 mA ±10mA as indicated on the ammeter. Turn ALC potentiometer (R118) to maximum clockwise as viewed from the front. Adjust slug of L9 (black) so that it is flush with top of the form. Key microphone and whistle into it (or inject a signal of 30 millivolts at 1 kHz through a 1 μF blocking capacitor base of Q1) while peaking L5 and L7 for maximum collector current and power output. Also, under the same conditions, peak C108 for maximum power output. Key the microphone (after disconnecting audio generator, if used) and pronounce the letter "O" loudly close to the microphone, while adjusting R118 (ALC potentiometer) for 400 mA as indicated on the ammeter.
	(OPTIONAL) Couple a 27 MHz RF scope to L9 via an RF pickup loop. Do not align with scope connected because of power lost in scope.	Observe the RF waveform. Some waveform examples are given in Figure 10.

SECTION VII

PARTS LIST

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	BRACKETS	
BKT	Bracket, mounting	023-2086-001
BKT	Bracket, heat sink	017-1440-001
	CABINET HARDWARE	
CH1	Front Panel Assembly	023-2082-001
CH2	Chassis Rail	017-1366-002
CH3	Cabinet assembly	023-2081-002
CH4	Overlay	559-2014-001
CH5	Overlay, off-volume	559-0022-001
CH6	Overlay, tune	559-0022-002
CH7	Overlay, squelch	559-0022-003
	CAPACITORS	
C99	15 pF ±5% mica	510-3013-150
C44	10 pF ±5% NPO disc	510-3013-100
C112	18 pF ±5% 500 volt	022-4031-005
C58	22 pF ±5% NPO disc	510-3013-220
C105, 121	39 pF ±5% NPO disc	510-3013-390
C56, 110	47 pF ±5% N750 disc	510-3020-470
C83, 85, 109	56 pF ±5% NPO disc	510-3027-560
C80, 90	39 pF ±5% N750 disc	510-3020-390
C91	82 pF ±5% N150 disc	510-3016-820
C86	91 pF ±5% N750 disc	510-3020-910
C93, 94	91 pF ±5% N150 disc	510-3016-910
C48, 52, 106	100 pF ±5% N150 disc	510-3016-101
C38, 41	110 pF ±5% NPO disc	510-3027-111
C111	130 pF ±5% NPO disc	510-3013-131
C98	150 pF ±5% NPO disc	510-3027-151
C15	180 pF ±5% 500 volt	022-4055-005
C68, 74	220 pF ±15% N150 disc	510-3016-221
C57	260 pF ±5% N150 disc	510-3016-261
C87, 88	270 pF ±10% 500 volt	022-4059-010
C4, 7, 23, 43, 61, 107, 118	.001 μF ±20% 50 volt Y5U	510-3002-102
C1, 50, 119	47 μF ±20%, 20 volt	510-2004-470

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	CAPACITORS (cont'd)	
C31, 35, 46, 47, 49, 51, 53, 54, 55, 59, 62, 63, 65, 66, 67, 69, 71, 72, 73, 76, 89, 92, 95, 96, 101, 102, 104, 100, 113, 115, 116, 117, 32, 78, 120	.01 μF +80% - 20% 100 volt Y5U	510-3003-103
C14	5.6 μF ±20% 35 volt	510-2005-569
C13, 39	.1 μF ±20% 25 volt Y5U	510-3007-104
C5, 8, 9, 12, 19, 22, 24, 27	1 μF ±20% 35 volt	510-2005-109
C3, 6, 11, 21, 64, 75, 97, 114	22 μF ±20% 15 volt	510-2003-220
C16, 26, 28, 29	56 μF ±20% 6.4 volt	510-2001-560
C25	100 μF +50% -10% 6.4 volt	510-4003-005
C103	320 μF +50% -10% 2.5 volt	510-4001-005
C2, 17	400 μF +50% -10% 16 volt	510-4006-001
C18	1000 μF +50% -10% 16 volt	510-4006-005
C45	1.5 - 20 pF mica compression variable	022-2322-003
C36, 37, 79, 81, 82, 84, 108	8 - 60 pF mica compression variable	022-2322-007
C77	3 - 32 pF variable	160-0130-057
	COILS	
L1	Filter choke, 20 μH	542-5007-001
L2, 3, 4, 12	RF choke, 20 μH	022-1835-020
L5	Coil, .22 μH	022-2321-014
L6, 8, 11	Choke, 13.7 μH	022-1944-130
L7	Coil, .28 μH	022-2321-015
L9	Series output coil, .58 μH	022-2321-010
	CRYSTALS	
Y1	Crystal, lower side-band (8.7485 MHz)	519-0002-001
Y2	Crystal, upper side-band (8.7515 MHz)	519-0002-002

