

**FERROD SENSORS
REPLACEMENT PROCEDURES
NO. 1 ELECTRONIC SWITCHING SYSTEM**

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1. GENERAL

1.01 This section describes the procedures for replacement of ferrod sensors in scanner circuits of the No. 1 Electronic Switching System (ESS). This section also covers the information necessary for ordering replacement ferrod sensor assemblies.

1.02 This section is reissued for the following reasons.

- (a) To include Addendum 1
- (b) To add coverage for the KS-21232 L1 electric wire wrapping gun
- (c) To change KS tool designations.

**Reprinted to comply with modified final judgment.

SECTION 231-010-801

1.03 Ferrod sensors used in the various scanner circuits are listed in Part 3. A typical two ferrod sensor assembly is shown in Fig. 1. For more information on scanner operation, refer to Section 231-030-010.

1.04 Before a ferrod sensor assembly can be replaced, the circuits in which it is used must be made busy or taken out of service.

(a) This is accomplished in the line scanners and junctor scanners by teletypewriter (TTY) input messages that make the line busy or remove the junctor circuit from service. Where input messages are specified, reference should be made to the Input Message Manual IM-1A001 for correct message format and contents. Replacement of a ferrod sensor assembly is performed without removing power from the scanner circuits. Appropriate precautionary measures are given in the procedure.

(b) In the universal trunk and miscellaneous trunk scanners, ferrod sensors are taken out

of service by keying the appropriate trunk network numbers on the line and trunk test panel.

(c) Ferrod sensors in the master scanners are made busy as determined by the circuits using the scan points. Replacement of a ferrod sensor assembly is performed without removing power from the scanner circuits. Appropriate precautionary measures are given in the procedure.

2. PIECE-PART DATA

2.01 When ordering replacement ferrod sensors, give both the type and the name as shown in the following example:

1B ferrod sensor assembly

Do not refer to the number or to any information shown on the illustrations.

