LOCAL TEST CABINET NO. 3

OPERATING AND TESTING METHODS

1. GENERAL

1.001 This addendum supplements Section 662-202-500, Issue 6.

1.002 This addendum is reissued to include information on the following:

(a) Drawing references.

(b) Method of establishing test connections.

(c) Table A (revised).

(d) Changing the designation of the DK1 circuit pack range extender from DK1 to 2A.

(e) Testing subscriber lines equipped with a 2A circuit pack range extender.

(f) General description of the Range Extender with Voice Frequency Gain (REG).

(g) Testing of subscriber lines equipped with a REG unit.

(h) Fig. 15 (added).

(i) Table J (added).

(j) Testing lines equipped with the KS-20988 multichannel subscriber carrier.

(k) Fig. 16 (added).

1. GENERAL

The following changes apply to Part 1 of this section:

(a) 1.04—added.

1.04 ▶This issue of the section is based on the following drawing:

SD-96181-01, Issue 27A.

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.◀

3. METHOD OF ESTABLISHING TEST CONNECTIONS (SEE TABLE A)

The following changes apply to Part 3 of this section:

(a) Table A—revised.

(b) 3.07, 3.11, and 3.12—revised.

Test Cabinet—Portable

3.07 ▶***Test Cabinet Used at ESS Protector Frame:*** If in and out tests are required, connect the protector frame to the test cabinet with a W4BR Cord (302-type connector) or a W4CJ cord (303-type connector). The 464 type plug is inserted into the MDF T and R jacks with the clamping bar toward the bottom of the cabinet. The protector unit is removed from the line under test and replaced with the 463-type plug of the test cord. When the test cabinet is to be bridged to the line without opening the connection, a W2FM cord is used. The 464-type plug is inserted in the MDF T and R jacks and the chuck end of the test cord is placed over tip and ring test pins located at the top and bottom of protector frame.◀

Test Cabinet Permanently Mounted Without Jack Panel

3.11 ***To Establish a Test Connection at ESS Protector Frame:*** Connection is established as if cabinet were portable as in 3.07. If cabinet is too far from protector frame, jacks must be provided as in 3.08. ▶Use the W4BR or W4CJ cord for in and out tests and the W2FM cord for bridging tests as in 3.07.◀

TABLE A

A. CORDS REQUIRED FOR PORTABLE TEST CABINET						
NO. REQ.	CODE	COLOR	LENGTH	EQUIPPED WITH	USE	HOW USED
2	3P7A	Slate	6 Ft	310 Plugs	Swbd	At Swbd E/W 49 Jacks
2	3P12E	Slate	6 Ft	309 Plug 310 Plug	Swbd	At Swbd E/W 92 Jacks
1	3P7A	Slate	6 Ft	310 Plug	Bat.	Bat. Supply
1	3P7A	Slate	6 Ft	310 Plug	Bat.	Test Bat.
1	3P7A	Slate	6 Ft	310 Plug	Bat.	Coin Supply
1	3P18B	Black	19.5 Ft	310 Plug 234 Plug	Patch	IDF
1	4W6A	Green	12 Ft	289B Plug 252A Plug 252B Plug	MDF	MDF E/W Other Than 121-Type Protectors or 300-Type Connectors
1	4W11A	Green	12 Ft	289B Plug 412A Plug 412B Plug	MDF	MDF E/W 121-Type Protectors or 300-Type Connectors
1	4W7A	Green	12 Ft	289B Plug 310A Plug	MDF	MDF E/W 444-Type Jacks
1	2W24A	Green	9.5 Ft	289B Plug 2-59 Cord Tips	MDF	MDF Protectors Where Required to Test the Line Without Opening it
1	6P4A	Slate	10 Ft	240 Plug 310 Plug 310 Plug	Conn	At Test Connector in Step-By-Step Office
1	W4BR	Black	16 Ft	464A Plug 463A Plug	Prot	ESS Protector Frame-In and Out Tests (302-Type Connector)
1	W4CJ	Slate	16 Ft	464A Plug 463A Plug	Prot	ESS Protector Frame In and Out Tests (303-Type Connector)
1	W2FM	Black	16 Ft	464A Plug 2-P15A864 (Chuck)	Prot	ESS Protector Frame Bridging Tests
B. CORDS REQUIRED WHEN TEST CABINET IS PERMANENTLY MOUNTED AT A NON ESS MDF OR WALL MOUNTED						
NO. REQ.	CODE	COLOR	LENGTH	EQUIPPED WITH	USE	HOW USED
1	4W6A	Green	12 Ft	289B Plug 252A Plug 252B Plug	MDF	MDF E/W Other Than 121-Type Protectors or 300-Type Connectors
1	4W11A	Green	12 Ft	289B Plug 412A Plug 412B Plug	MDF	MDF E/W 121-Type Protectors or 300-Type Connectors

TABLE A (Cont)

