35 RECEIVE-ONLY TELETYPEWRITER SET

SERVICE MAINTENANCE

(TROUBLE SHOOTING)

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1. GENERAL

1.01 The trouble shooting information presented in this section consists of operational and electrical checks designed to lead maintenance personnel to the functional schematic and circuit area that is causing the trouble in the equipment.

1.02 A thorough knowledge of the sequence of operation for each functioning element is of fundamental importance. Refer to the appropriate section to clarify the operation and function of all teletypewriter set parts.

1.03 The functional schematic wiring diagrams referenced will be found in the appropriate section covering the functional diagrams and connecting information for the receive-only set (RO).

1.04 Where equipment failures are due to mechanical maladjustments, the technician should refer to the adjustment section for the component in question to determine the correct procedure and adjustment.

1.05 Lubrication failures will seldom occur when normal periodic maintenance procedures are followed. See the lubrication section of the component to determine maintenance schedules.

2. TOOLS AND TEST EQUIPMENT

2.01 Standard set of tools (wire gages, spring scales, spring hooks, wrenches, etc.) as required for component adjustments.

2.02 A volt-ohm-milliampere meter for checking voltages, current, resistance (continuity) and capacitors.

2.03 An eight level signal distortion test set to perform signal distortion tests.

2.04 A signal analyzer, also required to perform signal distortion tests on the set.

3. TROUBLE SHOOTING

3.01 Since teletypewriter sets are an assemblage of components, the first step in trouble shooting, if the trouble is not obvious, is to sectionalize the trouble to a particular component, then determine what specific mechanism or electrical part is faulty.

3.02 Failures of the equipment can be traced functionally by means of the trouble shooting chart. A step-by-step analysis of the behavior of the equipment in response to the tabulated checks will indicate the area of trouble in which to apply remedial measures outlined below and referenced in the chart. Since, in most cases, each check step is conditioned by the procedure in preceding steps, examine the condition of all controls before rechecking any step or otherwise performing any trouble shooting check out of sequence.

(a) Comprehensive electrical analysis of the equipment is not generally required in trouble shooting. Reference to an open condition is to a circuit through which current will not flow, due either to a break, a poor connection or a poor or dirty contact mechanism. References to a closed condition is to a normally or intermittently open circuit through which current will flow, either due to a short or to a sticky, dirty or poorly adjusted contact mechanism.

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(b) Running Open is a condition created by an open signal circuit, resulting in operation of typing and printing mechanisms because of the absence of a stop signal to latch the function clutches.

(c) Running Closed is a condition created by a closed signal circuit, resulting in failure of typing and printing mechanisms to respond to a signal, due to the absence of the start and spacing elements in the signal, or to mechanical failure.

(d) Garbling is a condition in which the response of the typing and printing mechanisms does not correspond to the mechanical or signal input.

(e) Blind is a condition in which a unit is turned off or otherwise disconnected to assure non-response to various signal inputs.

Note: If trouble shooting checks indicate abnormal electrical conditions, refer to the functional schematics referenced in the chart. If the trouble appears to be mechanical, isolate the unit, and refer to the associated adjustment section for the unit isolated.

PROCEDURE

3.03 Make a visual inspection of the equipment to determine if the trouble is caused by loose line or power connections, improperly set switches, erratic motor speed, or improper rangefinder setting.

3.04 Arrange the equipment to operate on a test circuit and perform the procedures normally followed after the installation of an RO set, to sectionalize the trouble. These procedures are primarily performed after initial installation of new or repaired equipment but may be used to assist in locating troubles when they occur.

3.05 Localizing Electrical Troubles: Most electrical troubles are found at the various contacts in the equipment, which include switch contacts, plug-in connector and pin contacts, wiring field terminals, soldered contacts, (including spliced wires), and chassis ground contacts. Electrical circuits in the teletypewriter set have terminal connections at the points where test must be made. Do not disturb the wiring more than necessary when testing or inspecting. Maintenance personnel must be thoroughly familiar with the schematic and wiring diagrams and use them while making point-to-point checks of the circuits. Schematic wiring diagrams of external equipment to which the teletypewriter set is connected furnish information helpful for testing and localizing trouble.

