

DATA SET 205A
TRANSMITTER-RECEIVER
USED ON PRIVATE SERVICE SYSTEMS
TEST PROCEDURES

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1. GENERAL

1.01 This section contains information concerning the installation and maintenance tests of Data Set (DS) 205A.

1.02 This section is reissued to add the use of the 914B Data Test Set (DTS) when performing the installation and maintenance tests and to revise

information from the previous issue. Due to extensive revision, change arrows have been omitted.

1.03 For information concerning the operation of the 914B DTS, refer to the section entitled 914B Data Test Set, Description and Operation (107-101-100).

2. INSTALLATION TEST PROCEDURES

2.01 The following tests may be used at the time of installation and as an aid in clearing a trouble condition.

A. Power Test

2.02 Measure the ac voltage supplied to DS 205A with a KS-16979-L1 volt-ohm-milliammeter (VOM), or equivalent, set to 150 ACV.

B. Remote Test

2.03 Upon request of data test center, the data set is placed in the remote test mode by depressing Remote Test key on associated telephone.

2.04 In the remote test mode, the data test center may check the following:

- (a) The function of the CON lead
- (b) The RS-CS time interval
- (c) Data performance at 2400 and 1200 bits per second (bps)
- (d) Local oscillator accuracy
- (e) Effectiveness of the receiver synchronization recovery circuits.

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2.05 If the oscillator is inaccurate, it may be calibrated at the request of the data test center but must be calibrated once every three years.

2.06 The oscillator is located at the top and to the front of card 051. The adjustment screw is located on the front of the oscillator and may be reached and adjusted without the removal of the card.

2.07 One revolution of the screw varies the oscillator by approximately 5.5 ppm (parts per million).

2.08 The data set must have power on for 15 minutes prior to this adjustment.

- (a) To raise oscillator frequency, rotate screw clockwise.
- (b) To lower oscillator frequency, rotate screw counterclockwise.

2.09 The data test center will determine when the oscillator shall be calibrated.

2.10 If the telephone control equipment necessary to place the DS 205A in the remote test mode is unavailable, an alternative method may be used.

- (a) Check that set is strapped with options for normal operation.
- (b) Check that the LINE—TEST key is in the LINE position.
- (c) Place a strap between TP12 and TP4 on card 021. The K2 relay will operate.

2.11 Data test center may now test Data Set 205A in the remote test mode.

2.12 If the data set checks satisfactorily, no further testing is necessary.

2.13 If further testing is required, or a data test center is unavailable, test the DS 205A as described in the remainder of this section.

3. MAINTENANCE TEST PROCEDURES

3.01 These tests should be performed when a trouble report is received from a DS 205A customer.

A. Interface Test

3.02 The following equipment is required to perform this test:

1—901B Data Test Set and cover (interface test adapter)

1—KS-16979-L1 volt-ohm-milliammeter or equivalent

1—KS-19087-L2 connector

1—1011-type handset

1—600-ohm resistor ± 1 percent, 0.25 watt.

3.03 Perform the interface test by following this procedure:

(1) Disconnect the ac power cord of DS 205A, the TEL LINE, CUSTOMER A, CUSTOMER B, and the 4-WIRE connectors from the data set in the order given.

(2) Strap terminal E1 to E2.

(3) Check TR-SW (019) card. Place strap between terminals 3 and 4 and remove strap between terminals 1 and 2 if card is not already strapped in this manner.

(4) Connect the 4A1 Data Unit connector cord to the 4-WIRE connector.

(5) Remove locking bar and place 4A1 in TEST position.

(6) Connect a 901B test set, with A TEST and B TEST switches in OFF position, to a test cover and connect cover to the CUSTOMER B connector on DS 205A.

(a) Set SELECTOR switch of 901B to 3.

(b) Set B TEST switch to 1.

(c) Set ATT-UNATT to UNATT. In this position data set is operating full speed.

(7) Set KS-16979-L1 meter to 30 DCV and connect - probe to terminal A and + probe to terminal C on the 901B.

(8) Connect the ac power cord of DS 205A and observe reading on meter.

Requirement: 15.8 — 20.2 volts (negative power supply)

(9) Disconnect meter probes.

(10) Move B TEST switch to 2.

(11) Place - probe to terminal C and + probe to terminal A and observe reading on meter.

Requirement: 15.8 — 20.2 volts (positive power supply)

(12) Disconnect probes and remove ac power cord of DS 205A.

(13) Make the following changes on the 901B interface test adapter.

(a) Open shorting clips 14, 23, 24, and 25.

(b) Strap 9 to 18, 9 to 19, 20 to EQ23, and TST14 to EQ25.

(14) Connect ac power cord of DS 205A.

(15) Refer to Table A for ac and dc meter readings with the A TEST and B TEST switches in different positions. It is suggested that the dc readings be taken first, taking care to observe correct polarity, then take the ac readings. The dc readings are made between terminals A and C (ground) of the 901B test set. The ac readings are made between B and C. If results vary from those given, refer to Table B of 4. **TROUBLE-LOCATING PROCEDURES.**

(16) Set B TEST switch to OFF and A TEST switch to 1.

(17) Set VOM on 30-volt dc scale and place + probe on C (ground) and the - probe on A of the 901B. Observe a reading between -5.2 and -7.8 volts. If reading is out of limits, test as described in TEST XII of 4. **TROUBLE-LOCATING PROCEDURES.**

(18) Remove meter probes and place LINE—TEST key in the LINE position.

(19) Connect the - probe to C and + probe to A of the 901B. Observe a reading between +5.7 and +8.3 volts. If reading is out of limits,

TABLE A
DATA SET VOLTAGE READINGS

B TEST POSITION	METER SCALE	A TEST POSITION					
		23	22	21	20	19	17
		VOLTS					
8	dc	-0.7 - +0.7	-0.7 - +1.5	-5.2 - -7.8	-5.4 - -6.8	-0.7 - +0.7	-5.2 - -7.8
	ac	5.2 - 8.4	5.4 - 9.6	0	0	5.2 - 8.4	0
5	dc			+5.7 - +8.3	-0.7 - +0.7		+5.7 - +8.3
	ac			0	5.2 - 8.4		0
4	dc				+5.4 - +6.8		
	ac				0		
3	dc				-5.4 - -6.8		
	ac				0		
6	dc	0		0	0	0	0
	ac	0		0	0	0	0

TABLE B
TEST SECTIONS FOR TABLE A FAILURES

B TEST POSITION	A TEST POSITION					
	23	22	21	20	19	17
8	IV	II	III X	V IX	IV	VI
5			III X	V IX		VI
4				V IX		
3				V IX		
6	XI		XI	XI	XI	XI

test as described in TEST XII of 4. **TROUBLE-LOCATING PROCEDURES.**

(20) Remove test probes, place LINE—TEST key in TEST position and operate ATT-UNATT to ATT. In this position, data set is operating at half-speed.

(21) Repeat all settings given in Table A. Results should be the same for all steps except when B TEST switch is on position 5 and A TEST switch is on position 20. Readings for that step should be +5.4 to +6.8 volts dc and 0 volts ac.

(22) Place A TEST switch to 23 and B TEST switch to 5.

(23) Switch ATT-UNATT to UNATT.

Caution: Keep handset away from ear.

(24) Place 1011-type handset across terminals B and C on 901B test set. A 2400-Hz tone will be heard (full-speed transmit clock). If tone is not heard, test as described in TEST IV of 4. **TROUBLE-LOCATING PROCEDURES.**

(25) Move ATT-UNATT to ATT. A 1200-Hz tone will be heard (half-speed transmit clock).

(26) Move ATT-UNATT to UNATT. A 2400-Hz tone will be heard (full-speed transmit clock).

(27) Momentarily place a strap from EQ14 to TST7. A 4800-Hz tone will be heard (double-speed transmit clock).

(28) Place A TEST switch to 19 and repeat (23) through (27) (receive clock).

(29) Disconnect ac power cord of DS 205A.

(30) Remove strap between 9 and 18 and strap 10 to 18 on 901B interface test adapter.

(31) Place a 600-ohm resistor between terminals 7 and 8 on the rear of a KS-19087-L2 connector and connect it to the TEL LINE connector on the 4A1 Data Unit. Set the KS-16979-L1 VOM, or equivalent, on the 1—ACV scale and place the meter probes across the 600-ohm resistor.

(32) Place key on 4A1 Data Unit to LINE position.

(33) Turn A TEST and B TEST switches on 901B DTS to OFF position.

(34) Connect ac power cord of DS 205A.

(35) Place B TEST switch on 901B DTS to 5. Line reading should be:

VOLTS (AC)	TRANSMIT OUTPUT LEVEL (DB)	STRAPPING ON 044 (182) CARD
0.55 — 0.85	0	1 — 4
0.35 — 0.65	—3	1 — 3
0.20 — 0.50	—6	1 — 2
0.10 — 0.40	—9	None

Note: If reading is out of limit, test as described in TEST VI of 4. **TROUBLE-LOCATING PROCEDURES.**

(36) Place B TEST switch on 901B DTS to 8. A 0 reading should be obtained for all transmit output levels.

- (37) Remove the KS-19087-L2 connector from the TEL LINE connector.
- (38) Place key on 4A1 to TEST position.
- (39) Disconnect the ac power cord of DS 205A.

B. Interface Test Using 914B Data Test Set

3.04 The following test should be made when using a 914B DTS in place of a 901B DTS.

3.05 The following equipment and materials are required to perform this test:

- 1—914B Data Test Set
- 1—KS-19087-L2 connector
- 1—600-ohm resistor ± 1 percent, 0.25 watt.

3.06 Perform the installation test as follows:

- (1) Disconnect the ac power cord, the TEL LINE, CUSTOMER A, CUSTOMER B, and the 4-WIRE connectors from DS 205A in the order given.
- (2) Strap terminal E1 to E2.
- (3) On TR-SW (019) card, place a strap between terminals 3 and 4 and remove strap between terminals 1 and 2 if card is not already strapped in this manner.
- (4) Connect the 4A1 Data Unit connector cord to the 4-WIRE connector.
- (5) Remove locking bar and place 4A1 in the TEST position.
- (6) Connect a cord from the CUSTOMER B connector on the data set to the A connector on the 914B DTS.
- (7) Set up the 914B DTS as shown in Fig. 1.
- (8) Plug the 914B DTS power cord into a 117-volt ac outlet and connect the ac power cord to DS 205A.
- (9) Operate FUNCTION switch to VOLT INT and the METER should indicate from -15.8 to -20.2 volts dc (negative power supply).

(10) Operate 914B switches as follows:

FUNCTION switch to OFF

METER POLARITY to NOR

VERTICAL MONITOR to 9

FUNCTION switch to VOLT INT.

Requirement: $+15.8$ to $+20.2$ volts dc (positive power supply)

(11) Set up the 914B as follows:

FUNCTION switch to OFF

RANGE to DCV—10

METER POLARITY to REV

Note: Observe polarity on METER when measuring dc voltages. Operate FUNCTION switch to OFF whenever the METER POLARITY or VERTICAL MONITOR switch is being operated.

Depress POWER switch to ON

FUNCTION switch to VOLT INT

VERTICAL MONITOR to positions shown in Table C.

(12) Measure the interface voltages in Table C using the METER on the 914B to indicate dc voltages and the 914B lamps to indicate ac voltages. If results vary from those given, refer to Table D.

(13) If the measurements in Table C meet the listed requirements, operate switches S1 and S3 to OFF.

(14) Repeat all steps specified in Table C. Results should be the same except Step 14 should be $+6.1 \pm 0.7$ volts dc with no lamp indication.

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(15) Measure the data-set-ready (DSR) interface voltage as follows:

(a) Set up 914B as follows:

FUNCTION switch to OFF.

Remove matrix pin in 2-S5.

Switches S1 and S2 to OFF and S3 and S4 to ON.

METER POLARITY to REV.

VERTICAL MONITOR to 6.

FUNCTION switch to VOLT INT.

Requirement: -5.2 to -7.8 volts dc

(b) Operate switches as follows:

FUNCTION switch to OFF

METER POLARITY to NOR

4A1 Data Unit LINE—TEST key to LINE

FUNCTION switch to VOLT INT.

Requirement: +5.7 to +8.3 volts dc

If the readings are out of limits, test as described in TEST XII of **5. TROUBLE-LOCATING PROCEDURES USING 914B DATA TEST SET.**

(16) Check frequency with 914B DTS.

(a) Set up the 914B as follows:

FUNCTION switch to OFF.

Insert a matrix pin in 16-SD.

Switch S1 to ON.

RANGE switch to db—10.

FUNCTION switch to SPKR.

(b) Insert meter test leads into the METER INPUT jacks on the 914B DTS and connect one lead to interface selector switch 15 and the other lead to ground.

(c) This connects SCT to the 914B speaker and a 2400-Hz tone should be heard (full-speed transmit clock). If tone is not heard, test as described in TEST IV of **5. TROUBLE-LOCATING PROCEDURES USING 914B DATA TEST SET.**

(d) On the 914B, operate switch S3 to OFF and a 1200-Hz tone (half-speed transmit clock) should be heard.

(e) Operate switch S3 to ON and a 2400-Hz tone (full-speed transmit clock) should be heard.

(f) Insert a matrix pin in the 914B in position 14—GRD. A 4800-Hz tone (double-speed transmit clock) should be heard. Remove matrix pin in position 14—GRD.

(g) Move the meter test lead from interface selector switch 15 to interface selector switch 17 and repeat (a) through (e) (receive clock). The same requirements should be obtained.

(h) Measure the time interval between request-to-send and clear-to-send by setting up the 914B DTS as follows:

(1) Matrix pins in 4-TP1 and 5-TP2

(2) Switches S1 and S4 to OFF

(3) COUNTER to INTERVAL X.1

(4) TEST SET MODE to TRMT SER.

(i) Operate switch S1 to ON and observe that TP1 lamp lights first. Observe the interval on the counter.

Requirement: 64 ± 1.0 ms

(17) Disconnect ac power cord of DS 205A.

(18) On the 914B, operate switch S4 to OFF and operate FUNCTION switch to OFF.

(19) Place a 600-ohm resistor between terminals 7 and 8 on the rear of a KS-19087-L2 connector and connect it to the TEL LINE connector on the 4A1 Data Unit.

