

# SHEET INDEX

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- (MFR DISC) 346 JACK 242C PLUG  
F. SWITCH 192E INCLUDES 460 MAGNETS  
E. SWITCH 197E INCLUDES 570 MAGNETS  
ZL, 197GP SWITCH, 20, 197HR SWITCH
- (MFR DISC) 101. PROVIDE ONE 3 AMP FUSE FROM 48V BAT. FOR EACH CIRCUIT.
- (MFR DISC) 102. TO MAKE THIS CONNECTOR NON-REVERSING, REVERSE THE WIRES TO SPRINGS "7" AND "10" OF REL (D)
- (MFR DISC) 103. CONNECTION OF RINGING LEAD INDICATE WITH NEG BAT. SUPERIMPOSED ON MACHINE RINGING WHEN POS BAT IS SUPERIMPOSED ON MACHINE RINGING, REVERSE THE WIRES TO SPRINGS "5" AND "24" AT "Z".
104. SEE TRIPPING RANGES FOR (F) RELAY REQUIRED.
105. PRIOR TO ISSUE 3-B, THE RES OF THE "5" WDG OF RELAY (X) WAS 1300Ω.
- (MFR DISC) 106. WHEN CONNECTOR IS REQUIRED TO RELEASE UNDER CONTROL OF THE CALLING PARTY ONLY USE "Y" OPTION, OTHERWISE USE "X" OPTION.
107. PROVIDE ONE 1 1/3 AMP FUSE FROM 48V. TALKING BAT FOR EACH CKT. PRIOR TO ISSUE 10-D, NOTE 101 WAS NOT RATED "MFR DISC". AND THIS NOTE WAS NOT SHOWN.
108. WHEN CAPACITORS (T) AND (R) ARE PART OF A MULTI-UNIT CAPACITOR, UNITS (T) AND (R) SHALL BE BALANCED TO WITHIN 0.11MF.

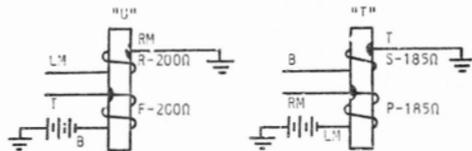
109. RECORD OF FIGURES, WIRING, AND APPARATUS CHANGES

CHANGED ON ISS	IF JOB RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN	SEE NOTE	USE IN CIRCUIT			
				STD	A & M	MD	PROV.
3-B	197E SW	192E		197E		192E	
3-B	221CK REL (L)	221D		221CK		221D	
3-B	221DT REL (E)	221AS		221DT		221AS	
8-D	X OR Y	X	106	X, Y			
9-B	M OR N	M	112	M			
10-D	A OR B	A		B		A	
13-D	V OR W	V		W		V	
14-D	248A REL (B)	222A		248A		222A	
17-A	222JJ REL (H)	222S		222JJ		222S	
21-D	T OR U	U		T		U	
21-D	Z	A OR B		Z		A, B	
22-A	Q	A OR B	108	Q			
22-A	R OR S	A OR B	108, 111	Q		J, S	
23-D			111			J, K	
24-D						FIG. 2	
26-D			113	H		G	
26-D			113	E		F	
26-D			113	ZB		ZA	
26-D			113	ZE		ZD	
26-D			113, 115	ZF, ZG			
26-D			113, 115	VV, TT			
31-D	ZH OR ZI	ZH		ZI		ZH	
32-D	ZJ OR ZK	ZJ	115	ZJ		ZK	
33-D	ZL	E OR F		ZL		E	
33-D			117			X	
34-B	ZM OR ZN	ZM	116, 119	ZN		ZM	
34-B	V OR W	W	118	V		W	
34-B	E, F, ZL OR ZD	E, F OR ZL		ZD		ZL	
39D	QZ, QY	QZ	119	QZ, QY			

## OPTION INDEX

FIGS.	APP OR WIRING			
1	Z	N	ZA	ZL
2	Y	M	ZB	ZM
	X	K	ZC	ZN
	W	J	ZD	ZO
	V	H	ZE	
	U	G	ZF	
	T	F	ZG	QZ
	S	E	ZH	QY
	R		ZI	VV
	Q	B	ZJ	TT
		A	ZK	