3.06 Power Supply Checks: To be sure that proper operating conditions exist, check the input power, AC circuits, and DC circuits in turn before making other tests. These checks will, of necessity, include normal operation of the parts in these circuits and the requirements of all adjustments which would affect the indicated trouble as related to the parts. When check of an adjustment is indicated, care should be exercised not to disturb the adjustment or related adjustments.

3.07 Continuity, Resistance, and Capacitor Checks

(a) Continuity: The continuity check is used to locate suspected open circuits. In making continuity checks, be sure that parallel current paths are disconnected. Make the tests by checking the continuity through the circuit suspected to be faulty by connecting the test leads so that the current can go only through the suspected circuit. Be sure no other part of the circuit is shunting the circuit being tested. If necessary, disconnect certain leads. Check all likely circuits in this manner. If, after checking all possible causes, the fault cannot be located, make a continuity test of the entire circuit. If continuity is indicated, test the other half of the circuit. Continue sub-dividing the circuit until the open point is definitely located.

(b) Resistance: The resistance check is used to locate suspected open or shorted coil windings, transformer windings, motor windings, fixed resistors and inductors. In making resistance checks, follow the same general procedures as those described for continuity checks.

(c) Capacitor: The capacitor check is used to locate shorted or leaking elements. To test, discharge the suspected capacitor with an insulated shorting jumper. Then disconnect one lead and connect the capacitor to an ohmmeter. Use the highest reading scale. A good capacitor will be indicated by the ohmmeter pointer first moving up the scale rapidly, then returning more slowly to the infinity mark. A capacitor which is open will give a reading of infinite ohms. A shorted

capacitor will give a reading of constant value between zero and infinity, depending upon the resistance of the short.

WARNING: Be extremely careful when handling charged capacitors. A severe electrical shock may be received from the capacitor or leads connected to a power supply in operation.

3.08 Electrical Checks

(a) Check for external interruptions to the 115 volt AC power supply by checking the power cord connections on the terminal board at the rear of the call control unit.

(b) Check fuses located on the call control unit and in the auxiliary ROTR cabinet. If open, rotate the associated motor by hand and check for excessive mechanical load before replacing the fuse. If a replaced fuse burns out immediately upon installation, check for shorted wiring in the motor, selector magnets, the copy light transformer, or the power transformer in the call control unit.

3.09 Localizing Mechanical Troubles

(a) Although mechanical troubles can occur in teletypewriter sets, no difficulty should be experienced in locating the fault if the sequence of operation is checked through its various steps. When a mechanical function fails to operate, or operates in a faulty manner, the trouble may be in a particular adjustment, or series of adjustments, or it may be in a particular assembly. One method for checking troubles involves checking the individual requirement for all adjustments in the faulty subassembly or mechanism. Use the related data found in the detailed adjustment procedures to determine the sequence to be followed.

(b) A second method involves setting up by hand the selecting mechanism and completing the operation by manually rotating the motor, shaft, gear, or cam that normally drives the assembly. This second method is usually quicker when only one adjustment is faulty and the remainder of the mechanism is in good condition. In such cases only the related adjustments need be checked.

(c) In some instances, faulty operation may be observed only when the mechanism is power driven. The experience of the maintenance personnel and the over-all condition of the equipment will indicate which method is the better approach to a particular trouble. In either mechanical or electrical troubles, additional aid in isolating the difficulty may be secured from records of previous troubles and adjustments.

3.10 The maintenance man can temporarily connect a hand dialer to originate calls during servicing by removing either telephone line from terminal K7 or K8 on the nine position terminal strip at the back of the Call Control Unit and connect his dialer between the wire removed and the terminal.