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	DIODES	
D1, 2, 3, 9, 13, 14, 15, 16, 18, 19 21, 25, 26	Silicon, type 1N881	022-3905-001
D4, 11, 12 23, 24, 10	Germanium, type 1N67A	523-1000-067
D5, 6, 7, 8, 17	Silicon, type FD777	523-0007-001
D22	Silicon, type ED 3002	523-0001-002
DZ1, 2, 3,	Zener, 10 volt ±5% at 1 watt	523-2003-100
	FILTER	
Z1	Filter, crystal bandpass (8.75 MHz)	532-0002-001
Z2	Filter, L-C bandpass (27 MHz)	023-2084-001
	GROMMET	
G1	Grommet, rubber	022-0113-004
	JACKS	
J1	Antenna Jack	022-0746-001
J2	Male jack, 8 pin (with ring)	022-1365-006
J3	Speaker jack, (circuit opening)	022-1946-001
	KNOB	
MP	Knob	022-1929-001
	MICROPHONE	
M1	Microphone, ceramic SSB	589-0007-001
	RESISTORS	
R27, 28	.33 ohms ±10% 1/2 watt	022-8013-010
R24, 26	3.9 ohms ±10% 1/2 watt	022-6195-010
R108	4.7 ohms ±10% 1/4 watt	022-5696-010
R3, 111	22 ohms ±10% 1/4 watt	022-5509-010
R1	39 ohms ±10% 1 watt	022-6015-010
R2, 106	47 ohms ±10% 1/2 watt	022-5017-010
R40	27 ohms ±10% 1/4 watt	022-5511-010
R21, 47, 55, 85, 89, 97, 114, 123	100 ohms ±10% 1/4 watt	022-5525-010
R83	120 ohms ±10% 1/4 watt	022-5527-010
R107	120 ohms ±5% 1/4 watt	022-5527-005
R23, 25	150 ohms ±10% 1 watt	022-6029-010

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	RESISTORS (cont'd)	
R65	180 ohms ±10% 1/4 watt	022-5531-010
R64, 96	220 ohms ±10% 1/4 watt	022-5533-010
R109	270 ohms ±10% 1/4 watt	022-5535-010
R57, 59	330 ohms ±10% 1/4 watt	022-5537-010
R16, 34, 98, 121	470 ohms ±10% 1/4 watt	022-5541-010
R46, 56, 104	560 ohms ±10% 1/4 watt	022-5543-010
R63, 71	680 ohms ±10% 1/4 watt	022-5545-010
R18	820 ohms ±10% 1/4 watt	022-5547-010
R4, 8, 17, 54, 72, 81, 82, 84	1000 ohms ±10% 1/4 watt	022-5549-010
R95	1200 ohms ±10% 1/4 watt	022-5551-010
R105	1000 ohms ±5% 1/4 watt	022-5549-005
R13, 33, 38, 67, 68, 76, 77, 78, 88, 91, 94, 103	1500 ohms ±10% 1/4 watt	022-5553-010
R32	1800 ohms ±10% 1/4 watt	022-5555-010
R12, 102	2200 ohms ±10% 1/4 watt	022-5557-010
R11, 15, 66	2700 ohms ±10% 1/4 watt	022-5559-010
R7, 10, 36	3300 ohms ±5% 1/4 watt	022-5561-005
R6, 69, 73, 44, 86, 87, 101	3300 ohms ±10% 1/4 watt	022-5561-010
R74, 122	3900 ohms ±10% 1/4 watt	022-5563-010
R49, 51	4700 ohms ±10% 1/4 watt	022-5565-010
R22	5600 ohms ±10% 1/4 watt	022-5567-010
R35	6800 ohms ±5% 1/4 watt	022-5569-005
R9, 14, 31	6800 ohms ±10% 1/4 watt	022-5569-010
R5, 39	10,000 ohms ±10% 1/4 watt	022-5573-010
R48, 99	12,000 ohms ±10% 1/4 watt	022-5575-010
R52	18,000 ohms ±10% 1/4 watt	022-5579-010
R41, 60, 93	22,000 ohms ±10% 1/4 watt	022-5581-010
R117	27,000 ohms ±10% 1/4 watt	022-5583-010
R113, 119	33,000 ohms ±10% 1/4 watt	022-5585-010
R92	39,000 ohms ±10% 1/4 watt	022-5587-010
R61, 62, 124	47,000 ohms ±10% 1/4 watt	022-5589-010
R53, 79, 115, 116	100,000 ohms ±10% 1/4 watt	022-5597-010

PARTS LIST (cont'd)

