

PROCEDURES FOR STRAPPING FERROD SENSORS

NO. 1 ELECTRONIC SWITCHING SYSTEM

CONTENTS	PAGE	CONTENTS	PAGE
1. GENERAL	1	2. Insulator Installed on Ferrod Terminals	8
2. PROCEDURE FOR FERREED LINE LINK NETWORKS	2	3. Strapping For Loop Start Operation	8
LIST OF TOOLS AND MATERIALS	2	4. Strapping For Ground Start Operation	8
GROUND START AND LOOP START CONVERSION PROCEDURE	2	5. Strapping For No-Test Vertical Operation	9
GROUND OR LOOP START TO NO-TEST VERTICAL CONVERSION PROCEDURE	3	6. Remreed Switch Package Type 296B (Front View)	10
3. PROCEDURE FOR REMREED LINE LINK NETWORKS	4	7. Strapping For No-Test Vertical Operation With Type 23A Apparatus (Remreed)	11
TOOLS AND MATERIALS	5	8. Remreed Switch Package Type 296D (Front View)	12
STRAPPING 12A AND 13A GRIDS	5		
A. Ground Start and Loop Start Conversion Procedure	5	TABLES	
B. Ground Start or Loop Start to No-Test Vertical Conversion Procedure Using a Type 23A Apparatus Unit	6	A. No-Test Assignments	4
STRAPPING 12B AND 13B GRIDS	7	B. Tools Used for 28- and 30-Gauge Wire	7
A. Ground Start and Loop Start Conversion Procedure	9		
B. Ground Start or Loop Start to No-Test Vertical Conversion	9	1. GENERAL	
		1.01 This section covers the procedure for converting the type 2 ferrod and type 2A ferrod used in the No. 1 Electronic Switching System (ESS) from ground start to loop start operation and vice versa. The type 2 ferrods in the type 1B ferrod sensors are used in the <i>ferreed</i> line switching networks. The type 2A ferrods in the type 296 switch package are used in the <i>remreed</i> line switching networks. Conversion from ground or loop start to no-test vertical operation is also covered. The request for making a change	
FIGURES			
1. Equipment End of Type 1B Sensor Assembly and KS-20187 L1 Insulator	8		

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SECTION 231-010-301

is originated by the dial administrator. The record is maintained on form ESS 1102 or 1103. The no-test record is maintained on form ESS 1506.

1.02 This section is reissued for the following reasons:

- (a) To add Notes 1 and 2 after 3.02 and 3.07
- (b) To add coverage for the KS-21232 electric wire wrapping gun
- (c) To make other minor changes.

1.03 The type 1B sensor, used in the ferreed line switching network, contains two ferrods: one type 1 and one type 2. Only the type 2 ferrod can be adapted to either ground start or loop start operation. Conversion from one method of operation to the other is accomplished by changing the terminal strapping at the equipment side of the sensor or switch package.

2. PROCEDURE FOR FERREED LINE LINK NETWORKS

LIST OF TOOLS AND MATERIALS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-16363 L1 or L2	Wire Wrapping Tool
KS-20963 L2	Stationary Sleeve for 22- and 24-gauge wire
KS-21232 L1	Electric Wire Wrapping Gun
KS-20827 L1	Wire Unwrapping Tool
KS-16734 L1	Wrapping Bit for 22 and 24-gauge wire
KS-20187 L1	Insulator
625	Wiss Cutting Pliers or equivalent

MATERIALS

—	24 AWG bare tinned copper wire (for straps)
KS-14090 or 3M #35	Insulating tape

2.02 Before beginning the conversion procedure, make sure the sensor containing the ferrod to be converted is positively identified and located at the equipment side of the line scanner. Refer to SD-1A111-01 for switching systems with 2 to 1 line concentration or to SD-1A115-01 for systems with 4 to 1 line concentration.

Caution: *The conversion procedure is performed without removing power from the line scanner circuits. Use the KS-20187 L1 insulator (Fig. 1) and exercise care to prevent shorting terminals of sensor against the frame or to any other terminals. This insulator is used only on ferrods with straight terminals.*

GROUND-START AND LOOP-START CONVERSION PROCEDURE

2.03 To convert the ferrod from ground start operation to loop start operation, or vice versa, proceed as follows.

- (1) To disconnect the ferrod from the line, use TTY input message T-DN or T-LEN. Type in

T-DN-aa bbb bbbb

aa = MB—Remove line from service

bbb bbbb = Directory number of line (all digits)

or

T-LEN-aa bb cd ef gg

aa = MB—Remove line from service

bb = Number (00 through 15) specifies line link network

c = Number (0 through 7) specifies line switch frame

d = Number (0 through 1) specifies bay

e = Number (0 through 7) specifies concentrator

f = Number (0 through 3 in 4 to 1 concentration) specifies switch

= Number (0 through 7 in 2 to 1 concentration) specifies switch

= Number (0 through 7 in 2 to 1 concentration) specifies switch

gg = Number (00 through 15 in 4 to 1 concentration) specifies level

= Number (0 through 3 in 2 to 1 concentration) specifies level.