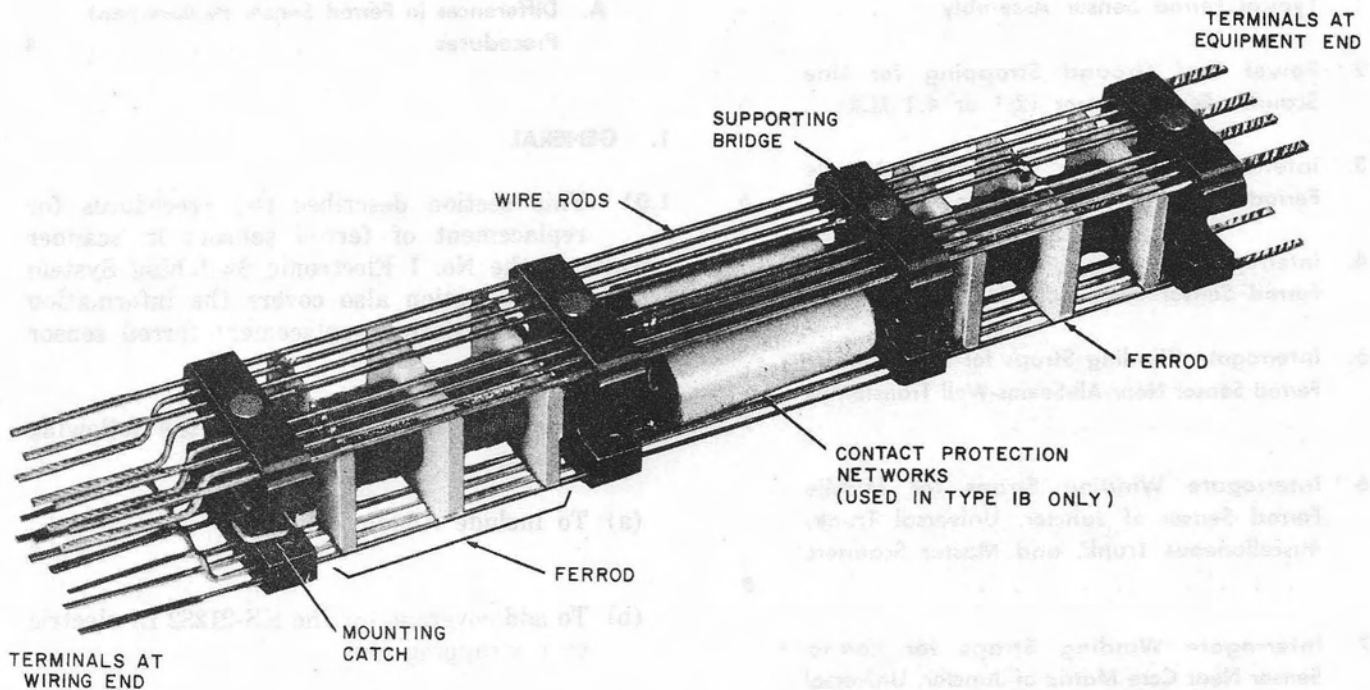


Fig. 1—Typical Ferrod Sensor Assembly

2.02 Four types of ferrod sensors are used in the scanner circuits as shown in the following list:

- Electrical tape
- Plastic sheets (for protective insulation)
- Solder

SCANNER CIRCUIT	FERROD SENSOR TYPE
Line	1B
Junctor (2-wire No. 1 ESS)	1C
Universal Trunk (2-wire No. 1 ESS)	1C and 1D
Universal Trunk (4-wire No. 1 ESS)	1D
Miscellaneous Trunk (4-wire No. 1 ESS)	1D
Master	1D and 1E

3. List of Tools and Materials

CODE OR

SPEC. NO. DESCRIPTION

TOOLS

KS-14440 L3	Soldering copper
KS-14440 L20	Heater and tip
◆KS-16363 L1 or L2	Wire wrapping tool
KS-21232 L1	Electric wire wrapping gun
KS-20963 L3	Stationary sleeve for 26-gauge wire
KS-20827 L1	Wire unwrapping tool◆
KS-16903 L1	Wrapping bit for 26-gauge wire

MATERIALS

—	26 AWG insulated wire (for straps)
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4. FERROD ASSEMBLY REPLACEMENT PROCEDURE

4.01 The procedures for replacing ferrod sensors in the various scanner circuits are essentially the same and are consolidated into one procedure. Pertinent references and procedural differences peculiar to each circuit are covered in Table A. The steps in the table are numbered to correspond with those in 4.02. For complete instructions applicable to a particular circuit, follow the steps in 4.02 as indicated in Table A.

4.02 To replace a ferrod sensor assembly, perform the following.

(1) Locate the faulty ferrod sensor in the equipment frame and on the schematic diagram (SD) specified in Table A.

(2) Make busy circuits associated with the ferrods or take them out of service as indicated in Table A. Since each ferrod sensor assembly contains two ferrods, **both must** be made busy.

(a) The master scanner ferrods should be made busy only when their failure impedes effective system operation. The method for making a master scanner ferrod busy is determined by the circuit using the scan point.

(b) Incoming trunk circuit ferrods must be made busy at the distant office associated with the circuit.

(c) The following replacement procedures refer to the faulty ferrod. To replace a faulty ferrod, the other ferrod in the assembly must also be replaced. The procedures for the faulty ferrod should also be applied to the other ferrod in the assembly.

Caution: Some line scanner and master scanner ferrod sensors are replaced while power is applied to the ferrod sensor. Do not short to ground (frame) the -48V power appearing

TABLE A
DIFFERENCES IN FERROD SENSOR REPLACEMENT PROCEDURES

STEP (See 4.02)	LINE SCANNERS		JUNCTOR SCANNERS (2 Wire Only)	UNIVERSAL TRUNK SCANNERS		MISCELLANEOUS TRUNK SCANNERS (4 Wire Only)	MASTER SCANNERS
	2:1 LCR	4:1 LCR		2 Wire	4 Wire		
(1)	SD-1A111-01	SD-1A115-01	SD-1A214-01	SD-1A215-01	SD-2A010-01	SD-2A003-01	SD-1A118-01 SD-1A209-01
(2)	Use TTY input message T-DN or T-LEN.		Use TTY input message T-JNN.	Use line and trunk panel.			As determined by circuit using scan point.
(3)	See caution in 4.02.		Remove the fuse carrying the -48V power.				See caution in 4.02
(4)	See Fig. 2.		Does not apply.				See Fig. 2.
(5)	See Fig. 3, 4, and 5.		See Fig. 6, 7, and 8.				
(6)	See Fig. 9.		See Fig. 10.				
(7), (8), (9), (10), and (11)	As stated in 4.02 (7), (8), (9), (10), and (11).						
(12)	Use TTY input message SCL-DGN.		Use TTY input message SC-DGN.				
(13)	Does not apply.		As stated in 4.02 (13).				Does not apply.
(14)	Use TTY input message T-DN or T-LEN.		Use TTY input message T-JNN.	Use line and trunk test panel.			As determined by circuit using scan point.
(15)	Make test from main distributing frame or from terminal block on LSF.		Use line and trunk test panel.				As determined by circuit using scan point.

on terminals 5, 9, or 12 of a line scanner ferrod sensor. Power may appear on any terminal of a master scanner ferrod sensor; therefore, the circuit using the ferrod must be analyzed to determine which terminals carry power. Use electrical tape, plastic sheets, and other protective devices as required to prevent shorting ferrod sensor terminals.