B. CORDS REQUIRED WHEN TEST CABINET IS PERMANENTLY MOUNTED AT A NON-ESS MDF OR WALL MOUNTED (Cont)						
NO. REQ	CODE	COLOR	LENGTH	EQUIPPED WITH	USE	HOW USED
1	4W7A	Green	12 Ft	289B Plug 301A Plug	MDF	MDF E/W 444-Type Jacks
1	2W24A	Green	9.5 Ft	289B Plug 2-59 Cord Tips	MDF	MDF Protectors Where Required to Test the Line Without Opening It
1	W4BR	Black	16 Ft	464A Plug 463A Plug	Prot	ESS Protector Frame In and Out Tests (302-Type Connector)
1	W4CJ	Slate	16 Ft	464A Plug 463A Plug	Prot	ESS Protector Frame In and Out Tests (303-Type Connector)
1	W2FM	Black	16 Ft	464A Plug 2-P15A864 (Chuck)	Prot	ESS Protector Frame Bridging Tests
C. CORDS REQUIRED WHEN TEST CABINET IS PERMANENTLY MOUNTED ON DESK WITH ASSOCIATED JACK PANEL						
NO. REQ	CODE	COLOR	LENGTH	EQUIPPED WITH	USE	HOW USED
1	3P7D	Slate	2 Ft	310 Plug	Patch	For Patching from T or ROHT Jack in Jack Panel to Test Trunk Jacks
1	4P18A	Slate	2 Ft	327A Plug	Patch	For Patching from the TST DIST L&T Jacks (or ROHT L&T jacks) to the Jacks of the Test Dist Test Trunk in the Jack Panel
1	No. 52S Head Telephone Set					Tel Set

Key Access to Test Trunk (See Fig. 2)

3.12 A test cabinet may be modified to provide key access to a test trunk circuit. This provision is made for use with ESS No. 2 and may be required for other applications. ***When key access is provided, the test cabinet is equipped with a SUPV lamp and the TD (test distributor) key is replaced with the TTRK (test trunk) key.*** When the TTRK key is operated to the first (connect) position the test cabinet circuit is transferred from the TST jack to the test trunk circuit. When the TTRK key is operated to the second (hold) position, the test cabinet circuit is transferred from the test trunk circuit to the TST jack and the test trunk circuit is placed on hold. If a customer should attempt to place a call over the line under test while the test trunk is being held at the test cabinet, the SUPV lamp lights with a flashing signal.

5. METHOD OF PERFORMING TESTS

The following changes apply to Part 5 of this section:

(a) 5.58 and 5.59—revised.

(b) 5.74 through 5.82—added.

(c) Fig. 15—added.

(d) Table J—added.

Coin Collector Relay Test

5.50 Request the employee at the station to remove the coin collector housing, trip the coin trigger, and report the type of coin relay. The older type 60-volt relays are two-coil relays, while the newer type 50-volt relays have only one coil. The nonoperate and operate values are given

in Table I and should be applied as described for the type of relay under test.

Nonoperate Tests—All Type Relays

(a) Operate the rheostat key, RH, and adjust the rheostat to include maximum resistance.

(b) Operate and hold the COIN− key while adjusting the current flow to the nonoperate value. Release and operate the COIN− key several times. The milliammeter should show a deflection each time the key is operated. No deflection indicates that the coin relay has operated on the previous application of nonoperate current.

(c) Operate and hold the COIN+ key. A milliammeter deflection of the nonoperate value should be obtained. Release and reoperate the COIN+ key several times. The milliammeter should show a deflection each time the key is operated. No deflection indicates that the coin relay has operated on the previous application of nonoperate current.

Operate Tests—60-Volt Relays

(d) Operate and hold the COIN+ key while adjusting the current flow to the proper operate value. Take care that the operate value is not exceeded during adjustment. If the operate value should be exceeded, signal the employee. After requesting the employee to retrip the coin trigger, repeat the adjustment. On long loops where the operate value cannot be obtained from the test desk, restore the rheostat key and repeat the test. Release and reoperate the COIN+ key. If the relay is properly adjusted, no deflection will be obtained. Signal the employee and ascertain that the relay operated properly.

TABLE I

OPERATE VALUES OF COIN RELAYS

NUMBER STAMPED ON RELAY	NUMBER OF RELAY COILS	TYPE OF COIN COLLECTOR OR COIN TELEPHONE SET	CURRENT VALUE		REMARKS
			OPERATE	NONOPERATE	
P-10C117 P-10C725	Two	Multi-Slot 155-, 166-, 174-, 176-Type, etc.	60 ma	40 ma	Relay cannot be re-adjusted to perform reliably at lower values established for single-coil relays
P-10E786 P-13E961	One	Multi-Slot 200-, 1200-Type	48 ma	40 ma	Restoral spring diameter approximately 5/32-inch
P-15E687		Single-Slot 1A-, 2A-Type			
P-10E786* P-13E961*		Multi-Slot 200-, 1200-Type	41 ma	30 ma	Restoral spring diameter approximately 9/32-inch
1A* 1A (Note)		Single-Slot 1A-, 2A-, 1C-, 2C-Type			

Note: Coin relays marked 1A without the asterisk symbol have bifurcated rather than solid contact springs.

If it did, request employee to trip the coin trigger again.

(e) Operate and hold the COIN– key. The milliammeter should indicate the same current flow as obtained in item (d). Release and reoperate the COIN– key. If the coin relay is properly adjusted, no deflection will be obtained on this test. Signal the employee and ascertain that the relay operated properly.