System responds with OK message if successful.

(2) Place the insulator over the terminals of the ferrod as shown in Fig. 2 if ferrod has straight terminals.

(3) Use the KS-20827 L1 wire unwrapping tool to remove the wire from the terminals.

(4) Cut required straps of AWG 24 bare tinned copper wire. Use the KS-16363 L1 or L2 wire wrapping tool or KS-21232 L1 wire wrapping gun to strap terminals as shown in Fig. 3 for loop start operation or in Fig. 4 for ground start operation.

(5) Remove insulator, if used, from ferrod terminals.

(6) Restore ferrod to service using TTY input message T-DN or T-LEN. Use 2.03 (1) format with aa=MI.

(7) Check operation of the ferrod by making a test call from the line location (T and R terminal) on the main distributing frame.

GROUND- OR LOOP-START TO NO-TEST VERTICAL CONVERSION PROCEDURE

Note: Unless difficulty arises, the line equipment numbers (LENs) listed in Table A should be used for no-test verticals. Translation data and main distributing frame (MDF) cross-connects must be changed to reflect the newly assigned no-test vertical LENs.

2.04 To convert the ferrod from ground- or loop-start, proceed as follows:

(1) Type in

TAG-UNTY-aa bbb.

aa = 14 for line junctor switch circuits (LJSCs)

= 15 for trunk junctor switch circuits (TJSCs)

= 008 through 011 for network one JSC 0-3

= 016 through 019 for network two JSC 0-3

Member Number = 8 times the junctor network number plus the junctor switch circuit number.

System response TR27 message contains the primary translation word octal address.

(2) Type in

T-READ-cccccc 01.

cccccc = Address obtained in (1).

System response TW02 message contains JSC auxiliary block octal address.

(3) For No-test Vertical Zero (NTVV0), first vertical, type in

RC:PSWD:/
ADD dddddd
LEN eefghjkk!

ddddd = Address obtained in (2) plus octal 3

eefghjkk = LEN for bay 0 of this JSC.

(4) For NTV1 (2nd Vertical), type in

TABLE A
NO-TEST LINE ASSIGNMENTS

NO-TEST VERTICALS IN	STANDARD LINE EQUIPMENT NUMBER ASSIGNMENTS					
	NETWORK	LSF	BAY	CONCENTRATOR	SWITCH	LEVEL
1st Vertical LJSC 0	nn	0	0	0	0	02
1st Vertical LJSC 1	nn	1	0	0	0	02
1st Vertical LJSC 2	nn	2	0	0	0	02
1st Vertical LJSC 3	nn	3	0	0	0	02
2nd Vertical LJSC 0	nn	0	0	4	0	02
2nd Vertical LJSC 1	nn	1	0	4	0	02
2nd Vertical LJSC 2	nn	2	0	4	0	02
2nd Vertical LJSC 3	nn	3	0	4	0	02
1st Vertical TJSC 0	nn	0	*	0	0	02
1st Vertical TJSC 1	nn	1	*	0	0	02
1st Vertical TJSC 2	nn	2	*	0	0	02
1st Vertical TJSC 3	nn	3	*	0	0	02
2nd Vertical TJSC 0	nn	0	*	4	0	02
2nd Vertical TJSC 1	nn	1	*	4	0	02
2nd Vertical TJSC 2	nn	2	*	4	0	02
2nd Vertical TJSC 3	nn	3	*	4	0	02

* Bay 1 in 2:1 type offices; Bay 2 in 4:1 type offices.

RC:PSWD:/
ADD mmmmmm
LEN nnoprstt!

mmmmmm = Address obtained in (2) plus
octal 4

nnoprstt = LEN for bay 1 of this JSC.

- (5) Perform 2.03(1) through (6) **except** in (4) refer to Fig. 5.
- (6) The MDF cross-connects must be changed to the new LENS before any no-test calls will be successful. Therefore, it is necessary to coordinate the time when the above recent change message will be card written.
- (7) Verify a single line equipment number using the following format:

VFY-LEN-31 aaaaaaa

aaaaaaa = line equipment number.

The system response should be a TR03 message with the line equipment number information.