110. THE DIFFERENCE BETWEEN THE (D) RELAYS IS AS FOLLOWS:



## 111. CHANGES IN EXISTING EQUIPMENTS

FEATURE OR OPTION	PROVIDE		
	FIG.	WIR OR APW	QUANTITY
CAPACITORS ON SW NETWORKS USED FOR CONTACT PROTECTION		Q, Z	
CAPACITORS ON SW SEPARATE CAPACITORS & RESISTORS USED FOR CONTACT PROTECTION. (MFR DISC)		B	
CAPACITORS ON SHELF (MFR DISC)		A	
CAPACITORS CONNECTED (T) TO (T) AND (R) TO (R)		S, Z	
CAPACITORS ON SW NETWORKS USED FOR CONTACT PROTECTION		S, J	
CAPACITORS ON SW SEPARATE CAPACITORS & RESISTORS USED FOR CONTACT PROTECTION		R, K	
CAPACITORS ON SHELF (MFR DISC)		A, B OR Q	

112. WHEN "R" OR "S" OPTION IS USED ON CKTS ASSOCIATED WITH EITHER A TRUNK CKT OR AN A-B TOLL TRANSMISSION SELECTOR ARRANGED TO CUT THRU ON CALLS TO A DISTANT OFFICE, "N" OPTION MUST ALSO BE FURNISHED.

113. OPTIONS "H", "G", "F", "E", "2A", "2B", "2C", "2D", "2E", "2F", "2G", "VV" AND "TT" WERE ASSIGNED ON ISSUE 36-D

114. USE RELAYS (C) 221D AND (E) 221AS WITH THE 192E SWITCH

115.

FEATURE OR OPTION	PROVIDE		
	FIGS	APP OR WIR	QUANTITY
MACHINE RINGING		ZG	
AC-DC OR SUPERIMPOSED NEG.		ZF	
REVERSE BATTERY SUPERVISION		VV	
REQUIRED		TT	
NOT REQUIRED		Y, ZJ	
RELEASE OF CONNECTOR		Y, ZK	
CALLING PARTY CONTROL		QY	
AUTOMATIC DISCONNECT ON CALLING PARTY HOLDS		QZ	
WHEN TIMED CONNECTOR PERMANENT RELEASE FEATURE IS		REQ'D	
		NOT REQ'D	

116. WHEN OPTION "ZN" IS FURNISHED, REMOVE OPTION "X", IF PROVIDED.

117. WHEN OPTION "ZK" IS FURNISHED, REMOVE OPTION "X", IF PROVIDED.

118. WHEN OPTION "ZN" IS PROVIDED, OPTIONS "V" AND "ZR" MUST BE PROVIDED.

119. PRIOR TO ISSUE 39D, "ZJ" OPTION WAS PART OF FIG. 1.

## EQUIPMENT NOTES:

FIELD MOD. ADDITION	SWITCH TO BE MOD		EQUIV. MOD SWITCH	
	SWITCH CODE	OPT	SWITCH CODE	OPT
RLS SPRING ASSEMBLY	197E	E	197GP	ZL
RGN SPRINGS	197E, 192E	E, F	SEE EQUIP NOTE 203	-
	197JP	ZL	197HR	ZO
RLS SPRING ASSEMBLY	192E	F	SEE EQUIP NOTE 202	-
RGN SPRINGS & RLS SPRING ASSEMBLY	197E	E	197HR	ZO

202. FOR FIELD MODIFICATION PROVIDE ASSEMBLY PARTS FOR RELEASE MAGNET SPRINGS AS FOLLOWS:

- P128224 - BREAK CONTACT
- P250483 - BUSHING
- P252926 - HEX HEAD MACHINE SCREW
- P485112 - SPRING ARM

203. TO PROVIDE RGN SPRINGS, FURNISH D179971 WHICH CONSISTS OF THE FOLLOWING ASSEMBLY PARTS:

- P138221 - RGN SPRING ASSEMBLY
- P251233 - WASHERS (2)
- P252505 - SCREWS (2)
- P296779 - CAM ASSEMBLY



WORKING LIMITS AND TRIPPING RANGES ON SHEET -013

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ED30228-35  
ED30228-02  
ED30228-01  
EQUIP INFO

REPLACING ES30403-01, REPLACED BY SD31739-01  
SD30228-01

STEP BY STEP SYSTEMS  
NE-NO. 1 OR 3504  
CONNECTOR CIRCUIT  
COMBINATION TOLL AND LOCAL  
LOOP DIALING TOLL TRAIN  
SELECTIVE OR  
1 RING GEM-SELECTIVE RINGING

(COMB CONN 1R)