3.11 Refer to the following trouble shooting charts for a more complete tabulation of possible troubles.

TROUBLE SHOOTING CHART FOR RO SETS

STEP	PROCEDURE AND NORMAL INDICATION	TROUBLE	CHECK	FUNCTIONAL SCHEMATIC REFERENCE
1.	Depressing the ORIG key will result in dial tone being heard over the hand held receiver.	Dial tone is not heard.	Check for proper telephone line connections.	FS12 E-5
			Check circuit continuity.	FS12
			Check hand held receiver.	FS12 E-5
2.	When the RO set is called from another station, the motor will turn on; the cabinet lamps will light, and the answer back will be sent upon connection.	The motor does not turn on.	Check power line connections.	FS15 B-5
			Check fuses.	FS15 A-4
			Check motor thermal cut-off switch.	-
		Synchronous motor (on sets so equipped) runs at incorrect speed.	Check power line frequency.	-
		Governed motor (on sets so equipped) runs at incorrect speed.	Check 117VAC line.	-
			Check motor and governor brushes.	-
			Check governor adjustments.	-
		Governed motor speed uncontrollable.	Check governor resistor and capacitor.	-
			Check for sticking governor contacts.	-
		No cabinet illumination.	Check copy light receptacle.	FS15 B-8
			Check copy light transformer.	FS15 B-8
		Some cabinet copy lamps not illuminated.	Check bulbs and sockets.	FS15 C-8

STEP	PROCEDURE AND NORMAL INDICATION	TROUBLE	CHECK	FUNCTIONAL SCHEMATIC REFERENCE
3.	When connected, send all of the printing characters from the other station. The printer will properly type each character.	The typing unit runs open.	Check output from data set. Signal line ground to connector D9.	FS5 F-4
			Check output of selector magnet driver card.	FS5 C-7
			Check for open selector coils.	FS5 E-7
			Check for signal line continuity.	FS5
			Check selector adjustments.	-
		The typing unit runs closed.	Check output from data set signal line ground to connector D9.	FS5 F-4
			Check selector adjustments.	-
			Check signal line.	FS5
		Selector receiving margin short.	Check data set output. Signal line ground to connector D9.	FS5 F-4
			Check current output from selector magnet driver. 500 MA.	FS5 C-7
			Check selector magnets.	FS5 E-7
			Check selector adjustments.	-
			Check motor speed.	-
		Intermittent errors or garbling.	Check selector range finder (may be at marginal setting).	-
			Check current output from selector magnet driver. Should be 500 MA.	FS5 C-7
			Check selector magnets.	FS5 E-7
			Check selector adjustments.	-
			Check motor speed.	-

STEP	PROCEDURE AND NORMAL INDICATION	TROUBLE	CHECK	FUNCTIONAL SCHEMATIC REFERENCE
4.	While connected, send bell from the other station. The bell will ring and the printer will not print.	Bell does not ring.	Check bell stunt box contacts for open condition.	FS15 B-6
			Check bell circuit continuity.	FS15
			Check stunt box function bar coding.	-
5.	Depression of the CLR key will disconnect the call.	Call does not disconnect.	Check motor control relay (MCR)	FS10 C-7
6.	Twisting the out of service switch to the locking position will cause the out of service lamp to light and the ringer and automatic answer circuits to become disabled.	Out of service lamp does not light.	Check bulb.	FS11 B-3
			Check out of service switch contacts 7 & 8.	FS11 B-2
		Set automatically answers incoming call.	Check out of service switch contacts 9 & 10.	FS13 E-3
		Ringer rings on incoming call.	Check out of service switch contacts No. 5 & 6.	FS12 D-3
7.	Twisting the out of service switch to the restore (non-locking) position will cause the ORIG lamp to light and an audible dial tone from the hand held receiver.	Dial tone is not heard.	Check out of service switch contacts 3 & 4.	FS12 D-6
8.	With a connection established to another station, and the other station sends an E.O.T. code combination, the local RO will disconnect.	Set does not disconnect.	Check the E.O.T. stunt box contacts for an open condition.	FS9 F-3
			Check the E.O.T. circuit for continuity.	FS9
			Check the S relay in the data set for operation.	FS9 F-6
9.	The answer back will operate upon connection with another station and will also operate in response to a received WRU code combination.	Answer back mechanism does not trip upon connection with another station. (ANS lamp does not light).	Check the AN relay in the data set. (The relay should be operated).	FS13 B-3