SCHEMATIC SYMBOL NO.	DESCRIPTION	PART NO.
	RESISTORS (cont'd)	
R45	330,000 ohms ±10% 1/4 watt	022-5601-010
R75	470,000 ohms ±10% 1/4 watt	022-5613-010
R37	1 meg ohm ±10% 1/4 watt	022-5621-010
R58, 112	Potentiometer, trim 250 ohms ±30%	562-0004-251
R43	Potentiometer, 50,000 ohms ±20% (squelch control)	022-1349-001
R19	Potentiometer, 10,000 ohms ±30% - with SPST CB switch (volume control)	562-0010-001
R29	Potentiometer, trim 10,000 ohms ±30% (AGC Gain)	562-0004-103
R118	Potentiometer, trim 25,000 ohms ±30% (ALC Level)	562-0004-253
	SHIELDS	
SH1	Shield	017-1442-001
SH2	Bandpass filter shield	017-1441-001
SH3	Shield, balanced modulator	017-1362-001
SH4	Shield, capacitor	017-1379-001
	SOCKET	
XY	Crystal socket	016-1019-001
	SPEAKER	
LS	Loudspeaker, 2" x 6" PM	589-1002-001
	SWITCHES	
S1, 2, 3	Switch, DPDT slide	583-3001-003
S4	Switch, SPDT slide	583-3001-002
	TRANSFORMERS	
T1	Antenna	022-1788-001
T2	RF	022-1788-002
T3	Mixer	592-5007-003
T4	IF	592-5007-004
T5	IF output	592-5007-005
T6	36 MHz tripler	592-5007-006
T7	Ring modulator detector	592-9001-001
T8	Audio driver	592-1015-001
	TRANSISTORS	
Q1	Audio 36917	576-0036-917
Q2, 3, 4, 7, 9, 11, 12, 17, 26, 27	Audio 36916	576-0036-916
Q5, 6	Output audio 40051	576-0040-051
Q8	Audio 2N406	022-3504-060
Q13, 14, 21, 22	Oscillator 36920	576-0036-920
Q15	RF 36918	576-0036-918
Q16, 23	Mixer 36919	576-0036-919
Q18, 19	IF 36921	576-0036-921
Q24	IPA 36913	576-0036-913
Q25	PA 36914	576-0036-914

CRYSTAL PARTS LIST

CHANNEL	OPERATING FREQUENCY MEGAHERTZ	TRANSCEIVER CRYSTAL PART NO.
1	26.965	519-0003-001
2	26.975	-002
3	26.985	-003
4	27.005	-004
5	27.015	-005
6	27.025	-006
7	27.035	-007
8	27.055	-008
9	27.065	-009
10	27.075	-010
11	27.085	-011
12	27.105	-012
13	27.115	-013
14	27.125	-014
15	27.135	-015
16	27.155	-016
17	27.165	-017
18	27.175	-018
19	27.185	-019
20	27.205	-020
21	27.215	-021
22	27.225	-022
23	27.255	-023