- (3) Remove the fuse carrying the -48V power to the ferrod sensor if indicated in Table A.

Note: In Steps (4), (5), and (6), use 26 AWG insulated wire for shorting straps and be sure to cut straps long enough to permit access to the terminals of the faulty ferrod sensor. At the wiring end, terminals are numbered from right to left; bottom row terminals are 1 through 8 and top row terminals are 9 through 16.

- (4) Strap the -48V battery and frame ground terminals as shown in Fig. 2.

Note: When replacing master scanner ferrods **caution** should be used when strapping -48 volts. If these straps are broken, ferrods in that row will be inoperative. Strap these leads in the same manner as a line scanner ferrod.

- (5) Strap around both interrogate windings of the faulty ferrod sensor as shown in the appropriate figure. The strapping arrangement for the interrogate windings of middle ferrod sensors in the line scanners are shown in Fig. 3; of ferrod sensors adjacent to the core matrix, in Fig. 4; and of ferrod sensors adjacent to the all-seems-well (ASW) transformer, in Fig. 5. Strapping arrangements for the interrogate windings of the junctor, universal trunk, miscellaneous trunk, and master scanner ferrod sensors are illustrated in Fig. 6 (middle ferrod sensors), Fig. 7 (ferrod sensors adjacent to core matrix), and Fig. 8 (ferrod sensors adjacent to ASW transformer).

- (6) Strap around both readout windings of the faulty ferrod sensor (Fig. 9 or 10) as indicated in Table A. Typical strapping arrangements for the line scanner readout windings are shown in Fig. 9. Figure 10 shows typical strapping

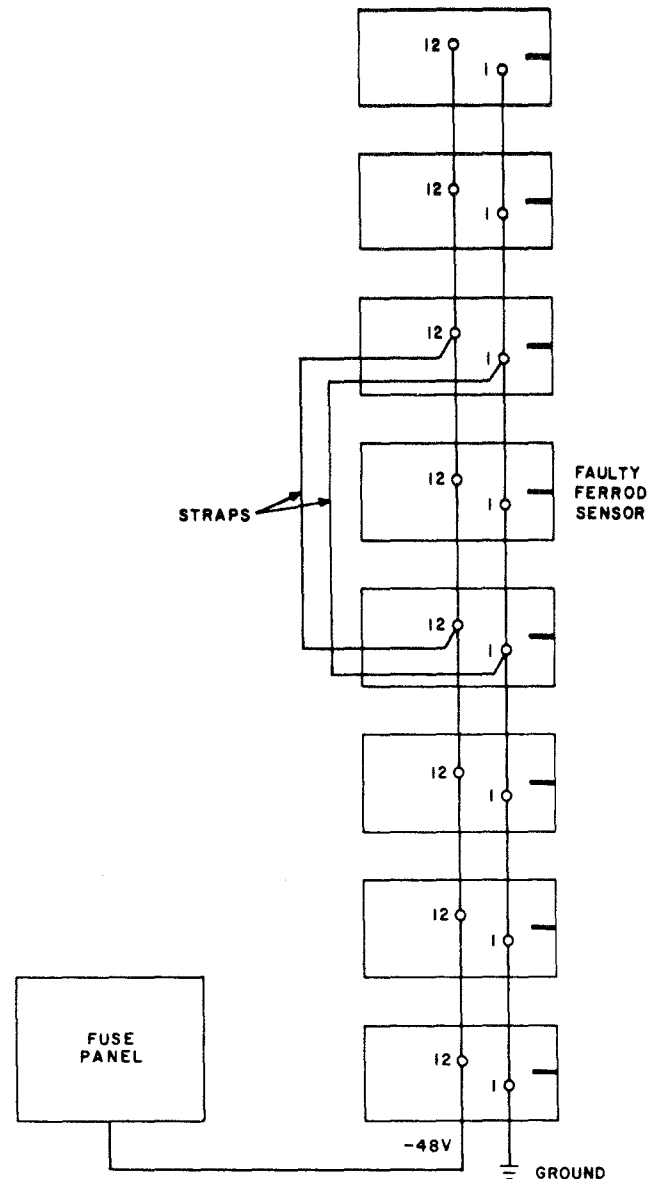


Fig. 2—Power and Ground Strapping for Line Scanner Ferrod Sensor (2:1 or 4:1 LCR)

arrangements for the readout windings in all other scanner circuits. The straps in Fig. 9 and 10 are numbered to correspond with the ferrod sensor being strapped out of the circuit. For example, if ferrod sensor 5 is faulty, use straps 5A and 5B.