3. PROCEDURE FOR REMREED LINE LINK NETWORKS

TOOLS AND MATERIALS

▶LIST OF TOOLS, TEST EQUIPMENT AND MATERIALS

CODE OR SERIAL NO.	DESCRIPTION
KS-14510,L1	Volt/ohmmeter
625	Wiss cutting pliers
KS-14090 or	Insulating tape
3M #35	
KS-21827 L1	Wire unwrap tool
515666	Gardener-Denver unwrap tool
—	30 AWG bare tinned copper wire (for straps)

30 AWG solid insulated copper wire

Note: See Table B for tools used for 30-gauge wire.

3.01 The remreed line link network is equipped with .025 inch diameter square wire wrap terminals. The wire used is 30 AWG bare tinned copper for straps and 30 AWG solid copper insulated for connecting the 23A apparatus unit.

STRAPPING 12A AND 13A GRIDS

3.02 In the remreed line link networks, the stage 0 type 296 switch package contains 64 crosspoints arranged in a four 4 by 4 matrix used in the 12A concentrator grids or a 16 by 4/8 matrix used in the 13A concentrator grids. Also included and wired internally are sixteen type 2A ferrod sensors and 16 cutoff crosspoints. The connections shown in Fig. 6 indicate that all odd numbered sensor/cutoff combinations (L1, L3, L5...L15) are wired internally in a loop start mode. Connections from all even numbered sensor/cut-off combinations (L0, L2, L4,...L14) are brought out to front terminals where they can be strapped for loop start, Fig. 6A, or for ground start, Fig. 6B, and no-test, Fig. 7.

Note 1: It is suggested that only half of these even numbered levels be assigned to ground start applications on any one switch; ie, level 0 or level 2 might be assigned as a ground start line, but not both. This is also true for level 4 or 6, level 8 or 10, and level 12 or 14. Each pair of levels shares a single -48V battery pin in the 500 row (502, 507, 512, 517) which is not physically long enough to accommodate the two standard wraps required.

Note 2: For applications where all eight even levels are required to be assigned as ground start lines, strapping should be made to the -48V battery pin in the 100 row for that particular level. However, the routing of this wire should be such that it does not interfere with the proper seating of the 951 connector.

3.03 Before beginning the conversion procedure, make sure the switch package containing the ferrod to be converted is positively identified

and located at the equipment side of the concentrator grid. Refer to SD-1A332-01 for switching systems with 2 to 1 line concentration or to SD-1A326-01 for systems with 4 to 1 line concentration.

A. Ground Start and Loop Start Conversion Procedure

3.04 To convert the ferrod from ground start operation to loop start operation, or vice versa, the following procedure is recommended.

Caution: *If an attempt is made to strap the ferrod without removing power from the concentrator and the -48V is shorted, severe service interruptions will follow. Shorting the -48V will blow circuit packs in both controllers and the frame will be out of service. This procedure should be done at time of extremely light traffic. If modification must be made with power applied, see 3.05.*

- (1) Identify and remove -48V fuse for this ferrod.
The fuses for the grids are located at the bottom of the frame and are labeled by concentrator number.
- (2) Connect VOM between -48V on front of concentrator and ground until voltage reading is 0 volts. This will discharge the circuit.
- (3) Remove VOM from concentrator.
- (4) Use the KS-21827-L1 wire unwrapping tool to remove the wire from the terminals.
- ▶(5) Cut required straps of AWG 30 bare tinned copper wire and solid insulated copper wire. Use the KS-16363 L1 or L2 wire wrapping tool or KS-21232 L1 wire wrapping gun to strap terminals. Figure 6A shows how to convert the sensor option for cut-off crosspoint L-14 to provide a loop start condition. Three 30 AWG wires are required for each such conversion. Figure 6B shows how to convert the sensor option for cut-off crosspoint L-0 to provide a ground start condition. Two 30 AWG wires are required for each such conversion.
- (6) Replace -48V fuse.

SECTION 231-010-301

(7) Check operation of the ferrod by making a test call from the line location (T and R terminal) on the main distributing frame.

= 008 through 011 for network 1 JSC 0 through 3

3.05 If the 12A or 13A grids **must** be strapped without removing power, the procedures for strapping 12B and 13B grids must be followed, with the following exceptions.

= 016 through 019 for network 2 JSC 0 through 3

(1) Terminals adjacent to these being strapped must be completely insulated using an insulating tape, KS14090 or 3M #35. This tape is to cover the pins and any components attached to those pins. This tape must be removed after the strapping operation is complete.

Member Number = 8 times the junctor network number plus the junctor switch circuit number.

(2) Straps should be removed by loosening the wraps at each end and sliding the wire from the terminal. A Gardner-Denver #515666 unwrap tool should be used.