Operate Tests—50-Volt Relays

Note: The 50-volt coin relay is self-restoring and will result in the station ground being removed after the operate and slow-release holding period of the relay. Due to this feature, it will not be possible to obtain a steady reading of the operate current being applied.

(f) Operate and hold the COIN+ key. Gradually increase the current flow, closely observing the milliammeter reading while this is being done. The coin relay should operate, as indicated by the meter needle returning to zero, before the operate value is exceeded. Signal the employee and ascertain that the relay operated properly. If it did, request employee to trip the coin trigger again.

(g) Reset the rheostat to include maximum resistance. Operate and hold the COIN– key. Adjust the current flow to the nonoperate value. Gradually increase the current flow, closely observing the meter reading while this is being done. The coin relay should operate, as indicated by the meter needle returning to zero, before the operate value is exceeded. Signal the employee and ascertain that the relay operated properly.

▶Testing Subscriber Lines Equipped With 2A Circuit Pack Range Extender

5.58 This range extender is a solid-state design of a dial long line circuit. It is used on subscriber lines over 30 kf from the central office, with as much as 1800-ohm conductor loop resistance. The LTD can make voltmeter tests on subscriber lines through the 2A circuit pack without having to use an MDF test trunk.

5.59 Establish a connection to the subscriber line in the normal manner. With the G key operated, a meter deflection of 37.5 to 40 volts should be measured on the 120-volt scale. Operate the 20,000 key, and with the G key still operated, a meter deflection of less than 0.7 volts should be measured on the 24-volt scale. A drop from approximately 12.3 volts to approximately 0.7 volts when the 20,000 key is operated is an indication that a range extender is in series with the line. In addition, reasonably accurate tip to ring leakage measurements, as well as loop continuity tests, may be made while the 20,000 key is operated. The station may be rung in the normal manner.◀

Testing Power Pair to Remote Repeater (Fig. 14)

5.69 The range of a customer loop can be extended by connecting a repeater in series with the loop. The repeater is located in a remote cabinet between the central office and the customer station and is powered from the central office over a separate cable pair. A remote cabinet has provision for two repeater panels, each panel capable of holding six repeaters. A separate power pair must be provided for each panel. A circuit in the first repeater on each panel constantly monitors the voltage on the associated power pair to insure that the voltage is adequate for repeater operation. Sufficient voltage on the power pair activates an oscillator, applying a 900-Hz tone on the power pair. If voltage drops below the required value, tone is removed from the pair, causing an alarm at the central office. When the current is unpowered, a power alarm and test circuit, associated with each repeater panel, shunts the series converters of the repeaters. This eliminates most of the loss normally added to the voice path of an unpowered E6 repeater. An unbalance detector in the power and alarm circuit monitors the power pair to detect line unbalance, which may affect circuit operation.

5.70 A power pair can be tested by establishing a connection from the MDF appearance of the pair. Portable test cabinet connections are described in 3.01 through 3.04 and 3.07. Permanently mounted test cabinet connections are described in 3.08, 3.11, and 3.32 through 3.36. Test the pair using each one of three possible connections; ***bridging to the pair without opening it, testing in*** toward the central office, and ***testing out*** toward the station.