Caution: To prevent shorting, tape each bare wire end with electrical tape as soon as it is disconnected.

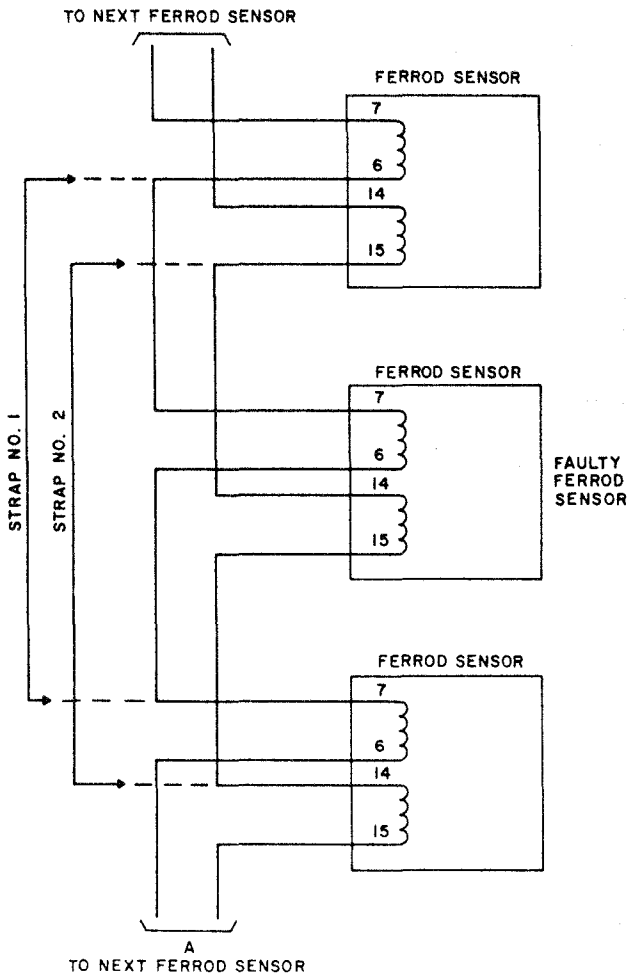


Fig. 3—Interrogate Winding Straps for Middle Ferrod Sensor of Line Scanner

- (7) Tag and disconnect all leads from the terminals of the faulty ferrod sensor. Use the KS-20827 L1 wire unwrapping tool or the KS-14440 L3 soldering copper with the KS-14440 L20 heater and tip.
- (8) Depress the mounting catch on the side of the faulty ferrod sensor assembly and push the assembly toward the front of the frame far enough to hold mounting catch disengaged. At the front of the frame, remove the ferrod sensor assembly from the apparatus mounting unit.
- (9) Make sure the new ferrod sensor assembly is of the proper type and the strapping on the equipment end is identical to that on the faulty ferrod sensor assembly. At the front of the frame, insert new ferrod sensor assembly

