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COMMUNICATION EQUIPMENT
INSTRUCTION MANUAL

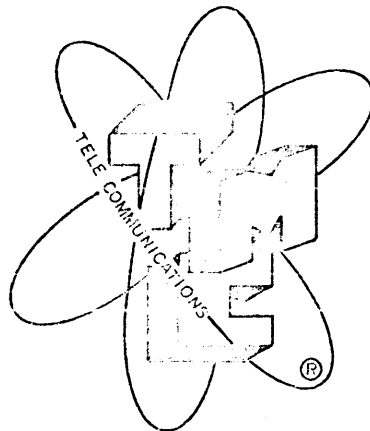
T.M.C. SYM-2007

N.Y. STATE CIVIL DEFENSE

NEW YORK STATE
CIVIL DEFENSE

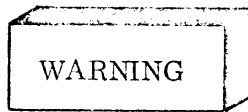
EMERGENCY COMMUNICATIONS
STATION

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, NEW YORK



PREFACE

This manual contains a description and operating instruction for the Auxiliary Sites of the New York State Civil Defense Emergency Communications Network. It is compiled to assist the operators at all the sites to better understand their stations thereby providing more efficient communications. The information relating to the operating instructions supplements the information contained in the individual equipment instruction manuals furnished with the site communication equipment. All illustrations are bound at the rear of the manual.



This equipment employs voltages which are dangerous and may be fatal if contacted by operating personnel. Extreme caution should be exercised when working with the equipment. While all practicable safety precautions have been incorporated in the equipment, operating and maintenance personnel must at all times observe all current safety regulations.

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EMERGENCY COMMUNICATIONS STATION SYM-2007

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NEW YORK STATE CIVIL DEFENSE
EMERGENCY COMMUNICATIONS STATION
AUXILIARY SITE

SECTION I
DESCRIPTION

1-1. INTRODUCTION.

The New York State Civil Defense Emergency Radio Network includes a main station at Albany and seven auxiliary stations as shown in figure 1-1. Circuit control of the radio network is exercised by the main station at Albany which may communicate with the auxiliary sites using Voice, CW, Frequency-Shift-Keying (FSK) or Facsimile (FAX).

The auxiliary stations, when granted permission by the circuit control station at Albany, may communicate with each other using Voice, CW or FAX.

1-2. AUXILIARY SITE EQUIPMENT.

All the auxiliary sites use the same type of equipment and are essentially the same except for the physical location of individual components which may differ from site to site. The type and quantity of electronic equipment at each auxiliary site is listed in Table 1-1. The description and principles of operation for the CW Control Unit and the TTY Control Unit, which are part of each site equipment, are contained in this section. Individual instruction manuals are furnished for the remaining equipment. Figure 1-2 is a block diagram showing equipment inter-connections at each auxiliary site.

TABLE 1-1

LIST OF AUXILIARY SITE EQUIPMENT

<u>QTY.</u>	<u>MODEL</u>	<u>DESCRIPTION</u>	<u>MFGR.</u>
1	SBT-1KV	Radio Transmitter	T.M.C.
1	GPR-92	Radio Receiver	T.M.C.
1	PSP-2	D.C. Battery, Dual	T.M.C.
1	TIS-3	Tone Keyer	T.M.C.
1	MSR-4 or MSR-9	S.S.B. Converter	T.M.C.
1	FFR-3	Radio Receiver	T.M.C.
1	QDP6A1X6	Coax Patch Panel	T.M.C.
1	HFD-1	Receive Antenna Multicoupler	T.M.C.
1	LSP-6(V)	Dual Speaker Panel (Modified)	T.M.C.
1	AN/UGC-6 (MOD-28ASR)	Teletype Send/Receive	Teletype
1	9208	FAX Scanner	Alden
1	421	FAX Converter AM-DC	Alden
1	9203B	FAX Recorder	Alden
1	101A	Tone Keyer	Telesig.
1	102A	Tone Converter	Telesig.
1	109	Transistor Switch & D.C. Battery	Telesig.
1	139	Shelf	Telesig.
1	A-143-2-10	D.C. Control Panel	T.M.C.S.
1	AV-0038	C.W. Control Unit	T.M.C.S.
1	A-143-2-030	TTY Control Unit	T.M.C.S.
1	A-143-2-29	I F - A F Patch	T.M.C.S.

1-3. CW CONTROL UNIT.

The CW control unit (Drawing AV-0038, Sheet 2) provides for full control of the transmitter by the telegraph key. No operator functions are necessary to go from receive to transmit other than depressing the key. Conversely, going from the transmit to the receive condition involves only releasing the key. The following features are provided:

1. Control of the transmitter HV relay.
2. Switching of the antenna between transmitter and receiver.
3. Keying of the transmitter carrier.
4. Muting the receiver during the transmit condition.
5. Providing keyed sidetone to the receiver.

1-4. DESCRIPTION.

The overall dimensions of the CW Control Unit are approximately 9 X 5 X 8 inches. It is mounted on the inside of the rear door of the SBT-1KV transmitter. Approximately thirty-five watts of input power from a 115-volt, 60-cycle AC source is required for this unit.

1-5. THEORY.

For this discussion, the CW Control Unit is divided into Keyer Control, Exciter Keying, Sidetone, and Power Supply circuits which are described in the following paragraphs.

1-6. KEYER CONTROL.

The telegraph key is connected in series with relay K2. Depressing the key energizes K2 grounding the plates of keying diode V3 through one set of its contacts. This allows C6 to discharge through keying diode V3, effectively shorting resistor R11 (hangover time), and placing the control grid of keying relay control tube V4 at ground potential. Under these

conditions, V4 conducts causing current flow in the coil of K1 and closing the contacts of K1.

1-7. When the key is opened, bias voltage is again applied through R9 to the negative side of C6 and the control grid of V4, at a rate determined by the time constants of R11 and C6. The voltage at the grid of V4 varies directly with the voltage across C6. When the control grid of V4 reaches a potential of approximately -6 volts, the tube is cut off, current ceases to flow in its plate circuit and relay K1 is de-energized. Capacitor C6 continues to charge until it reaches its maximum steady state value. Slow release relay K1 therefore remains energized, after the keying circuit has been opened, for periods of time varying from zero to several seconds depending on the setting of R11. Resistor R9 is a current-limiting resistor which isolates the bias voltage supply from variations caused by CW keying. The contacts of relay K1 operate the transmitter HV relay which in turn operates the antenna change-over relay with its auxiliary receiver muting contacts.

1-8. EXCITER KEYING.

The key line to the SBE-6 is connected to a second set of contacts on K2. Closing the CW key energizes K2 completing the cathode circuit of V118 in the SBE-6. This allows the tube to conduct and causes carrier to appear at the exciter output.

1-9. SIDETONE.

The control unit contains a sidetone oscillator tube (V1) which allows the operator to monitor his own CW keying. V1 is keyed (simultaneously with the transmitter) by closing the telegraph key and energizing K2. This removes cut-off bias from the grid of V1.

Sidetone oscillator V1 is multivibrator type oscillator which, when keyed, generates a 1,000-cycle tone. Oscillations are started by a slight unbalance in the circuit which causes one-half of V1 to be cut off while the other half is conducting. Assuming that the first half of the tube (pins 1, 2 and 3) is cut off, its plate (pin 1) is at B+ potential (250 volts) and capacitor C2 is charged to that value. As C2 begins to discharge through grid resistor R4, the negative voltage developed across R4 reduces the current flow in the conducting half (pins 6, 7 and 8). This increases the plate (pin 6) voltage and causes capacitor C3, which has been at nearly ground potential, to charge through resistor R5. When the amplitude of the positive voltage developed across R5 is sufficient to overcome the cathode bias provided by R6, the second half of V1 begins to conduct. The time required before this conduction starts depends primarily on the C3-R5 time constant. The values of C3-R5 determine the rate at which the current flow decreases in the conducting half and the time at which the charging potential applied to C2 becomes sufficiently high. When the first half of V1 conducts, C3 discharges still more rapidly through R5, driving the second half to cutoff. This in turn increases conduction in the first half. The two halves of V1 remain in this reversed condition until the slow discharge of C2 through R4 initiates the next half cycle.

1-10. The 1000-cycle output is taken from across resistor R5 and coupled to the grid of cathode follower V2 through capacitor C4. Resistors R2 and R3 are plate resistors and resistor R1 with capacitor C1 forms a decoupling network. Cathode follower tube V2 matches the high-impedance output of V2 to the low-impedance line feeding the GPR-92 receiver(s). Resistor R7 is the grid load resistor. Resistor R8, the cathode load resistor, also functions as the SIDETONE GAIN control. The output of V2 is coupled through capacitor C5 to terminal 10 of E101 of the GPR-92 receiver and to pin 1 of V118,

the audio output stage. Thus, when the transmitter is keyed, 1000-cycle keyed audio is fed to the audio output stage and thence to the speaker or headphones. The volume is set independently of the receiver AF gain and once properly set, need not be disturbed. The sidetone lead feeding the receiver is routed via the console control panel where it is opened in the non-CW (RTTY and Voice) position.