System response TR27 message contains the primary translation word octal address.

(3) Straps should be added using an insulated wire wrapping tool. Connections to -48 volt pins should be applied last.

(2) Type in

T-READ-cccccc 01

cccccc = Address obtained in (1).

System response TW02 message contains JSC auxiliary block octal address.

B. Ground Start or Loop Start to No-Test Vertical Conversion Procedure Using a Type 23A Apparatus Unit

(3) For no-test vertical zero (NTV0), first vertical, type in

RC:PSWD:/
ADD ddddddd
LEN eefghjkk!

ddddddd = Address obtained in (2) plus octal 3

eefghjkk = LEN for bay 0 of this JSC

Note: Unless difficulty arises, the line equipment numbers (LENs) listed in Table A should be used for no-test verticals. Translation data and main distributing frame (MDF) cross-connects must be changed to reflect the newly assigned no-test vertical LENs.

(4) For NTV 1 (second Vertical) type in

RC:PSWD:/
ADD:mmmmmmm
LEN:nnprstt!

mmmmmmm = Address obtained in (2) plus octal 4

nnprstt = LEN for bay 1 of this JSC.

3.06 To convert the ferrod from ground or loop start, proceed as follows:

(1) Type in

TAG-UNTY-aa bbb

aa = 14 for line junctor switch circuits (LJSCs)

= 15 for trunk junctor switch circuits (TJSCs)

bbb = 000 through 003 for network 0 JSC 0 through 3

(5) Perform 3.04(1) through (6) except in (5) refer to Fig. 7.

(6) The MDF cross-connects must be changed to the new LENs before any no-test calls will be successful. Therefore, it is necessary to

coordinate the time when the above recent change message will be card written.

- (7) Verify a single line equipment number using the following format:

VFY-LEN-31 aaaaaaaaa

aaaaaaaa = Line Equipment Number

The system response should be a TR03 message with the line equipment number information.

STRAPPING 12B AND 13B GRIDS

3.07 In the remreed line link network, the stage 0 type 296D input switch package contains 64 crosspoints arranged in four 4 by 4 matrixs used in the 12B concentrator grids or a 16 by 4/8 matrix used in the 13B concentrator grids. Also included and wired internally are 16 type 2A ferrod sensors and 16 cutoff crosspoints. The connections shown in Fig. 8 indicate that all odd numbered sensor/cutoff combinations (L1, L3, L5__L15) are wired internally in a loop start mode. Connections from all even numbered sensor/cutoff combinations (L0, L1, L4__L14) are brought out to front terminals where they can be strapped for loop

▶ TABLE B ◀

TOOLS USED FOR 28 AND 30 GAUGE WIRE

SPEC. NO.	DESCRIPTION	MANUFACTURER	MODEL NO.
K-16363-L1 or L2	Wire wrapping tool		
KS-21232-L1	Electric wire wrapping gun		
	Wrapping sleeve for 30 gauge wire [for .045 square term.]	Gardner Denver Co.	512056
	Wrapping sleeve for 28 and 30 gauge wire [for .025 term.]	Gardner Denver Co.	507100
	Wire unwrapping tool	Standard Pneumatic Inc.	SP-682
	Wrapping bit for 30 gauge wire [for .025 square term.]	Gardner Denver Co.	507063
	Wrapping bit for 30 gauge wire [for .045 square term.]	Gardner Denver Co.	501381
	Wrapping bit for 28 gauge wire [for .025 square term.]	Gardner Denver Co.	509278
	28 Gauge wire cutting tool	O.K. Mechain and Tool Co.	ST-100-28
	30 Gauge wire cutting and stripping tool	O.K. Mechain and Tool Co.	ST-100-30
KS-7851-L3	Sleeving, yellow No. 20 [term marking]		