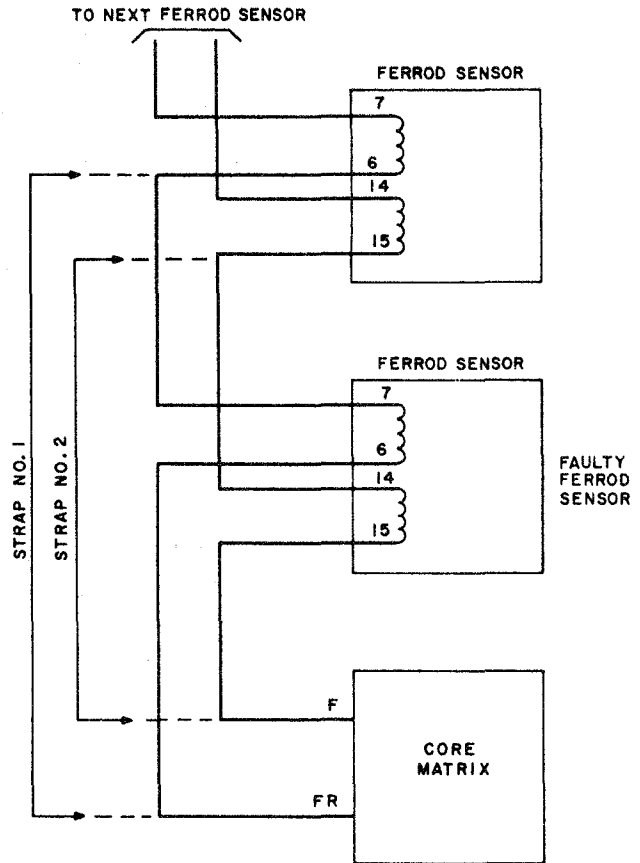


Fig. 4—Interrogate Winding Straps for Line Scanner Ferrod Sensor Near Core Matrix

- into cell with equipment end toward the front. Make sure mounting catch snaps into place, securing ferrod sensor assembly in the cell.
- (10) Using the KS-16363 L1 or L2 wire wrapping tool or the KS-21232 wire wrapping gun with the KS-16903 L1 wrapping bit and the KS-14440 L3 soldering copper with the KS-14440 L20 heater and tip, connect leads to terminals according to the tags attached in Step (7). Each terminal should be wire wrapped and soldered. Do not remove the electrical tape from end of a lead until ready to connect it to the terminal.
- (11) Remove the shorting straps installed in steps (4), (5), and (6).
- (12) Request diagnosis of the ferrod sensors using the TTY as indicated in Table A. If the diagnosis fails, recheck connections for interrogate and readout windings; then, if

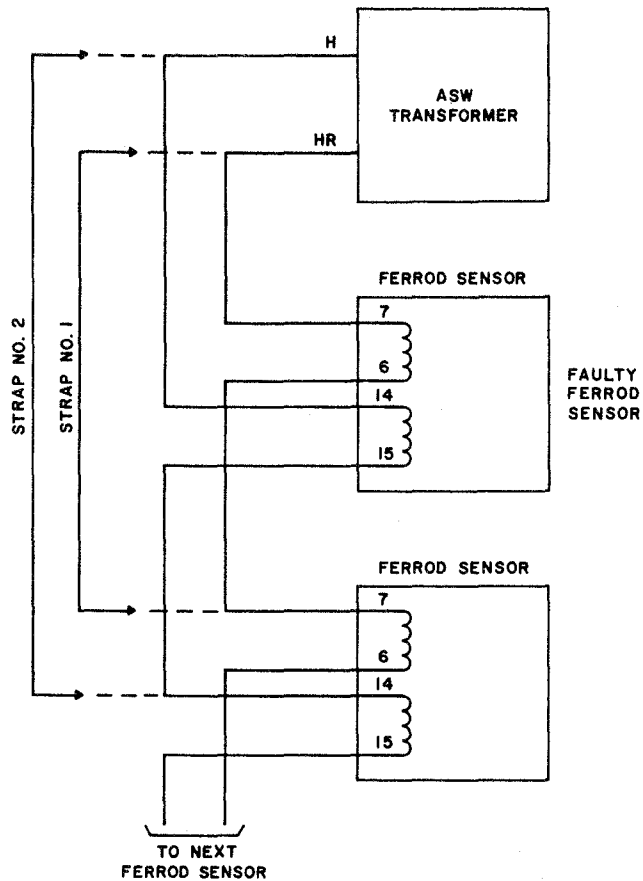


Fig. 5—Interrogate Winding Straps for Line Scanner Ferrod Sensor Near All-Seems-Well Transformer

necessary, use the trouble locating manual to find the trouble. If the diagnosis passes, proceed to next step.

- (13) If a fuse was removed in Step (3), replace it as indicated in Table A.
- (14) Restore the circuits associated with the ferroids to service using the TTY or the line and trunk test panel as indicated in Table A. Since each ferrod sensor contains two ferroids, both must be restored to service.
- (15) Test the ferroids to make sure they are operating properly.
 - (a) For line ferroids, make a test call across the tip and ring of the line from the main distributing frame or from a terminal block on the line switching frame. To verify ferrod saturation, dial tone should be returned.
 - (b) Junctor, universal trunk, and miscellaneous trunk scanner ferroids may be tested using the line and trunk test panel.
 - (c) The master scanner ferroids must be tested as determined by the circuit using the scan point.