1-11. POWER SUPPLY.

The positive and negative power supplies (Drawing AV-0038 Sheet 3) are conventional full-wave and half-wave supplies utilizing silicon diodes.

1-12. MAINTENANCE.

In the event of CW Control Unit failure, refer to the following Voltage and Resistance Chart, and to the schematic diagrams of the unit (AV-0038, Sheets 2 and 3) which are located at the rear of this manual.

TABLE 1-2

CW CONTROL UNIT

VOLTAGE & RESISTANCE CHART

KEY UP								
PIN	V1		V2		V3		V4	
	VOLTS	OHMS	VOLTS	OHMS	VOLTS	OHMS	VOLTS	OHMS
1	+300	150K	+300	2800	-29	170K	-19	170K
2	-31	450K	-	∞	-29	170K	Grnd.	0
3	+1.0	560	3.15vac	0.2	3.15vac	0.2	3.15vac	0.2
4	3.15vac	0.2	3.15vac	0.2	3.15vac	0.2	3.15vac	0.2
5	3.15vac	0.2	+300	2800	-29	170K	+320	28K
6	+36	150K	0	450K	-	∞	+300	62K
7	0	290K	+9	500	-29	170K	Grnd.	0
8	+1.0	560						
9	3.15vac	0.2						
KEY DOWN								
1	+120		+280		0		0	
2	-34		-		0		Grnd.	
3	+1.35		3.15vac		3.15vac		3.15vac	
4	3.15vac		3.15vac		3.15vac		3.15vac	
5	3.15vac		+280		0		+30	
6	+120		-13		-		+75	
7	-45		+11		0		Grnd.	
8	+1.35							
9	3.15vac							

CONDITIONS:

Sidetone Gain - Full Clockwise

Hangover Time - Full Clockwise

All measurements made with 20,000 OHM/VOLT V. O. M (Simpson 260)

For resistance measurements disconnect unit from power source

All measurements taken between indicated terminal and ground

1-13. RADIO TELETYPE CONTROL UNIT.

The Radio Teletype Control Unit (Drawing A143-2-030) provides for control of the teletype and for station identification in accordance with FCC rules and regulations.

1-14. DESCRIPTION.

The Radio Teletype Control Unit is constructed on a small chassis whose dimensions are 5 X 4 X 6 inches. The unit is mounted on the right side of the AN/UGC-6 cabinet. Input power from a 115-volt AC source is required for lighting the two indicator lamps.

1-15. THEORY.

With switch S1 in the RECEIVE, or normal, position, the teletypewriter signal line is connected to the receive loop (Telesig 102A, 109 and 159PB combination) via terminals 1 and 2 of TB1 and will print such signals as are received by the GPR-92 receiver.

1-16. When switch S1 is moved to the TRANSMIT position, the teletypewriter is transferred to the send loop (Telesig 101A tone keyer or TMC TIS-3 Keying Unit) via terminals 3 and 4 of TB1. The lamp circuit I1 is also completed via terminals 5 and 6 of to light. The transmitter interlock circuit is also completed via terminals 5 and 6 of TB1, placing high voltage on the transmitter circuits. A ground is applied via terminal 8 of TB1 to relay K1, mounted on the rear apron of the TIS-3 tone intelligence unit, which applies the teletype tones to the transmitter input.

1-17. When switch S1 is moved to the IDENTIFY position, a short is applied to the send loop via terminals 3 and 4 of TB1 causing a steady mark to be sent out by the tone keyer, and the transmitter interlock circuit is completed via terminals 5 and 6 of TB1 placing

the transmitter on the air. A ground is applied through the telegraph key, via terminal 8 of TB1, to relay K1 at the TIS-3. In the normal (key-up) condition, the relay is non-energized and no mark tone is fed to the transmitter input. When the key is closed, the relay is energized and the mark tone is fed to the transmitter input, allowing the station to identify in normal CW fashion in accordance with FCC regulations. The lamp circuit I2 is also completed, causing the amber identify indicator to light.

SECTION II
OPERATING INSTRUCTIONS

2-1. INTRODUCTION.

The following operating instructions for the SYM-2007 Auxiliary Sites include tuning procedures for the transmitting and receiving equipment, and system operating instructions for Voice, CW, Radio-Teletype and Facsimile operation. The tuning procedures and operating instructions are arranged in a logical order that will assist the operator to quickly and accurately bring the equipment on the air for operation. Knowledge of the physical location and capabilities of the equipment at the site is assumed. Before attempting to operate the equipment, the operator should read completely through and understand the procedures and instructions.

2-2. TUNING PROCEDURE FOR THE SBT-1KV TRANSMITTER.

The following is a unit-by-unit tuning procedure for the non-synthesized SBT-1KV transmitter including a special tuning procedure in Step 5 which is used for Facsimile and 850-cycle FSK operation.

STEP 1. SBE-6 AND VOX-5 TUNING.

Crystals within the SBE-6 are normally used as the medium -frequency (MF) injection except in special cases when the VOX-5 is used as the transmitter master oscillator. This step includes both methods of tuning the SBE-6.

a. On the SBE-6, set front panel controls as follows:

BAND MCS to on the air frequency band

OUTPUT TUNING to on the air frequency band

POWER	ON
EXCITER	ON
METER SW	MF
CARRIER INSERT	10
OUTPUT	0(zero)
MF XTAL SW	to required crystal frequency position, or, to VMO if using VOX-5 (refer to Step 1.b.)
XMTR	OFF
USB and LSB	selector switches to OFF

NOTE

When in the Voice or CW modes and the desired on the air frequency is provided for by one of the SBE-6 crystals (selected by the MF XTAL SW above), proceed to Step 1d.

- b. This step provides the method of calculating the VOX-5 setting in kilocycles or the crystal frequency that is required for an MF injection to the SBE-6.

1.75 to 4.25 mc band.

For frequencies between 1.75 and 3.75 mcs:

VOX-5 or crystal frequency = $f_o + 250$ kc, where f_o = desired on the air frequency.

Example: On the air frequency = 2000 kc

VOX-5 or crystal frequency = $2000 + 250 = 2250$ kc

VOX-5 setting would then be 2250 kc

For frequencies between 3.75 and 4.25 mcs:

VOX-5 or crystal frequency = $f_o + 250$ kc

Example: On the air frequency = 4000 kc

VOX-5 or crystal frequency = $4000 + 250 = 4250$ kc

However, since the VOX-5 master oscillator does not oscillate above 4 mcs, it becomes necessary to set the VOX-5 dial (MASTER OSCILLATOR FREQUENCY) at a frequency exactly one-half the desired output frequency. Then, by setting the VOX-5 band switch to the 4-8 mcs position this basic oscillator frequency will be doubled and the proper frequency will be fed into the SBE-6.

Example: On the air frequency = 4000 kc

VOX-5 frequency = $f_o + 250$ kc = 4250 kc

VOX-5 MO setting = $\frac{4250}{2} = 2125$ kc

VOX-5 band switch = 4-8 mcs position.

For all other bands and frequencies:

VOX-5 or crystal frequency = $2N - f_o + 250$ kc, where N = Number (the number appearing under band spread in the window above the SBE-6 BAND-MCS switch) X 1000; and f_o = desired on the air frequency in kilocycles.

Example: On the air frequency = 5000 kc

$N = 4 \times 1000$

VOX-5 or crystal frequency = $2(4000) - 5000 + 250$
 $= 8000 - 5000 + 250 = 3250$ kc

VOX-5 setting = 3250 kc

c. VOX-5 TUNING.

NOTE

When using the TIS-3 Keyer for FSK or FAX operation, first perform Step 5 of this procedure, then proceed with Step 1c.

1. Once the MF injection to the SBE-6 has been determined set the switches and controls on the VOX-5 as follows:

POWER	ON
HFO	ON
BEAT	ON
XTAL	VMO
BAND-MCS	to position determined in Step 1b or this procedure, usually 2-4 mcs.

MASTER OSCILLATOR to the even 100 kc point nearest the
FREQUENCY
VOX-5 setting as determined in Step
1b (or in Step 1c when in the 850-cycle
FSK or FAX modes of operation).

CALIBRATE Adjust for zero-beat indication on
ZERO BEAT indicator lamp, or for
audio zero beat on headphones plugged
into jack. Lock CALIBRATE control,

BEAT	OFF
------	-----

2. Reset the MASTER OSCILLATOR FREQUENCY counter dial to the setting determined in Step 1b (or in Step 1c when in FAX or 850-cycle FSK modes).

3. Peak the TUNING adjustment while watching DC MILLIAMMETER located on the front panel.
4. Set OUTPUT control for a reading of 2 on the DC MILLIAMMETER
If no peak can be found, check to ensure that MILLIAMMETER switch inside the little front panel door is in the HFO position.

d. SBE-6 TUNING.