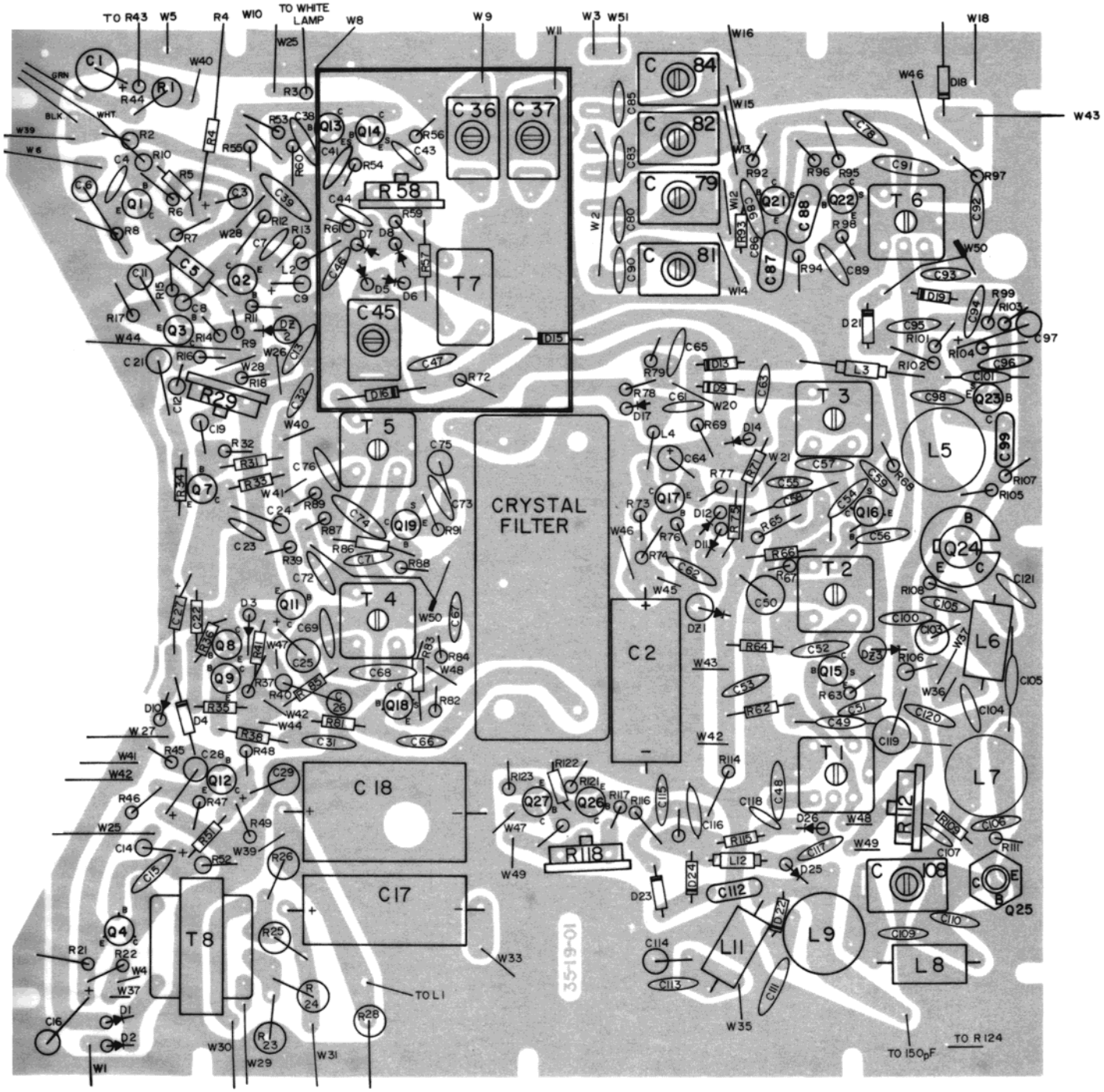


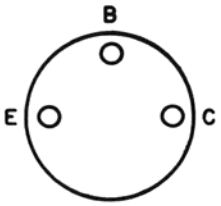
FIGURE 11
PRINTED CIRCUIT PARTS LAYOUT
BOTTOM VIEW OF PC BOARD

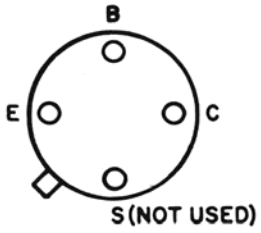
DIAGRAM OF TRANSISTOR LEAD LOCATIONS AND DIODE NOTATIONS FOR THE COMPONENTS USED IN THE MESSENGER 350

36913
36914
36916
36917
2N406
1004
1005
4007
4008

36918
36919
36920
36921

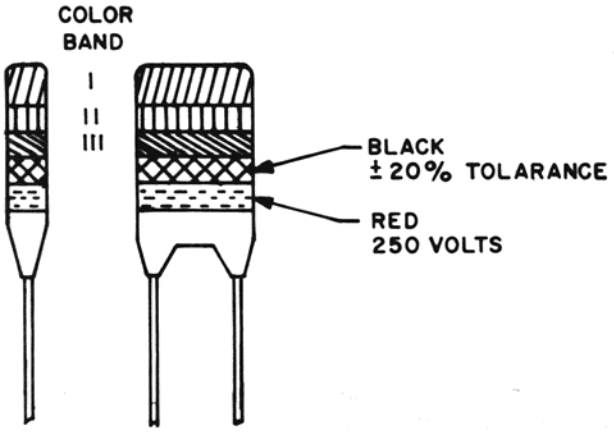
DIODES





TRANSISTOR BASES
(BOTTOM VIEW)

COLOR	CAPACITANCE VALUE		MULTIPLYING FACTOR
	I	II	III
BLACK	–	0	1
BROWN	1	1	10
RED	2	2	10^2
ORANGE	3	3	10^3
YELLOW	4	4	10^4
GREEN	5	5	–
BLUE	6	6	–
VIOLET	7	7	–
GRAY	8	8	–
WHITE	9	9	–



COLOR BAND INTERPRETATION OF CAPACITOR

QUALITY ELECTRONIC PRODUCTS SINCE 1923

E. F. JOHNSON COMPANY
WASECA, MINNESOTA 56093

FORM NO. 001-0102-001

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