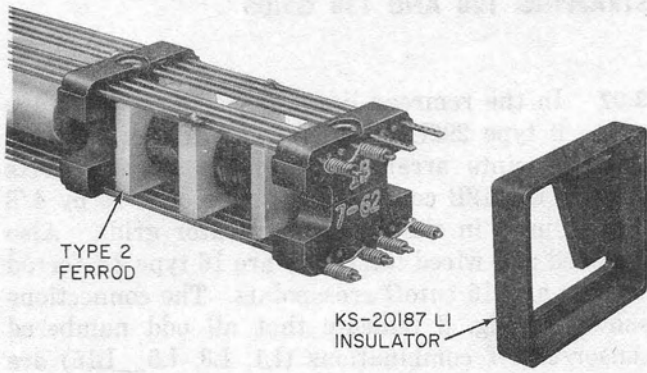


Fig. 1—Equipment End of Type 1B Sensor Assembly and KS-20187 L1 Insulator

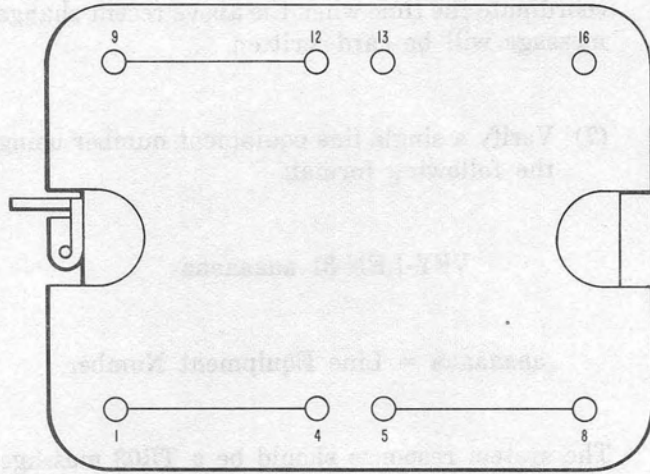


Fig. 3—Strapping for Loop Start Operation

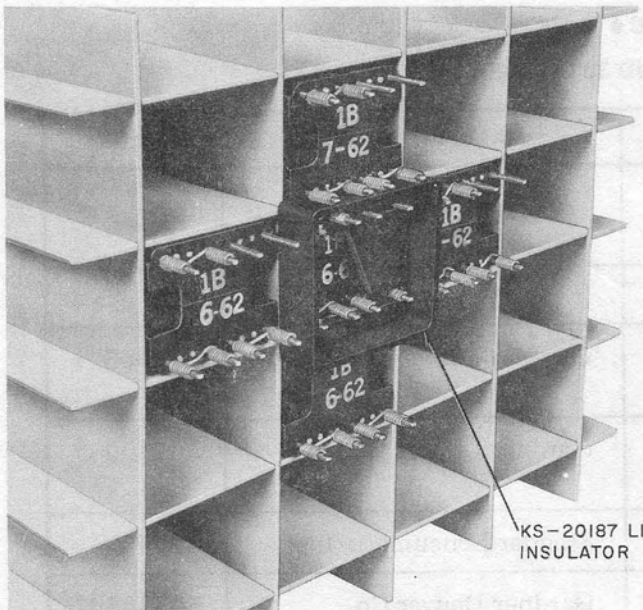


Fig. 2—Insulator Installed on Ferrod Terminals

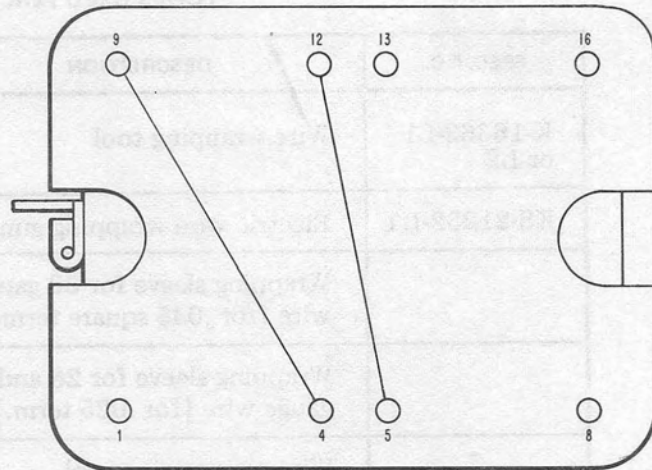


Fig. 4—Strapping for Ground Start Operation

start, Fig. 8A, or for ground start, Fig. 8B, and no-test, Fig. 8C.

◆**Note 1:** It is suggested that only half of these even numbered levels be assigned to ground start applications on any one switch, ie, level 0 or level 2 might be assigned as a ground start line, but not both. This is also true for level 4 or 6, level 8 or 10, and level 12 or 14. Each pair of levels shares a single -48V battery pin in the 500 row (502, 507, 512, 517) which is not physically long enough

to accommodate the two standard wraps required.