Check to insure that the SBE-6 switches are in positions called out in Step 1a, then proceed as follows:

1. Tune the MF TUNING control for maximum indication on the multimeter.
Three peaks may be found. The proper peak (regardless of amplitude) is the one most nearly corresponding to the frequency determined in Step 1b. (In general, from left to right on the dial, this will be the first of three peaks).
2. Place METER SW in the RF position
3. Turn OUTPUT gain control fully clockwise.
4. Tune the clear plastic OUTPUT TUNING control (located behind main band switch) for maximum. Again more than one peak may be found. Proper peak is the one nearest the desired on the air frequency.
Decrease OUTPUT gain control so as to maintain approximately half-scale reading on the multimeter while tuning.
5. Turn output gain control fully counter clockwise.

STEP 2. PAL-1K TUNING.

- a. Set DRIVER BAND SWITCH and PA BAND switch to proper band for the on the air frequency.

- b. Turn TRANSMITTER VOLTAGES switch (located on front panel of low voltage power supply) to ON position. FINAL VOLTAGES switch should be in the OFF position at this point.
- c. Turn MULTIMETER switch (on PA unit) to 1ST AMPL RF position.
- d. Turn OUTPUT gain control on the SBE-6 clockwise until a reading is noted on the Power Amplifier MULTIMETER.
- e. Adjust 1st AMPL TUNING control for maximum indication on PA MULTIMETER. Increase or decrease the SBE-6 OUTPUT gain control so as to maintain approximately half-scale reading.
- f. Turn MULTIMETER switch to PA GRID position.
- g. Adjust PA GRID TUNING control for maximum on MULTIMETER. (Maintain half-scale reading by adjusting SBE-6 OUTPUT gain control as necessary.
- h. Turn SBE-6 OUTPUT gain control to minimum (fully counter-clockwise).
- j. Turn FINAL VOLTAGES switch located on low voltage power supply to ON position.
- k. Turn PA MULTIMETER to PA (DC) SCREEN CURRENT.
- l. Increase OUTPUT gain control on SBE-6 until an increase is noted on the PA PLATE CURRENT meter.
- m. Using PA TUNING control, tune for a dip on PA PLATE CURRENT meter.
- n. Turn ALDC control (located between and slightly below PA meters) fully clockwise.

NOTE

If at any time while tuning PA unit you should experience a DC voltage failure, reduce OUTPUT gain control on SBE-6 to minimum and check the three overload switches on the front-left of the PS-4a low voltage power supply. These should all be in the up position. If these are all up, check that the overload light on the very top unit in the rack (ATS antenna tuning unit) is not on. If it is on, press the red overload reset button next to it. Once voltages are back, continue tuning.

STEP 3. ATS-MCU TUNING.

This is the antenna tuning unit. With XMTR on the air read forward power from large meter (black pointer). While tuning this unit, this should be maintained below 100 watts. Note setting of OFF-short-X1-X10 switch. In the X1 position, the meter reading is as shown. In the X10 position, multiply reading by 10, to get actual power output.

- a. Adjust SBE-6 OUTPUT gain control for 50-80 watts forward power on ATS meter (black pointer.)
- b. Place ATS TUNE-OPERATE switch in TUNE position.
- c. Place OFF-Short-X10 switch in X1.
- d. Notice the small meter to the right of the power meter. In the normal position this reads the travel of a movable arm located on the antenna tuning inductor. This is controlled by a motor and can be moved by using the INCR-DECR lever switch nearby. Below the meter you will notice a black spring loaded switch. This is the meter select switch. Turn it counter-clockwise and note that the small meter reads one of

six numbers (1-6). These numbers correspond to capacitor taps in the tuning unit. Capacitor Taps are changed by depressing the red res. button. Neither of these controls should be operated when transmitter FWD POWER exceeds 100 Watts. Using both the res. button and the motor, tune for a minimum reflected power reading on the watt meter.

To read reflected power note the point where the red and the black pointers cross. You will notice that this point falls on or near one of the black jagged lines on the meter face. Follow these black jagged lines to the red scale and read reflected power and VSWR.

- e. Turn X1-X10 switch to X10 position.

STEP 4. PAL-1K FINAL TUNING.

- a. Return to power amplifier unit and using the tuning and loading controls adjust for a PA plate current dip of between 300 and 600 ma at a power output of 500 watts. Do not exceed 600 ma or 500 watts.
- b. With output set at a point about 20% higher than desired, adjust ALDC knob counter-clockwise until power meter reads desired power output. ALDC knob is on the PA unit between and slightly below the two meters.
- c. Set OFF-Short-X1-X10 switch on ATS antenna tuning unit to Short. This completes the tuning of the SBT-1KV on carrier. At this point, proceed to individual mode of operation instructions.

STEP 5. SPECIAL INFORMATION CONCERNING FACSIMILE AND 850 CYCLE FSK

In these modes the VOX-5 should be utilized as the transmitter master oscillator. Perform the following after first determining VOX-5 setting as per step 1-b of this procedure.

- a. If the output band switch on the SBE is in one of the upper three positions, i.e., 4-8 (frequencies between 4.25 and 8 mc only), 8-16, 16-32, adjust VOX as follows:

If the TIS-3 has been injected into the uppersideband circuitry of the SBE-6, add TIS-3 center frequency, as indicated on TIS-3 center frequency CPS control, to the VOX-5 setting as indicated on VOX-5 five (5) digit readout. If the TIS-3 has been injected into the lower sideband circuitry of the SBE-6, subtract the TIS-3 center frequency from the VOX-5 setting.

Example: Initial VOX-5 setting = 2250 kc (From step 1-b)

TIS-3 center frequency = 2 kc

Proper VOX-5 setting for LSB injection = 2248 kc

Proper VOX-5 setting for USB injection = 2252 kc

- b. If the output band switch on the SBE-6 is in the lowest position, and your on the air frequency is between 1.75 and 3.75 mcs, reverse the above procedure. That is, subtract the TIS-3 center frequency from the VOX-5 setting for upper sideband injection, and add the TIS-3 center frequency to the VOX-5 setting for lower sideband injection.

- c. If the output band switch on the SBE-6 is in the lowest position, i. e., 1.75 - 4.25 mcs and the on the air frequency is between 3.75 mc and 4.00 mc; subtract one-half the TIS-3 center frequency from the VOX-5 setting for upper sideband injection, add one-half the TIS-3 center frequency to the VOX-5 setting for lower sideband injection.

Example: On the air frequency = 4000 kc

$$\text{Initial VOX-5 setting} = \frac{4000 + 250}{2} = 2125 \text{ kc} \quad (\text{From step 1-b})$$

$$\text{TIS-3 center frequency} = 2 \text{ kc}$$

$$\text{Proper VOX-5 setting for USB Injection} = 2124 \text{ kc}$$

$$\text{Proper VOX-5 setting for LSB Injection} = 2126 \text{ kc}$$

- d. If the output band switch on the SBE-6 is in the 4-8 mcs position and the on the air frequency is between 4.00 mcs and 4.25 mcs, reverse the above procedure. That is, add one-half the TIS-3 center frequency to the VOX-5 setting for USB injection, and subtract one-half the TIS-3 center frequency for LSB injection.

NOTE

Following the above procedure will cause the mark-space frequency shift to revolve around the assigned frequency and not around a frequency removed from the assigned frequency by an amount equal to the TIS-3 center frequency.

- e. Return to Step 1-c and continue the tuning procedure for VOX-5.

2-3. TUNING PROCEDURE FOR VOX-5 WHEN USED AS RECEIVER OSCILLATOR

When receiving voice or tone multiplex signals, the VOX-5 may be used in place of the Receiver HFO, IFO, and BFO.

STEP 1. Place receiver front panel INT/EXT switch in EXT position.

STEP 2. Tuning VOX-5 HFO - The VOX-5 master oscillator circuitry is continuously tunable over the range of 2-4 mcs. Higher HFO frequencies are obtained by multiplying this basic frequency by 2, 4, 8, or 16.

Set the VOX-5 switches as follows:

POWER	ON
HFO	ON
BEAT	ON
XTAL	VMO

STEP 3. At this point, it is necessary to calculate the VOX-5 HFO output frequency.

This is done by adding the Receiver First IF frequency to the receive signal frequency. Receiver First IF frequencies are as follows:

Receiver Bands 1, 2, 3, - 455 KCS

Receiver Bands 4, 5, 6, - 3955 KCS

The sum of signal frequency and IF frequency will give you the VOX-5 HFO output frequency.

STEP 4. Set VOX-5 BAND-MCS switch to band corresponding to this sum frequency.

