V4 TELEPHONE REPEATER

SIGNALING COMPATIBILITY

1. GENERAL

1.01 This section furnishes information on the signaling compatibility of the V4 telephone repeater with various switching circuits. Detailed information is provided in the attachment, which is also issued as SD-99421-03.

1.02 This section is reissued to include the latest available information.

ATTACHMENT TO
SEC. 179-100-303

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1N14
COMMON SYSTEMS

V-TYPE REPEATERS SIGNALING COMPATIBILITY WITH SWITCHING CIRCUITS

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GENERAL INFORMATION

1.0 DESCRIPTION OF THIS DRAWING

1.01 SECTION B OF THIS DRAWING PROVIDES GENERAL SIGNALING COMPATIBILITY INFORMATION FOR V-TYPE REPEATERS WORKING WITH SWITCHING CIRCUITS.

1.02 SECTION C PROVIDES MORE DETAILED SIGNALING COMPATIBILITY INFORMATION FOR CERTAIN SWITCHING CIRCUITS, PARTICULARLY DIAL-PULSING AND REVERTIVE-PULSING CIRCUITS BECAUSE DC PULSING IS GENERALLY AFFECTED TO SOME EXTENT BY THE USE OF V-TYPE REPEATERS. SECTION D PROVIDES STILL MORE DETAILED SIGNALING COMPATIBILITY INFORMATION IN THAT IT LISTS THE COMPATIBILITY RATING OF TYPICAL SWITCHING CIRCUITS WITH V-TYPE REPEATERS BY CIRCUIT NUMBER. A CIRCUIT MAY NOT BE LISTED IN SECTION D IF THE INFORMATION GIVEN IN SECTIONS B OR C PROVIDES THE NEEDED COMPATIBILITY INFORMATION.

1.03 SECTION D LISTS EACH CIRCUIT AS COMPATIBLE (YES), CONDITIONALLY COMPATIBLE (COND), OR NOT COMPATIBLE (NO). CIRCUITS ARE LISTED AS CONDITIONALLY COMPATIBLE WHEN A STANDARD CIRCUIT OPTION IS REQUIRED FOR COMPATIBLE OPERATION WITH V-TYPE REPEATERS OR WHEN COMPENSATED LOOPS OR OTHER MODIFICATIONS ARE NEEDED TO PROVIDE COMPATIBLE OPERATION. FOR CIRCUITS WHICH ARE LISTED AS CONDITIONALLY COMPATIBLE OR NOT COMPATIBLE, EXPLANATORY INFORMATION IS PROVIDED UNDER NOTES OR REFERENCE IS MADE TO A PARAGRAPH IN SECTION C OF THIS DRAWING.

2.0 GENERAL COMPATIBILITY INFORMATION

2.01 THE V3 AMPLIFIERS HAVE BEEN RATED MANUFACTURE DISCONTINUED. WHERE AMPLIFIERS PER J68747A WERE USED WITH HYBRID COILS OR TRANSFOMERS TO FORM REPEATERS, THESE REPEATERS ARE SUPERCEDED BY THE 24V4 OR 44V4 REPEATERS. WHERE THE V3 AMPLIFIER PER J68747A WAS USED AS AN APPARATUS COMPONENT OF A SWITCHING CIRCUIT, IT HAS BEEN SUPERCEDED BY THE KS-20378L1 AMPLIFIER. THE KS-20378L1 AMPLIFIER IS A DIRECT REPLACEMENT FOR THE V3 AMPLIFIER PER J68747A. ALTHOUGH DIFFERENT IN APPEARANCE AND DIMENSIONS FROM THE V3, THE KS-20378L1 WILL PLUG INTO THE SAME CONNECTOR AND REQUIRES NO WIRING CHANGES.
NO REPLACEMENT HAS BEEN PROVIDED FOR THE V3 AMPLIFIER PER J68747B, BECAUSE OF LACK OF DEMAND.

2.02 MF TRUNK CIRCUITS AND RING-DOWN OR AUTOMATIC TIE-TRUNK CIRCUITS ARE GENERALLY COMPATIBLE FROM A SIGNALING STANDPOINT WITH V-TYPE REPEATERS.