STEP	PROCEDURE AND NORMAL INDICATION	TROUBLE	CHECK	FUNCTIONAL SCHEMATIC REFERENCE
			Check the M relay in the data set. (The relay should be operated).	FS6 B-1
			Check the CON relay contacts in the data set. (The contacts should be closed).	FS6 B-1
			Check the automatic answer circuit for proper continuity.	FS6 C-7
			Check the low paper contacts on the friction feed printer and the low tape switch on the ROTR (if applicable). The set will not answer automatically if these contacts are operated.	FS13 D-3
		Answer back does not operate in response to a received WRU code combination.	Check for continuity through the answer back clutch trip magnet circuit.	FS6
10.	When the paper supply on the friction feed printer runs low, the buzzer will buzz and the BUZ-RLS lamp will light.	Buzzer does not buzz.	Check buzzer connections.	FS13 D-1
			Check for an open in the buzzer coils.	FS13 D-1
		Buzzer does not buzz and BUZ-RLS lamp does not light.	Check for an open in the buzzer circuit.	FS13
			Check for an open condition across the low paper switch.	FS13 D-3
		BUZ-RLS lamp does not light.	Check BUZ-RLS bulb.	FS13 C-2
			Check BUZ-RLS lamp socket connections.	FS13 C-2
11.	A notched form is fed through the sprocket feed printer. The buzzer will buzz and the BUZ-RLS lamp will light when the notch passes the low paper alarm actuator.	Buzzer does not buzz.	Check buzzer connections.	FS13 D-1
			Check for open in buzzer coils.	FS13 D-1

STEP	PROCEDURE AND NORMAL INDICATION	TROUBLE	CHECK	FUNCTIONAL SCHEMATIC REFERENCE
		Buzzer does not buzz and BUZ-RLS lamp does not light.	Check for an open in the buzzer circuit.	FS13
			Check for an open condition across the low paper switch.	FS13 D-3
		BUZ-RLS lamp does not light.	Check the BUZ-RLS bulb.	FS13 C-2
			Check the BUZ-RLS lamp socket connections.	FS13 C-2
12.	Depressing the BUZ-RLS key will stop the buzzing and the BUZ-RLS lamp will remain lit.	Buzzer does not stop buzzing.	Check for a closed condition across BUZ-RLS contacts No. 31 and 32.	FS13 D-2
		BUZ-RLS lamp does not remain lit.	Check for an open condition across BUZ-RLS contacts No. 31 and 33.	FS13 D-2
13.	When in a low paper condition, the automatic answer circuit will be disabled to calls from another station, the set can answer manually by depressing the ANS key while the BUZ-RLS key is depressed.	The automatic answer circuit does not disable.	Check for a closed condition in the low paper switch.	FS13 D-3
		The set cannot answer manually.	Check for an open condition in the ANSWER key.	FS3 D-7
14.	When the last form is fed out of the sprocket feed printer, the set will automatically disconnect.	Set does not automatically disconnect.	Check paper out switch for open circuit condition.	FS8 D-3
15.	When another station transmits FORM-EOT in immediate succession to the RO when the RO sprocket feed printer is at the beginning of a form, the motor will not slow down until after the form feed out is finished.	The motor slows down before the form feed operation is completed.	Check for an open condition across the form out off normal contacts.	FS10 D-3