STEP 5. As mentioned earlier, the master oscillator circuitry of the VOX-5 operates only in the range of 2-4 mcs. To find the VOX-5 HFO setting, you must divide the sum frequency found in Step 3 by an even multiple number. This, then, will give you the VOX-5 HFO setting. These even dividers are as follows:

<u>VOX Band</u>	<u>Divide By:</u>
2-4 MCS	1
4-8 MCS	2
8-16 MCS	4
16-32 MCS	8
32-64 MCS	16

STEP 6. After determining HFO setting, calibrate MASTER OSCILLATOR FREQUENCY dial in following manner:

- a. Turn dial to the even 100 KC point nearest the HFO setting.
- b. Adjust CALIBRATE knob for zero beat indication on ZERO BEAT indicator lamp, or for audio zero beat on headphones plugged into phone jack.
- c. Lock CALIBRATE control.
- d. Reset MASTER OSCILLATOR FREQUENCY dial to Step 5 frequency.
- e. Lock Dial.
- f. Turn BEAT switch OFF.
- g. Turn METER switch to the HFO position.

STEP 7. Peak TUNING adjust while watching DC MILLIAMMETER located on VOX-5 front panel.

STEP 8. Set VOX--5 OUTPUT gain control for a reading of 2 on the MILLIAMMETER.

STEP 9. Turn IFO ON. No adjustment is necessary.

STEP 10. Turn BFO ON. (This may be left OFF when using the MSR). The BFO is supplied with two crystals. Selection is made by S-105 located on rear of the chassis. Select crystal as follows:

455 kcs - Voice and tone multiplex operation.

456.900 kcs - FAX operation. Not normally used;
since in the FAX mode the VOX-5
is needed as a transmitter master
oscillator. However, for "Receive Only"
FAX the VOX-5 may be used in place
of the MSR.

STEP 11. After the VOX-5 is set up, return to the GPR-92 and tune in the desired
signal using the internal Receiver oscillators (INT/EXT switch in INT
position). After the signal is tuned in, place receiver INT/EXT switch
in EXT position and fine tune the VOX-5 using the large main tuning dial.
(If using MSR, perform fine tuning at it instead of at VOX-5.)

Example 1:

Receive on the air frequency	3992 kcs
Receiver Band	3
Receiver First IF Frequency	455 kcs
Desired HFO Output Frequency = 3992 kcs + 455 kcs	= 4447 kcs
VOX-5 Band	4-8 mcs
Even Multiple Divider	2
Master Oscillator Setting = $\frac{4447}{2}$	2223.5 kcs
Calibrate at nearest 100 KC point of 2200.0 kcs	

Example 2:

Receive on the air frequency	7380.0 kcs
Receiver Band	4
Receiver First IF Frequency	3955 kcs
Desired HFO Output Frequency = 7380 kcs + 3955 kcs	= 11335 kcs
VOX-5 Band	8-16 mcs
Even Multiple Divider	4
Master Oscillator Setting = $\frac{11335}{4}$	2833.75 kcs
Calibrate at nearest 100 KC point of 2800.0 kcs	

2-4. CW OPERATION

In this system this mode of operation is defined as "Carrier Only" operation with the carrier turned on and off by a handkey in accordance with the Morse Code.

STEP 1. On Console DC Control Panel, place Mode Select Switch in RATT and VOICE position.

STEP 2. At RF Patch Panel - Patch whip to XMTR; Patch T/R or doublet to HFD-1

STEP 3. At LSP-6 Speaker - By placing the speaker select switch located on the LSP-6 in either of the first two positions, the audio output of the GPR-92 may be picked up by the right-hand speaker of the LSP-6.

STEP 4. At GPR-92 - Tune Receiver as per tuning procedure in GPR-92 instruction manual. Upon completion of tuning, check to ensure that front panel SEND-RECEIVE Switch is in the SEND position.

NOTE

This station is provided with a semi-automatic control unit which is used in CW operation. This unit supplies a sidetone of your transmitted message to the final audio amplifier in the GPR-92. For this reason, only the GPR-92 should be used as a CW receiver.

STEP 5. At Transmitter - Tune transmitter as outlined in the SBT-1KV transmitter tuning procedure in this manual. Upon completion of tuning, set the following controls in the positions indicated below:

CARRIER INSERT on SBE-6 to 10 (maximum)

TRANSMITTER VOLTAGES on PS4A to STANDBY

FINAL VOLTAGES on PS4A to ON

XMTR on SBE-6 to OFF

EXCITER on SBE-6 to ON

LSB and USB selector switches on SBE-6 to OFF

STEP 6. On Console DC Control Panel, move Mode Select switch to CW position.

STEP 7. At CW Key - Plug CW Key into jack provided on DC Control Panel. You are now ready for 2-Way CW operation.

NOTE

The semi-automatic CW control unit which is mounted on the rear inside door of the transmitter will switch your station from send to receive. Depressing the CW Key will automatically energize the transmitter. Releasing the key will allow the transmitter to de-energize after a period of time which can be adjusted from 0 to approximately 5 seconds. For a more detailed discussion of the CW Control Unit see the unit theory of operation in Section I this manual.

2-5. VOICE OPERATION

In this system, this mode of operation is defined as Single-Sideband voice operation with fully suppressed carrier.

STEP 1. On Console DC Control Panel place Mode Select Switch in RATT and VOICE position.

STEP 2. At RF Patch Panel - Patch Whip to XMTR.

Patch T/R or Doublet to HFD-1

STEP 3. At Speaker Panel - Select MSR audio on three position switch.

STEP 4. At IF Patch - Connect GPR-92 IF Out to MSR IF In.

STEP 5. At Receiver - Tune receiver as per tuning procedure in GPR-92 instruction manual.

NOTE

For optimum reception the GPR-92 receiver should be used. When it is, the VOX-5 Variable Frequency Oscillator mounted in the transmitter rack may be used in place of the internal oscillators in the GPR-92 Receiver. To accomplish this, follow the VOX-5 tuning procedure as described in this manual.

Upon completion of tuning, place Receiver front panel SEND-RECEIVE switch in the SEND position. (This will allow audio muting of the Receiver during your transmit time, a function available only on the GPR-92.)

STEP 6. At MSR - Tune MSR Converter as per procedure in MSR instruction manual for SSB operation. Adjust speaker gain as necessary for good listening.

STEP 7. At Transmitter - Tune transmitter as outlined in SBT-1KV transmitter tuning procedure in this manual. Upon completion of transmitter tuning, set the following transmitter controls in the positions indicated below:

CARRIER INSERT on SBE-6 to Zero (0)

TRANSMITTER VOLTAGES on PS4A to Standby

TRANSMITTER FINAL VOLTAGES on PS4A to ON

XMTR on SBE-6 to OFF

EXCITER on SBE-6 to ON

Desired Sideband Selector switch (LSB or USB) on SBE-6 to MIKE

Undesired Sideband Selector switch (LSB or USB) on SBE-6 to OFF

STEP 8. Plug microphone into front panel jack provided on SBE-6. Depress push-to-talk switch and note that transmitter energizes. Speak into microphone and adjust sideband GAIN and RF OUTPUT controls for power output peaks at desired operating level.

NOTE

If transmitter "kicks down" during transmissions, increase adjustment of ALDC control, located on power amplifier front panel.

STEP 9. At MSR - Fine tune converter while receiving transmission from remote station.

2-6. RADIO TELETYPE OPERATION USING AUDIO TONE EQUIPMENT

In this system, this mode of operation employs an 85-cycle frequency shift signal removed from the assigned carrier frequency by an amount equal to the center frequency of the tone keyer.

STEP 1. On Console DC Control Panel place Mode Select Switch in RATT and VOICE position.

STEP 2. At RF Patch Panel - Patch Whip to XMTR

Patch T/R or Doublet to HFD-1

STEP 3. At IF Patch - Connect GPR-92 IF OUT to MSR IF IN.

STEP 4. Connect MSR AF OUT to 102A AF IN.

STEP 5. At Teletype ASR - Check to insure that unit is turned on and running, and that 3-position switch located on Teletype Control Unit (unit with hand key) is in RECEIVE position.

NOTE

For a detailed description of the overall function of the Teletype Control Unit read theory of operation in Section I of this manual.

- STEP 6. At GPR-92 - Tune receiver as per tuning procedure in GPR-92 instruction manual. The VOX-5 Variable Frequency Oscillator has been cabled to the GPR-92, and must be used as an external HFO, IFO in place of the internal receiver oscillators. Refer to VOX-5 Tuning Procedure in this booklet. Upon completion of tuning, place Receiver front panel SEND-RECEIVE switch in RECEIVE position.
- STEP 7. At MSR - Tune Converter as per tuning procedure for SSB operation in MSR instruction manual.
- STEP 8. At Receive Tone Equipment - No Tuning is required.
- STEP 9. Fine Tune Receiver and MSR for optimum copy on Teletype Page Printer.
- STEP 10. With the Teletype Control Unit 3-position switch in the TRANSMIT position, verify that the PSP-2 battery supply (located below console desk extension) is on and set for 60 ma DC, and that the model 101A Tone Keyer is in the line (L) position.
- STEP 11. Verify that the CHAN-1 and CHAN-2 Toggle switches on the TIS-3 are in the LINE position.
- STEP 12. Place the 3-position lever switch on the Teletype Control Unit (unit with hand-key) in the RECEIVE position.
- STEP 13. Verify that the Channel Select switches (LSB and USB) on the SBE-6 are both in the OFF position. (These switches are labeled MIKE, CH-1, CH-2, OFF).
- STEP 14. Tune transmitter as outlined in transmitter tuning procedure, except for Step 5. The VOX-5 is not used as the XMTR master oscillator in this mode since it is being used as a receiver HFO. Upon completion of tuning set the following controls in positions indicated.