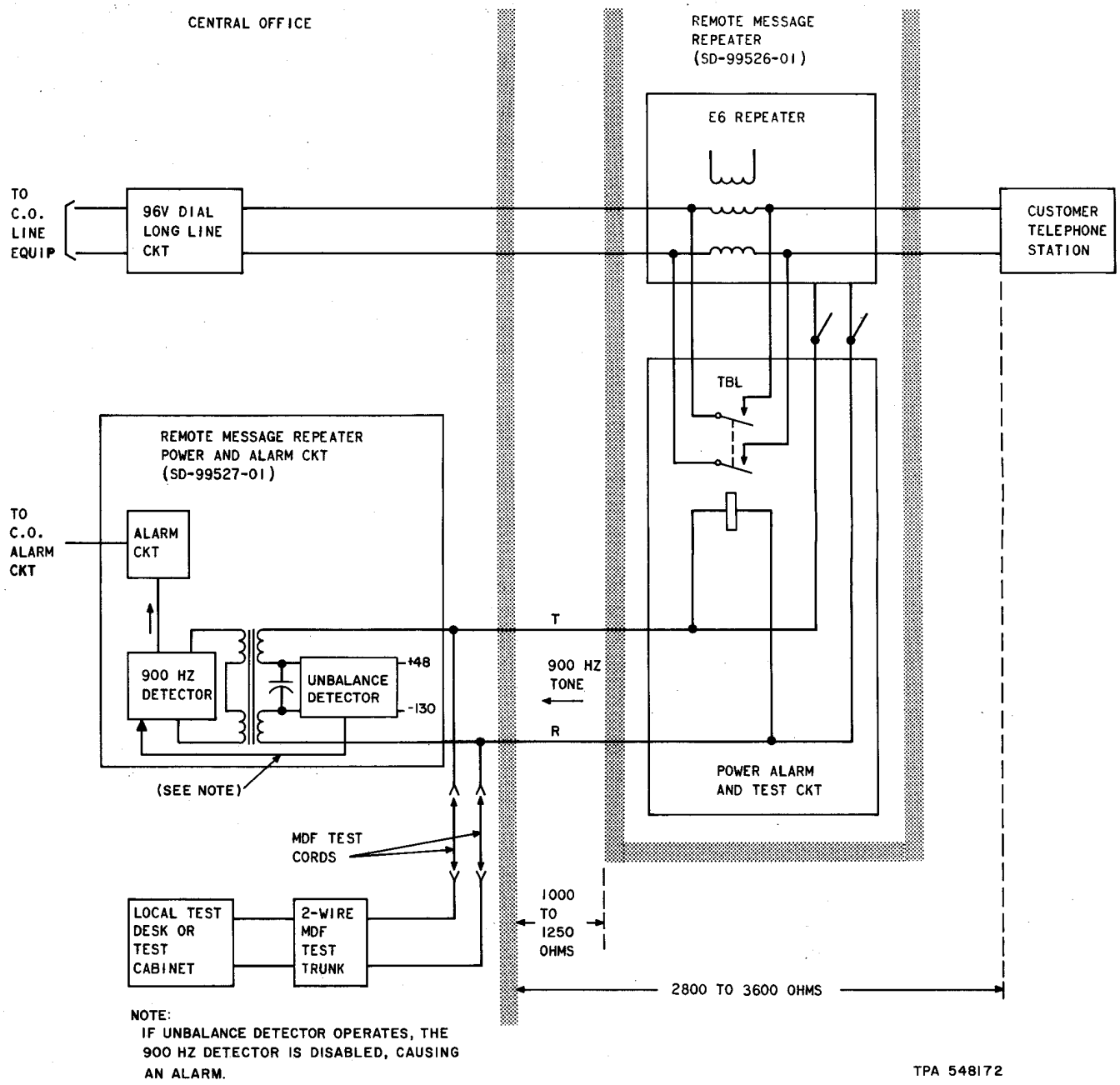

Fig. 14—Arrangement for Testing Power Pair for Remote Message Repeaters

5.71 ***Bridging tests:*** Establish a bridging connection to the power pair at the MDF.

(a) A tone (900 Hz) should be heard on the pair.

(b) Voltage to ground on the tip and ring should be approximately +35 volts and −117 volts, respectively.

5.72 ***Testing In:*** Establish a testing in connection to the power pair.

(a) Voltage readings to ground on the tip and ring should be +48 volts ±4 volts, and −130 volts ±5 volts. The test meter can measure 120 volts, therefore, the meter needle will be off-scale when −130 volts is applied.

5.73 ***Testing out:*** Establish a testing out connection to the power pair.

(a) There should be no foreign potential on the line.

(b) Leakage resistance, measured ring to ground and tip to ground, should be infinite. However, voltage at the repeater should be adequate with a 30,000-ohm leak.

(c) Line resistance measured ring to tip should measure approximately 1000 to 1500 ohms. The resistance measured tip to ring should be approximately 100 to 400 ohms greater than when measured ring to tip depending on the number of repeaters plugged into the panel.

▶General Description of Range Extender With Voice Frequency Gain

5.74 The Range Extender with Voice Frequency Gain (REG) is of solid state design with both the signaling and transmission circuits housed in a single plug-in module. Twelve of these modules plug into a shelf which fits standard 23-inch racks. The REG (Fig. 15) is located between the subscriber line circuit appearance at distributing frames in a central office and the subscriber line connection at the main distributing frame.

5.75 The functions of the REG are:

1. To serve long subscriber loops having Plain Old Telephone Service (POTS).
2. To make possible the use of finer gauge cable and less expensive equipment.
3. To increase the resistance limit of the central office to 2800 ohms of conductor loop resistance.
4. To replace the combination of the 96V Dial Long Line (DLL) and an E6 repeater currently in use for the 1600- to 2800-ohm range.
5. To extend dial pulsing and supervision.
6. To add 4dB of 2-way voice frequency gain on loops having between 1600 and 2000 ohms of conductor resistance.
7. To add 6dB of 2-way voice frequency gain on loops having between 2000 and 2800 ohms of conductor resistance.