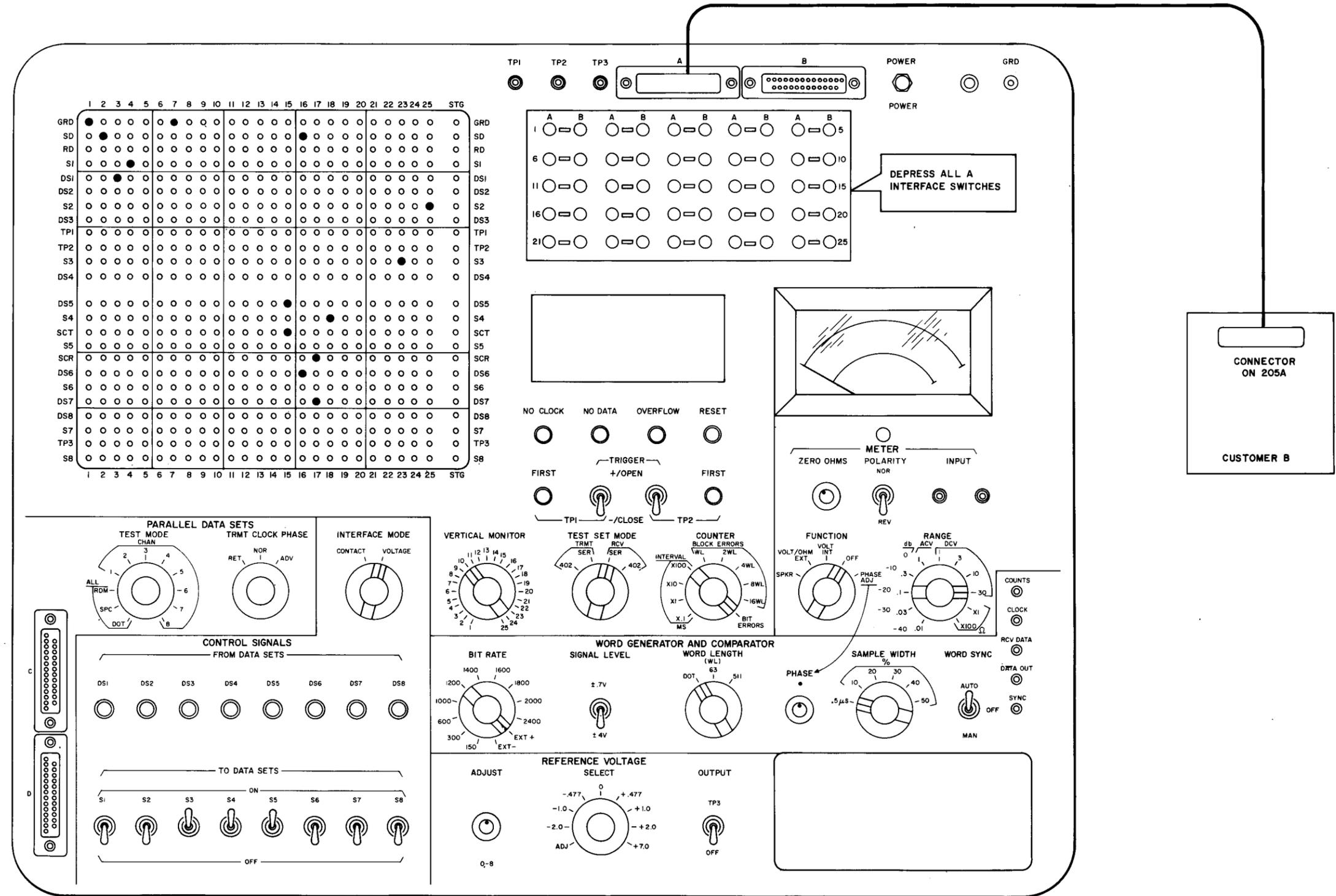


Fig. 1—914B Data Test Set Switch Positions

TABLE C
INTERFACE REQUIREMENTS

STEPS	VERTICAL MONITOR SWITCH	LEAD TESTED	REQUIREMENTS	
			VOLTS DC	LAMP*
1	3	RD	-5.4 - -6.8	—
2	5	CS	-5.2 - -7.8	—
3	8	COO	-5.2 - -7.8	—
4	15	SCT	-0.7 - +0.7	DS5
5	16	DTI	-0.7 - +0.7	DS6
6	17	SCR	-0.7 - +0.7	DS7
7	Operate switch S2 to ON.			
8	17	SCR	0.0	—
9	15	SCT	0.0	—
10	8	COO	0.0	—
11	5	CS	0.0	—
12	3	RD	0.0	—
13	Operate switches S1 to ON and S2 and S4 to OFF.			
14	3	RD	-0.7 - +0.7	DS1
15	5	CS	+5.7 - +8.3	—
16	8	COO	+5.7 - +8.3	—
17	Move matrix pin from 16—SD to 2—S5.			
18	3	RD	+5.4 - +6.8	DS1
19	Operate switch S5 to OFF.			
20	3	RD	-5.4 - -6.8	DS1

*DS lamps on 914B will glow dimly when ac voltage is present. Disregard all lamps except the lamp specified in the step being conducted.

(20) Operate switch S1 on the 914B to ON.

(22) Set up the 914B as follows:

(21) Insert meter test leads into the METER INPUT jacks on the 914B. Connect the meter leads across the 600-ohm resistor.

RANGE to ACV—1

FUNCTION switch to VOLT/OHM EXT.

TABLE D
TEST SECTIONS FOR TABLE C FAILURES

VERTICAL MONITOR SWITCH*	TEST SECTIONS†	
	3	V
5	III	X
8	V	
15	IV	
16	II	
17	IV	
17	XI	
15	XI	
8	V	
5	XI	
3	XI	
3	V	IX
5	III	X
8	VI	
3	V	IX
3	V	IX

*These switch positions correspond to switch positions in Table C.

†Refer to 5.12 for these tests.

(23) Connect the ac power cord to the data set and line readings should be as shown in the following chart for the desired output level as stated on the service order:

VOLTS (AC)	TRANSMIT OUTPUT LEVEL (DB)	STRAPPING ON 044 (182) CARD
0.55 — 0.85	0	1 — 4
0.35 — 0.65	—3	1 — 3
0.20 — 0.50	—6	1 — 2
0.10 — 0.40	—9	None

(24) If the reading is out of limits, test as described in TEST VI of **5. TROUBLE-LOCATING PROCEDURES USING 914B DATA TEST SET.**

(25) Operate switch S1 on the 914B to OFF and a 0 reading should be obtained for all transmit output levels.

(26) Remove the KS-19087-L2 connector from the TEL LINE connector on the data set.

(27) Place key on 4A1 Data Unit to TEST position.

(28) Disconnect the ac power cord of the DS 205A and depress POWER switch on 914B.

C. Back-to-Back Test

3.07 The following equipment is required to perform this test:

1—901B Data Test Set

1—902B Data Test Set

2—903B Data Test Sets.

3.08 Arrange the 901B, 902B, and the two 903B sets as follows:

● 901B

SELECTOR switch to 3

A TEST switch to 9

B TEST switch to OFF

ATT-UNATT to UNATT

● 902B

BIT RATE to EXT SYNC

Selector switch to DIST MEAS

TRIGGER to —

● 903B (Both Sets)

BIT RATE to EXT CLOCK

RANDOM-DOT to RANDOM

TRIGGER to +

Power to OFF.

Note: Connect red to red and black to black for the following connections.

- (1) Connect the SIGNAL OUT terminals of the No. 1 903B set to the TRANSMIT DATA terminals of the 901B.
- (2) Connect the EXT CLOCK terminals of the No. 1 903B set to the TRANSMIT CLOCK terminals of the 901B.
- (3) Connect the DATA IN terminals of the 902B to the RECEIVE DATA terminals of the 901B.
- (4) Connect the EXT SYNC terminals of the 902B to the RECEIVE CLOCK terminals of the 901B.
- (5) Connect the No. 2 903B set to the 902B with the connector cord provided.
- (6) Connect both 903B power cords.
- (7) Turn both 903B power switches to ON.
- (8) Connect ac power cord of DS 205A.
- (9) Momentarily depress the START switch of the No. 1 903B set.
- (10) Momentarily depress the START switch of the No. 2 903B set.
- (11) Momentarily depress the WORD SYNC & RESET switch of the 902B.

(12) The TOTAL ERRORS lamps on the 902B set will note errors which occur. To obtain total errors, add the values indicated by all lighted lamps. When bottom lamp is lighted, the capacity of the counter has been exceeded and the count indicated is erroneous.

(13) To ensure that the 902B is counting errors, depress the START switch of the No. 2 903B set. The 902B shall indicate maximum errors by the bottom lamp lighting.

(14) Momentarily depress the WORD SYNC & RESET switch of the 902B. Allow the test to continue for five minutes. No errors should be recorded. If errors are recorded, test as described in TEST IX of 4. **TROUBLE-LOCATING PROCEDURES.**

(15) Operate ATT-UNATT switch to ATT.

(16) Repeat (9) through (14).

(17) Disconnect ac power cord of DS 205A.

(18) Disconnect all test equipment and restore set for normal operation.

Note: Check set for proper options and remove strap between E1 and E2 before connecting the CUSTOMER A plug.

D. Back-to-Back Test Using 914B Data Test Set

3.09 The following test equipment is required to perform this test:

1—914B Data Test Set

1—903-type Data Test Set.

3.10 Disconnect the CUSTOMER B connector from the data set. Set up the 914B DTS as shown in Fig. 1, except operate switch S4 to OFF, and S1 to ON. Make the following connections with the data set and the 914B:

(1) On DS 205A, disconnect the ac power cord and the CUSTOMER A connector.

(2) Pull up interface selector switches 2A and 15A on the 914B DTS.

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(3) Make connections from the 903-type DTS to the interface selector switches on the 914B DTS as follows:

- (a) EXT CLOCK to switch 15A
- (b) SIGNAL OUT (red binding post) to switch 2A
- (c) SIGNAL OUT (black binding post) to switch 1A.

(4) Set controls on 903-type DTS as follows:

- (a) TRIGGER to +
- (b) RANDOM-DOT to RANDOM
- (c) BIT RATE to EXT CLOCK.

Note: Place a strap between E1 and E2 when CUSTOMER A plug is disconnected and remove the strap when CUSTOMER A plug is connected.

(5) On card TR-SW (181), place a strap between terminals 3 and 4 and remove the strap between terminals 1 and 2 if card is not already strapped in this manner.

(6) Check that the 4A1 connector cord is connected to the 4-WIRE connector and the LINE—TEST key is in the TEST position.

(7) Connect ac power cord of DS 205A and depress 914B POWER switch.

(8) Depress the START button on the 903-type DTS and operate the WORD LENGTH switch on the 914B DTS to 63. Transfer matrix pin in the 914B matrix board from 2-SD to 3-RD.

(9) Momentarily depress the RESET button on the 914B and the counter should indicate zero errors. Momentarily operate WORD LENGTH switch to DOT and the counter should run freely. Operate WORD LENGTH switch back to 63 and depress the RESET button.

(10) Allow the test to continue for five minutes. No errors should be recorded. If errors are recorded, test as described in TEST IX of

5. TROUBLE-LOCATING PROCEDURES USING 914B DATA TEST SET.

(11) Operate switch S3 to OFF and repeat (9) and (10).

(12) Disconnect ac power cord of DS 205A.

(13) Disconnect the 914B interface cord from the data set and the power cord from the ac outlet. Restore set for normal operation.

Note: Check set for proper options and remove strap between E1 and E2 before connecting the CUSTOMER A plug.

E. End-to-End Test

3.11 In this test, the data test sets are set up similar to the back-to-back test. A No. 1 903B test set, through a 901B test set and cover, drives DS 205A. At a distant DS 205A, the signals are fed through a 901B test set and cover to a 902B DTS. Also, at the distant station a No. 2 903B test set delivers a signal, identical to that delivered by the No. 1 903B, to the 902B set. The 902B set synchronizes these two signals and counts the number of errors in the received data. The following test set arrangement allows for transmitting and receiving at both stations simultaneously.

(1) Arrange the 901B, 902B, and the two 903B sets at both the local and distant stations as follows:

● 901B

SELECTOR switch to 3

A TEST switch to 9

B TEST switch to OFF

ATT-UNATT to UNATT

● 902B

BIT RATE to EXT SYNC

Selector switch to DIST MEAS

TRIGGER to —

● 903B (Both Sets at Both Locations)

BIT RATE to EXT CLOCK

RANDOM-DOT to RANDOM

TRIGGER to +

Power to OFF.

Note: Connect red to red and black to black on the following connections.

- (2) Connect the SIGNAL OUT terminals of the No. 1 903B set to the TRANSMIT DATA terminals of the 901B.
- (3) Connect the EXT CLOCK terminals of the No. 1 903B set to the TRANSMIT CLOCK terminals of the 901B.
- (4) Connect the DATA IN terminals of the 902B to the RECEIVE DATA terminals of the 901B.
- (5) Connect the EXT SYNC terminals of the 902B to the RECEIVE CLOCK terminals of the 901B.
- (6) Connect the No. 2 903B set to the 902B with the connector cord.
- (7) Connect the 901B DTS to the 901B data test set cover.

Caution: *No test equipment shall be connected to data set or power on at this time.*

- (8) Make the following changes on the 901B test set cover:
 - (a) Open shorting clips 14, 23, 24, and 25.
 - (b) Strap 9 to 19, 10 to 18, 20 to EQ23, and TST14 to EQ25.
- (9) Disconnect the ac power cord of the DS 205A, the CUSTOMER A, and CUSTOMER B connectors.

Note: Place strap between E1 and E2 when CUSTOMER A plug is disconnected and remove strap when CUSTOMER A plug is connected.

- (10) Check TR-SW (181/019) card. Place strap between terminals 3 and 4 and remove

strap between 1 and 2 if card is not already strapped in this manner.

- (11) Check that the 4A1 Data Unit connector cord is connected to the 4-WIRE connector and the LINE—TEST key is in the LINE position.
- (12) Check that DS 205A is connected to the TEL LINE.
- (13) Connect 901B test set cover connecting cord to the CUSTOMER B connector on the DS 205A.
- (14) Connect the ac power cords of the two 903B sets and the 205A set.
- (15) Turn both 903B power switches to ON.
- (16) Momentarily depress the START switch of the No. 1 903B set.
- (17) Momentarily depress the START switch of the No. 2 903B set.
- (18) Momentarily depress the WORD SYNC & RESET switch of the 902B.

Note: Both the local and distant stations shall perform the preceding three steps simultaneously if possible.

- (19) Note the errors which occur on the 902B TOTAL ERRORS lamps. To obtain total errors, add the values indicated by all lighted lamps. When the bottom lamp is lighted, the capacity of the counter has been exceeded and the count indicated is erroneous.
- (20) To ensure that the 902B is counting errors, depress the START switch of the No. 2 903B set. The 902B shall indicate maximum errors by the bottom lamp lighting.
- (21) Momentarily depress the WORD SYNC & RESET switch of the 902B.
- (22) The error rate is to be determined by the data test center.
- (23) Operate ATT-UNATT to ATT and repeat (16) through (22) for End-to-End Test half-speed.