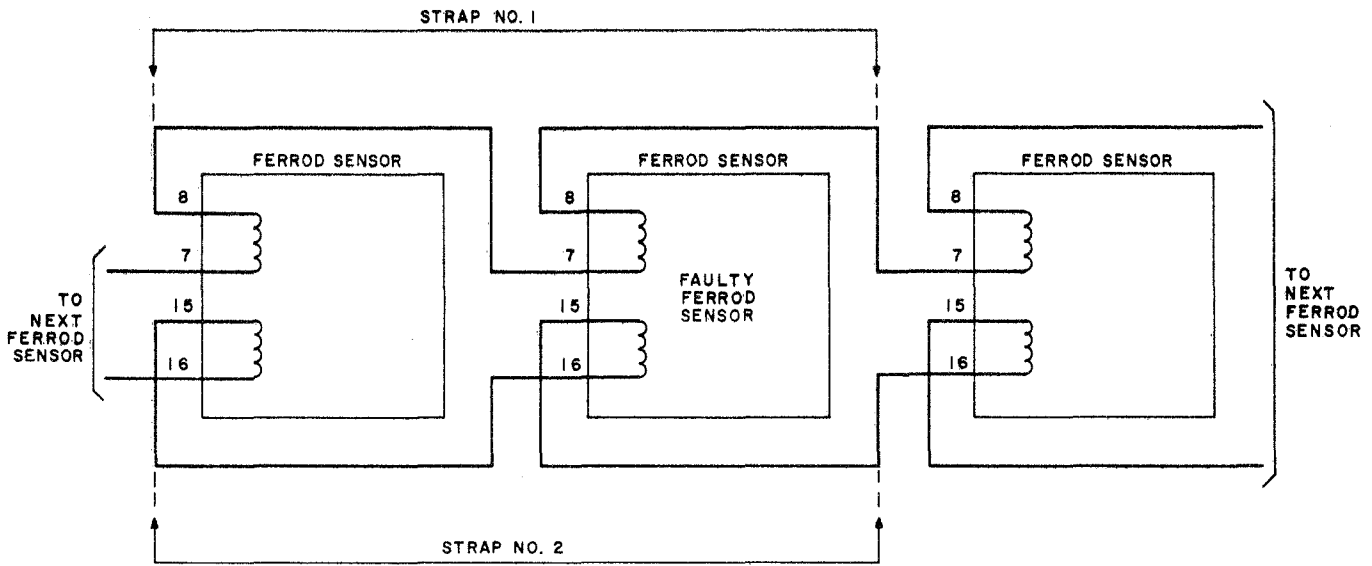


Fig. 6—Interrogate Winding Straps for Middle Ferrod Sensor of Junctor, Universal Trunk, Miscellaneous Trunk, and Master Scanners

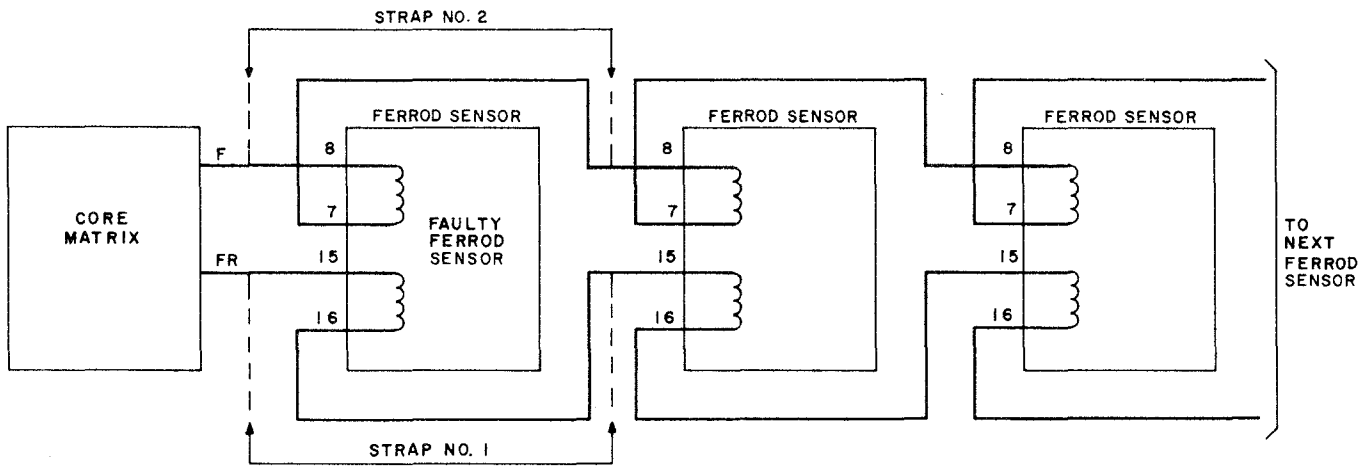


Fig. 7—Interrogate Winding Straps for Ferrod Sensor Near Core Matrix of Junctor, Universal Trunk, Miscellaneous Trunk, and Master Scanners