2.03 DC SUPERVISION, 20 CYCLE RINGING, AND TRIPPING OF RINGING ARE NOT AFFECTED BY V-TYPE REPEATERS PROVIDED THE DC RESISTANCE OF THE REPEATERS IS TAKEN INTO ACCOUNT IN COMPUTING THE MAXIMUM EXTERNAL RESISTANCE OF THE SWITCHING CIRCUIT.

2.04 NOISE MAY BE A PROBLEM WHERE V-TYPE REPEATERS ARE USED OVER A COMBINATION OF 2 AND 4 WIRE LINES WITH LOOP SIGNALING. BECAUSE OF THE LARGE PHYSICAL SEPARATION OF THE THE TWO PAIRS OF A 4-WIRE LINE THE BALANCE OF THE 4-WIRE LINE IS RELATIVELY POOR. WHERE A HIGH LEVEL OF LONGITUDINAL INDUCTION EXISTS, THIS POOR BALANCE MAY RESULT IN NOISE BEING PASSED INTO THE 2-WIRE LINE AT THE 2-4 WIRE JUNCTION.
SIMPLEX INDUCTORS ARE PROVIDED IN THE V-TYPE REPEATERS TO SUPPRESS THE LONGITUDINAL CURRENTS

GENERAL INFORMATION

TO REDUCE THE NOISE LEVEL.HOWEVER,IN CERTAIN APPLICATIONS IT IS NECESSARY TO SHORT OUT THESE INDUCTORS TO FACILITATE SIGNALING.

IN THOSE CASES WHERE THE NOISE LEVEL IS UNACCEPTABLE BECAUSE THE SX INDUCTORS ARE SHORTED OUT,OR BECAUSE THE SX INDUCTORS ARE INADEQUATE TO SUPPRESS THE NOISE,A DIAL LONG LINE CIRCUIT SUCH AS SD-96555-01 OR A LOOP SIGNALING REPEATER SUCH AS SD-1C359-01 CAN BE USED TO BLOCK THE LONGITUDINAL CURRENTS AND PASS THE DC SIGNALS AROUND THE V-TYPE REPEATER.ALTERNATIVELY DX SIGNALING CAN BE USED,WITH A SIGNAL LEAD EXTENSION CIRCUIT SUCH AS SD-1C364-01 AT THE 2-4 WIRE JUNCTION TO PREVENT THE LONGITUDINAL CURRENTS FROM BEING PASSED TO THE TWO WIRE LINE.

DETAILED CIRCUIT INFORMATION

1.0 DC METALLIC LOOP PULSING ON CUSTOMER OR PBX LINES.

1.01 THE CROSSBAR NO. 1 SUBSCRIBER SENDER AND EARLY VINTAGES OF THE CROSSBAR NO. 5 ORIGINATING REGISTER USE THE 239HE, 280W OR 316Y RELAYS WHICH PULSE SATISFACTORILY.

1.02 ALL RECENT VINTAGES OF THE CROSSBAR NO. 5 ORIGINATING REGISTER, ALL CROSSBAR PBX ORIGINATING REGISTERS AND ESS NO. 1 CUSTOMER DP RECEIVERS USE THE 292A MERCURY CONTACT RELAY WHICH MAY SPLIT PULSES BECAUSE OF OSCILLATIONS IN THE RELAY CIRCUIT CAUSED BY THE CIRCUIT PARAMETERS OF THE 24V4 REPEATER. SINCE THE 292A TYPE RELAY IS MAGNETICALLY BIASED RATHER THAN POLAR, A DIODE ADDED IN SERIES WITH THE LINE WINDING OF THE 292A RELAY WILL ELIMINATE THE SPLIT PULSES BY MAKING THE CIRCUIT POLAR. LATER ISSUES OF THESE REGISTERS PROVIDE THIS DIODE.