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- (24) Disconnect ac power cord of DS 205A.
- (25) Remove all test equipment and restore circuit to normal.

F. End-to-End Test Using 914B Data Test Set

3.12 In this test, the data test sets are set up similar to the back-to-back test, except transmission between data set stations is tested in each direction independently. This test procedure covers the end-to-end test of DS 205A with a 914B DTS at the transmitting and receiving stations. At the transmitting station, a 914B provides signals to drive the data set which transmits the signals to the receiving station data set. From the receiving data set, the signals are sent to another 914B which generates comparison signals, synchronizes them with the received signals, and counts the number of errors in the received signals. The following test set arrangement allows alternate checking of data set transmission and reception:

- (1) Condition the 914B DTS at the transmitting station as shown in Fig. 1, except remove matrix pin in 16-SD, operate TEST SET MODE switch to TRMT SER, operate WORD LENGTH switch to 63, and operate switches S1 to ON and S4 to OFF.
 - (2) Condition the 914B DTS at the receiving station as shown in Fig. 1, except remove matrix pin in positions 16-SD and 2-SD and place a pin in 3-RD. Operate switches S1 to ON and S4 to OFF and operate WORD LENGTH switch to 63.
 - (3) Carefully remove the TR-SW (181/019) circuit pack. Strap terminals 3 and 4 and remove any strap between terminals 1 and 2 if the board is not already strapped in this manner.
 - (4) Check that the 4A1 Data Unit connector cord is connected to the 4-WIRE connector and that the LINE—TEST key is in the LINE position.
 - (5) Check that the line is connected to the 4A1 Data Unit TEL LINE connector.
 - (6) Connect the 914B interface cord to the CUSTOMER B connector on DS 205A and disconnect CUSTOMER A plug if used.
- Note:** Place a strap between E1 and E2 when CUSTOMER A plug is disconnected and remove strap when CUSTOMER A plug is connected if required to do so by service order.
- (7) At each station, connect both 914B DTS power cords to 117-volt ac outlets and depress POWER switches to on.
 - (8) Connect the data set ac power cords and perform the end-to-end test using the following sequence of operations:
 - (a) At the receiving station, momentarily depress the RESET switch on the 914B DTS. The counter should indicate zero errors. Momentarily operate the WORD LENGTH switch to DOT. The counter should run freely. Operate WORD LENGTH switch back to 63 and depress the RESET switch.
 - (b) Allow the test to continue for five minutes, note the indicated error count, and press the RESET switch. Operate this test for three consecutive 5-minute intervals. The error rate can be considered average if a total of 20 errors are recorded for the three test periods. If the error count approaches 100 for the three test periods, the transmission parameters of the line should be checked in accordance with Section 314-410-500. If the line checks satisfactorily, refer to plant staff through lines of organization. If these tests are satisfactory, disconnect both data set ac power cords and both 914B DTS ac power cords.
 - (c) Repeat the end-to-end test except transmit in the opposite direction.
 - (d) Remove test equipment connections and replace original options in the data set before restoring to normal operation. Remove the strap between terminals E1 and E2 before connecting CUSTOMER A plug if required to do so by service order. Call the data test center for a final check before releasing the data set for customer service.

4. TROUBLE-LOCATING PROCEDURES

4.01 The following test equipment is required to perform these procedures:

- 1—901B Data Test Set with cover
- 1—KS-16979-L1 volt-ohm-milliammeter or equivalent
- 1—Oscilloscope, Tektronix, 533-type, CA plug-in unit (or equivalent).

4.02 This section does not cover all trouble possibilities. These tests will point to a circuit board or boards that may be in trouble.

4.03 It is recommended that the tests be performed in numerical sequence if type of trouble is unknown. However, testing may begin with any section, and if trouble or abnormal condition still exists after replacement of the suggested circuit boards, the preceding test must be made and each preceding test thereafter until circuit board in trouble is replaced.

4.04 The numbers in the blocks in Table B refer to the test number(s) of the test(s) to be performed as a result of a failure or abnormal reading for the corresponding block in Table A. Make the lowest numbered test first if more than one test number is given.

4.05 Table E lists the dc voltages that appear on the circuit boards. If the reading given is not obtained, the card shall be replaced.

4.06 Signal grounds are available at the following locations:

- (a) TP12 on 008
- (b) TP1 on 012
- (c) TP1 on 014
- (d) TP5 on 017
- (e) TP4 on 021
- (f) TP3 on 044
- (g) TP4 on 059.

TABLE E**DC VOLTAGE READINGS ON DATA SET**

DC VOLTAGE	TEST POINT ON CPS	CIRCUIT BOARDS
+5.6 - +6.8	TP8	001, 002, 003, 005, 006, 007, 008, 009, 037, 038, 039, 040, 041, 042, 043, 053, 054, 055, 056, 057, 058
	TP14	010, 017
	TP6	012, 014
	TP2	021
+5.8 - +7.8	TP7	019
	TP8	059
+7.3 - +9.1	TP1	044
+10.5 - +13.5	TP11	017
	TP6	019
-5.6 - -6.8	TP6	060
-5.8 - -7.8	TP12	059
-7.1 - -9.3	TP3	012, 014
-10.5 - -13.5	TP10	016

4.07 Information Note: The 901B Data Test Set used in the following test procedures performs the functions listed below. The functions are obtained when the 901B test set cover is strapped as described in (13) of 3.03; (8) of 3.11; and (7) of 4.08.

- (a) SELECTOR switch in position 3 prepares the A TEST and B TEST switches to control the data set in a manner similar to the customer business machine.
- (b) A TEST switch connects various interface leads to test terminals on the set. It is also used to simulate business machine operation. (See Table F.)

TABLE F
A TEST SWITCH

A TEST POSITION	CONNECTS			
	INTERFACE LEAD			901B A TERM. TO
	RS TO	SD TO	RMT TO	
1				DSR
2				RD
3				SCT
4				CS
5				COO
6	+18I	-18I	GRD	RD
7	+18I	+18I	GRD	RD
8	+18I	DTI	GRD	RD
9	+18I		GRD	SCR
10	+18I			CS
11	+18I			COO
12	+18I			
13	+18I			
14	+18I			SCR
15	+18I			
16	+18I			
17				COO
18				
19				SCR
20				RD
21				CS
22				DTI
23				SCT
OFF				

Note: Blank spaces indicate no connections.

(c) B TEST switch is used in conjunction with A TEST switch and in a similar manner. (See Table G.)

(d) ATT-UNATT key is used to control the data speed select (SS) interface lead. In the ATT position, the DS 205A operates at 1200 bps (half speed). In the UNATT position, the DS 205A operates at 2400 bps (full speed).

4.08 Set up data set and test equipment as follows:

Note: The following test equipment arrangement is to be used for all of the tests unless otherwise specified. Switch settings on the data test sets, the scope, and test meter will be specified if they are to be changed. Unless

TABLE G
B TEST SWITCH

B TEST POSITION	CONNECTS			
	INTERFACE LEAD			901B A TERM. TO
	RS TO	SD TO	RMT TO	
1				-18I
2				+18I
3	+18I	-18I	GRD	
4	+18I	+18I	GRD	
5	+18I	DTI	GRD	
6	GRD	DTI	+18I	
7	GRD	DTI	+18I	
8	GRD	DTI	GRD	
9	GRD	DTI	GRD	
10	+18I	+18I	GRD	
11	GRD	+18I	+18I	
OFF				

Note: Blank spaces indicate no connections.

stated otherwise, use same settings that were used to begin previous test.

(1) Disconnect ac power cord of DS 205A, the TEL LINE, CUSTOMER A, CUSTOMER B, and 4-WIRE connectors from the data set in the order stated.

(2) Strap terminal E1 to E2.

(3) Check TR-SW (019) card. Place strap between terminals 3 and 4 and remove strap between terminals 1 and 2 if card is not already strapped in this manner.

(4) Connect the 4A1 Data Unit connector cord to the 4-WIRE connector.

(5) Remove locking bar and place 4A1 in the TEST position.

(6) Connect a 901B test set, with the A TEST and B TEST switches in the OFF position, to a test set cover and connect the cover to the CUSTOMER B connector on DS 205A.

(a) Set SELECTOR switch of 901B to 3.

(b) Operate ATT-UNATT to UNATT.

- (7) Make the following changes on the 901B test set cover:
- Open shorting clips 14, 23, 24, and 25.
 - Strap 9 to 19, 10 to 18, 20 to EQ23, and TST14 to EQ25.
- (8) Set the 903B test set switches as follows:
- BIT RATE to EXT CLOCK
 - RANDOM-DOT to RANDOM
 - TRIGGER to +.

Note: In the following connections, strap red to red and black to black.

- (9) Connect the EXT CLOCK terminals of the 903B to the TRANSMIT CLOCK terminals of the 901B.
- (10) Connect the ac power cords of the 903B and DS 205A.

TEST I—CLOCK

24S Lead Check

- Set scope TRIGGER to + INT AUTO.
- Set VERTICAL AMPLITUDE VOLTS/CM to 0.5.
- Set HORIZONTAL SWEEP—TIME/CM to 2 μ sec.
- Connect scope CHAN A probe to TP1 on 053. A 57.6 kHz square wave as shown in Fig. 2 shall be observed.
- Replace cards 051, 053, and 054 if proper waveform is not obtained.

TEST II—TRANSMITTER TIMING

SXG Lead Check

- Connect scope CHAN A probe to TP4 on 009. Observe between +5.1 and +7.3 Vdc.
- Replace cards 008, 009, and 059 if proper result is not obtained.

2ST' Lead Check

- Set TIME/CM to 50 μ sec.
- Connect scope CHAN A probe to TP14 on 041. A 4.8 kHz square wave as shown in Fig. 3 shall be observed.
- Replace cards 041, 042, and 043 if proper result is not obtained.

EG and E'G Lead Check

- Place scope TRIGGER to TP3 on 040 on the rise (positive transition) of E.
- Set VOLTS/CM to 0.5.
- Set TIME/CM to 0.2 msec.
- Set scope MODE to CHOPPED.
- Place CHAN A probe to TP14 on 040 and CHAN B probe to TP9 on 040. Observe waveform as shown in Fig. 4.
- Replace card 040 if proper result is not obtained.

ST'G1 and DT1 Lead Check

- Place scope TRIGGER to TP3 on 040 on the rise of E.
- Set VOLTS/CM to 0.5.
- Set TIME/CM to 0.1 msec.
- Place CHAN A probe to TP5 on 039 and CHAN B probe to TP4 on 039. Observe waveform as shown in Fig. 5.
- Replace cards 039, 042, and 043 if proper result is not obtained.

CI' AND CII Lead Check

- Place scope TRIGGER to TP3 on 040 on the rise of E.
- Set VOLTS/CM to 0.5.
- Set TIME/CM to 0.5 msec.

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- (4) Place CHAN A probe to TP5 (CI') on 038 and CHAN B probe to TP10 (CII) on 039. Observe waveform as shown in Fig. 6.
- (5) Replace cards 038, 039, and 043 if proper result is not obtained.

3CS Lead Check

- (1) Place scope TRIGGER to TP3 on 040 on the rise of E.
- (2) Set VOLTS/CM to 0.5.
- (3) Set TIME/CM to 50 μ sec.
- (4) Set scope MODE to A ONLY.
- (5) Place CHAN A probe to TP3 on 041. Observe waveform in Fig. 7.
- (6) Replace card 041 if proper result is not obtained.

TEST III—TRANSMITTER CONTROL TIMING

- (1) Set B TEST switch on 901B to position 10.
- (2) Set KS-16979-L1 to 30-volt dc scale.
- (3) Place + probe to TP12 on 058 and - probe to ground. Reading shall be less than +0.5 Vdc.
- (4) Remove + probe from TP12 and place to TP4 on 058. Reading shall be between +5.1 and +7.3 Vdc.
- (5) Set B TEST switch on 901B to 9. Observe reading on VOM; it shall be less than 0.5 Vdc.
- (6) Replace cards 058 and 059 if proper results are not obtained.
- (7) Place scope TRIGGER on TP4 of 058, RS1 lead.

Note: The scope TRIGGER may be set to trigger on rise of RS1 by switching the 901B from position 9 to 10.

- (8) Set VOLTS/CM to 0.5.

- (9) Set TIME/CM to 0.1 sec.
- (10) Place CHAN A probe to TP10 on 054, CS1 lead.
- (11) Observe waveform as shown in Fig. 8 each time the B TEST switch is operated from 9 to 10.
- (12) Replace cards 054, 055, and 056 if proper result is not obtained.
- (13) Place CHAN A probe to TP9 on 059, CS lead.
- (14) Observe waveform as shown in Fig. 9 each time the B TEST switch is operated from 9 to 10.
- (15) Replace cards 057 and 059 if proper result is not obtained.
- (16) Set B TEST switch to OFF.

TEST IV—CLOCK SELECT CIRCUITS

SS2 Lead Check (Full-Speed)

- (1) Place scope TRIGGER to TP4 on 039 on the rise of DT1.
- (2) Set VOLTS/CM to 0.5.
- (3) Set TIME/CM to 50 μ sec.
- (4) Place CHAN A probe to TP5 on 057. Observe waveform between +5.1 and +7.3.
- (5) Replace cards 039, 057, and 059 if proper result is not obtained.

SS2 Lead Check (Half-Speed)

- (1) Operate ATT-UNATT to ATT (half-speed).
- (2) Observe waveform of less than +0.5 Vdc.
- (3) Replace cards 039, 057, and 059 if proper result is not obtained.

SCT Lead Check

- (1) Operate ATT-UNATT to UNATT (full-speed).

- (2) Set TIME/CM to 50 μ sec.
- (3) Place CHAN A probe to TP10 on 060. Observe waveform as shown in Fig. 10.
- (4) Replace cards 057, 058, and 060 if proper result is not obtained.
- (5) Operate ATT-UNATT to ATT.
- (6) Set TIME/CM to 0.1 msec. Observe waveform as shown in Fig. 11.
- (7) Replace cards 057, 058, and 060 if proper result is not obtained.
- (8) Place strap between 7 and EQ14 on test set cover.
- (9) Set TIME/CM to 50 μ sec. Observe waveform as shown in Fig. 10.
- (10) Replace cards 057, 058, and 060 if proper result is not obtained.
- (11) Operate ATT-UNATT to UNATT. Observe waveform as shown in Fig. 12.
- (12) Replace cards 057, 058, and 060 if proper result is not obtained.

SCR Lead Check

- (1) Adjust scope to trigger on the rise of DR at TP5 on 053.
- (2) Place CHAN A probe to TP1 on 060. Observe waveform as shown in Fig. 13.
- (3) Replace cards 057, 058, and 060 if proper result is not obtained.
- (4) Operate ATT-UNATT to ATT. Observe waveform as shown in Fig. 10.
- (5) Replace cards 057, 058, and 060 if proper result is not obtained.
- (6) Remove strap between 7 and EQ14 on 901B test set cover.
- (7) Set TIME/CM to 0.1 msec. Observe waveform as shown in Fig. 11.