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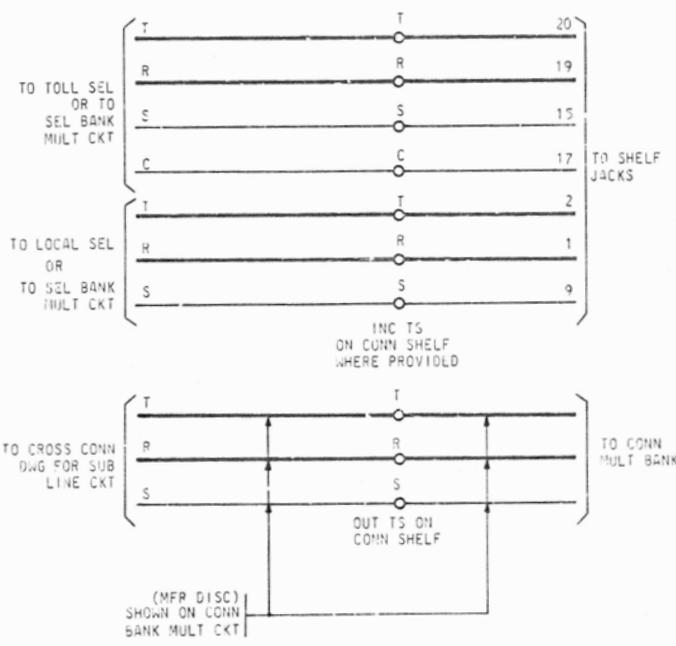
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FIG. K



TRANSMISSION TEST REQUIREMENTS  
(1000 CYCLE LOSS BETWEEN 6000 LINES)

MAX ALLOWABLE CKT LOSS (db)	
"U" OPTION	0.9
"T" OPTION	0.7

ALLOWABLE INDIVIDUAL APPARATUS LOSSES (db)

APPARATUS	DESIG	CODE	MAX LOSS	MIN LOSS	REMARKS
CAPACITOR	R	2MF	14.5	11.5	
CAPACITOR	T	2MF	14.5	11.5	
RELAY	A	221A	0.3		"U" OPTION
RELAY	D	222AA	0.3		
RELAY	A	221ND	0.3		"T" OPTION
RELAY	D	222KP	0.3		

NOTES:  
1. WHERE THE (T) & (R) CAPACITORS ARE PART OF A MULTI-UNIT CAPACITOR, THE INDIVIDUAL LOSSES FOR THE (T) & (R) CAPACITORS SHALL BE WITHIN 0.5 db OF EACH OTHER.

TRIPPING RANGES

TYPE OF RINGING AND DISTRICT	RINGING INTERVAL VOLTAGE		SILENT INTERVAL VOLTAGE	CODE OF (F) RELAY	OPTION	RATING	MAX EXT CKT LOOP FOR TRIPPING		
	NO. 1	NO. 350A					ADJ "A"	ADJ "B"	ADJ "C"
AC-DC	84-88 ① AC & 45-52 DC	72-88 OR 84-88 AC & 45-52 DC	45-52	222J	ZE	STD ①	1030Ω	—	1400Ω
			48-52	222J	ZE	STD ①	1115Ω	—	1500Ω
SUP TUBE 15V EP	84-88 ① AC & 37-40 DC ③	72-88 OR 84-88 AC & 37-40 DC ③	45-52	222J	ZE	STD ①	1030Ω	—	1400Ω
			48-52	222J	ZE	STD ①	1115Ω	—	1500Ω
			60-75	222J OR 222L	ZC OR ZD	A & M	—	1500Ω	—
SUP INVERTED 42A PND TUBE	84-88 ① AC & 37-40 DC ③	72-88 OR 84-88 AC & 37-40 DC ③	60-75	222K OR 222L	ZC OR ZD	A & M	1040Ω	—	—
SUP 42A, INV 42A AND TUBE	75-80 ② AC & 42-46 DC	7. 80 OR 84-88 AC & 37-40 DC	60-75	222K OR 222L	ZC OR ZD	A & M	900Ω	—	—

① 72-88 AC & 80-88 AC ARE A & M IN NO. 1.  
② 64-80 AC & 72-80 AC ARE ALSO A & M IN NO. 1.  
③ 64-80, 72-80, OR 76-80 AC & 42-46 DC ARE ALSO A & M IN NO. 1 AND 350A.