1.03 PANEL SUBSCRIBER SENDERS USE ANY ONE OF SEVEN TYPES OF RELAYS. THE SHORT RANGE SENDERS USING E827, L1, OR L24 TYPES DO NOT PULSE SATISFACTORILY BECAUSE OF SPLIT PULSES AND LOW PERCENT BREAK. THE LONG RANGE SENDERS USING 239HE, 280W OR 316Y RELAYS PULSE SATISFACTORILY. SENDERS USING THE 292A RELAY REQUIRE THE ADDITION OF A DIODE AS STATED IN PARAGRAPH 1.02.

1.04 STEP-BY-STEP CENTRAL OFFICE OR PBX CIRCUITS WILL PULSE SATISFACTORILY WITH 24V4 REPEATERS IF THE RINGERS AT THE CUSTOMER STATION ARE LIMITED TO 4 HIGH IMPEDANCE RINGERS SUCH AS THE C4A OR ONE LOW IMPEDANCE RINGER SUCH AS THE 8A WITH A SERIES CAPACITOR OF NOT MORE THAN 1 MF. LOW IMPEDANCE RINGING BRIDGES (SUCH AS A J-TYPE RELAY IN SERIES WITH 2 MF) MUST BE REMOVED FROM PBX CORD CIRCUITS.

1.05 DIAL LONG LINE CIRCUITS OR LONG TRUNK CIRCUITS OF THE LOOP-TO-LOOP TYPE USING POLAR OR L-TYPE PULSE REPEATING RELAYS MAY SPLIT DIAL PULSES BECAUSE THEY DO NOT HAVE A PULSE HELP FEATURE AS IN THE LONG RANGE PANEL AND CROSSBAR SENDERS AND REGISTERS. THESE CIRCUITS MAY BE USED WITH 24V4 REPEATERS IF THE EXTERNAL PULSING CIRCUIT RESISTANCE IS COMPENSATED TO A MINIMUM OF 600 OHMS.

1.06 WHEN THE DIAL LONG LINE CIRCUITS ARE USED AS DIAL PULSE REPEATERS AT A 2-4 WIRE JUNCTION FOR IMPROVED NOISE REJECTION, THE ABOVE COMPENSATION IS NOT NECESSARY. IN THESE CASES THE SX INDUCTORS SHOULD BE CONNECTED AS FOLLOWS. WHERE THE DLL IS AT THE ORIGINATING END OF THE 4-WIRE SECTION THE SX INDUCTORS OF THE TERMINATING SET SHOULD BE SHORTED OUT. WHERE THE DLL IS AT THE TERMINATING END OF THE 4-WIRE SECTION, THE SX INDUCTORS SHOULD BE USED. A TYPICAL APPLICATION OF THIS TYPE IS SHOWN ON SD-96555-017.

1.07 WHEN LOOP SIGNALING REPEATER (LSR) SD-1C359-01 IS USED FOR DIAL PULSE REPETITION WITH A 24V4 OR 44V4 REPEATER, NO COMPENSATION IS REQUIRED. THE SX INDUCTORS OF THE REPEATERS MAY BE CONNECTED AS DICTATED BY TRANSMISSION CONSIDERATIONS.

2.0 DC METALLIC LOOP PULSING ON CENTRAL OFFICE TRUNKS, PBX TRUNKS, OR PBX TIE TRUNKS.

2.01 DIAL PULSING FROM A STEP-BY-STEP REPEATER TO CROSSBAR

DETAILED CIRCUIT INFORMATION

OR CROSSBAR PBX BY-LINK TRUNK CIRCUITS THROUGH 24V4 REPEATERS CAUSES THE BY-LINK TRUNK CIRCUIT PULSE REPEATING RELAY TO SPLIT PULSES AND ALSO TO DISTORT THE PULSES TO A VERY LOW PERCENT BREAK. THIS ARRANGEMENT IS THEREFORE NOT USABLE.