Note 2: For applications where all eight even levels are required to be assigned as ground start lines, strapping should be made to the -48V battery pin in the 100 row for that particular level. However, the routing of this wire should be such that it does not interfere with the proper seating of the 951 connector.◆

3.08 Before beginning the conversion procedure, make sure the switch package containing

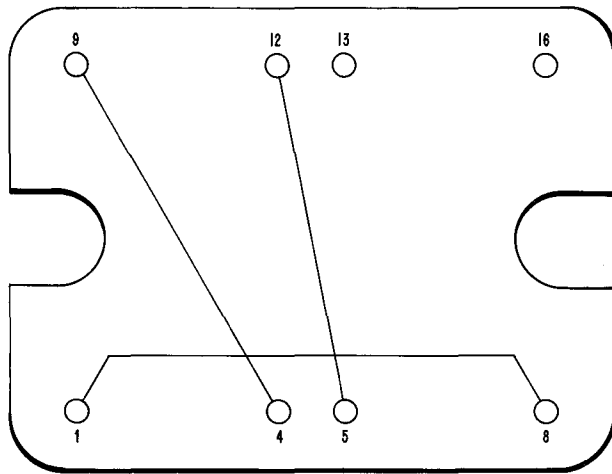


Fig. 5—Strapping for No-Test Vertical Operation

the ferrod to be converted is positively identified and located at the equipment side of the concentrator grid. Refer to SD-1A332-01 for switching systems with 2 to 1 line concentration or to SD-1A326-01 for systems with 4 to 1 concentration.

A. Ground Start and Loop Start Conversion Procedure

3.09 To convert the ferrod from ground start operation to loop start operation, or vice versa, the following procedure is recommended.

Caution: *The conversion procedure is performed without removing power from the grid. Care must be exercised to prevent shorting terminals. This procedure should be done at times of light traffic.*

- (1) Locate and identify ferrod to be converted.
- (2) Cut required straps of AWG 30 bare tinned copper wire.
- (3) Use the wire unwrapping tool to remove the wire from the terminals.
- ◆(4) Use the wire wrapping tool or wire wrapping gun to strap terminals. Figure 8A shows how to convert the sensor option for cut-off crosspoint L-2 to provide a loop start condition. Three 30 AWG straps are required for each such conversion. Figure 8B shows how to convert

the sensor option for cut-off crosspoint L-0 to provide a ground start condition. Two 30 AWG straps are required for each such conversion.◆

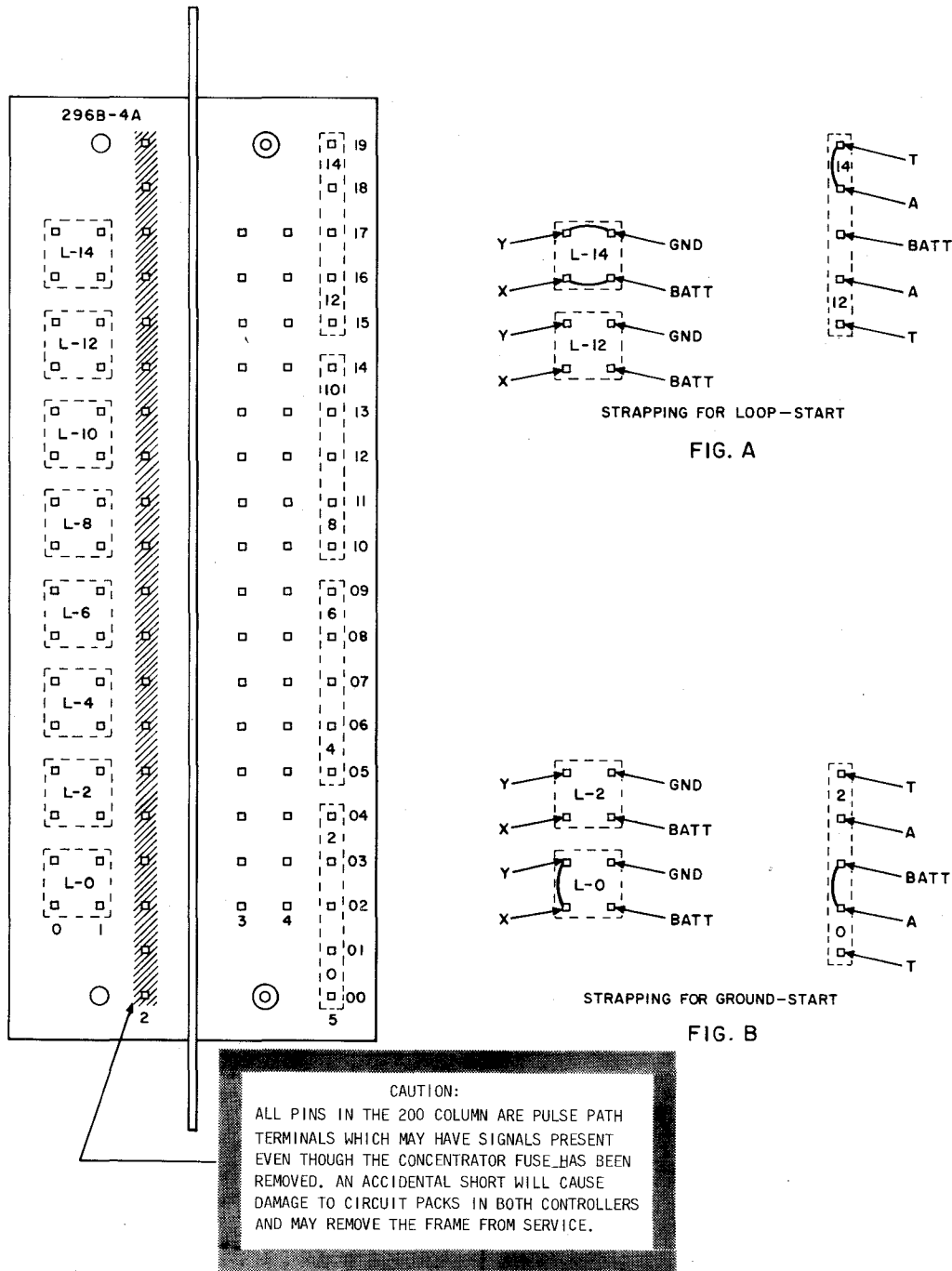
- (5) Check operation of ferrod by making a test call from the line location (T and R terminal) on the main distribution frame.