CARRIER INSERT on SBE to Zero

TRANSMITTER VOLTAGES on PS4A to ON

FINAL VOLTAGES on PS4A to ON

XMTR on SBE to OFF

EXCITER on SBE to ON

USB Selector on SBE to CH-1 if transmitting on USB; to OFF
if using LSB.

LSB Selector on SBE to CH-1 if transmitting on LSB; to OFF
if using USB

STEP 15. With SBE-6 OUTPUT control remaining as it was upon completion of transmitting tuning, adjust sideband GAIN control on SBE-6 for desired level on ATS wattmeter. This must be no higher than what was had upon completion of the ALDC adjustment or the ALDC will have to be reset.

STEP 16. Turn TRANSMITTER VOLTAGES switch on PS4A to Standby. From this point on all that is necessary is for the operator seated at the Teletype ASR to change the lever switch on the Teletype Control Unit from Ident to Transmit to Receive as desired.

NOTE

A more detailed description of the Teletype Control Unit is available in Section I of this manual.

2-7. FACSIMILE OPERATION

In this system, this mode employs a 1000-cycle frequency shift signal at the assigned carrier frequency for the transmission and reception of pictorial matter.

STEP 1. On Console D.C. Control Panel, place mode select switch in RATT
and VOICE position.

STEP 2. At RF Patch Panel - Patch Whip Ant. to XMTR.

Patch DOUBLET to HFD-1

NOTE

To avoid the interruption of an incoming FAX signal upon energizing the transmitter, the doublet antenna should always be used as the receive antenna when in the FAX mode.

STEP 3. At IF Patch - Connect GPR-92 IF OUT to MSR IF IN.

STEP 4. At AF Patch - Connect MSR AF OUT to FAX REC.

STEP 5. At TIS-3 - Tune as per TIS-3 manual, section 3, FAX operation. Verify that CH-1 and CH-2 Toggle switches are in the FSK, FAX, CW position and that CENTER FREQ CPS control is in the 2000 position.

STEP 6. At 9208C FAX Scanner - Verify that both scanner and converter are ready to operate per Alden instructions.

STEP 7. Tune SBT-1KV transmitter as outlined in transmitter tuning procedure in this manual. Upon completion of tuning set the following controls in the positions indicated:

CARRIER INSERT on SBE-6 to Zero (0)

TRANSMITTER VOLTAGES on PS4A to ON

FINAL VOLTAGES on PS4A to ON

XMTR on SBE to OFF

EXCITER on SBE-6 to ON

Desired Sideband

Select Switch on SBE-6 to CH-1

Undesired Sideband

Select Switch on SBE-6 to OFF

With SBE-6 OUTPUT control remaining as it was upon completion of transmitter tuning, adjust sideband GAIN control (on SBE-6, next to sideband select switch) for desired output on ATS wattmeter. This must be no higher than what was had upon completion of the ALDC adjustment or the ALDC will have to be reset.

- STEP 8. Return to facsimile scanner and place it in the fully operate, run, condition.
- STEP 9. Set up the 9203CA Facsimile Recorder and Converter per Alden instructions for receipt of a 1900-cycle frequency shift FAX signal.
- STEP 10. Tune GPR-92 receiver per GPR-92 instruction manual procedure.
- STEP 11. Tune MSR per MSR instruction manual procedure. This unit acts as the BFO and audio amplifier. It receives the IF output of the GPR-92.
- STEP 12. Fine tune GPR-92 and MSR for optimum copy on the Facsimile recorder.

2-8. RADIO TELETYPE OPERATION USING THE TIS-3 TONE INTELLIGENCE UNIT -
SEND ONLY.

In this system, this mode of operation employs 850-cycle frequency shift keying at the assigned carrier frequency.

- STEP 1. On Console D.C. Control Panel place Mode Select switch in RATT and VOICE position.
- STEP 2. At RF Patch Panel - Patch Whip to XMTR.

Patch T/R or doublet to HFD-1

- STEP 3. At DC Patch Panel - Patch from TIS-3 to looping jack associated with AN/UGC-6 SEND. Dummy out 101A IN.
- STEP 4. At AN/UGC-6 (Mod. 28 ASR) - Verify that Teletype Control Unit 3-position lever switch is in the transmit position and ASR is turned on.
- STEP 5. Verify that PSP-2 battery supply is on and adjusted for 60 ma.
- STEP 6. Place 3-position lever switch on Teletype Control Unit in RECEIVE position.
- STEP 7. At TIS-3 - Tune as per TIS-3 manual, section 3, for FSK operation 60 ma neutral key. Verify that CH-1 toggle switch is in the FSK, FAX, CW position. Always use 2000-cps for your center frequency.
- STEP 8. At Transmitter - Tune transmitter as outlined in SBT-1KV transmitter tuning procedure in this manual. Upon completion of tuning, set the following controls in the positions indicated:

CARRIER INSERT on SBE to Zero

TRANSMITTER VOLTAGES on PS4A to ON

FINAL VOLTAGES on PS4A to ON

XMTR on SBE to OFF

EXCITER on SBE to ON

Desired Sideband Select Switch on SBE to CH-1

Undesired Sideband Select Switch on SBE to OFF

With SBE-6 OUTPUT control remaining as it was upon completion of transmitter tuning, adjust sideband GAIN control (on SBE-6 next to sideband select switch) for desired output on ATS wattmeter. This must be no higher than the power output which was noted upon completion of the ALDC adjustment or the ALDC will have to be reset.

STEP 9. Turn TRANSMITTER VOLTAGES switch on PS4A to standby. From this point on, all that is necessary is for the operator seated at the Teletype ASR to change the lever switch on the Teletype Control Unit from Transmit to IDENT as necessary.

NOTE

A more detailed description of the Teletype Control unit is available in section I of this manual.

APPENDIX A
REPLACEMENT PARTS LIST

This section contains the replacement parts lists for the CW Control Unit and the Teletype Control Unit. A Manufacturers Code is provided at the end of this section.

REPLACEMENT PARTS LIST FOR CW CONTROL UNIT

<u>Circuit Symbol</u>	<u>Number</u>	<u>Mfgr.</u>	<u>Description</u>
C1	8-350 BBR	CD	Capacitor, Elect, 8 Mfd, 350V
C2	5HK-D10	SP	Capacitor, Disc, 1000 MMF, 500V
C3	5HK-D10	SP	Capacitor, Disc
C4	4TM-D50	SP	Capacitor, Paper, 5000 MMF, 400V
C5	6TM-P25	SP	Capacitor, Paper, 0.25 MFD, 600V
C6	2-450 BBR	CD	Capacitor, Elect, 2 MFD, 450V
C7	8-600 BBR	CD	Capacitor, Elect, 8 MFD, 600V
C8	8-600 BBR	CD	Capacitor, Elect, 8 MFD, 600V
C9	8-600 BBR	CD	Capacitor, Elect, 8 MFD, 600V
R1		OH	Resistor, Comp, 1K, 1/2W, $\pm 10\%$
R2		OH	Resistor, Comp, 150K, 1/2W $\pm 5\%$
R3		OH	Resistor, Comp, 150K, 1/2W $\pm 5\%$
R4		OH	Resistor, Comp, 270K, 1/2W $\pm 10\%$
R5		OH	Resistor, Comp, 270K, 1/2W $\pm 10\%$
R6		OH	Resistor, Comp, 560 OHM, 1/2W, $\pm 5\%$
R7		OH	Resistor, Comp, 470K, 1/2W $\pm 10\%$
R8	CMU-5011	OH	Resistor, Variable, 500 OHM, 2 Watt
R9		OH	Resistor, Comp, 100K, 1W, $\pm 10\%$
R10		OH	Resistor, Comp, 1.5 MEG, 1/2W $\pm 5\%$
R11	CLU-5052	OH	Resistor, Variable 5 MEG, 2 Watt
R12		OH	Resistor, Comp, 56K, 2W, $\pm 10\%$
R13		OH	Resistor, Comp, 27K, 2W, $\pm 10\%$
R14		OH	Resistor, Comp, 10K, 2W, $\pm 10\%$
R15		OH	Resistor, Comp, 10K, 1/2W, $\pm 10\%$
R16		OH	Resistor, Comp, 100K, 1/2W, $\pm 10\%$
R17		OH	Resistor, Comp, 220K, 1/2W, $\pm 10\%$

Appendix A

Replacement Parts List for CW Control Unit (continued)