2.02 CROSSBAR NO. 5 AND CROSSBAR PBX INCOMING REGISTERS, NO. 1 ESS TRUNK DIAL PULSE RECEIVERS OR CROSSBAR TANDEM SENDERS MAY RECEIVE DIAL PULSES FROM CROSSBAR SENDERS OVER THE TRUNK CONDUCTORS. THESE REGISTERS GENERALLY HAVE A 292B MERCURY CONTACT PULSE REPEATING RELAY. WHEN 24V4 REPEATERS ARE USED ON SUCH A TRUNK, THIS RELAY MAY SPLIT THE DIAL PULSES UNLESS THE EXTERNAL CIRCUIT RESISTANCE FOR THE REGISTER IS COMPENSATED TO A MINIMUM OF 1200 OHMS. CROSSBAR NO. 1 TERMINATING SENDERS OR CROSSBAR TANDEM SENDERS OR CROSSBAR NO. 5 INCOMING REGISTERS WHICH HAVE A 239JK OR 280 AJ PULSE REPEATING RELAY MUST BE COMPENSATED TO A MINIMUM OF 1000 OHMS EXTERNAL CIRCUIT RESISTANCE. WHEN THESE LATTER CIRCUITS HAVE A 239HE OR 280W RELAY, NO COMPENSATION IS NEEDED.

2.03 STEP-BY-STEP OUTGOING REPEATERS SUCH AS SD-31779-01 AND TIE-TRUNK CIRCUITS SUCH AS SD-65531-01 BOTH OF WHICH USE TUNED ADJUSTMENTS ON THE (A) PULSE REPEATING RELAY TO COMPENSATE FOR THE TRUNK CAPACITANCE ARE NOT COMPATIBLE WITH 24V4 REPEATERS IN THE TRUNK. THE 2 MF CAPACITANCE OF THE 24V4 REPEATERS MAKES IT IMPOSSIBLE TO MEET THE PULSE REPEATING REQUIREMENTS OF THE (A) RELAY.

2.04 STEP-BY-STEP INCOMING REPEATERS HAVING A PULSE CORRECTING FEATURE AND A POLAR TYPE PULSING RELAY SUCH AS IN SD-32184-01 SHOULD BE COMPENSATED TO A MINIMUM OF 1200 OHMS EXTERNAL CIRCUIT RESISTANCE FOR PULSING.

2.05 WHEN DIAL PULSES ARE SENT FROM A CROSSBAR OFFICE TO A STEP-BY-STEP OFFICE ON 1200 OHM OR 2000-OHM LOOP TRUNKS THE TERMINATING SELECTOR MAY USE A REPEATING COIL WITH THE PULSE RECEIVING RELAY. WHEN PULSES TERMINATE IN THIS TYPE OF CIRCUIT, THE EXTERNAL CIRCUIT RESISTANCE MUST BE COMPENSATED TO A MINIMUM OF 600 OHMS FOR SATISFACTORY PULSING. HOWEVER, IF THE CIRCUIT DOES NOT USE A REPEAT COIL WITH THE PULSE RECEIVING RELAY AND THE TIP AND RING TERMINATE DIRECTLY IN THE RELAY, NO COMPENSATION IS NECESSARY EITHER FOR LOOP OR BATTERY-GROUND PULSING.

3.0 DIAL PULSING THROUGH SIGNALING SYSTEMS.

E AND M LEAD SIGNALS ARE TRANSMITTED OVER TRUNK FACILITIES BY MEANS OF DUPLEX (DX) SIGNALING CIRCUITS. A DX SIGNALING CIRCUIT PER SD-95487-01 OR SD-1C363-01 (HEREINAFTER REFERRED TO AS A DX1 CIRCUIT) IS USED AT EACH END OF A SIMPLE WIRE FACILITY. IF IT IS NECESSARY TO CONNECT TWO SIGNALING SYSTEMS TO EACH OTHER OR TO CONNECT A CARRIER SYSTEM TO A SIGNALING SYSTEM IT IS NECESSARY TO USE A DX SIGNALING CIRCUIT PER SD-95488-01 OR SD-1C364-01 (HEREINAFTER REFERRED TO AS A DX2 CIRCUIT) AT THE JUNCTION.