B. Ground Start or Loop Start to No-Test Vertical Conversion

3.10 The 12B and 13B grids can be strapped for NO-TEST without using the 23A apparatus unit. The terminals used for NO-TEST on the 12B grid are input level 2 of switches 0, 1, 4 and 5. The terminals used for NO-TEST on the 13B grid are input levels 2 and 6 on each switch. Other input levels on the 12B and 13B grids can be used with a 23A apparatus unit for no-test.

Caution: *This conversion procedure is performed without removing power from the grid. Care must be exercised to prevent shorting terminals. This procedure should be done at times of light traffic.*

- 3.11 To convert the ferrod from ground or loop start, proceed as follows:
 - (1) Locate and identify ferrod to be converted.
 - (2) Perform 3.06 steps 1 through 4.
 - (3) Cut required straps, one 30 AWG bare tinned copper awd two 30 AWG solid copper insulated.
 - (4) Use the wire unwrapping tool to remove the wire from the terminals.
 - ◆(5) Use the wire wrapping tool or wire wrapping gun to strap terminals. Figure 8C shows how to convert the sensor to NO-TEST.◆
 - (6) The MDF CROSS-CONNECTS must be changed to the new LENs before any NO-TEST calls will be successful. Therefore, it is necessary to coordinate the time when the recent change message will be cardwritten.



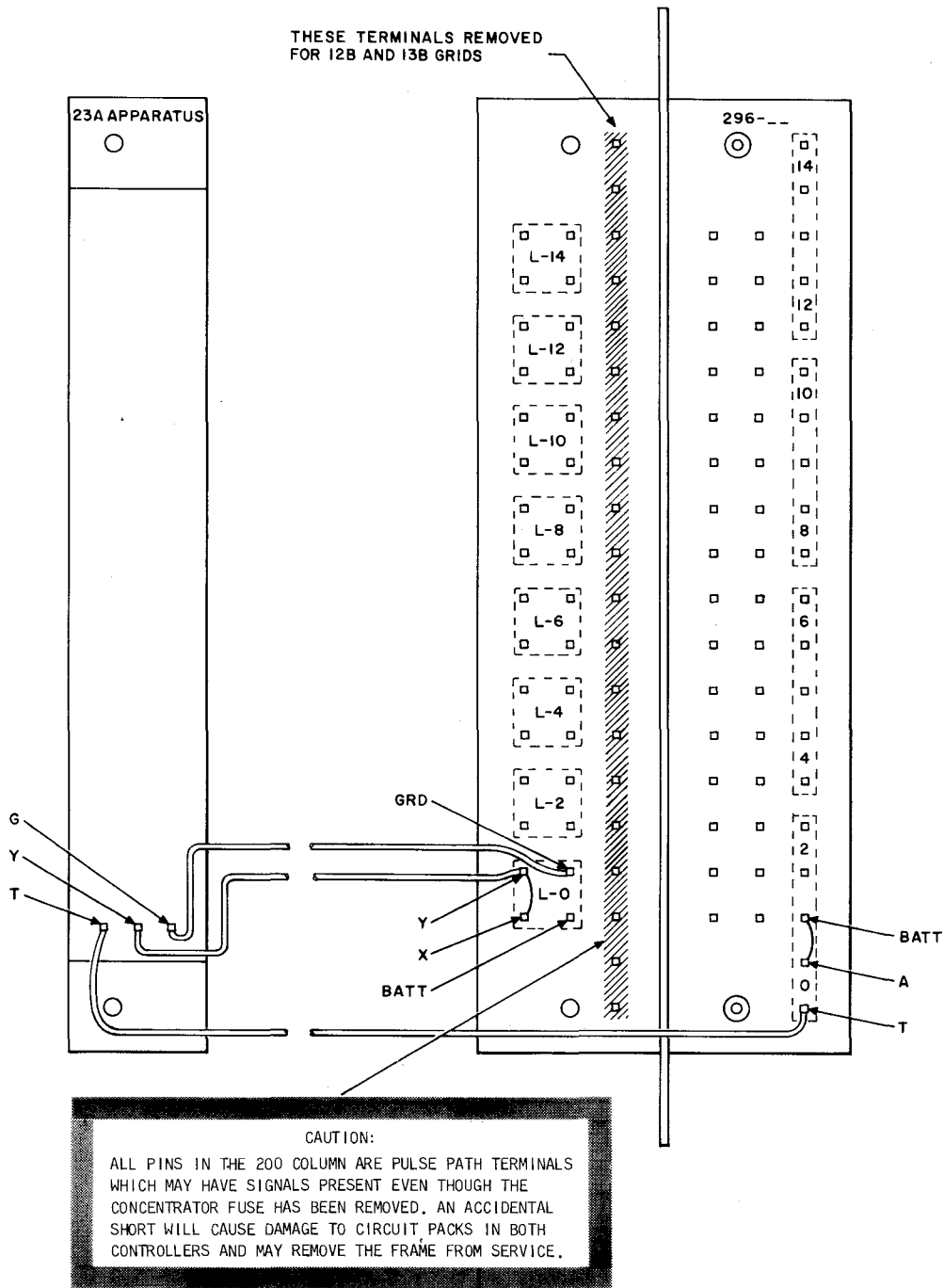
◆Fig. 6—Remreed Switch Package Type 296B- (Front View)◆