SD30228-01 STEP BY STEP SYSTEMS NE-NO. 1 OR 350A CONNECTOR CIRCUIT COMBINATION TOLL AND LOCAL LOOP DIALING TOLL TRAIN

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APPARATUS		MECH REQ				CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQ						TIME REQ						
DESIG	CODE	OPT	FIG	BSP FIG	RESID	CONT PRESS	ARM. TRVL	BLOCK OR INSULATE	TEST CLIP DATA	TEST SET PREP	SEE NOTE	TEST WDG	TEST FOR	AFTER SOAK	TEST	READJ	TEST	READJ	TEST	READJ		
									CONN BAT	CONN GRD				MA	MA	MA	SEC	SEC				
RELAYS																						
A	221A	U	1	11	7-11		8	B(NO) B(NO)	TST JK 1 TST JK 2	TST JK 1 TST JK 1	M M	1/2 1/2	F/R F/R	0 NO	FS FS	15.1 13.9	14.8 14.4					
A	221ND	T	1	11	7-11		8	B(NO) B(NO)	TST JK 2 TST JK 2	TST JK 1 TST JK 1	M M	1/2 1/2	P/S P/S	0 NO	FS FS	15.1 13.9	14.8 14.4					
B	248A	H	1	500	15-4		27	5 & 7 (VON) 5 & 7 (VON)	3(A) 3(A)	GRD GRD	3 3		0 NO	FS FS	10.5 8.5	10 9						
					MIN 1.5				TST JK 1	TST JK 2	V/BR	4/5	H							.333		
								5 & 7 (VON)	3(A)	GRD	5		R							.750	.500	
B	222A	G	1	4A	SL		11	5 & 7 (VON) 5 & 7 (VON)	3(A) 3(A)	GRD GRD	3 3		0 NO	FS FS	8.4 6.9	7.9 7.3						
									TST JK 1	TST JK 2	V/BR	5/6	H								.300	
									TST JK 1	TST JK 2	V/BR	5	R								.750	.500
								5 & 7 (VON)	3(A)	GRD	5		NO	FS	6.9	7.3						
B	222A MOD	G	1	500	15-4		27	5 & 7 (VON) 5 & 7 (VON)	3(A) 3(A)	GRD GRD	3/7 3		0 NO	FS FS	9.8 7.7	9.3 8.2						
					MIN 1.5				TST JK 1	TST JK 2	V/BR	4/5	H								.450	
									TST JK 1	TST JK 2	V/BR	5	R								.750	.500
								5 & 7 (VON)	3(A)	GRD	5		NO	FS	7.7	8.2						
C	221CK	C	1	4	S4		12	3(B) 3(B)	GRD GRD	GRD	3		0 NO	500 500	90 62	85 69						
									TST JK 1	TST JK 2	V/M	5/9/10	H								.100	
									TST JK 1	TST JK 2	V/M	5/10	R								.155	.140
								3(B)	GRD	GRD	5		NO	500	62	69						
C	221D	F	1	4	S4		12	3(B) 3(B)	GRD GRD	GRD	3		0 NO	500 500	115 85	105 95						
									TST JK 1	TST JK 2	V/M	5/9/10	H								.100	
									TST JK 1	TST JK 2	V/M	5/10	R								.155	.140
								3(B)	GRD	GRD	5		NO	500	85	95						
D	222AD	U	1	118	S2		15	(A)NO (A)NO	5(F) 5(F)	8(F) 8(F)	M M	11/12/14 11/12/14	F/R F/R	0 NO	FS FS	20.5 13.3	19.5 14					
(8)	(5)	(3)	(3)	(3)	(5)	(5)	(5)	(8)	(9)	(9)	(4)	(4)	(4)	(4)	(5)	(5)	(5)	(5)	(5)	(5)	(17)	

TEST NOTES:  
 1. ARMATURE NEED NOT TOUCH CORE.  
 2. TEST-CONT FOLLOW ON MAKE CONT MIN .008" CONT SEP ON ALL CONTS MIN .003.  
 3. FOR USE WHEN TIME REQ ARE NOT APPLIED.  
 4. TEST HOLD-USE 1400N LOOP IN PULSING TEST SET.  
 5. FOR USE WHEN TIME REQ ARE APPLIED.  
 6. TEST HOLD-USE 1200N LOOP IN PULSING TEST SET.  
 7. MOD REL HAS 1:1 RATIO ARMATURE.  
 8. JACK SPGS 9 & 11 AND JACK SPGS 13 & 15 SHALL MAKE CONTACT WHEN THE SWITCH IS REMOVED FROM THE FR.  
 9. TEST HOLD-USE LEAK A IN PULSING TEST SET.  
 10. CONNECT DIRECT GRD TO "S" WIPER.  
 11. TEST-MIN 35 GRAMS ON CONTS 3-4, 8-9 & 11-12.  
 12. ADJ "A" IS SUPERSEDED BY ADJ "B" ON ISS 26-D