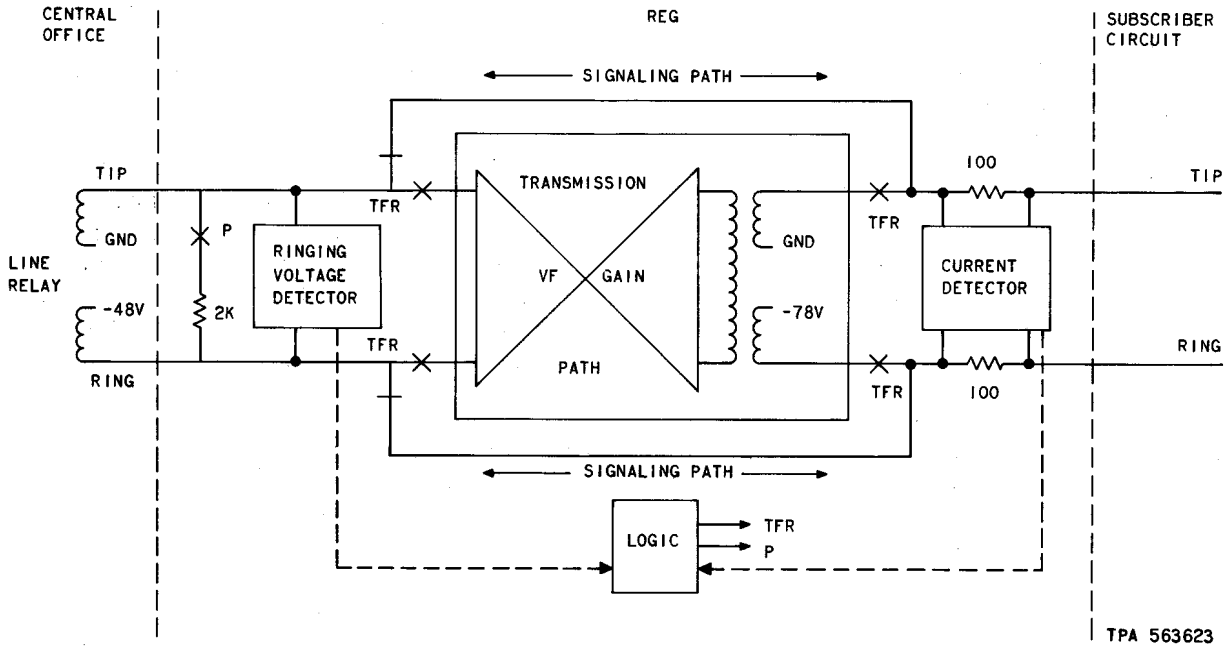

Fig. 15—▶Range Extender Circuit Showing Transmission and Signaling Paths◀

5.76 Figure 15 shows how tip and ring are connected straight through the REG in the signaling mode when the transfer (TFR) relay is in its normal position. The loop current and the voltage between tip and ring are monitored by current and voltage detectors whose shunt resistances are very high. The two 100-ohm series resistors in the loop current detector represent a small fraction of the total loop resistance. These series resistors are used as part of both the loop current detector and the line build-out (LBO) network. The LBO network provides a means of extending the subscriber loop end-section by providing the proper impedance match for the repeater. The LBO settings are made on a prescription basis. This eliminates the need for a gain or return loss measurement on the transmission circuit.

5.77 When a subscriber connected to a loop equipped with a REG unit initiates a call:

1. Current supplied by the −48 volt talking battery in the central office develops a voltage across the two 100-ohm series resistors in the loop current detector.

2. The voltage developed across the 100-ohm resistors causes the P relay to operate (via the logic circuitry). The operation of the P relay places a 2000-ohm shunt resistor across tip and ring.

3. Current flows through the shunt resistor. This current supplements the current drawn by the subscriber set. This causes the appropriate central office supervisory relays to operate.

4. Sixty-five milliseconds after the P relay operates, the TFR relay operates. The P relay then returns to the normal position, removing the 2000-ohm shunt resistor from the circuit.

   Note: If the subscriber has a standard rotary dial telephone set, the P relay repeats the subscriber dial pulses. This causes the appropriate central office relays to operate. The repeater and added voltage is out of the circuit with the TFR relay in the normal position.

5. The operation of the TFR relay inserts the repeater into the loop. The repeater increases the loop voltage to bring the loop current into the range specified for proper transmitter, receiver, and TOUCH-TONE® dial performance.

5.78 When a subscriber connected to a loop equipped with a REG unit receives a call:

1. Ringing signals pass directly through the REG in the signaling path.

2. Current flows when the subscriber answers due to the talking voltage applied to the loop. This current is detected by the loop current detector, causing the P relay to operate.

3. The operation of the P relay provides ringing trip during either the silent or the ringing interval.

4. Sixty-five milliseconds after the P relay operates, the TFR relay operates. The voice frequency repeater is inserted into the loop. The repeater's added voltage brings the loop current into the specified range for proper telephone performance.

5. Current initially drawn through the P relay and 2000-ohm shunt resistor now passes through the repeater and supervision is maintained.

6. The REG returns to the signaling path when the call terminates.

5.79 In the transmission mode, the REG provides 2-way voice frequency amplification by means of a negative impedance amplifier. Fig. 15 shows how the voice frequency gain unit is inserted into the loop when the TFR relay is operated. The gain unit remains in the loop during dialing and talking if the susbscriber has a TOUCH-TONE dial. The voice frequency repeater is powered by the −48 volt talking battery in the central office during voice transmission. Each REG unit draws approximately 30mA from the −48 volt talking battery. To bring the subscriber loop current into the range specified to power the station transmitter, the REG is furnished with an additional −48 volt dc input. Each REG unit draws 10 mA at idle and 30mA in operation from this second −48 volt supply. The additional voltage of the −48 volt dc input powers the REG logic and the supplemental

battery supply. The supplemental battery adds −30 volts to the −48 volts of the central office battery. This brings a total of −78 volts to the subscriber loop. The supplemental battery serves up to 165 REG units.

Testing of Subscriber Lines Equipped With a Range Extender With Voice Frequency Gain

5.80 Establish a connection to the subscriber line in the normal manner (Part 3). A bypass with a test cord at the MDF is only necessary if the gain unit remains in the loop due to relay failure in the REG or due to a short circuit in the loop or station set causing more than 7.5mA to flow. Ringer impedances can be measured. Tests for foreign EMFs, false crosses, and false grounds can be performed. These tests pass directly through the signaling path of the REG unit.