- (8) Replace cards 057, 058, and 060 if proper result is not obtained.
- (9) Operate ATT-UNATT to UNATT.
- (10) Set TIME/CM to 50 μ sec. Observe waveform as shown in Fig. 10.
- (11) Replace cards 057, 058, and 060 if proper result is not obtained.

Note: If SCR lead trouble cannot be corrected by replacing cards, proceed to TEST VIII, RECEIVER TIMING.

TEST V—TRANSMITTER DATA

SD2 Lead Check

- (1) Place B TEST switch to position 3.
- (2) Operate ATT-UNATT to ATT.
- (3) Place scope TRIGGER to TP4 on 039 on the rise of DT1.
- (4) Set VOLTS/CM to 0.5.
- (5) Set TIME/CM to 0.1 msec.
- (6) Place CHAN A probe on TP13 of 057. Observe waveform as shown in Fig. 14.
- (7) Replace cards 057, 058, and 060 if proper result is not obtained.
- (8) Place B TEST switch to OFF.
- (9) Operate ATT-UNATT to UNATT.
- (10) Place scope TRIGGER to TP3 on 040 on the rise of E.
- (11) Set TIME/CM to 0.2 msec. Observe waveform as shown in Fig. 15.
- (12) Replace cards 057 and 058 if proper result is not obtained.
- (13) Place B TEST switch to 4.
- (14) Connect scope to trigger on TP3 of 040, on the rise of E. Observe waveform between +5.1 and +7.3.

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- (15) Replace cards 057, 058, and 060 if proper result is not obtained.

PL90 Lead Check

- (1) Connect scope TRIGGER to TP10 on 039. Adjust scope to trigger on the rise of CII.
- (2) Set TIME/CM to 1 msec.
- (3) Connect CHAN A probe to TP1 on 037. Observe waveform as shown in Fig. 16 or 17.
- (4) Replace cards 037, 038, and 039 if proper result is not obtained.
- (5) Place B TEST switch to 3. Observe waveform as shown in Fig. 16 or 17.
- (6) Replace cards 037, 038, and 039 if proper result is not obtained.

PL180 Lead Check

- (1) Place B TEST switch to 5.
- (2) Put scope TRIGGER on TP1 of 037. Trigger on the fall (negative transition) of this signal (PL90).
- (3) Place CHAN A probe to TP11 on 040. Observe waveform as shown in Fig. 18 or 19.
- (4) Replace cards 037, 039, and 040 if proper result is not obtained.
- (5) Set B TEST switch to OFF.
- (6) Ground TP11 (PL180) on 040 and TP1 (PL90) on 037.
- (7) Place scope TRIGGER to TP3 on 040 on the rise of E.
- (8) Set VOLTS/CM to 0.5.
- (9) Set TIME/CM to 0.5 msec.
- (10) Set scope MODE to CHOPPED.
- (11) Place CHAN A probe to TP3 on 037, I180 lead, and CHAN B probe to TP14 on 037,

I180 lead. Observe waveform as shown in Fig. 20.

- (12) Replace cards 037 and 038 if proper result is not obtained.
- (13) Remove grounds from TP11 on 040 and TP1 on 037.
- (14) Ground TP10 (PL180) on 040 and TP6 (PL90) on 037.
- (15) Set TIME/CM to 0.1 msec. Observe waveform as shown in Fig. 21.
- (16) Replace cards 037 and 038 if proper result is not obtained.
- (17) Set scope MODE for A minus B operation.
- (18) Place scope TRIGGER to TP3 on 040 on the rise of E.
- (19) Set VOLTS/CM to 0.2.
- (20) Set TIME/CM to 0.2 msec.
- (21) Place CHAN A probe to TP5 on 044, TL lead, and CHAN B probe to TP6 on 044, TL' lead. Observe waveform as shown in Fig. 22.

Note: The waveform in Fig. 22 is for 1-to-4 strapping on the 044 card. Other strapping will result in less amplitude.

- (22) Replace cards 019 and 044 if proper result is not obtained.
- (23) Remove the grounds from TP10 on 040 and TP6 on 037, and place MODE to A ONLY.

TEST VI—TRANSMIT-RECEIVE SWITCH (TR-SW)

- (1) Set B TEST switch to 5.
- (2) Place scope TRIGGER to TP4 on 039, DT1 lead.
- (3) Set VOLTS/CM to 0.05.
- (4) Set TIME/CM to 0.2 msec.

- (5) Place CHAN A probe to TP12 on 017. Observe waveform as shown in Fig. 23.

Note: The waveform in Fig. 23 is for 1-to-4 strapping on the 044 card. Other strapping will result in less amplitude.

- (6) Replace cards 017 and 019 if proper result is not obtained.
- (7) Set B TEST switch to position 8. The signal shall disappear. If not, replace cards 017 and 019.
- (8) Set B TEST switch to OFF.

TEST VII—RECEIVER ANALOG

AGC Output Lead Check

- (1) Set B TEST switch to 5.
- (2) Place scope TRIGGER to TP4 on 039 on the rise of DT1.
- (3) Set VOLTS/CM to 0.2.
- (4) Set TIME/CM to 0.2 msec.
- (5) Place CHAN A probe to TP13 (AGC) on 016. Observe waveform as shown in Fig. 24.
- (6) Replace cards 016 and 017 if proper result is not obtained.
- (7) Set B TEST switch to OFF.
- (8) Remove all scope probes.

COO Lead Check

- (1) Set VOM to 30-volt dc scale.
- (2) Set B TEST switch to 5.
- (3) Place + probe to TP10 (COO) on 059 and – probe to ground. Reading shall be between +5.7 and +8.3 Vdc.
- (4) Reverse meter polarity.
- (5) Place LINE—TEST key of 4A1 to LINE position.

- (6) Reading shall be between -5.2 and -7.8 Vdc.
- (7) Replace cards 009, 016, 017, and 059 if proper results are not obtained.
- (8) Remove meter probes and set B TEST switch to OFF.
- (9) Place LINE—TEST key in TEST position.

EYE Pattern Test

- (1) Connect the SIGNAL OUT terminals of the 903B to the TRANSMIT DATA terminals of the 901B. Keep red to red and black to black.
 - (2) Set A TEST switch of 901B to position 9.
 - (3) Place scope TRIGGER to TP4 on 039 on the rise of DT1.
 - (4) Set VOLTS/CM to 0.5.
 - (5) Set scope MODE for A minus B operation.
 - (6) Place CHAN A probe to TP8 on 012, ADM' lead, and CHAN B probe to TP14 on 012, ADM lead. Observe waveform as shown in Fig. 25.
- Note:** Momentarily depress START of 903B to ensure start of word generator.
- (7) Replace card 012 if proper result is not obtained.
 - (8) Do not readjust scope. Place CHAN A probe to TP8 (BDM) on 014, place CHAN B probe to TP14 (DBM') on 014, and observe waveform as shown in Fig. 26.
 - (9) Replace card 014 if proper result is not obtained.
 - (10) Set A TEST switch to OFF.

TEST VIII—RECEIVER TIMING

Clock Countdown Chain

2SR Lead Check

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- (1) Disconnect the leads from SIGNAL OUT and TRANSMIT DATA terminals.
- (2) Set scope MODE to A ONLY.
- (3) Ground TP7 (RAD) and TP10 (RDL) on 006.
- (4) Place scope TRIGGER to + INT AUTO.
- (5) Set VOLTS/CM to 0.5.
- (6) Set TIME/CM to 50 μ sec.
- (7) Place CHAN A probe to TP14 on 003. Observe waveform as shown in Fig. 27.
- (8) Replace cards 003, 005, and 006 if proper result is not obtained.
- (2) Ground TP7 (RAS) on 001 and TP10 (RXG) on 007.
- (3) Place scope TRIGGER to TP4 on 001 on the fall of CTR.
- (4) Set TIME/CM to 2 msec.
- (5) Set scope MODE to CHOPPED.
- (6) Place CHAN A probe to TP4 on 001, CTR lead, and CHAN B probe to TP5 on 053, DR lead. Observe waveform as shown in Fig. 31.

Note: Observe fourteen cycles of DR for one period of CTR.

DR'G1 Lead Check

- (1) Adjust scope to trigger on TP5 of 053 on the rise of DR.
- (2) Set TIME/CM to 0.5 msec.
- (3) Place CHAN A probe to TP5 on 001. Observe waveform as shown in Fig. 28.
- (4) Replace cards 001, 003, and 053 if proper result is not obtained.
- (7) Replace cards 001, 002, and 006 if proper result is not obtained.
- (8) Set A TEST switch to OFF and remove the grounds from the TPs on 001, 006, and 007.

ADD-DELETE Circuits

- (1) Set A TEST switch to 9.
- (2) Ground TP4 (CTR) on 001 and TP10 (RXG) on 007.
- (3) Place scope TRIGGER to TP5 on 053 on the fall of DR.
- (4) Set TIME/CM to 50 μ sec.
- (5) Set scope MODE to A ONLY.
- (6) Place CHAN A probe to TP2 on 005, 8SR lead. Observe waveform as shown in Fig. 32.

RSMG Lead Check

- (1) Place CHAN A probe to TP5 on 007. Observe waveform as shown in Fig. 29.
- (2) Replace cards 003 and 007 if proper result is not obtained.

RDZ Lead Check

- (1) Place scope TRIGGER to TP5 on 053 on the rise of DR.
- (2) Place CHAN A probe to TP12 on 003. Observe waveform as shown in Fig. 30.
- (3) Replace card 003 if proper result is not obtained.
- (7) Replace cards 001, 005, and 006 if proper result is not obtained.
- (8) Momentarily ground TP7 (RAS) on 001. Observe waveform as shown in Fig. 33.
- (9) Momentarily ground TP10 (RDS) on 001. Observe waveform as shown in Fig. 34.

Crossing Countdown Chain

- (1) Set A TEST switch to 9.
- (10) Momentarily ground TP6 (TC1) and TP11 (TC2) on 001. Observe waveform as shown in Fig. 33.

- (11) Replace cards 001, 005, and 006 if proper results are not obtained.
- (12) Set A TEST switch to OFF and remove all grounds from the TPs on 001 and 007.

TEST IX—RECEIVER DIGITAL DATA

RXG Crossing Pulses

- (1) Connect the SIGNAL OUT terminals of the 903B to the TRANSMIT DATA terminals of the 901B. Keep red to red and black to black.
- (2) Set A TEST switch to 9.
- (3) Connect the FREQUENCY counter to TP10 on 007, RXG lead, to count the RXG pulses.
- (4) Ground TP2 (A0P) and TP14 (A1P) on 008. The counter shall read 610 ± 10 pps.

Note: Momentarily depress START of 903B to ensure start of word generator.

- (5) Replace cards 007, 008, and 014 if proper result is not obtained.
- (6) Remove the ground from TP2 and TP14 on 008.
- (7) Ground TP3 (B0P) and TP13 (B1P) on 008. The counter shall read 610 ± 10 pps.
- (8) Replace cards 007, 008, and 014 if proper result is not obtained.
- (9) Remove ground from TP3 and TP13 on 008.
- (10) Set A TEST switch to OFF and remove SIGNAL OUT and TRANSMIT DATA connections.

Receiver Data Logic

- (1) Ground TP10 on 054, CS1 lead.
- (2) Set A TEST switch to 8.
- (3) Place scope TRIGGER to -INT.
- (4) Set TIME/CM to 0.5 msec.

- (5) Place CHAN A probe to TP14 on 060, RD lead. Observe waveform as shown in Fig. 35.
- (6) Replace cards 007, 009, and 060 if proper result is not obtained.
- (7) Remove ground from TP10 on 054.
- (8) Place scope TRIGGER to TP5 on 053 on the rise of DR.
- (9) Set TIME/CM to 0.2 msec. Observe waveform as shown in Fig. 36.
- (10) Operate ATT-UNATT to ATT. Observe waveform of $+6.1 \pm 0.7$ Vdc (no pulses).
- (11) Replace cards 007 and 009 if proper result is not obtained.
- (12) Set A TEST to OFF and ATT-UNATT to UNATT.

TEST X—SINGLE FREQUENCY DETECTOR

- (1) Set B TEST switch to 10.
- (2) Ground TP10 on 054, CS1 lead.
- (3) Set VOM on 30-volt dc scale.
- (4) Place + probe to TP9 (CLCON') on 055 and - probe to ground. The reading shall be between +5.1 and +7.3 Vdc.
- (5) Replace cards 009, 010, and 055 if proper result is not obtained.
- (6) Set B TEST switch to 9. The reading shall be less than +0.5 Vdc.
- (7) Replace cards 009, 010, and 055 if proper result is not obtained.
- (8) Remove strap between 10 and 18 and place strap between 9 and 18 on the 901B test set cover.
- (9) Place + probe on TP12 (CLCON) of 058 and - probe to ground. Reading shall be between 5.1 and 7.3 Vdc.

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- (10) Replace cards 058 and 059 if proper result is not obtained.
- (11) Remove strap between 9 and 18 and place strap between 10 and 18.
- (12) Remove meter probes.
- (13) Remove ground from TP10 on 054 and set B TEST switch to OFF.
- (15) Replace cards 008, 009, and 059 if proper result is not obtained.
- (16) Set TIME/CM to 50 μ sec.
- (17) Set scope MODE to CHOPPED.
- (18) Place CHAN A probe to TP1 on 040, ST lead, and CHAN B probe to TP11 SR on 053. Observe waveform as shown in Fig. 39.

TEST XI—REMOTE TEST CIRCUIT

- (1) Set B TEST switch to 10. Observe visually that the K2 wire-spring relay in bottom right section of data set is released.
- (2) Set B TEST switch to 11. The K2 relay operates.
- (3) Replace card 021 if proper result is not obtained.
- (4) Place LINE—TEST key to LINE position.
- (5) Strap TP3 (E) on 040 to TP12 (CO') on 009 and TP4 (E) on 040 to TP12 (CS') on 057.
- (6) Place scope TRIGGER to + INT.
- (7) Set TIME/CM to 0.5 msec.
- (8) Place CHAN A probe to TP6 on 054, RTSS lead. Observe waveform as shown in Fig. 37.
- (9) Replace cards 021, 053, and 054 if proper result is not obtained.
- (10) Remove straps from 040 to 009 and 040 to 057.
- (11) Strap TP12 (RTCON) and TP13 (RTRS) on 053 to ground.
- (12) Place scope TRIGGER to TP11 on 053 on the rise of SR.
- (13) Set TIME/CM to 0.2 msec.
- (14) Place CHAN A probe to TP4 (SXG) on 009. Observe waveform as shown in Fig. 38.