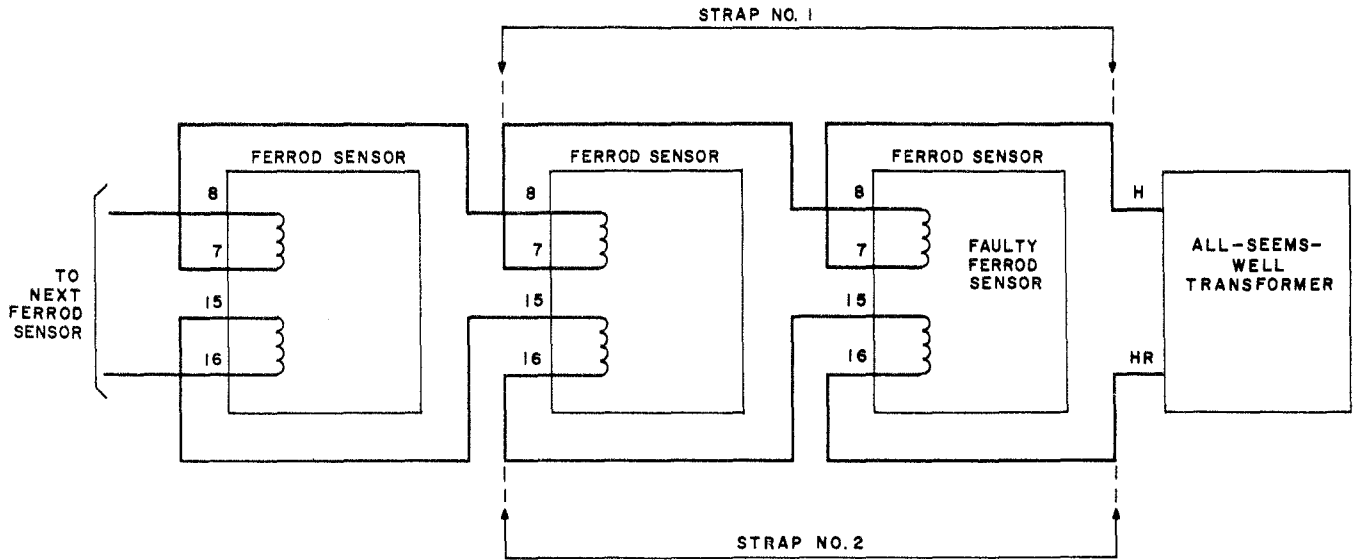


Fig. 8—Interrogate Winding Straps for Ferrod Sensor Near All-Seems-Well Transformer of Junctor, Universal Trunk, Miscellaneous Trunk, and Master Scanners