(7) Verify a single line equipment number using the following format:

VFY-LEN-31 aaaaaaaaa

aaaaaaaa = line equipment number

The system response should be a TR03 message with the line equipment number information.



◆ Fig. 7—Strapping for No-Test Vertical Operation With Type 23A Apparatus (Remreed) ◆

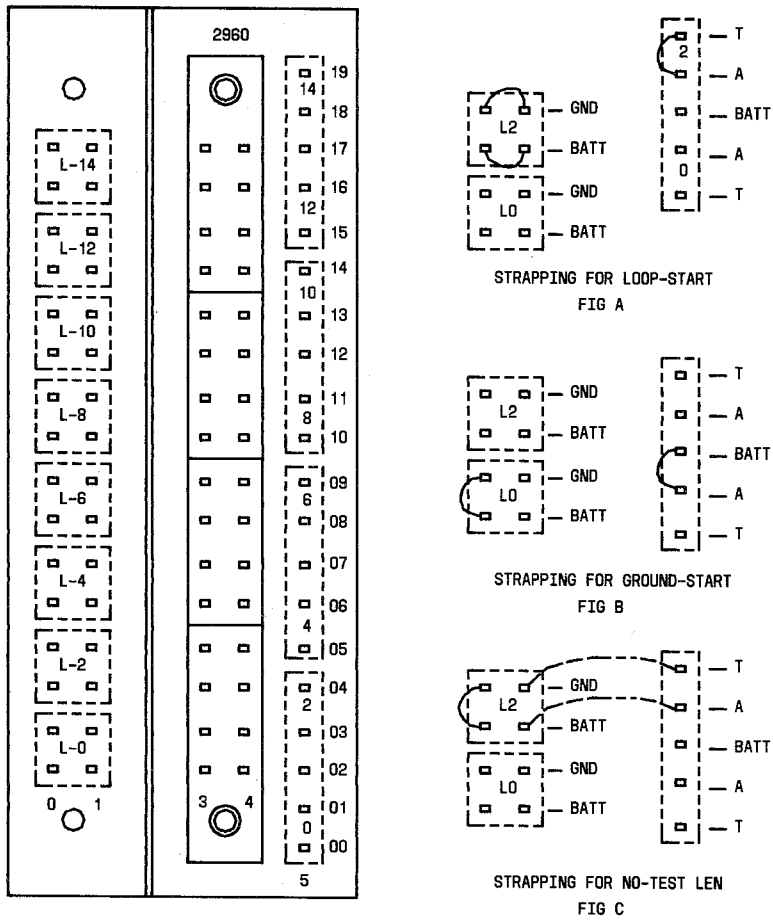


Fig. 8—Remreed Switch Package Type 296D—(Front View)