Note: The positive transitions of ST shall be within +0 and -35μ sec of the positive transitions of SR.

- (19) Replace cards 041, 042, and 043 if proper results are not obtained.
- (20) Remove straps on 053.

TEST XII—DSR LEAD CHECK

- (1) Set B TEST switch to OFF.
- (2) Set LINE—TEST key to TEST.
- (3) Set VOM to 30-volt dc scale.
- (4) Place + probe to TP13 on 059, DSR lead, and $-$ probe to ground. The reading shall be between -5.2 and -7.8 Vdc.
- (5) Remove meter probes.
- (6) Place LINE—TEST key to LINE position.
- (7) Place + probe to TP13 on 059 and $-$ probe to ground. The reading shall be between $+5.7$ and $+8.3$ Vdc.
- (8) Replace cards 054, 057, and 059 if proper result is not obtained.
- (9) Disconnect ac power cords of the DS 205A and 903B.
- (10) Remove all test equipment.
- (11) Remove strap between E1 and E2.
- (12) Verify that proper options are strapped.
- (13) Place LINE—TEST key in LINE position.

- (14) Connect TEL LINE, 4-WIRE, CUSTOMER A, and CUSTOMER B connectors.
- (15) Connect ac power cord of DS 205A.
- (16) Call data test center for final check before turning data set back to customer.

5. TROUBLE-LOCATING PROCEDURES USING 914B DATA TEST SET

5.01 The following equipment is required for the test procedures:

1—914B Data Test Set

1—Oscilloscope, Tektronix, 533-type, CA plug-in unit (or equivalent).

5.02 This section does not cover all trouble possibilities. These tests will point to a circuit board or boards that may be in trouble.

5.03 It is recommended that the tests be performed in numerical sequence if the type of trouble is unknown. However, testing may begin with any section, and if trouble or abnormal condition still exists after replacement of the suggested circuit boards, the preceding test must be made and each preceding test thereafter until the defective circuit board is replaced.

5.04 The numbers in the VERTICAL MONITOR SWITCH column in Table D refer to the test(s) to be performed as a result of a failure or abnormal reading for the corresponding column in Table C. Make the lowest numbered test first if more than one test number is given.

5.05 Table E lists the dc voltages that appear on the circuit boards. If the reading given is not obtained, the card should be replaced.

5.06 Signal grounds are available at the following locations:

- (a) TP12 on 008
- (b) TP1 on 012
- (c) TP1 on 014
- (d) TP5 on 017

- (e) TP4 on 021
- (f) TP3 on 044
- (g) TP4 on 059.

5.07 The following test equipment arrangement is to be used for all of the tests unless otherwise specified. Switch settings on the data test sets, the scope, and data set will be specified if they are to be changed. Unless stated otherwise, use same settings that were used to begin previous tests.

5.08 Disconnect from the data set, in the following order, the ac power cord, the TEL LINE, CUSTOMER A, CUSTOMER B, and 4-WIRE connectors.

5.09 On DS 205A, strap terminal E1 to E2 and on TR-SW (019) card place a strap between terminals 3 and 4 and remove strap between terminals 1 and 2 if card is not already strapped in this manner.

5.10 Connect the 4A1 Data Unit connector cord to the 4-WIRE connector and place the 4A1 in the TEST position.

5.11 Connect a cord from the CUSTOMER B connector on DS 205A to the A connector on the 914B. Set up the 914B DTS as shown in Fig. 40.

5.12 Connect the ac power cords of the 914B DTS and DS 205A. Depress POWER switch on 914B.

TEST I—CLOCK

24S Lead Check

- (1) Set scope TRIGGER to + INT AUTO.
- (2) Set VERTICAL AMPLITUDE VOLTS/CM to 0.5.
- (3) Set HORIZONTAL SWEEP—TIME/CM to 2 μ sec.
- (4) Connect scope CHAN A probe to TP1 on 053. A 57.6 kHz square wave, as shown in Fig. 2, shall be observed.

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- (5) Replace cards 051, 053, and 054 if proper waveform is not obtained.

TEST II—TRANSMITTER TIMING

SXG Lead Check

- (1) Set scope TRIGGER to + INT AUTO.
- (2) Set VOLTS/CM to 0.5.
- (3) Set TIME/CM to 2 μ sec.
- (4) Connect scope CHAN A probe to TP4 on 009. Observe between +5.1 and +7.3 volts dc.
- (5) Replace cards 008, 009, and 059 if proper result is not obtained.

2ST' Lead Check

- (1) Connect scope CHAN A probe to TP14 on 041. A 4.8 kHz square wave, as shown in Fig. 3, shall be observed.
- (2) Replace cards 041, 042, and 043 if proper result is not obtained.

EG and E'G Lead Check

- (1) Place scope TRIGGER to TP3 on 040 on the rise (positive transition) of E.
- (2) Set VOLTS/CM to 0.5.
- (3) Set TIME/CM to 0.2 msec.
- (4) Set scope MODE to CHOPPED.
- (5) Place CHAN A probe to TP14 on 040 and CHAN B probe to TP9 on 040. Observe waveform as shown in Fig. 4.
- (6) Replace card 040 if proper result is not obtained.

ST'G1 and DT1 Lead Check

- (1) Place scope TRIGGER to TP3 on 040 on the rise of E.
- (2) Set VOLTS/CM to 0.5.

- (3) Set TIME/CM to 0.1 msec.
- (4) Place CHAN A probe to TP5 on 039 and CHAN B probe to TP4 on 039. Observe waveform as shown in Fig. 5.
- (5) Replace cards 039, 042, and 043 if proper result is not obtained.

CI' and CII Lead Check

- (1) Place scope TRIGGER to TP3 on 040 on the rise of E.
- (2) Set VOLTS/CM to 0.5.
- (3) Set TIME/CM to 0.5 msec.
- (4) Place CHAN A probe to TP5 (CI') on 038 and CHAN B probe to TP10 (CII) on 039. Observe waveform as shown in Fig. 6.
- (5) Replace cards 038, 039, and 043 if proper result is not obtained.

3CS Lead Check

- (1) Place scope TRIGGER to TP3 on 040 on the rise of E.
- (2) Set VOLTS/CM to 0.5.
- (3) Set TIME/CM to 50 μ sec.
- (4) Set scope MODE to A ONLY.
- (5) Place CHAN A probe to TP3 on 041. Observe waveform in Fig. 7.
- (6) Replace card 041 if proper result is not obtained.

TEST III—TRANSMITTER CONTROL TIMING

- (1) On the 914B DTS, place a matrix pin in 4—S1 and operate switches S1 and S5 to ON.
- (2) Insert meter test leads into the METER INPUT jacks on the 914B DTS and operate FUNCTION switch to VOLT/OHM EXT.
- (3) Connect the positive probe to TP12 on 058 and the negative probe to ground. The

METER reading should be less than +0.5 volt dc. Operate RANGE switch on 914B DTS to DCV—10.

- (4) Remove positive probe from TP12 and place to TP4 on 058. Reading should be between +5.1 and +7.3 volts dc.
- (5) On the 914B, operate switch S1 to OFF. The METER should read less than +0.5 volt dc.
- (6) Replace cards 058 and 059 if proper result is not obtained.
- (7) Place scope TRIGGER on TP4 of 058 on RS1 lead.

Note: The scope TRIGGER may be set to trigger on the rise of RS1 by operating switch S1 to ON. Each time switch S1 is operated, sweep should begin.

- (8) Set VOLTS/CM to 0.5.
- (9) Set TIME/CM to 0.1 sec.
- (10) Place CHAN A probe to TP10 on 054, CS1 lead.
- (11) Observe waveform as shown in Fig. 8 each time S1 is operated from OFF to ON.
- (12) Replace cards 054, 055, and 056 if proper result is not obtained.
- (13) Place CHAN A probe to TP9 on 059, CS lead.
- (14) Observe waveform as shown in Fig. 9 each time switch S1 is operated from OFF to ON.
- (15) Replace cards 057 and 059 if proper result is not obtained.
- (16) Set up the 914B as shown in Fig. 40.

TEST IV—CLOCK SELECT CIRCUITS

SS2 Lead Check (Full-Speed)

- (1) Place scope TRIGGER to TP4 on 039 on the rise of DT1.

- (2) Set VOLTS/CM to 0.5.
- (3) Set TIME/CM to 50 μ sec.
- (4) Place CHAN A probe to TP5 on 057. Observe waveform between +5.1 and +7.3 volts dc.
- (5) Replace cards 039, 057, and 059 if proper result is not obtained.

SS2 Lead Check (Half-Speed)

- (1) Operate switch S3 to OFF.
- (2) Observe waveform of less than +0.5 volt dc.
- (3) Replace cards 039, 057, and 059 if proper result is not obtained.

SCT Lead Check

- (1) Operate switch S3 to ON (full-speed).
- (2) Set TIME/CM to 50 μ sec.
- (3) Place CHAN A probe to TP10 on 060. Observe waveform as shown in Fig. 10.
- (4) Replace cards 057, 058, and 060 if proper result is not obtained.
- (5) Operate switch S3 to OFF.
- (6) Set TIME/CM to 0.1 msec. Observe waveform as shown in Fig. 11.
- (7) Replace cards 057, 058, and 060 if proper result is not obtained.
- (8) Place a matrix pin in 14—GRD.
- (9) Set TIME/CM to 50 μ sec. Observe waveform as shown in Fig. 10.
- (10) Replace cards 057, 058, and 060 if proper result is not obtained.
- (11) Operate switch S3 to ON and observe waveform as shown in Fig. 12.
- (12) Replace cards 057, 058, and 060 if proper result is not obtained.

SCR Lead Check

- (1) Adjust the scope to trigger on the rise of DR at TP5 on 053.
- (2) Place CHAN A probe to TP1 on 060. Observe waveform as shown in Fig. 13.
- (3) Replace cards 057, 058, and 060 if proper result is not obtained.
- (4) Operate switch S3 to OFF and observe waveform as shown in Fig. 10.
- (5) Replace cards 057, 058, and 060 if proper result is not obtained.
- (6) Remove the matrix pin in 14—GRD.
- (7) Set TIME/CM to 0.1 msec. Observe waveform as shown in Fig. 11.
- (8) Replace cards 057, 058, and 060 if proper result is not obtained.
- (9) Operate switch S3 to ON.
- (10) Set TIME/CM to 50 μ sec. Observe waveform as shown in Fig. 10.
- (11) Replace cards 057, 058, and 060 if proper result is not obtained.
- (6) Place CHAN A probe on TP13 of 057. Observe waveform as shown in Fig. 14.
- (7) Replace cards 057, 058, and 060 if proper result is not obtained.
- (8) Operate switch S1 to OFF.
- (9) Operate switch S3 to ON.
- (10) Place scope TRIGGER to TP3 on 040 on the rise of E.
- (11) Set TIME/CM to 0.2 msec. Observe waveform as shown in Fig. 15.
- (12) Replace cards 057 and 058 if proper result is not obtained.
- (13) Operate switches S1 and S5 to ON.
- (14) Place scope TRIGGER on TP3 of 040 on the rise of E. Observe waveform between +5.1 and +7.3 volts dc.
- (15) Replace cards 057, 058, and 060 if proper result is not obtained.

Note: If SCR lead trouble cannot be corrected by replacing cards, proceed to TEST VIII, RECEIVER TIMING.

TEST V—TRANSMITTER DATA

SD2 Lead Check

- (1) Place a matrix pin in 4—S1 and operate switch S1 to ON. Check to see that switch S5 is OFF.
- (2) Operate switch S3 to OFF.
- (3) Adjust the scope to trigger on the rise of DT1 at TP4 of 039.
- (4) Set VOLTS/CM to 0.5.
- (5) Set TIME/CM to 0.1 msec.

PL90 Lead Check

- (1) Place scope TRIGGER on TP10 of 039. Adjust scope to trigger on the rise of CII. If necessary, vary sweep rate to obtain steady sweep.
- (2) Set TIME/CM to 1 msec.
- (3) Place CHAN A probe to TP1 on 037. Observe waveform as shown in Fig. 16 or 17.
- (4) Replace cards 037, 038, and 039 if proper result is not obtained.
- (5) Operate switch S5 to OFF. Observe waveform as shown in Fig. 16 or 17.
- (6) Replace cards 037, 038, and 039 if proper result is not obtained.

PL180 Lead Check

- (1) On the 914B DTS, operate the TEST SET MODE switch to RCV SER and remove matrix pin in 2—S5 and place in 16—SD. Place

a matrix pin in 2—SD and check that switches S1 and S3 are ON.

(2) Place scope TRIGGER on TP1 of 037. Trigger on the fall (negative transition) of this signal, PL90.

(3) Place CHAN A probe to TP11 on 040. Observe waveform as shown in Fig. 18 or 19.

(4) Replace cards 037, 039, and 040 if proper result is not obtained.

(5) Set up the 914B as shown in Fig. 40.

(6) Ground TP11 (PL180) on 040 and TP1 (PL90) on 037.

(7) Place scope TRIGGER to TP3 on 040 on the rise of E.

(8) Set VOLTS/CM to 0.5.

(9) Set TIME/CM to 0.5 msec.

(10) Set scope MODE to CHOPPED.

(11) Place CHAN A probe to TP3 on 037, I180 lead, and CHAN B probe to TP14 on 037, I180 lead. Observe waveform as shown in Fig. 20.

(12) Replace cards 037 and 038 if proper result is not obtained.

(13) Remove grounds from TP11 on 040 and TP1 on 037.

(14) Ground TP10 (PL180) on 040 and TP6 (PL90) on 037.

(15) Set TIME/CM to 0.1 msec. Observe waveform as shown in Fig. 21.

(16) Replace cards 037 and 038 if proper result is not obtained.

(17) Set scope MODE for A minus B operation.

(18) Place scope TRIGGER to TP3 on 040 on the rise of E.

(19) Set VOLTS/CM to 0.2.

(20) Set TIME/CM to 0.2 msec.

(21) Place CHAN A probe to TP5 on 044, TL lead, and CHAN B probe to TP6 on 044, TL' lead. Observe waveform as shown in Fig. 22.

Note: The waveform in Fig. 22 is for 1-to-4 strapping on the 044 card. Other strapping will result in less amplitude.

(22) Replace cards 019 and 044 if proper result is not obtained.

(23) Remove the grounds from TP10 on 040 and TP6 on 037, and place MODE to A ONLY.

TEST VI—TRANSMIT-RECEIVE SWITCH (TR-SW)

(1) On the 914B DTS, operate the TEST SET MODE switch to RCV SER. Remove matrix pin 2—S5 and place in 16—SD, place a pin in 4—S1, and operate switch S1 to ON.