STEP	PROCEDURE AND NORMAL INDICATION	TROUBLE	CHECK	FUNCTIONAL SCHEMATIC REFERENCE
16.	When reconnected to another station and the other station transmits TAB-EOT in immediate succession to the RO sprocket feed printer, the printer will complete the tabulation operation before the motor slows down.	The motor slows down before the tabbing function is completed.	Check for an open condition across the V. TAB or H. TAB contacts on the page printer.	FS10 D-3
17.	When reconnected to another station and the other station transmits a form code to the RO sprocket feed printer, the printer will feed a formout. Depression of the CLR key after the form feed is finished, will not cause a form feed operation on the disconnect.	Depression of the CLR key causes a form feed operation on the disconnect.	Check for a closed condition across the form out off normal contacts.	FS7 A-4
18.	When reconnected to another station and the other station transmits an E.O.T. code to the RO sprocket feed printer while the form out off normal contacts are closed will cause the form to feed out.	Form does not feed out.	Check for an open condition across the form out off normal contacts.	FS7 A-4
19.	RO equipped with an auxiliary ROTR and reconnected to another station. The ROTR will become unblinded when it receives a TAPE code from the other station	ROTR remains blinded.	Check for an open condition across the RION stunt box contacts.	FS14 E-2
			Check circuit continuity.	FS14
20.	RO equipped with an auxiliary ROTR and connected to another station. The ROTR will become blinded and feed out TAPE when it receives a ~~TAPE~~ code from the other station.	ROTR remains unblinded.	Check the RCR relay. The relay should be de-energized.	FS14 C-2
			Check RIOF stunt box contacts for a closed condition.	FS14 E-2
		ROTR does not feed out tape.	Check for an open condition across the TFR No. 1 contacts.	FS14 B-3
			Check circuit continuity.	FS14

STEP	PROCEDURE AND NORMAL INDICATION	TROUBLE	CHECK	FUNCTIONAL SCHEMATIC REFERENCE
			Check tape feed magnet.	FS14 B-2
			Check mechanical linkages.	-
21.	RO equipped with an auxiliary ROTR and the all traffic switch in the all traffic position. The ROTR will normally be unblinded and will feed out tape on break and disconnect.	The ROTR is not normally unblinded.	Check wiring and continuity in conjunction with the all traffic switch.	FS14 D-2
		Tape is not fed out on break.	Check RB relay. Should be energized.	FS14 F-2
22.	RO equipped with an auxiliary ROTR including a turn around traffic control card. The ROTR will perform the functions described in steps 19, 20 and 21 except that the ROTR will be blinded to the locally generated answer back message.	The ROTR perforates tape during a locally generated answer back message.	Check output of turn around traffic control card in ROTR cabinet.	FS14 C-5
			Check circuit continuity of TATC.	FS14 D-4
Note:	THE FOLLOWING STEPS INCLUDE FEATURES WHICH WERE PROVIDED IN THE RO SET SPECIFICALLY AS AN AID IN MAINTENANCE.			
23.	Removing the bezel and operating the HERE IS Switch when connected to another station will cause the answer back mechanism to operate. Answer back will not repeat while switch remains operated.	Answer back mechanism does not operate.	Check HERE IS contacts No. 3 and 4 for open condition.	FS6 C-5
		Answer back mechanism repeats as long as HERE IS switch remains operated.	Check the ABR relay. The relay should remain energized until HERE IS switch is unoperated.	FS6 B-7
24.	Removing the bezel and operating the break switch when connected to another station will cause the RO printer to run open momentarily.	RO printer does not run open.	Check for closed condition across BREAK key contacts No. 1 and No. 2 when BREAK key is operated.	FS5 E-2
25.	Connect dialer per instructions in Par. 3.10 on page 3, then dial number of the automatic test line.	No break in dial tone or the wrong number dialed consistently.	Check associated RO circuitry for continuity.	-

STEP	PROCEDURE AND NORMAL INDICATION	TROUBLE	CHECK	FUNCTIONAL SCHEMATIC REFERENCE
26.	Connected to the test center with the TST key depressed, the RO set should monitor the traffic from the center and send it back for analysis.	Local message garbled or not received.	Check for data set output signal line ground to connector D9.	FS5 F-4
		Test center does not receive message.	Check circuit continuity in area of TEST key.	FS1 D-3
27.	Depress the CLR key and call will be disconnected.	Call does not disconnect.	Check motor control relay (MCR).	FS10 C-7