5.81 Results that can be expected from testing a loop equipped with a REG are:

1. The REG does not hinder the Line Insulation Tests (LIT) on long loops due to the high leakage resistance of the REG unit.

2. Operation of the 20,000 key permits loop continuity tests and leakage tests. A high leakage resistance is seen across tip and ring due to the REG with no leakage from either side to ground.

   Note: A neon lamp in the REG affects the tip to ring leakage resistance. The lamp is ionized by the 100 volt test battery, but not by the 20 volt test battery. Tip to ring leakage resistances are:

   (a) 200K ohms on the 120 volt scale;

   (b) 950K ohms on the 24 volt scale.

3. The minimum leakage resistance allowed at any point on the long loop is 30,000 ohms for normal circuit operation. Combinations of leakage resistances which have an effective resistance of less than 30,000 ohms are considered a trouble condition.

4. The REG does not hinder two-party Automatic Number Identification (ANI) tests. This is because the REG either stays in or switches to the signaling mode when ANI tests are performed.

5. By calling the subscriber, ringing is verified and the transmission quality is determined.

6. When the subscriber answers a call, the repeater goes into operation. While the loss on the line or the gain of the repeater cannot be measured at this point, it can be decided if the line is in satisfactory working order or in need of maintenance.

7. Loop balance tests conducted on a ballistics basis, under some conditions, show a maximum of one volt imbalance on the 120-volt scale.

8. The ballistics tests (Table J) are modified due to the REG because:

   (a) The REG voltage detector bridges the line between tip and ring.

   (b) The 100-volt test battery ionizes the neon lamp in the REG.

5.82 There are two types of alarms associated with the REG unit—fuse alarms and power unit failure alarms. The operation of a fuse alarm indicates a failure either in the −48 volts necessary to power the logic circuitry or in the −78 volts talking voltage. As many as 12 subscriber lines are taken out of service when a fuse alarm operates. The REG power unit failure alarm indicates a failure in the REG power unit. Failure of the REG power unit causes the −78 volt talking voltage for as many as 165 REG units to be reduced to −48 volts. Subscriber loops with a resistance of 2200 ohms or greater experience degraded or loss of service in this event. All subscriber stations experience reduced transmitter output.◀

6. ▶TESTING LINES EQUIPPED WITH THE KS-20988 MULTI-CHANNEL SUBSCRIBER CARRIER◀

The following changes apply to Part 6 of this section:

6.01 through 6.11—added

Fig. 16—added.

→TABLE J←

TYPICAL BALLISTIC METER DEFLECTIONS –
WITH AND WITHOUT RANGE EXTENDER UNIT (REG)

CABLE LENGTH AND CONDUCTOR GAUGE*	EQUIVALENT MILES	DC LOOP RESISTANCE	NUMBER STATIONS TERMINATED ON LINE†	BALLISTIC DEFLECTION (READING TO GROUND)‡			
				LOOP ONLY		E/W RANGE EXT.	
				TIP	RING	TIP	RING
24,000 FEET — 26 GAUGE	4.5	2014	0	26.5	26.5	43.0	43.0
			1	47.0	47.0	55.0	55.0
			2	63.0	63.0	65.0	65.0
27,000 FEET — 26 GAUGE AND 21,000 FEET — 19 GAUGE	9.1	2655	0	45.5	45.5	54.0	54.0
			1	74.0	74.0	64.0	64.0
			2	74.5	74.5	72.0	72.0
9,000 FEET — 26 GAUGE AND 63,000 FEET — 19 GAUGE	13.6	1872	0	60.0	60.0	63.0	63.0
			1	72.5	72.5	71.0	71.0
			2	83.0	83.0	78.0	78.0
102,000 FEET — 19 GAUGE	19.3	1803	0	72.0	72.0	70.5	70.5
			1	82.5	82.5	77.5	77.5
			2	91.0	91.0	84.0	84.0
132,000 FEET — 19 GAUGE	25.0	2335	0	82.0	82.0	77.0	77.0
			1	90.0	90.0	83.0	83.0
			2	98.0	98.0	88.0	88.0
162,000 FEET — 19 GAUGE	30.7	2867	0	90.0	90.0	83.0	83.0
			1	97.0	97.0	88.0	88.0
			2	105.0	105.0	93.0	93.0

NOTES:

1. The measurements in this table were taken on the 120 volt scale.
2. A neon lamp in the REG affects tip to ring leakage resistance. The lamp is ionized by the 100 volt test battery, but not by the 20 volt test battery. Tip to ring leakage resistances are:
   (a) 200K ohms on 120 volt scale
   (b) 950K ohms on 24 volt scale.

* H-88 loading is used on cable conductors. Load coils are spaced every 6000 feet, beginning 3000 feet from the central office and ending 3000 feet from the subscriber end of the cable.

† 500-type telephone sets using C4A ringers (.45 μf capacitance) were used.

‡ These ballistic tests were made using lab models with simulated equipment. The figures in this table are merely characteristic of the true values.