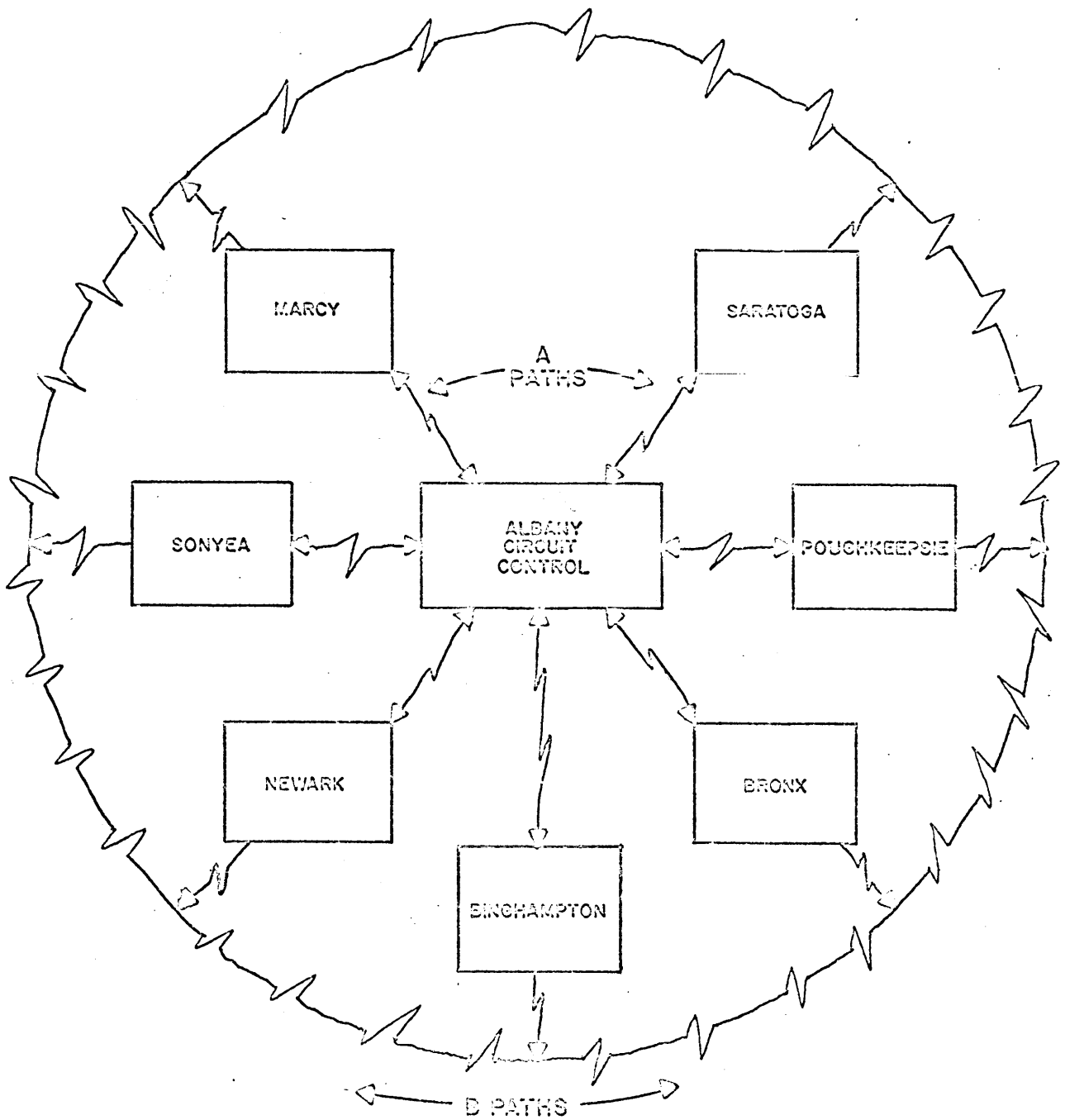
<u>Circuit</u> <u>Symbol</u>	<u>Number</u>	<u>Mfgr.</u>	<u>Description</u>
K1	ML11D	PB	Relay, Plate Circuit, 10K Coil, 2C Cont
V1	5814A	RCA	Tube, Electron
V2	6C4	RCA	Tube, Electron
V3	6AL5	RCA	Tube, Electron
V4	6AH6	RCA	Tube, Electron
E1	4-140	CJ	Terminal Strip
CR1	1N2071	T1	Diode
CR2	1N2071	T1	Diode
CR3	1N561	T1	Diode
CR4	1N561	T1	Diode
T1	62G551	KN	Power Transformer PR1:115VAC 60CPS SEC #1:500VCT @40MA SEC #2:6.3VCT @2A
L1	61G485	KN	Choke, 8HY @85MA
F1	MDL3/8	BU	Fuse, 3/8 AMP
XF1	HKL	BU	Fuseholder
XV1	9XM	CJ	Socket, Tube, 9 Pin Noval
XV2	7XM1	CJ	Socket, Tube, 7 Pin Min
XV3	7XM1	CJ	Socket, Tube, 7 Pin Min
XV4	7XM1	CJ	Socket, Tube, 7 Pin Min
XVS1	9S2	CJ	Shield, Tube
XVS2	7S2	CJ	Shield, Tube
XVS3	7S2	CJ	Shield, Tube
XVS4	7S3	CJ	Shield, Tube
TB1	3002	SM	Terminal Board
TB2	3003	SM	Terminal Board
TB3	3007	SM	Terminal Board
TB4	3009	SM	Terminal Board
P1	7465	HU	Plug
K2	KHP17A11	PB	Relay 4PDT 6.3 VAC
XK2	9KH1	PB	Socket, Relay

REPLACEMENT PARTS LIST FOR RADIO TELETYPE CONTROL UNIT

<u>Symbol</u>	<u>Part Number</u>	<u>Mfgr.</u>	<u>Description</u>
I1	6S6	GE	Lamp
I2	6S6	GE	Lamp
XI1	1957	SM	Indicator
XI2	1957	SM	Indicator
	1916 (Red)	SM	Jewel
	1916 (Amber)	SM	Jewel
S1	60324L	SW	Switch
XS1	530	SW	Switch Mounting Plate
	114-310	JO	Telegraph Key
TB1	600-3/4ST-12	SM	Terminal Board

MANUFACTURERS CODE

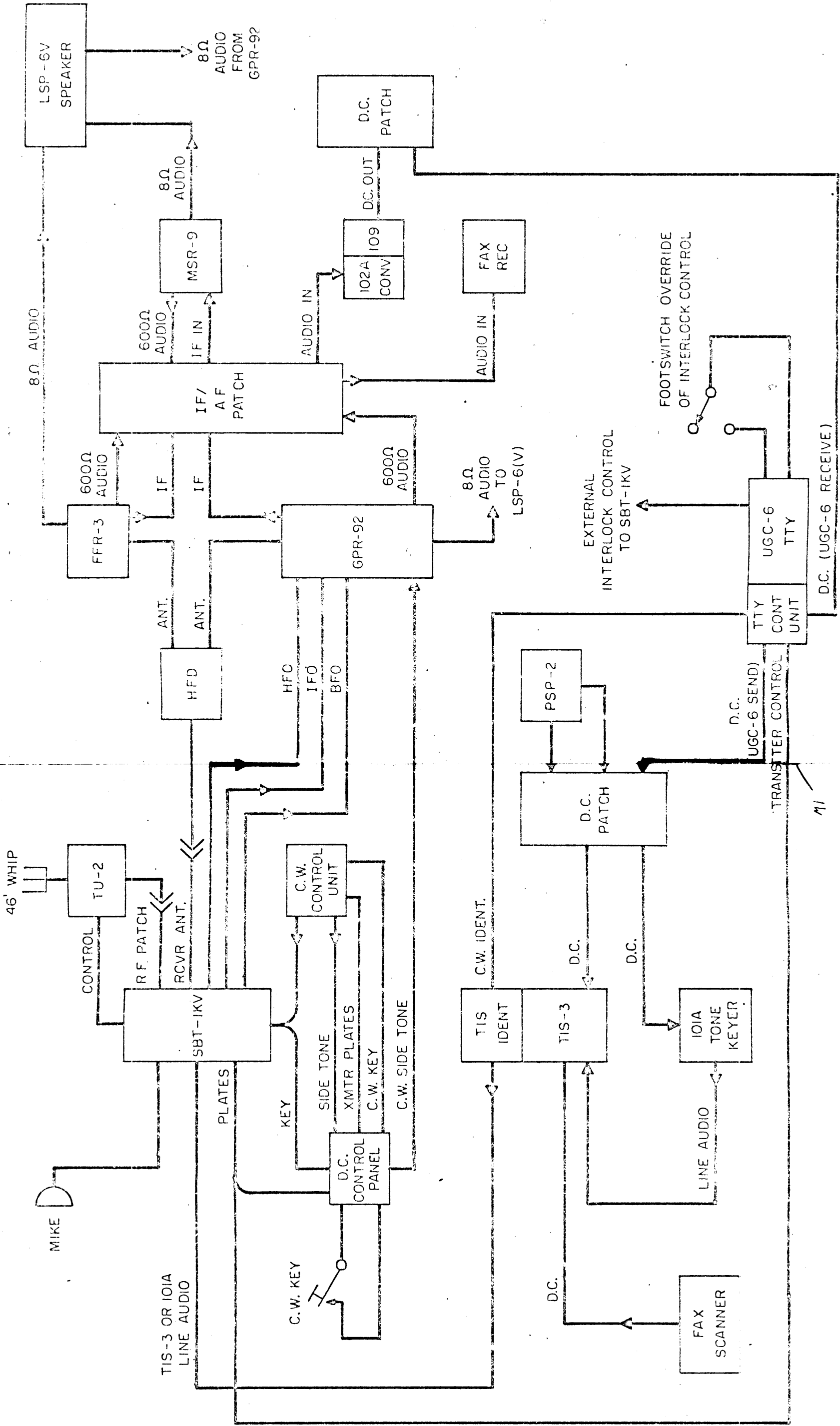
<u>Code</u>	<u>Manufacturer</u>
PB	Potter and Brumfield
RCA	Radio Corp. of America
CJ	Cinch-Jones
TI	Texas Instruments
KN	Knight (Allied Radio)
BU	Bussman
SM	H. H. Smith
HU	Harvey Hubbell
CD	Cornell-Dubilier
SP	Sprague
OH	Ohmite
CE	Centralab
GE	General Electric
SW	Switchcraft
JO	E. F. Johnson