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 STEP BY STEP SYSTEMS  
 NO. 1 OR 350A  
 CONNECTOR CIRCUIT  
 COMBINATION TOLL AND LOCAL  
 LOOP DIALING TOLL TRAIN  
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APPARATUS		MECH REQ				CIRCUIT PREPARATION				DIRECT CURRENT FLOW REQ						TIME REQ						
DESIG	CODE	OPT	FIG	BSP FIG	RESID	CONT PRESS	ARM. TRVL	BLOCK OR INSULATE	TEST CLIP DATA	TEST SET PREP	SEE NOTE	TEST WDG	TEST FOR	AFTER SOAK	TEST	READJ	TEST	READJ	TEST	READJ		
									CONN BAT	CONN GRD				MA	MA	MA	SEC	SEC				
RELAYS																						
D								S4	(A)NO	5(F)	8(F)	M	11/12/14	F/R	0	FS	28.5	27				
									(A)NO	5(F)	8(F)	M	11/12/13/15	F/R	NO	FS	19	21				
D	222KP	F	1	118	S2		15	(A)NO	5(F)	8(F)	M	11/12/14	P/S	0	FS	20.5	19.5					
									(A)NO	5(F)	8(F)	M	11/12/14	P/S	NO	FS	13.3	14				
								S4	(A)NO	5(F)	8(F)	M	11/12/13/15	P/S	0	FS	28.5	27				
									(A)NO	5(F)	8(F)	M	11/12/13/15	P/S	NO	FS	19	21				
E	221DT	E	1	94	0		14	(K)O (K)O	6(VON) 6(VON)	GRD GRD	3/16 16		0 NO	FS FS	15.5 10.6	14.7 11.2						
								S2	TST JK 1	TST JK 2	V/M	5/9/10/16	H							.111		
									TST JK 1	TST JK 2	V/M	9/10/16	R								.300	.275
									(K)O	6(VON)	GRD	5/16	NO	FS	10.6	11.2						
E	221AS	F	1	94	S4		14	(K)O (K)O	6(VON) 6(VON)	GRD GRD	3/16 16		0 NO	FS FS	15.5 9.7	13.8 10.6						
								S2	TST JK 1	TST JK 2	V/M	5/9/10/16	H								.140	
									TST JK 1	TST JK 2	V/M	9/10/16	R								.225	.200
									(K)O	6(VON)	GRD	5/16	NO	FS	9.7	10.6						
F	222J	ZE	1	74	S4		25	1B(J) 1B(J)	6T(K) 6T(K)	3(F) 3(F)	B/G B/G	17/12 13/19	P P	0 NO	FS FS	25 22	26.5 23.5					
									1B(J)	6T(K)	3(F)	B/G	17/12	P	0		20	27				
									1B(J)	6T(K)	3(F)	B/G	18/17/15	P	NO		23	25.5				
									1B(J)	6T(K)	3(F)	B/G	17/18	P	0	FS	23.5	22.5				
									1B(J)	6T(K)	3(F)	B/G	19/21/22	P	NO	FS	20	21				
									1B(J)	4(C)	GRD	20	S	0	FS	28.5	27					
									1B(J)	4(C)	GRD	20	S	NO	FS	20	21					
(8)	(5)	(3)	(3)	(3)	(5)	(5)	(5)	(8)	(9)	(9)	(4)	(4)	(4)	(4)	(5)	(5)	(5)	(5)	(5)	(5)	(17)	

TEST NOTES- (CONT'D)  
 13. PRIOR TO ISS 18-D, TEST OPERATE VALUE FOR THE (D) REL WAS 29MA.  
 14. ADJ "B"  
 15. ADJ "A"  
 16. TEST-MIN 15 GRAMS ON CONTS 6-7.  
 17. WHEN SWITCH IS ARRANGED FOR SUPERIMPOSED POSITIVE RINGING, REVERSE TEST CLIP DATA.  
 18. CONTS 1-2 SHALL MAKE BEFORE SPG.1 STRIKES THE BUSHING ON SPG.4.  
 19. REQ FOR SPGS.1-2.  
 20. CONTS 1-2 MAY MAKE.  
 21. ADJ "C"  
 22. ADJ "B" IS SUPERSEDED BY ADJ "C" FOR AC-DC AND SUP. (WITH SOV. SILENT INTERVAL BAT.) OFFICES ON ISS 29-B ADJ "B" IS FOR "MAINTENANCE ONLY" FOR SUP OFFICES WITH 60-75V. SILENT INTERVAL BAT.

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 NO. 1 OR 350A  
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 COMBINATION TOLL AND LOCAL  
 LOOP DIALING TOLL TRAIN  
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