3.01 OUTGOING STEP-BY-STEP REPEATERS AND TRUNK CIRCUITS SUCH AS SD-31795-01 AND SD-32241-01 WHICH CONVERT SUBSCRIBER DIAL PULSES FROM LOOP TO E AND M SIGNALS, REQUIRE A 4 MF CAPACITOR AT THE MIDPOINT OF THE HYBRID COIL

DETAILED CIRCUIT INFORMATION

WHEN CONNECTED TO A 24V4 REPEATER. THE RETURN LOSS OBTAINED WITH THE 4 MF CAPACITOR IS NOT OPTIMUM BUT IT IS SATISFACTORY FOR CLASS 5 OFFICES AND THE 4 MF CAPACITOR IS NECESSARY FOR PROPER PULSING. MOST TRUNK CIRCUITS ALREADY PROVIDE THIS 4 MF CAPACITOR IN WHICH CASE THE CAPACITOR IN THE 1G TERMINATING SET SHOULD BE DISCONNECTED.

3.02 DIAL LONG LINE CIRCUITS SUCH AS SD-96252-01 WHICH CONVERT SUBSCRIBER DIAL PULSES FROM LOOP TO E AND M SIGNALS REQUIRE A 4 MF CAPACITOR AT THE MIDPOINT OF THE HYBRID COIL. EITHER THE 4 MF CAPACITOR OF THE 1G TERMINATING SET OR THE 4 MF CAPACITOR OF THE DIAL LONG LINE CIRCUIT CAN BE USED.

3.03 WHEN A 4-WIRE CARRIER TRUNK IS CONNECTED TO A 2-WIRE METALLIC EXTENSION WITH A DX2 SIGNALING CIRCUIT ON THE 2-WIRE SIDE,A 4 MF CAPACITOR OPTION IS REQUIRED AT THE JUNCTION OF THE CARRIER AND THE METALLIC FACILITY TO REDUCE THE TRANSIENT INDUCED INTO THE LINE TRANSMIT COIL WHEN PULSES ARE RECEIVED OVER THE CARRIER AND REPEATED TO THE DX SYSTEM. A TYPICAL CIRCUIT LAYOUT IS SHOWN ON THE DX2 CIRCUIT DRAWIMGS.

3.04 WHEN A DX1 SIGNALING CIRCUIT IS USED ON 4-WIRE FACILITIES, THE A AND B LEADS FROM THE DX CIRCUIT ARE CONNECTED DIRECTLY TO THE SX LEADS OF THE 24V4 REPEATER AND THE SIMPLEX INDUCTORS SHOULD BE SHORTED.WHEN SO CONNECTED THERE IS NO BALANCING CAPACITOR BETWEEN THE A AND B LEADS.THE BALANCING NETWORK IN THE DX CIRCUIT MUST BE ADJUSTED TO APPROXIMATE THE CAPACITANCE AND RESISTANCE TO WHICH THE A AND B LEADS ARE CONNECTED. IF THE CABLE FACILITY IS BETWEEN 0 AND 15 MILES NO CAPACITOR IS NEEDED. FOR 15-60 MILES PROVIDE 1.3MF. FOR 60-75 MILES PROVIDE 2MF. A TYPICAL CIRCUIT LAYOUT IS SHOWN ON THE DX1 CIRCUIT DRAWINGS.

3.051 THE FULL 5000 OHM RANGE OF A DX1 SIGNALING CIRCUIT CAN BE OBTAINED OVER A FACILITY MADE UP OF A TWO WIRE SECTION IN TANDEM WITH A FOUR WIRE SIMPLEXED SECTION PROVIDED THAT A 4 MF CAPACITOR IS CONNECTED BETWEEN THE DX A AND B LEADS THAT CONNECT TO THE SIMPLEX LEADS AT THE 4-WIRE END (SEE APPROPRIATE FIGURE ON DX CKT). LATER ISSUES OF DX CIRCUITS PROVIDE THIS CAPACITOR. FOR EARLIER VERSIONS IT WILL BE NECESSARY TO ADD A PIGTAIL CAPACITOR ON A JOB BASIS.