(2) Place scope TRIGGER to TP4 on 039, DT1 lead.

(3) Set VOLTS/CM to 0.05.

(4) Set TIME/CM to 0.2 msec.

(5) Place CHAN A probe to TP12 on 017. Observe waveform as shown in Fig. 23.

Note: The waveform in Fig. 23 is for 1-to-4 strapping on the 044 card. Other strapping will result in less amplitude.

(6) Replace cards 017 and 019 if proper result is not obtained.

(7) Operate switch S1 to OFF. The signal should disappear; if not, replace cards 017 and 019.

TEST VII—RECEIVER ANALOG

AGC Output Lead Check

(1) Operate switch S1 to ON. Insert a matrix pin in 4—S1 and move the matrix pin in 18—S4 to 17—S4. Verify that switches S1 and

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S3 are ON and switches S2, S4, and S5 are OFF.

- (2) Place scope TRIGGER to TP4 on 039 on the rise of DT1.
- (3) Set VOLTS/CM to 0.2.
- (4) Set TIME/CM to 0.2 msec.
- (5) Place CHAN A probe to TP13 (AGC) on 016. Observe waveform as shown in Fig. 24.
- (6) Replace cards 016 and 017 if proper result is not obtained.
- (7) Remove all scope probes.

COO Lead Check

- (1) On the 914B, insert meter test leads into the METER INPUT jacks.
- (2) Operate FUNCTION switch to VOLT/OHM EXT.
- (3) Place + probe to TP10 (COO) on 059 and - probe to ground.

Requirement: Between +5.7 and +8.3 volts dc

- (4) Operate METER POLARITY to REV.
- (5) Place LINE—TEST key of 4A1 to LINE position.
- (6) Observe meter reading.

Requirement: Between -5.2 and -7.8 volts dc

- (7) Replace cards 009, 016, 017, and 059 if proper result is not obtained. Remove meter probes from data set.
- (8) Operate FUNCTION switch to OFF, remove matrix pin 16—SD and place in 2—SD.
- (9) Place LINE—TEST key in TEST position.

EYE Pattern Test

- (1) Verify that switch S1 is ON.
- (2) Operate TEST SET MODE switch to TRMT SER and verify that WORD LENGTH switch is to 63.
- (3) Place scope TRIGGER to TP4 on 039 on the rise of DT1.
- (4) Set VOLTS/CM to 0.5.
- (5) Set scope MODE for A minus B operation.
- (6) Place CHAN A probe to TP8 on 012, ADM' lead, and CHAN B probe to TP14 on 012, ADM lead. Observe waveform as shown in Fig. 25.
- (7) Replace card 012 if proper result is not obtained.
- (8) Do not readjust scope. Place CHAN A probe to TP8 (BDM) on 014, place CHAN B probe to TP14 (BDM') on 014, and observe waveform as shown in Fig. 26.
- (9) Replace card 014 if proper result is not obtained.

TEST VIII—RECEIVER TIMING

Clock Countdown Chain

2SR Lead Check

- (1) Set up the 914B as shown in Fig. 40, except remove matrix pin in 15—SCT.
- (2) Set scope MODE to A ONLY.
- (3) Ground TP7 (RAD) and TP10 (RDL) on 006.
- (4) Place scope TRIGGER to + INT.
- (5) Set VOLTS/CM to 0.5.
- (6) Set TIME/CM to 50 μ sec.
- (7) Place CHAN A probe to TP14 on 003. Observe waveform as shown in Fig. 27.

- (8) Replace cards 003, 005, and 006 if proper result is not obtained.

DR'G1 Lead Check

- (1) Place scope TRIGGER on TP5 of 053 on the rise of DR.
- (2) Set TIME/CM to 0.5 msec.
- (3) Place CHAN A probe to TP5 on 001. Observe waveform as shown in Fig. 28.
- (4) Replace cards 001, 003, and 053 if proper result is not obtained.

RSMG Lead Check

- (1) Place CHAN A probe to TP5 on 007. Observe waveform as shown in Fig. 29.
- (2) Replace cards 003 and 007 if proper result is not obtained.

RDZ Lead Check

- (1) Place scope TRIGGER to TP5 on 053 on the rise of DR.
- (2) Place CHAN A probe to TP12 on 003. Observe waveform as shown in Fig. 30.
- (3) Replace card 003 if proper result is not obtained.

Crossing Countdown Chain

- (1) Place a matrix pin in 4—S1 and operate switch S1 to ON.
- (2) Ground TP7 (RAS) on 001 and TP10 (RXG) on 007.
- (3) Place scope TRIGGER to TP4 on 001 on the fall of CTR.
- (4) Set TIME/CM to 2 msec.
- (5) Set scope MODE to CHOPPED.
- (6) Place CHAN A probe to TP4 on 001, CTR lead, and CHAN B probe to TP5 on 053, DR lead. Observe waveform as shown in Fig. 31.

Note: Observe 14 cycles of DR for one period of CTR.

- (7) Replace cards 001, 002, and 006 if proper result is not obtained.
- (8) Remove the grounds from the TPs on 001, 006, and 007.

ADD-DELETE Circuits

- (1) Ground TP4 (CTR) on 001 and TP10 (RXG) on 007.
- (2) Place scope TRIGGER to TP5 on 053 on the fall of DR.
- (3) Set TIME/CM to 50 μ sec.
- (4) Set scope MODE to A ONLY.
- (5) Place CHAN A probe to TP2 on 005, 8SR lead. Observe waveform shown in Fig. 32.
- (6) Replace cards 001, 005, and 006 if proper result is not obtained.
- (7) Momentarily ground TP7 (RAS) on 001. Observe waveform as shown in Fig. 33.
- (8) Momentarily ground TP10 (RDS) on 001. Observe waveform as shown in Fig. 34.
- (9) Momentarily ground TP6 (TC1) and TP11 (TC2) on 001. Observe waveform as shown in Fig. 33.
- (10) Replace cards 001, 005, and 006 if proper result is not obtained.
- (11) Remove all grounds from the TPs on 001 and 007.

TEST IX—RECEIVER DIGITAL DATA

RXG Crossing Pulses

- (1) Remove matrix pin in 2—S5 and place in 2—SD.
- (2) Check to see that there is a matrix pin in 4—S1 and that switch S1 is ON. Check that the 4A1 Data Unit on the DS 205A is in the TEST position.

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- (3) Connect the FREQUENCY counter to TP10 on 007, RXG lead, to count the RXG pulses.
- (4) Ground TP2 (A0P) and TP14 (A1P) on 008. The counter shall read 610 ± 10 pps.
- (5) Replace cards 007, 008, and 014 if proper result is not obtained.
- (6) Remove the ground from TP2 and TP14 on 008.
- (7) Ground TP3 (B0P) and TP13 (B1P) on 008. The counter shall read 610 ± 10 pps.
- (8) Replace cards 007, 008, and 014 if proper result is not obtained.
- (9) Remove ground from TP3 and TP13 on 008.

Receiver Data Logic

- (1) Ground TP10 on 054, CS1 lead.
- (2) Operate TEST SET MODE to RCV SER and place a matrix pin in 16—SD.
- (3) Place scope TRIGGER to INT —.
- (4) Set TIME/CM to 0.5 msec.
- (5) Place CHAN A probe to TP14 on 060, RD lead. Observe waveform as shown in Fig. 35.
- (6) Replace cards 007, 009, and 060 if proper result is not obtained.
- (7) Remove ground from TP10 on 054.
- (8) Place scope TRIGGER to TP5 on 053 on the rise of DR.
- (9) Set TIME/CM to 0.2 msec. Observe waveform as shown in Fig. 36.
- (10) Operate switch S3 to OFF. Observe waveform between +5.4 and +6.8 volts dc (no pulses).
- (11) Replace cards 007 and 009 if proper result is not obtained.

TEST X—SINGLE FREQUENCY DETECTOR

- (1) Operate switches S3 and S5 to ON.
- (2) Ground TP10 on 054, CS1 lead.
- (3) Operate 914B FUNCTION switch to VOLT/OHM EXT.
- (4) Place + test meter lead to TP9 (CLCON') on 055 and the — lead to ground.

Requirement: Between +5.1 and +7.3 volts dc

- (5) Replace cards 009, 010, and 055 if proper result is not obtained.
- (6) Operate switch S1 to OFF. The reading should be less than +0.5 volt dc.
- (7) Replace cards 009, 010, and 055 if proper result is not obtained.
- (8) Operate switch S4 to ON.
- (9) Place + probe on TP12 of 058 (CLCON) and — probe to ground.

Requirement: Between 5.1 and 7.3 volts dc

- (10) Replace cards 058 and 059 if proper result is not obtained.
- (11) Operate switch S4 to OFF.
- (12) Operate FUNCTION switch to OFF and remove meter test leads from data set.
- (13) Remove ground from TP10 on 054.

TEST XI—REMOTE TEST CIRCUIT

- (1) Operate switch S1 to ON. Observe visually that the K2 wire-spring relay in bottom right section of data set is released.
- (2) Operate switch S1 to OFF and S2 to ON. The K2 relay should operate.
- (3) Replace card 021 if proper result is not obtained.

- (4) Place LINE—TEST key to LINE position.
- (5) Strap TP3 (E) on 040 to TP12 (CO') on 009 and TP4 (E) on 040 to TP12 (CS') on 057.
- (6) Place scope TRIGGER to + INT.
- (7) Set TIME/CM to 0.5 msec.
- (8) Place CHAN A probe to TP6 on 054, RTSS lead. Observe waveform as shown in Fig. 37.
- (9) Replace cards 021, 053, and 054 if proper result is not obtained.
- (10) Remove straps from 040 to 009 and 040 to 057.
- (11) Strap TP12 (RTCON) and TP13 (RTRS) on 053 to ground.
- (12) Place scope TRIGGER to TP11 on 053 on the rise of SR.
- (13) Set TIME/CM to 0.2 msec.
- (14) Place CHAN A probe to TP4 (SXG) on 009. Observe waveform as shown in Fig. 38.
- (15) Replace cards 008, 009, and 059 if proper result is not obtained.
- (16) Set TIME/CM to 50 μ sec.
- (17) Set scope MODE to CHOPPED.
- (18) Place CHAN A probe to TP1 on 040, ST lead, and CHAN B probe to TP11 SR on 053. Observe waveform as shown in Fig. 39.

Note: The positive transitions of ST shall be within +0 and -35μ sec of the positive transitions of SR.

- (19) Replace cards 041, 042, and 043 if proper result is not obtained.
- (20) Remove straps on 053.

TEST XII—DSR LEAD CHECK

- (1) Set up the 914B as shown in Fig. 40.
- (2) Operate LINE—TEST key on data set to TEST.
- (3) Operate 914B FUNCTION switch to VOLT/OHM EXT and METER POLARITY switch to REV and verify that switch S2 is OFF.
- (4) Place + meter lead probe to TP13 on 059, DSR lead, and - probe to ground.

Requirement: Between -5.2 and -7.8 volts dc

- (5) Remove meter probes from the data set. Operate METER POLARITY to NOR.
- (6) Operate LINE—TEST key to LINE.
- (7) Place + probe to TP13 on 059 and - probe to ground.

Requirement: Between $+5.7$ and $+8.3$ volts dc

- (8) Replace cards 054, 057, and 059 if proper result is not obtained.
- (9) Depress POWER switch on the 914B and disconnect ac power cords of the DS 205A and the 914B.
- (10) Remove all test equipment.
- (11) Remove strap between E1 and E2.
- (12) Verify that proper options are strapped.
- (13) Place LINE—TEST key in LINE position.
- (14) Connect TEL LINE, 4-WIRE, CUSTOMER A, and CUSTOMER B connectors.
- (15) Connect ac power cord of Data Set 205A.
- (16) Call data test center for final check before turning data set over to customer.