6.01 The KS-20988 multichannel carrier provides a maximum of six derived subscriber lines on a pair of exchange-grade nonloaded cable conductors. The physical cable conductors are only used for the carrier channels and may not be used for voice communication on other than the derived lines. The subscriber channels are numbered from one through six.

6.02 A typical carrier system (Fig. 16) consists of:

- ***A nonloaded cable pair***—Cable pair must be free of load coils, bridge lifters, building out capacitors, building out cable and loop extenders.

- ***A central office terminal***—Equipped with one transceiver card for each of the six channels in service, one line driver card, one dc-to-dc converter and a ring detector card when party line service is provided.

NOTE: All cards are plug-in type and the central office terminal must be equipped with transceiver cards for channels 4, 5, and 6, even if the associated subscriber terminals are not in service.

- ***Repeaters***—A maximum of three repeaters, located at loss intervals of 35 dB at 112 kHz.

- ***Subscriber terminals***—Two types of subscriber terminals are available. The terminals are classified according to their ringing ability feature. An SPS (single-party service) terminal provides two channels for two single-party service lines. An SPR (party line service) terminal provides one channel used for 2- and 4-party, full selective superimposed ringing. The SPS terminal is equipped with two plug-in cards and the SPR terminal is equipped with ten plug-in cards. Each type of subscriber terminal contains a battery to supply ringing power.

- ***Carrier line termination unit***—The terminating unit is an encapsulated network used to terminate the far end of cable conductors associated with the carrier system. The ends of all branch cables require terminating units.

- ***Directional couplers***—Used when a subscriber receives service through a branch cable. The directional coupler is located where the branch cable taps into the main feed cable.

- ***An ac isolation unit***—Used on carrier lines that have extremely high magnetic induction.

6.03 Carrier system troubles are classified as either a total system failure, a partial system failure, or a single channel failure. The type of trouble determines the proper procedure for handling the trouble report.

Total System Failure

6.04 A total system failure results when all the channels of the system are out of service. Common causes of a total system failure are:

- Defective power supply unit or excessive drain on the power supply

- Defective common equipment in the central office terminal

- Cable trouble

- Defective repeaters.

Partial System Failure

6.05 A partial system failure results when more than one, but not all channels are out of service. The common causes of a partial system failure are:

- Defective repeater

- Defective section of cable

- Defective line driver in central office terminal.

6.06 A single channel failure results when one of the carrier system channels is out of service. The common causes of a single channel failure are:

- Defective circuit pack (central office transceiver channel card)

- Defective subscriber terminal card or cards

- Defective battery in subscriber terminal.