THE TWO WIRE SECTION MAY HAVE UP TO TWO E6 REPEATERS WITH LOADED OR NONLOADED LINE BUILDOUT NETWORKS. THE SIMPLEX INDUCTORS SHOULD BE USED IN THE SX LEADS AT THE INTERMEDIATE OFFICE TO TERMINATE THE 2-WIRE LINE AND MAY ALSO BE USED AT THE TERMINAL END.

ASSUMING A 4 MF MIDPOINT CAPACITOR AT THE 2-WIRE END, A SATISFACTORY BALANCE WILL BE OBTAINED IN THE DX CIRCUITS AT EITHER END OF SUCH A FACILITY IF 6 MF IS USED IN EACH OF THE BALANCING NETWORKS.

3.052 IF THE TRUNK ARRANGEMENT DESCRIBED IN PARAGRAPH 3.051 CONNECTS TO A CARRIER SYSTEM AT THE 4-WIRE END, THEN A DX2 CIRCUIT WILL BE USED AT THIS END INSTEAD OF A DX1 CIRCUIT. THE USE OF THE SIMPLEX INDUCTORS ARE AS DESCRIBED IN PARAGRAPH 3.051.

3.053 THE FULL 5000 OHM RANGE OF A DX1 SIGNALING CIRCUIT CAN BE OBTAINED OVER THE COMBINATION OF A SIMPLEXED 4-WIRE LINE WITH 2-WIRE EXTENSIONS AT EACH END.

DETAILED CIRCUIT INFORMATION

EITHER OR BOTH 2-WIRE EXTENSIONS MAY HAVE AN E6 REPEATER WITH LOADED OR OR NONLOADED LINE BUILDOUT NETWORKS. THE SIMPLEX INDUCTORS SHOULD BE USED IN THE SX LEADS AT THE INTERMEDIATE OFFICES TC TERMINATE THE 2-WIRE LINES.

ASSUMING A 4 MF MIDPOINT CAPACITOR AT EACH 2-WIRE END, A SATISFACTORY BALANCE WILL BE OBTAINED IN THE DX CIRCUITS AT EITHER END OF SUCH A FACILITY IF 6 MF IS USED IN EACH OF THE BALANCING NETWORKS.

3.061 EARLIER VERSIONS OF DX SIGNALING CIRCUITS CAN BE USED OVER THE COMBINATION OF A SIMPLEXED 4-WIRE LINE AND A 2-WIRE EXTENSION WHERE THERE IS NO CAPACITOR BETWEEN THE A AND B LEADS AT THE 4-WIRE END, A 1 MF CAPACITOR AT THE INTERMEDIATE OFFICE, AND A 4 MF CAPACITOR (2 MF HAS BEEN USED IN SOME CASES) AT THE 2-WIRE END. THE SERIES INDUCTORS SHOULD BE USED IN THE SX LEADS AT THE INTERMEDIATE OFFICE BUT SHOULD BE SHORTED OUT AT THE TERMINAL END. WITH THIS ARRANGEMENT ZERO CAPACITANCE SHOULD BE USED IN THE DX BALANCING NETWORK AT THE 4-WIRE END AND 4 MF (OR 2 MF) TO MATCH THE BLOCKING CAPACITOR IN THE COIL AT THE 2-WIRE END. WITH THIS ARRANGEMENT, THE SUM OF THE 2-WIRE CONDUCTOR RESISTANCE AND THE SIMPLEX LOOP RESISTANCE IS LIMITED TO 1400 OHMS.

3.062 IF THE TRUNK ARRANGEMENT DESCRIBED IN PARAGRAPH 3.061 CONNECTS TO A CARRIER SYSTEM AT THE 4-WIRE END, THEN A DX2 CIRCUIT WILL BE USED AT THIS END INSTEAD OF A DX1 CIRCUIT. THE CAPACITOR VALUES, THE USE OF THE SIMPLEX INDUCTORS, AND THE RANGE ARE AS DESCRIBED IN PARAGRAPH 3.061.