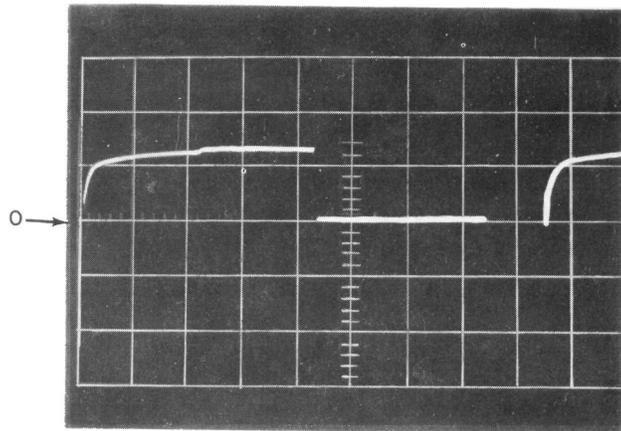


Fig. 2—Waveform—24S Lead

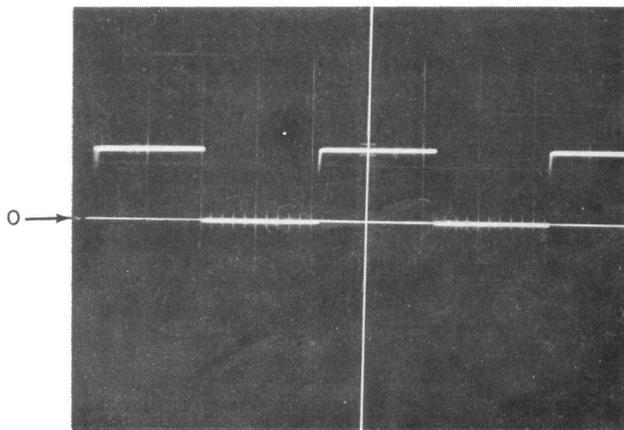


Fig. 3—Waveform—2ST' Lead

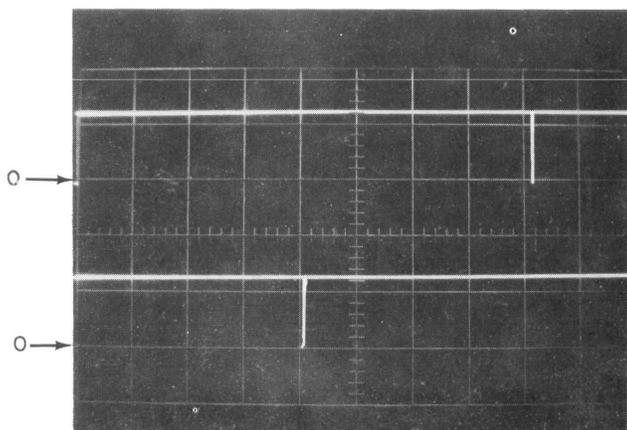


Fig. 4—Waveform—Connect A Probe to EG Lead, B Probe to E'G Lead

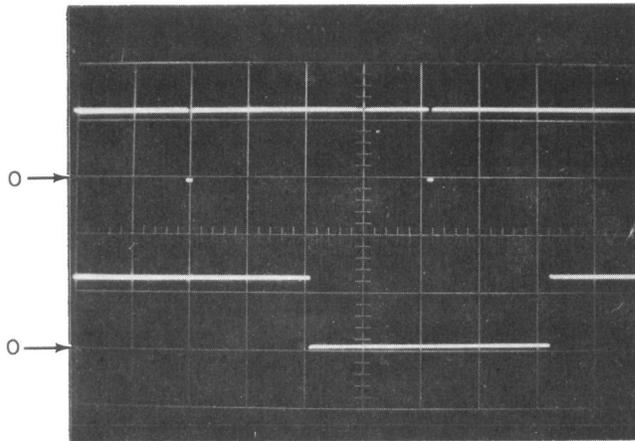


Fig. 5—Waveform—Connect A Probe to ST'G1 Lead, B Probe to DT1 Lead

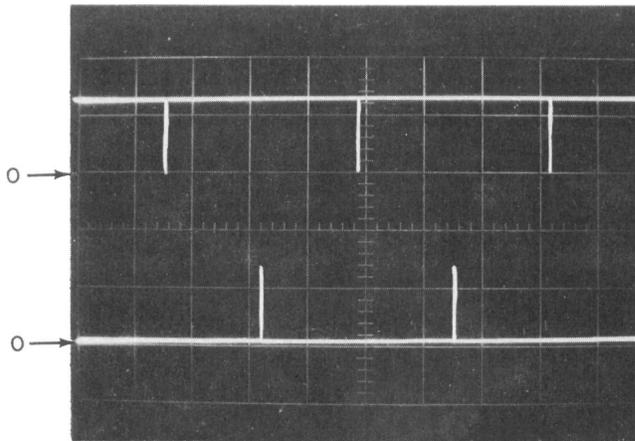


Fig. 6—Waveform—Connect A Probe to CI' Lead, B Probe to CII Lead

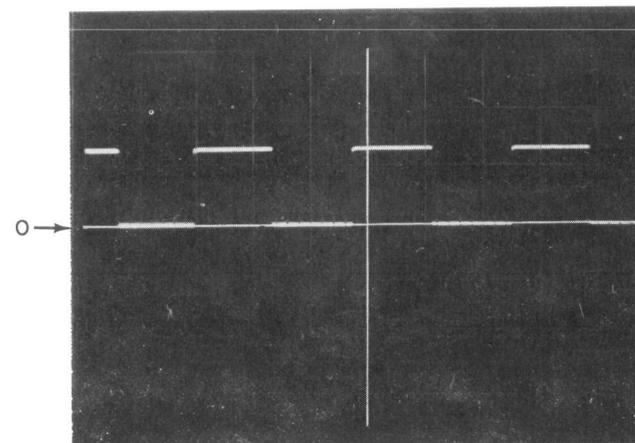


Fig. 7—Waveform—3CS Lead

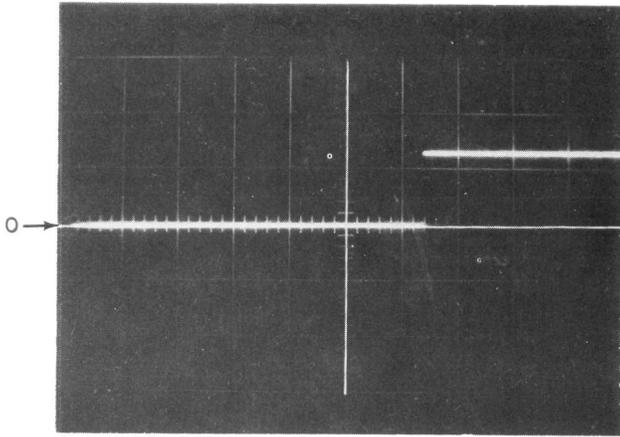


Fig. 8—Waveform—CS1 Lead

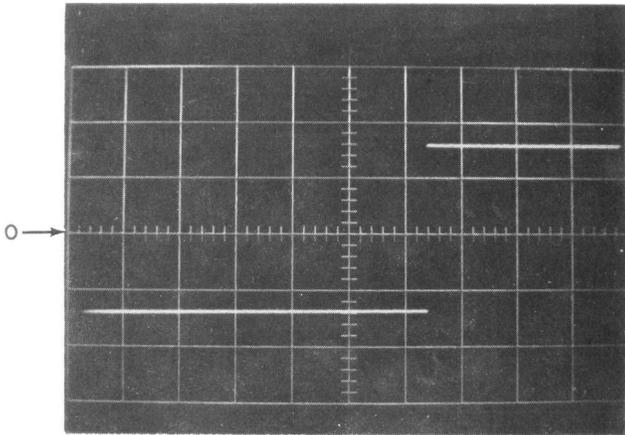


Fig. 9—Waveform—CS Lead

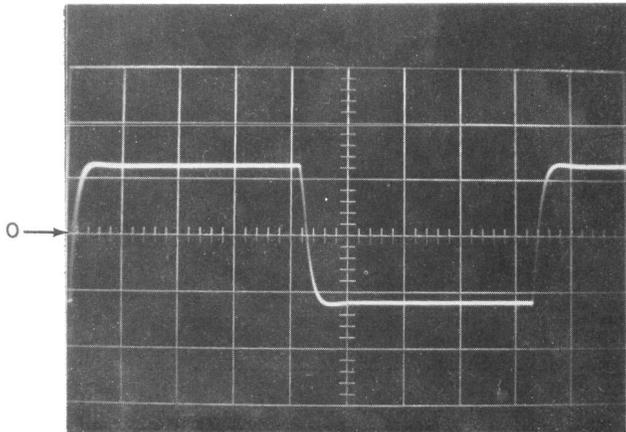


Fig. 10—Waveform—SCT Lead (Full-Speed, Shorting Clip Open)

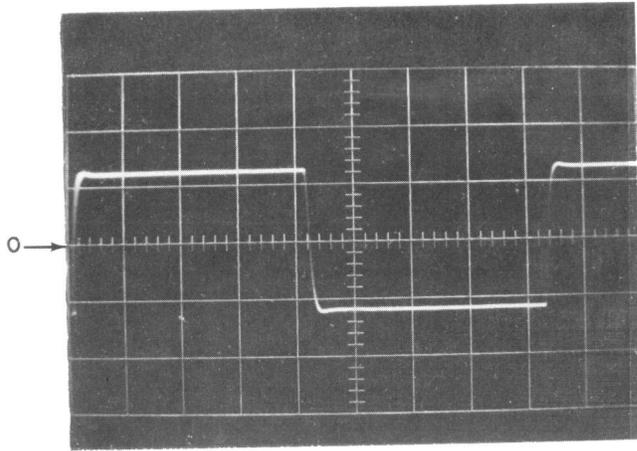


Fig. 11—Waveform—SCT Lead (Half-Speed)

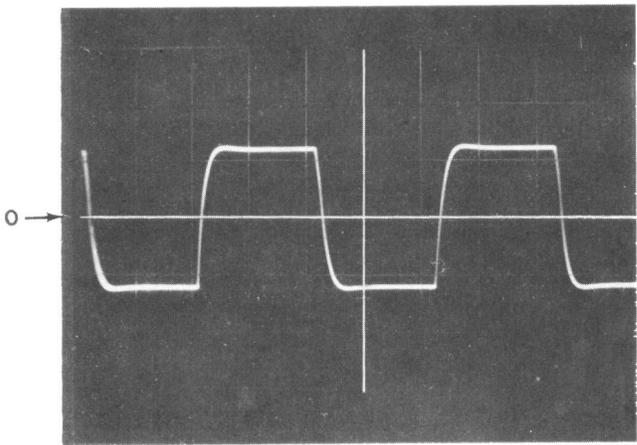


Fig. 12—Waveform—SCT Lead (Half-Speed, Shorting Clip Closed)

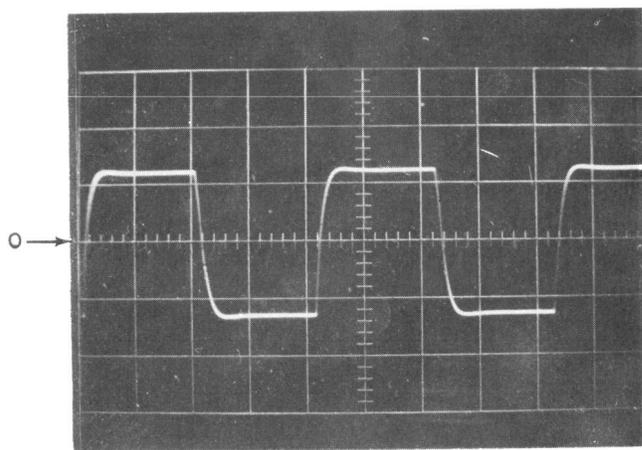


Fig. 13—Waveform—SCR Lead

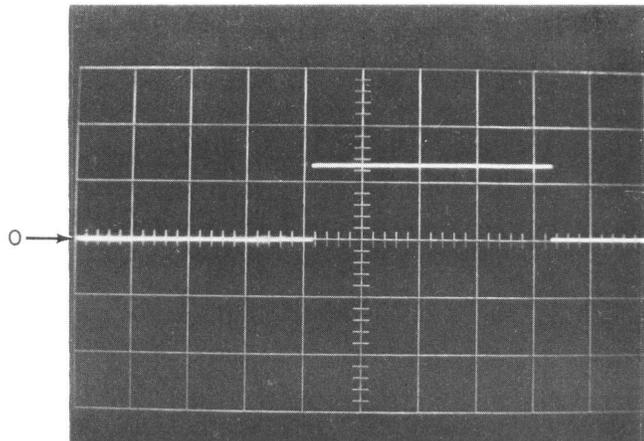


Fig. 14—Waveform—SD2 Lead (Half-Speed)

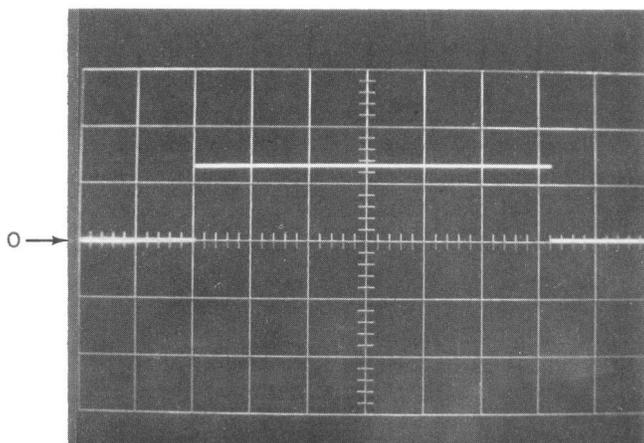


Fig. 15—Waveform—SD2 Lead (Full-Speed)

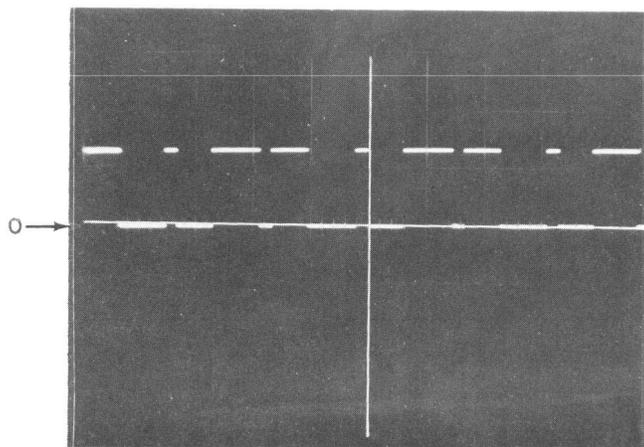


Fig. 16—Waveform—PL90 Lead (+18 to SD)

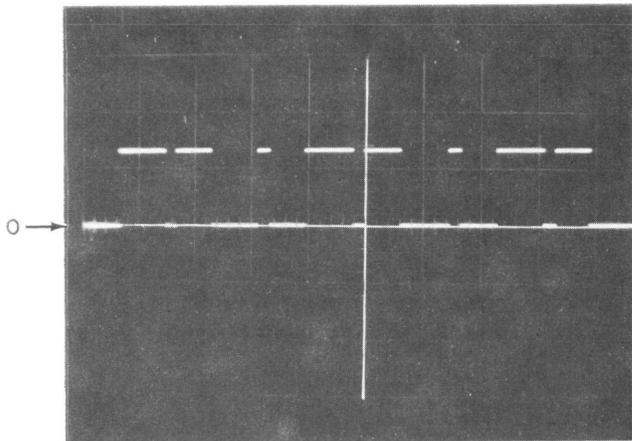


Fig. 17—Waveform—PL90 Lead (-18 to SD)

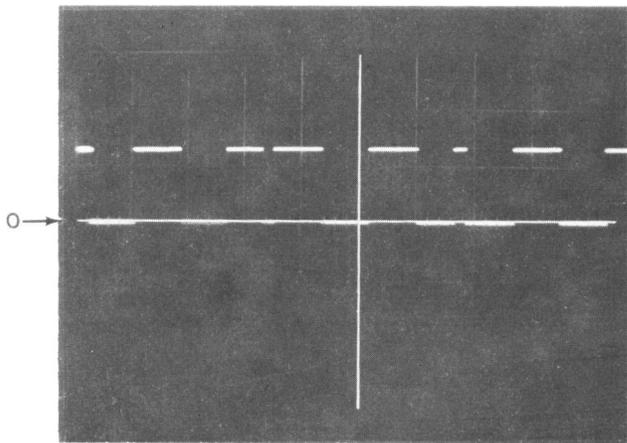


Fig. 18—Waveform—PL180 Lead

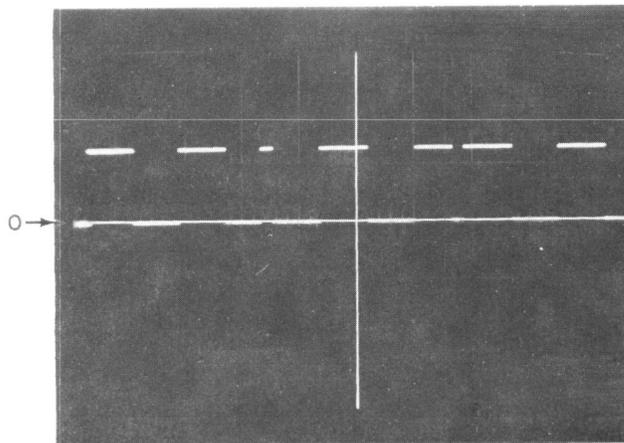


Fig. 19—Waveform—PL180 Lead (Inverted)