A PATH - VOICE, CW, FSK, FAX

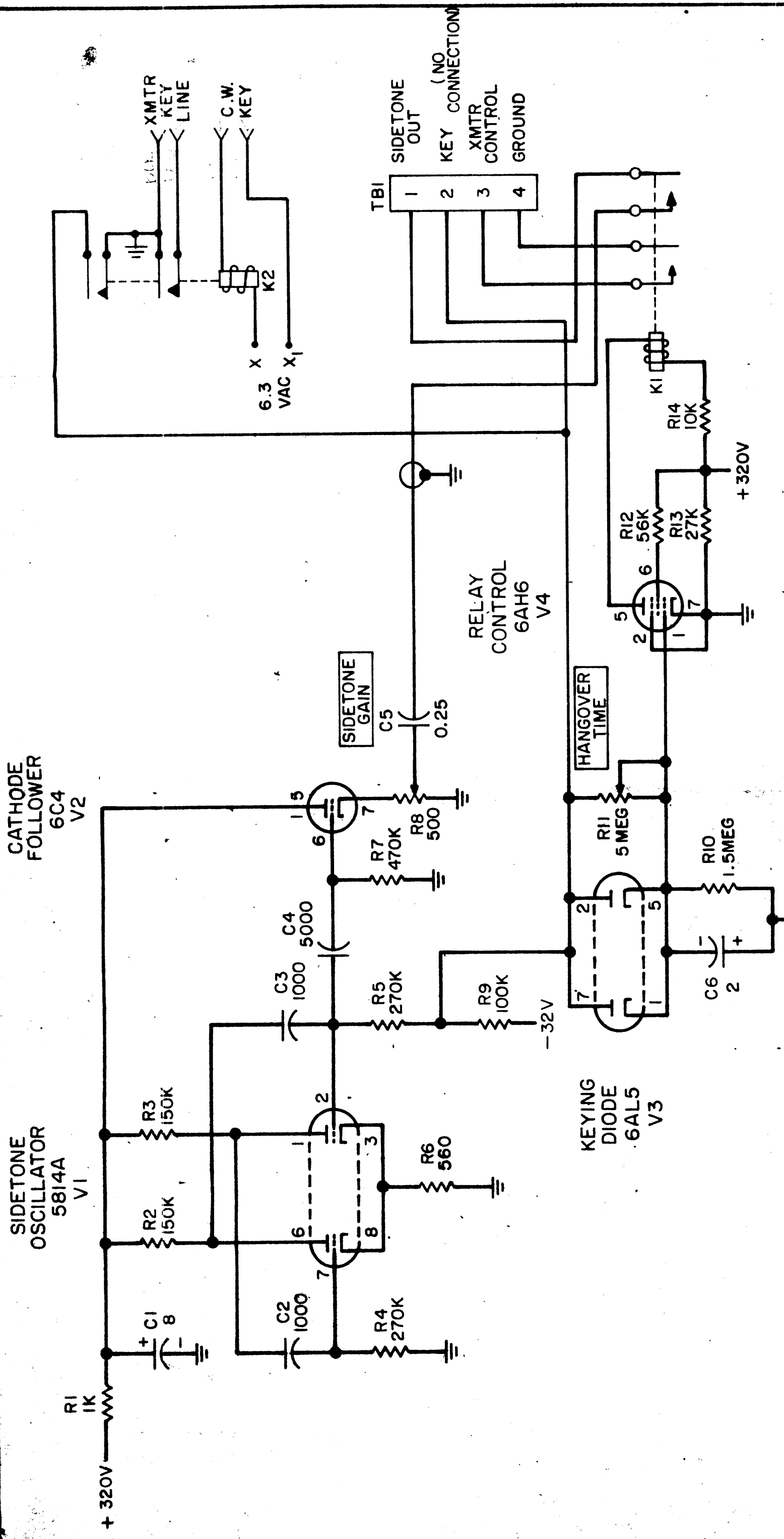
B PATH - VOICE, CW, FAX (WITH CIRCUIT CONTROL PERMISSION)

RADIO PATHS
 NEW YORK STATE CIVIL DEFENSE
 EMERGENCY RADIO NETWORK



AUXILIARY SITE BLOCK DIAGRAM
NEW YORK STATE CIVIL DEFENSE
NETWORK

AV - 0038



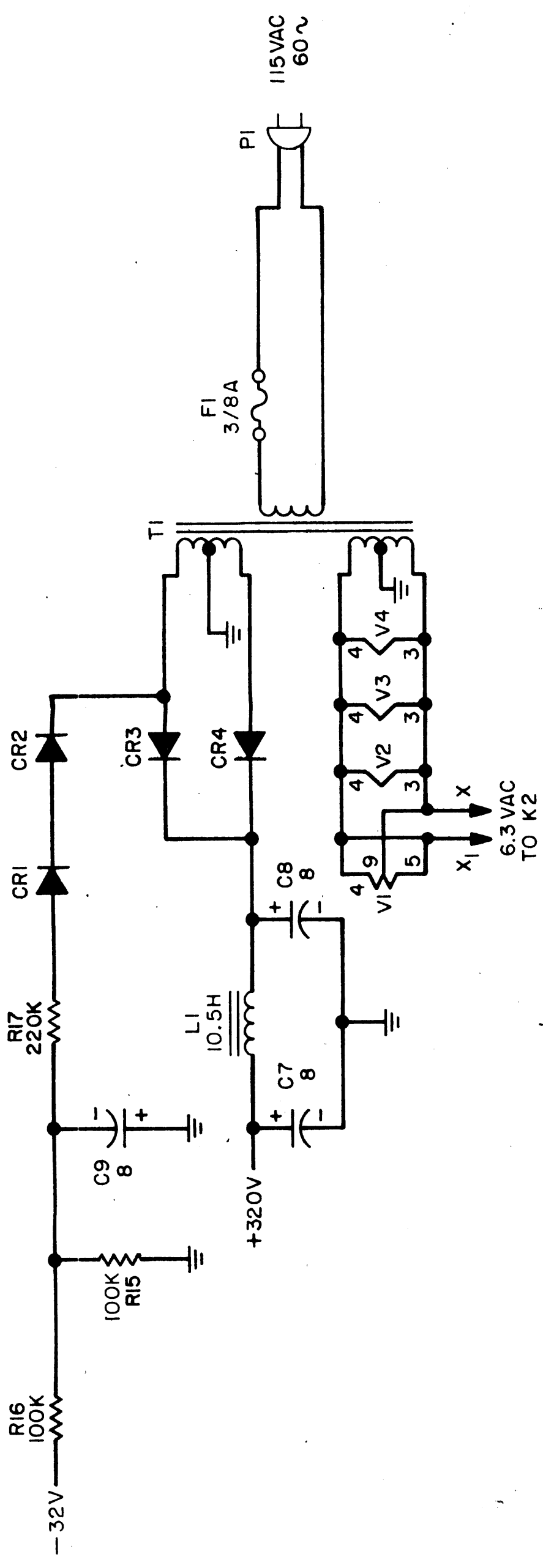
REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
	#	T.M.C. SYSTEMS, INC.	
	#	ALEXANDRIA, VIRGINIA	
	#	CW CONTROL UNIT	
	#	SCHEMATIC DIAGRAM	
	#	K.N.DETRO	
	#	FINISH APPROVAL	
TYPE & TEMPER	HEAT TREAT. SPEC.	DRAWN	CHECKER
FINISH	SPEC. NO.	AV - 0038	
		B	