3.07 THE BALANCE NETWORK RESISTORS OF THE DX CIRCUITS SD-95487-01 AND SD-95488-01 SHOULD BE MADE EQUAL TO THE 2-WIRE CONDUCTOR RESISTANCE PLUS THE SIMPLEX LOOP RESISTANCE OF THE LINE FACILITY PLUS 1250 OHMS + OR - 125 OHMS. THE BALANCE NETWORK POTENTIOMETERS OF SD-1C363-01 AND SD-1C364-01 SHOULD BE SET EQUAL TO THE 2-WIRE CONDUCTOR RESISTANCE PLUS THE SIMPLEX LOOP RESISTANCE ONLY WITH A TOLERANCE OF + OR - 125 OHMS.

CIRCUIT		BAL. NET. RES.
SD-95487-01.	FIG. 3	C,D,E,
SD-95488-01.	FIG. 3	C,D,E,
SD-95487-01.	FIG. 4	A,B,C,D,E,
SD-95488-01.	FIG. 4	A,B,C,D,E,
SD-1C363-01		POT-R1
SD-1C364-01		POT-R1

4.0 REVERTIVE PULSING

4.01 THE SHUNT CAPACITANCE IN THE 24V4 REPEATER HAS AN ADVERSE EFFECT ON THE (L) RELAY RELEASE TIME OF PANEL TYPE INCOMING SELECTORS. THE ADDED CAPACITANCE IN THE REPEATERS TENDS TO INCREASE THE RELEASE TIME OF THE (L) RELAY, WHICH CAUSES THE PANEL ELEVATOR TO OVERSTEP IN SELECTIONS AND RESULTS IN WRONG NUMBERS. THE 24V4 REPEATER IS, THEREFORE, UNUSABLE ON ALL METALLIC REVERTIVE PULSING TRUNKS EXCEPT THOSE TERMINATING IN BALANCED BCO PANEL INCOMING SELECTORS OR BALANCED-TYPE CROSSBAR REGISTERS AND SENDERS, PROVIDED THAT THESE TRUNKS ARE RESTRICTED TO A MAXIMUM LOOP RANGE OF SEVEN MILES OF CABLE.

4.02 44V4 REPEATERS CAN BE USED ON REVERTIVE TRUNKS WITH SF SIGNALING BUT THE RANGE WILL BE LIMITED BY THE 'ROUND TRIP' TIME WHICH INCREASES ABOUT 1 MS FOR EACH 5 MILES OF LOADED CABLE. THIS INCREASED TIME IS DUE TO THE LOW PROPAGATION VELOCITY OF VOICE FREQUENCIES OVER LOADED CABLE.

DETAILED CIRCUIT INFORMATION

THE RANGE LIMITATIONS OF SUCH ARRANGEMENTS FOR THE DIFFERENT REVERTIVE TERMINATIONS HAVE NOT BEEN DETERMINED.