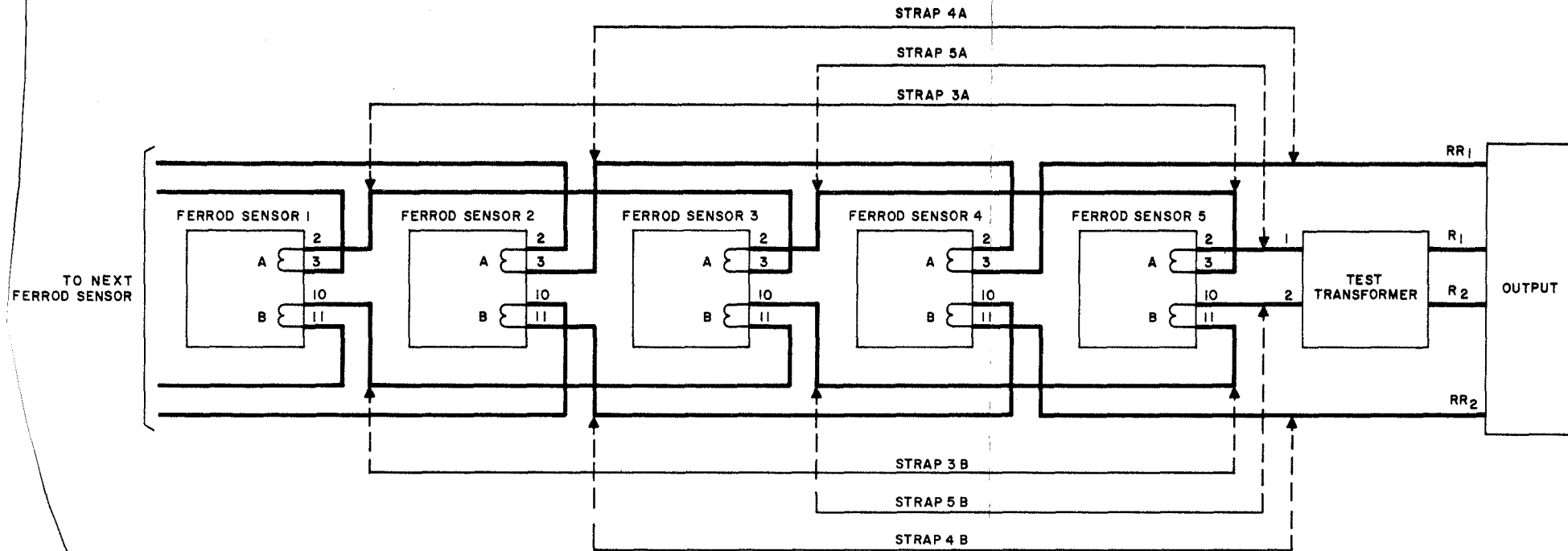


Fig. 9—Typical Readout Winding Straps for Ferrod Sensors in Line Scanner

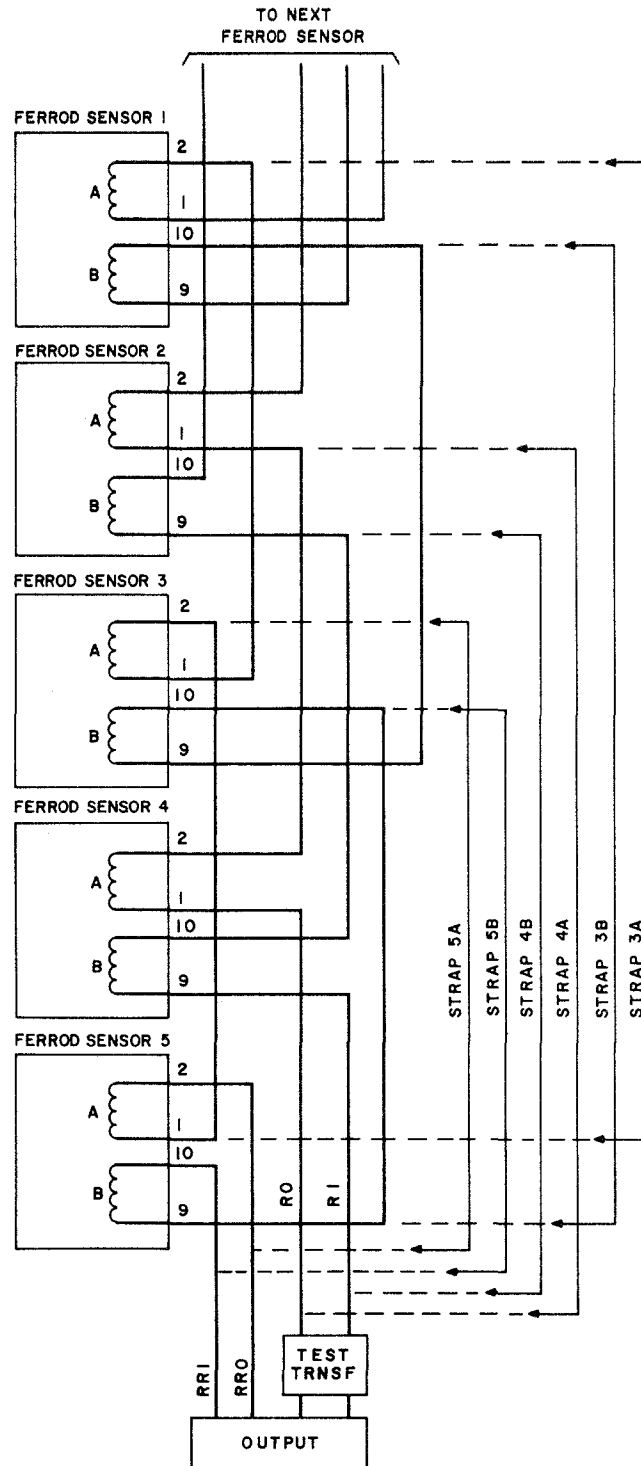


Fig. 10—Typical Readout Winding Straps for Ferrod Sensors in Junctor, Universal Trunk, Miscellaneous Trunk, and Master Scanners