SHEET 2 OF 4

RE	SECTION	MODEL	ABBY. NO.	DATE
				5-18-65
USED ON				

DATE	CH. NO.	DRAFTS	CHECKER	ENG. APP.
12/23/64	50X			
1/12/65				
SCALE: NONE				
MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND ANY DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES				
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCE ON PRACTICE ± 1/64 DECIMALS ± .005 ANGLES ± 1/2°				

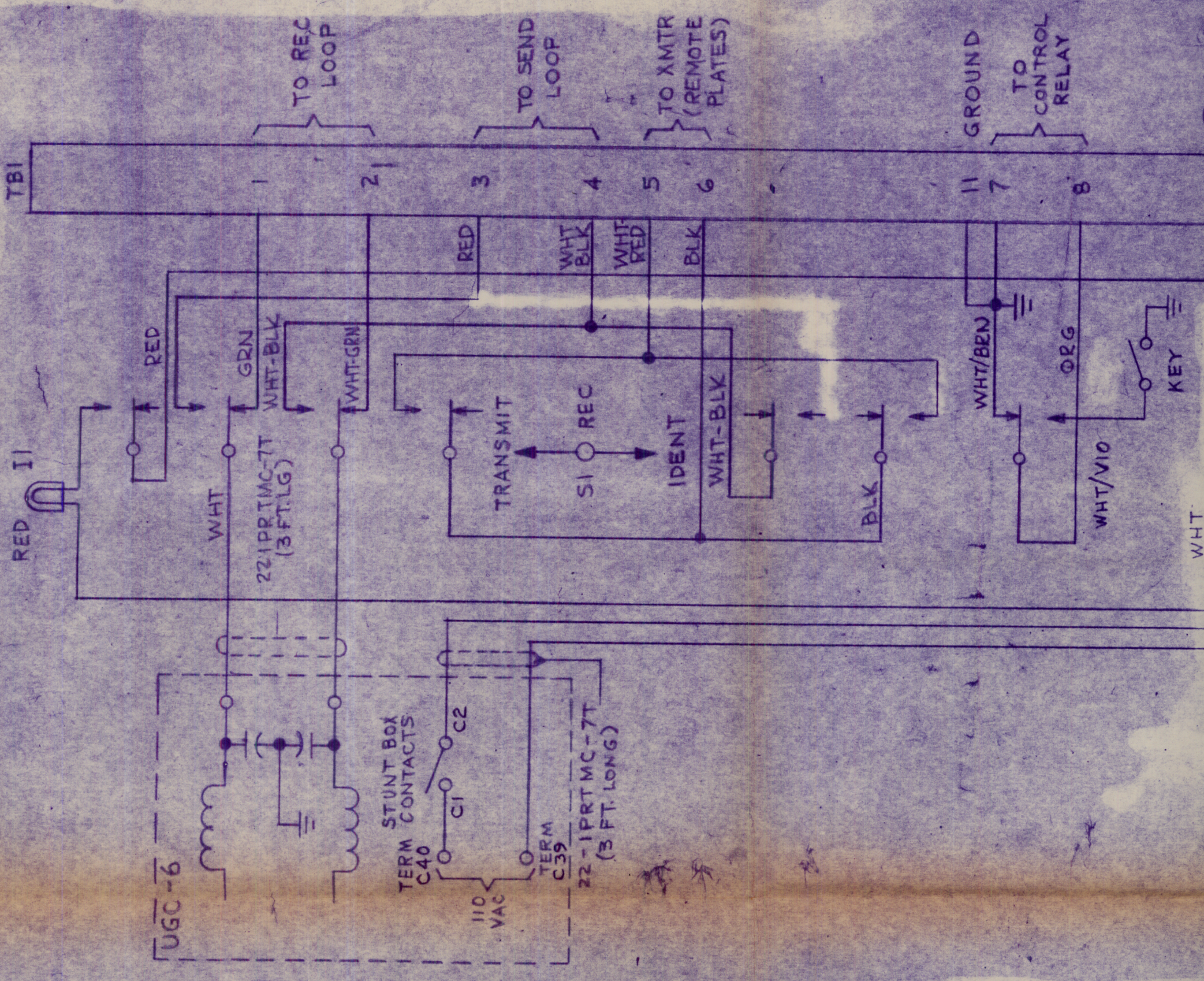
AV-0038



REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
	#	T.M.C. SYSTEMS, INC. ALEXANDRIA, VIRGINIA	
	#	CW CONTROL UNIT	
	#	SCHEMATIC DIAGRAM	
	#	K.N. DETRO	DRAWN
	#		CHECKER
	#		FINAL APPROVAL
	#		AV-0038
	#		MECH. DES. APP. MECH. DES. APP.

SHEET 3 OF 4			
REQ. PER UNIT	MODEL	SECTION	DATE
			5-19-65
			ASBY. NO.
			U ED ON

SYM	DESCRIPTION	DATE	CH. NO.	DRAFTS	CHECKER	ENG. APP.
1A	ADDED AC. TO K2 & FIXED PLUG	10/20/65				
SCALE: NONE						
MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND ANY DEVIATIONS WILL BE CAUSE FOR REJECTION.						
REMOVE ALL BURRS AND SHARP EDGES						
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ± .008 ANGLES ± 1/20						



UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS
±1/64 ±0.005

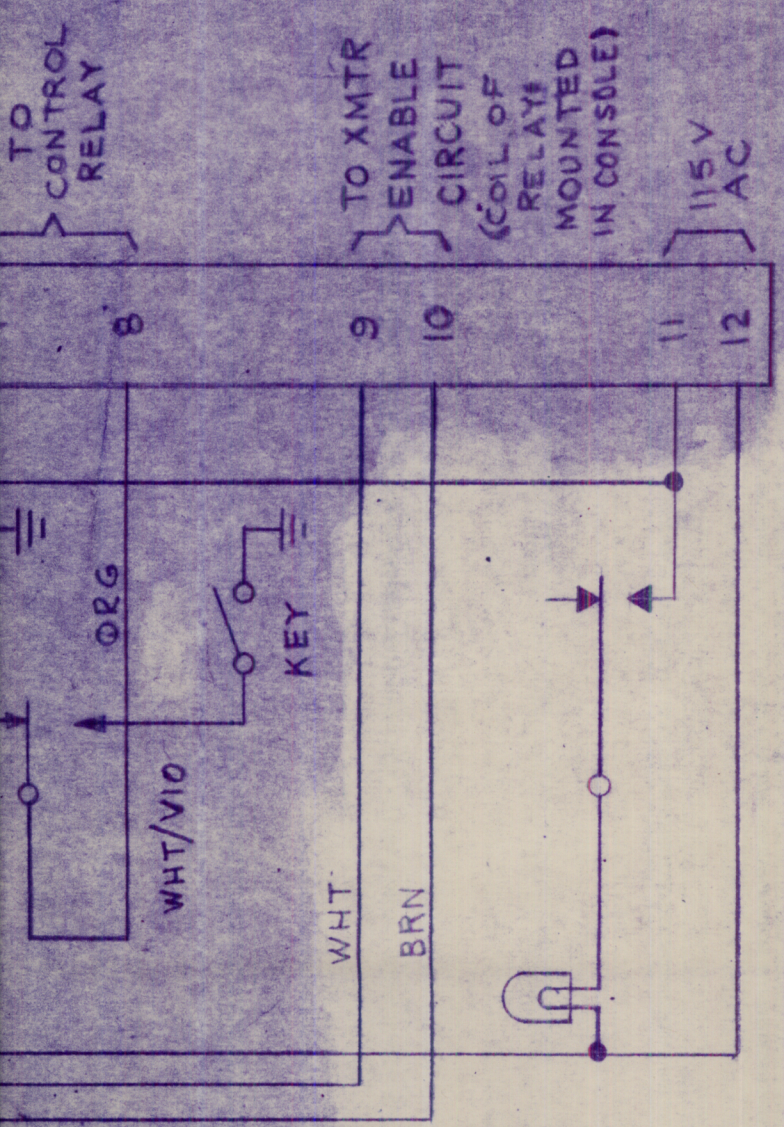
MATERIAL

MANUAL ONLY

FINISH

MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND ANY DEVIATIONS WILL BE CAUSE FOR REJECTION

REVISIONS			
ISSUE	DESCRIPTION	DRAFT	DATE APPROVED



QTY REQ	ITEM	PART NO.	DESCRIPTION	SYMBOL
BILL OF MATERIAL				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ±1/64 ±.005 ±1/2°		DATE	J.M.C. SYSTEMS INC ALEXANDRIA, VA	
MATERIAL		11-1-65	TELETYPE CONTROL UNIT SCHEMATIC DIAGRAM (AUXILIARY SITE)	
FINISH		DRAWN	CODE	
		CHECKED	SIZE	DWG NO
		PROJ. ENG.	18361	C A143-2-030
		PROJ. ENG.		ISSUE
		PROJ. MGR.		D
			SCALE	SHEET
			NONE	2