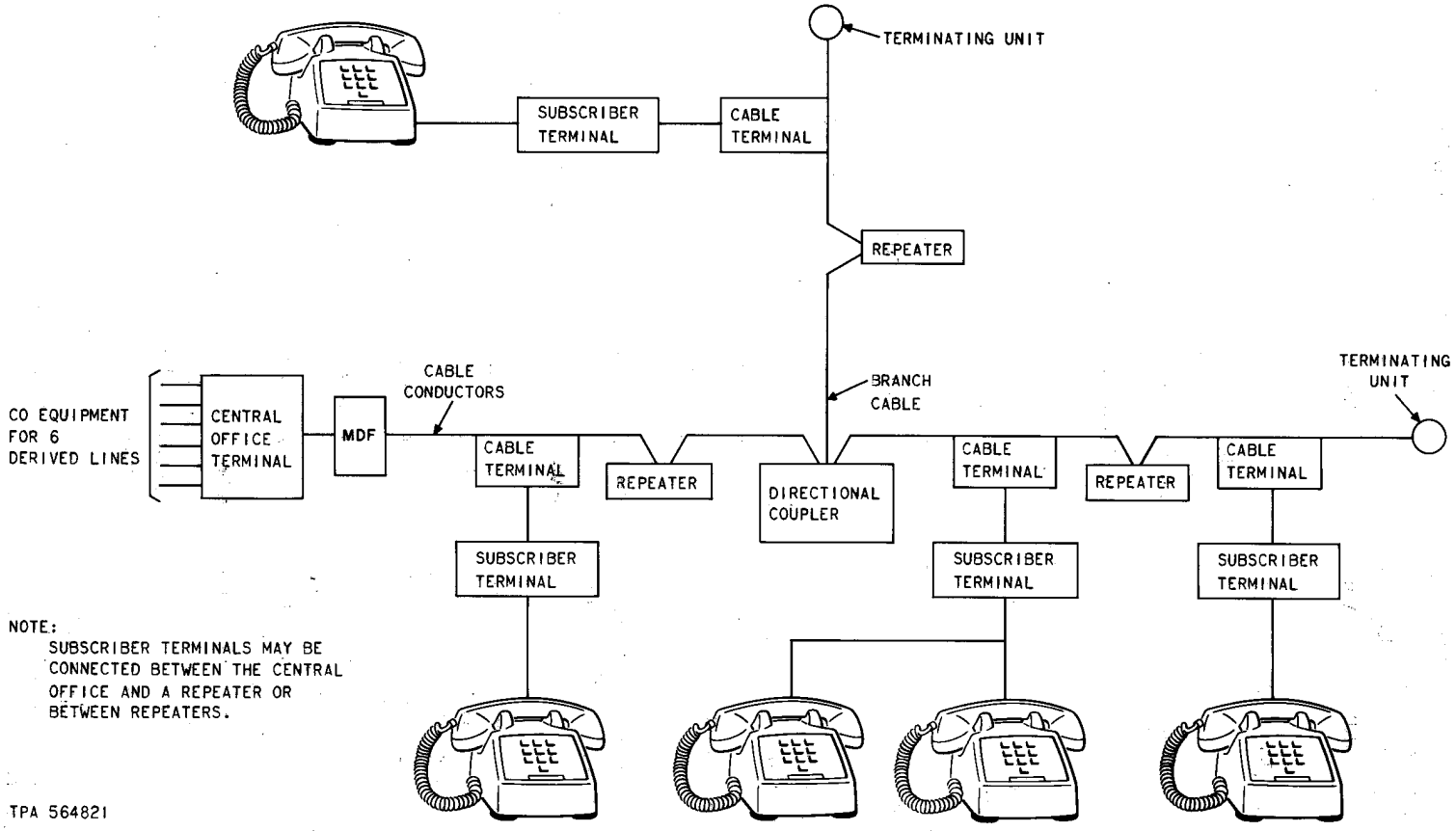

Fig. 16—Typical KS-20988 Multichannel Subscriber Carrier System

Testing Subscriber Lines Equipped With the KS-20988 Multichannel Subscriber Carrier

6.07 Testing on carrier-derived lines is limited. This limitation is due to the equipment used to interconnect the subscriber station and the central office equipment to the cable conductors. A total system failure can be determined by the following:

- Trouble reports from all subscribers on the carrier system.
- A power failure or irregularity at the central office terminal. This condition is usually indicated by an operated alarm light. An operated alarm always indicates a total system failure.
- Monitoring on each subscriber line. Connect to the subscriber line by dialing in the normal manner from the test cabinet as described in Part 3. If conversation is detected on any of the derived lines, a total system failure may be ruled out.

6.08 A test may be made from the test cabinet through the central office switching train to the input of the carrier central office terminal. With the MON key operated, connect to each channel in turn by dialing a subscriber telephone number associated with the channel to be tested, as described in Part 3. As each channel is seized, restore the MON key, operate the G key and then alternately operate and release the REV key as outlined in 5.04 and 5.05(a). The central office carrier terminal has a 1-microfarad capacitor across the tip and ring at the input of each channel. The capacitor simulates a ringer capacitor to the central office equipment to satisfy central office continuity test. The circuit for the ringing attenuator will register on the 120V scale of the meter as approximately a 50 volt (100K ohm) ring to tip leak. Alternate operation and restoral of the REV key results in an increased meter deflection of approximately 20 volts greater than the 50 volts already registered on the meter. This deflection is similar to that obtained when testing for the presence of a bridged ringer. This verifies that all input connections to the central office carrier terminal are in place and checks the path through the switching train to the terminal.

6.09 The physical cable conductors may be tested from the test cabinet by having the central office line driver unit (L18) removed from the central office carrier terminal and connecting MDF test cords to the proper cable conductors at the distributing frame. Portable test cabinet connections are described in 3.01, 3.02, and 3.07. Permanently mounted test cabinet connections are described in 3.08, 3.11, 3.32, and 3.33. The conductors are tested for capacity and leakage from tip to ground and ring to ground as described in 5.05 (b) and (c).

DO NOT OPERATE THE G (GROUND) KEY OR APPLY VOLTAGE ACROSS THE CABLE CONDUCTORS WHILE TESTING ON THE LINE

WARNING: POWER MUST BE REMOVED FROM THE SYSTEM BEFORE THE MDF TEST CORD IS CONNECTED TO THE DISTRIBUTION FRAME. POWER IS REMOVED BY UNPLUGGING THE CENTRAL OFFICE LINE DRIVER UNIT.

Removing the line driver unit (L18) places all channels in the system out of service. Therefore, tests on the cable pair may not be performed until a total system failure is confirmed, or until all other tests described in Sections 363-300-300 and 363-300-310 have failed to clear the trouble.

6.10 All tests made with an MDF test cord must be made ***out*** on the cable conductors. No tests may be made from the test cabinet on an MDF test cord toward the central office equipment. A volt-ohm-milliameter may be used at the distribution frame as outlined in Section 363-300-310 to make a resistance check toward the central office equipment.

6.11 Failure of more than one channel may indicate a repeater failure. Repeater failures may be isolated by comparing subscriber terminal locations to find a repeater common to the stations in trouble. No testing may be done on repeaters or subscriber carrier terminals from the test cabinet. Section 363-300-310 outlines the tests which may be performed from the repeater or subscriber carrier terminal locations. Also, the section provides information on testing the internal battery at the subscriber terminal when a subscriber station does not receive a ringing signal. Section 363-300-300 describes the general maintenance plan for the carrier system.

WARNING: HIGH VOLTAGE IS PRESENT ON MULTICHANNEL SUBSCRIBER CARRIER LINES. A WARNING OF THIS NATURE SHOULD BE EXTENDED TO EMPLOYEES DISPATCHED TO SERVICE CARRIER EQUIPMENT.