SWITCHING CIRCUIT COMPATIBILITY LIST

TERMINAL CIRCUITS OUTGOING	INCOMING	COMPATIBILITY	NOTES
DIAL	ES-20008-01	COND	SECT.C,PAR.1.03
DIAL	ES-20009-01	COND	SECT.C,PAR.1.03
DIAL	ES-20082-01	COND	SECT.C,PAR.1.03
DIAL	ES-20083-01	NO	SECT.C,PAR.1.03
SENDER	SD-21115-01	COND	SECT.C,PAR.4.01
SENDER	SD-21116-01	COND	SECT.C,PAR.4.01
DIAL	SD-21193-01	COND	SECT.C,PAR.1.03
DIAL	SD-21193-02	COND	SECT.C,PAR.1.03
DIAL	SD-21193-05	COND	SECT.C,PAR.1.03
DIAL	SD-21194-01	COND	SECT.C,PAR.1.03
DIAL	SD-21826-01	NO	SECT.C,PAR.1.03
SENDER	SD-21949-01	NO	SECT.C,PAR.4.01
DIAL	SD-21976-01	COND	SECT.C,PAR.1.02
DIAL	SD-25012-01	YES	
SENDER	SD-25434-01	COND	SECT.C,PAR.2.02
SENDER	SD-25478-01	COND	SECT.C,PAR.2.02
DIAL	SD-25551-01	YES	
SENDER	SD-25729-01	COND	SECT.C,PAR.2.02
SENDER	SD-25999-01	COND	SECT.C,PAR.2.02
DIAL	SD-26040-01	COND	SECT.C,PAR.1.02
SENDER	SD-26041-01	COND	SECT.C,PAR.2.02
ANY	SD-26043-01	COND	SECT.C,PAR.4.01
SXS REP	SD-26077-01	NO	SECT.C,PAR.2.01
DIAL	SD-26258-01	COND	SECT.C,PAR.1.02
DIAL	SD-26290-01	COND	SECT.C,PAR.1.02
SENDER	SD-27101-01	COND	SECT.C,PAR.2.02
DIAL	SD-27667-01	COND	SECT.C,PAR.1.02
ANY	SD-30200-01	COND	SECT.C,PAR.1.04
DIAL	SD-31506-01	COND	MIN.900 OHMS EXT CKT RES.
DIAL	SD-31592-01	COND	SECT.C,PAR.1.04
DIAL	SD-31779-01	COND	SECT.C,PAR.1.04
SD-31779-01	SXS	NO	SECT.C,PAR.2.03
DIAL	SD-31795-01	COND	SECT.C,PAR.1.04
SXS REP	SD-31841-01	COND	MIN.600 OHMS EXT CKT RES.
SD-31892-01	SXS	COND	MAX.10 MILES OF CABLE
DIAL	SD-31892-01	COND	SECT.C,PAR.1.04
SD-32008-01	SXS	COND	MAX 11 MILES OF CABLE
DIAL	SD-32184-01	COND	SECT.C,PAR.1.04
SXS REP	SD-32184-01	COND	SECT.C,PAR.2.04
DIAL	SD-32207-01	YES	
DIAL	SD-32241-01	COND	SECT.C,PAR.1.04
ANY	SD-56525-01	YES	
SD-65531-01	SXS	NO	SECT.C,PAR.2.03
DIAL	SD-65718-01	COND	MIN.600 OHMS EXT CKT RES.
SD-65718-01	ANY	YES	
DIAL	SD-65742-01	COND	SECT.C,PAR.1.02
SENDER	SD-66739-01	COND	SECT.C,PAR.2.02
SXS REP	SD-66740-01	NO	SECT.C,PAR.2.01
DIAL	SD-66744-01	COND	SECT.C,PAR.1.02
DIAL	SD-66775-01	COND	SECT.C,PAR.1.02

ATTACHMENT TO
SEC. 179-100-303

SWITCHING CIRCUIT COMPATIBILITY LIST

TERMINAL CIRCUITS		COMPAT-IBILITY	NOTES
OUTGOING	INCOMING		
ANY	SD-68233-01	YES	
ANY	SD-68579-01	YES	
ANY	SD-68581-01	YES	
ANY	SD-95487-01	YES	
ANY	SD-95488-01	YES	
ANY	SD-96234-01	COND	SECT.C,PAR.1.05
SD-96252-01	SD-96251-01	YES	
SENDER	SD-96504-01	COND	SECT.C,PAR.2.02
ANY	SD-96555-01	COND	SECT.C,PAR.1.05
ANY	SD-96589-01	YES	
DIAL	ES-226610	NO	SECT.C,PAR.1.03
DIAL	ES-240053	NO	SECT.C,PAR.1.03
ANY	SD-1A166-01	YES	
DIAL	SD-1A172-01	COND	SECT.C,PAR.1.02
SENDER	SD-1A178-01	COND	SECT.C,PAR.2.02
ANY	SD-1A220-01	YES	
ANY	SD-1A236-01	YES	
ANY	SD-5E004-01	YES	
DIAL TO SXS	CONNECTORS	COND	SECT.C,PAR.1.04
DIAL TO SXS	SELECTORS	COND	SECT.C,PAR.1.04
DX	DX	YES	SECT.C,PAR. 3.03 TO 3.07