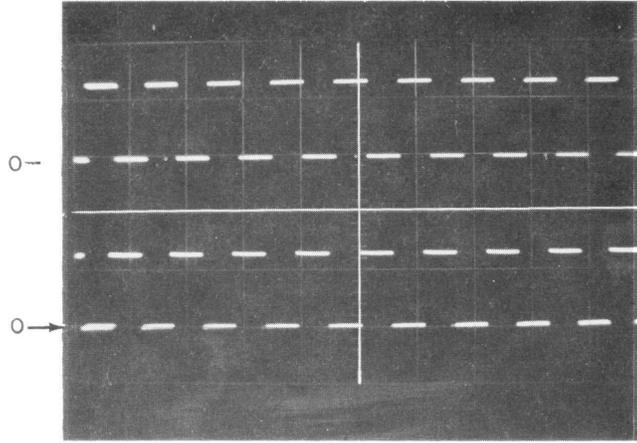


Fig. 20—Waveform—Connect A Probe to I180 Lead, B Probe to II180 (Clear)

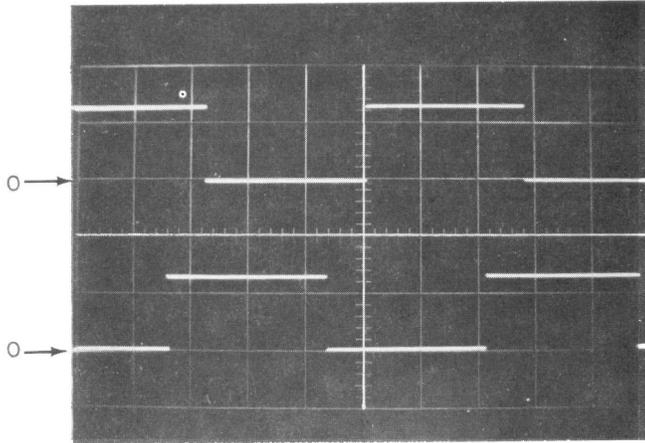


Fig. 21—Waveform—Connect A Probe to I180, B Probe to II180 (Set)

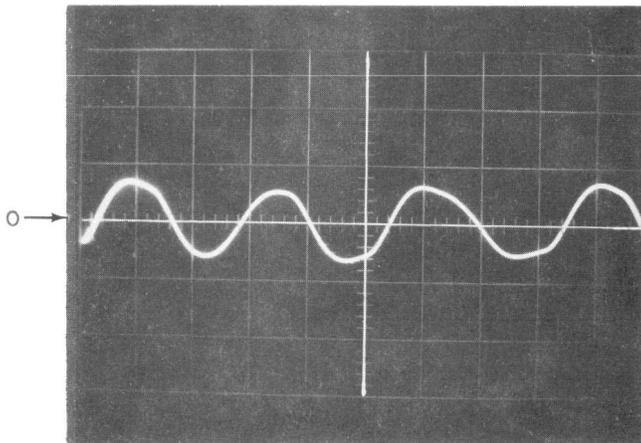


Fig. 22—Waveform—Connect A Probe to TL Lead, B Probe to TL' Lead

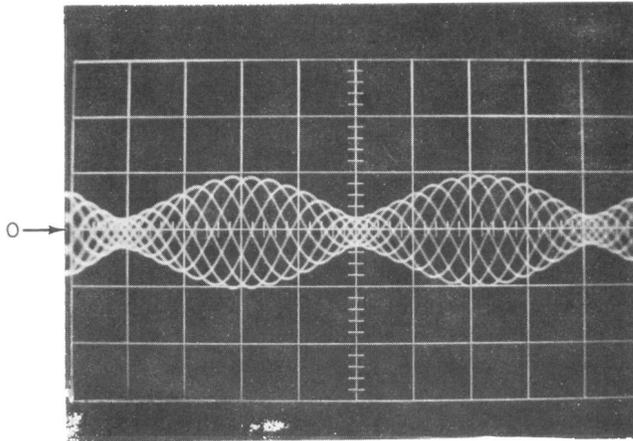


Fig. 23—Waveform—BPF Output

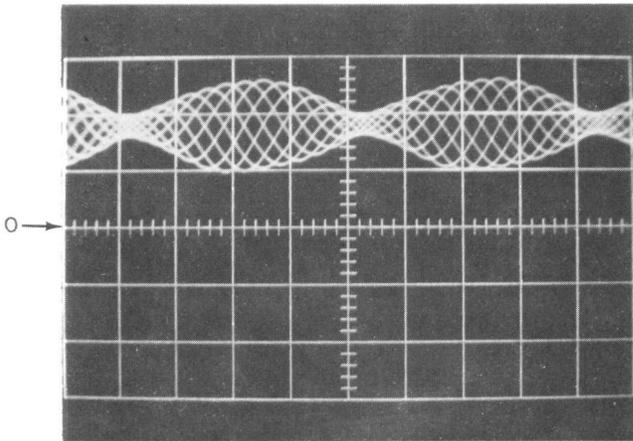


Fig. 24—Waveform—AGC Output

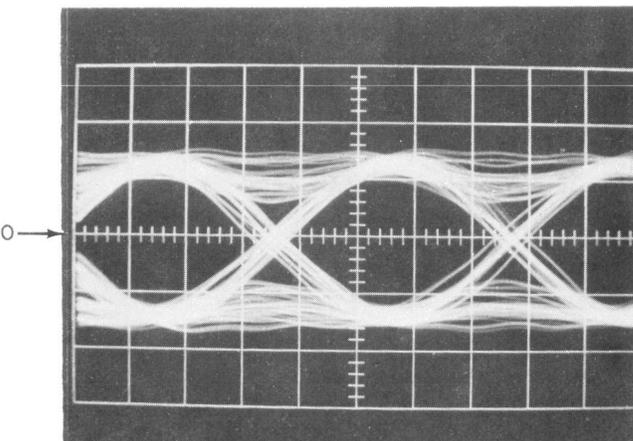


Fig. 25—Waveform—Connect A Probe to ADM' Lead, B Probe to ADM Lead

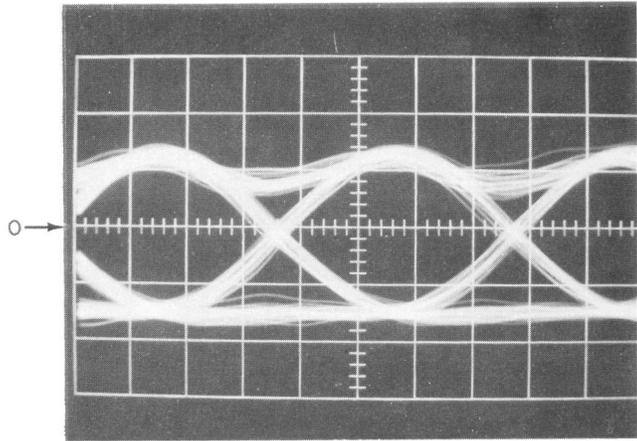


Fig. 26—Waveform—Connect A Probe to BDM Lead, B Probe to BDM' Lead

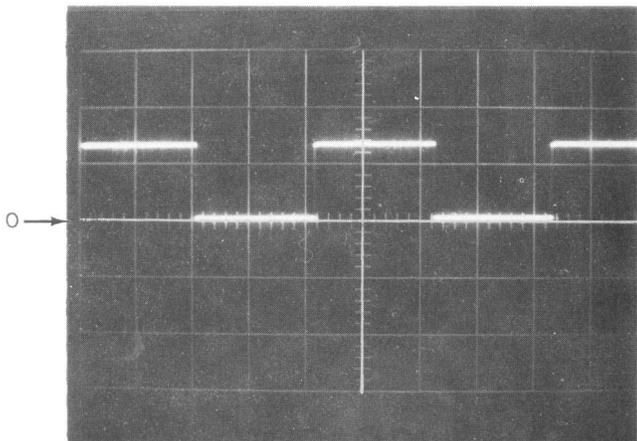


Fig. 27—Waveform—2SR Lead

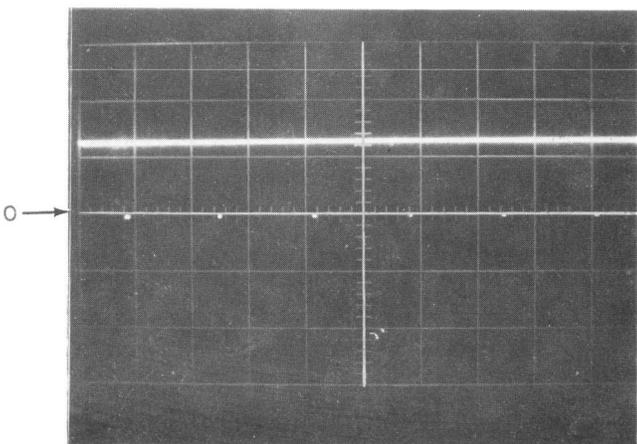


Fig. 28—Waveform—DR'G1 Lead

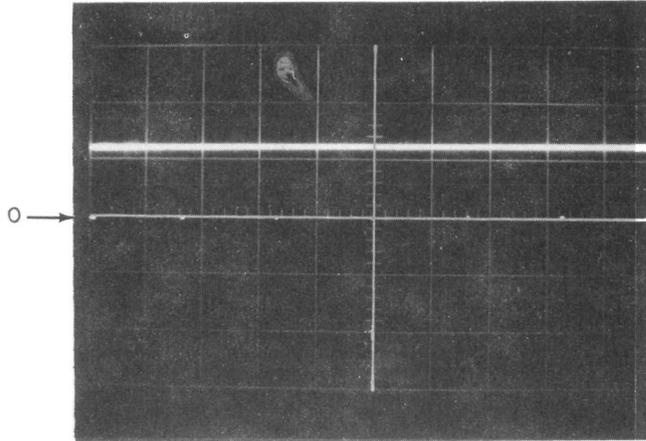


Fig. 29—Waveform—RSMG Lead

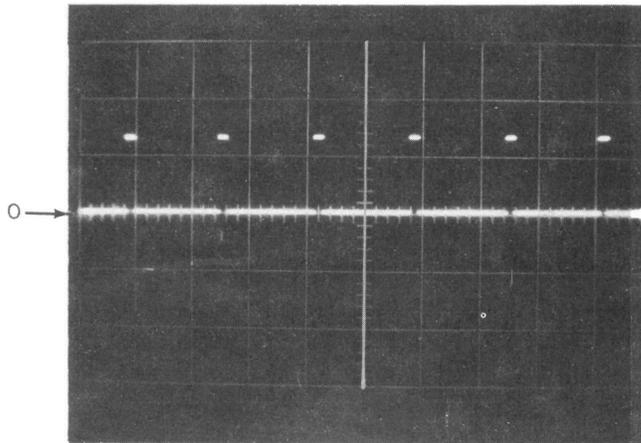


Fig. 30—Waveform—RDZ Lead

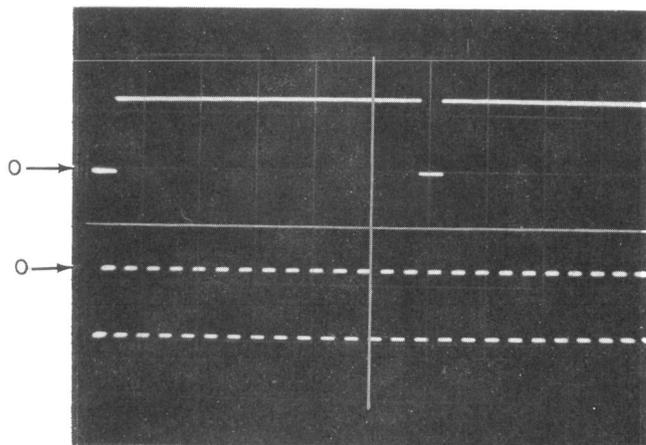


Fig. 31—Waveform—Connect A Probe to CTR,
B Probe to DR

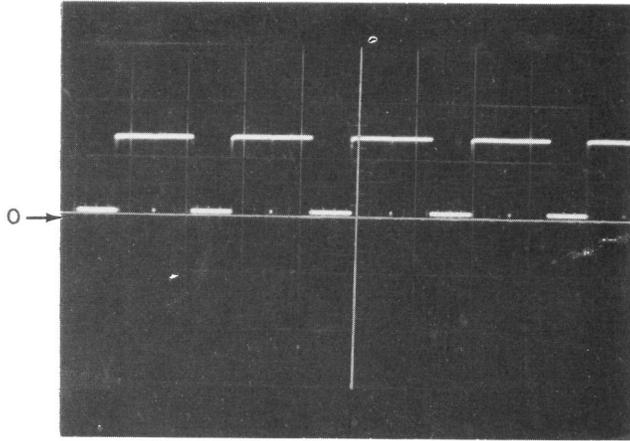


Fig. 32—Waveform—8SR Lead

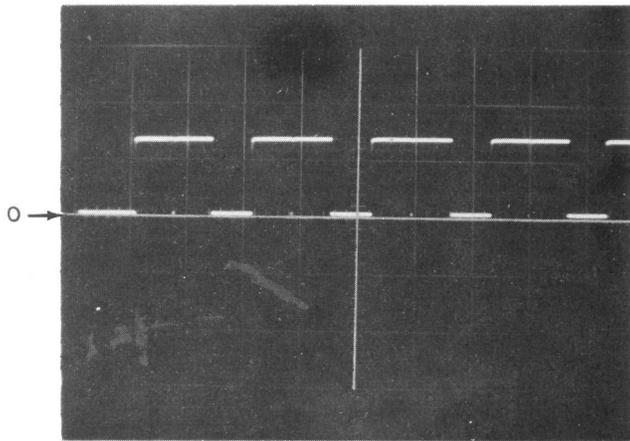


Fig. 33—Waveform—8SR Lead (Delete)

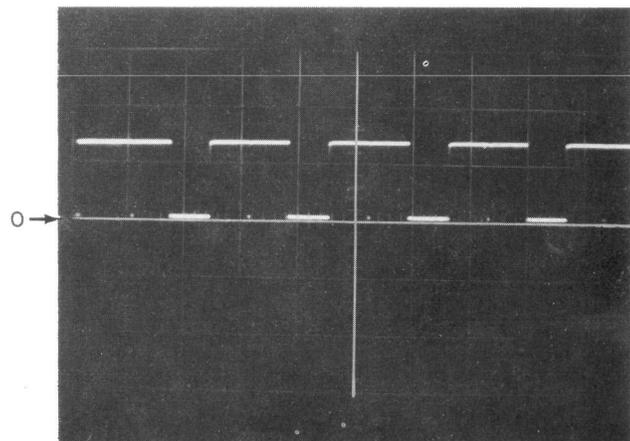


Fig. 34—Waveform—8SR Lead (Add)

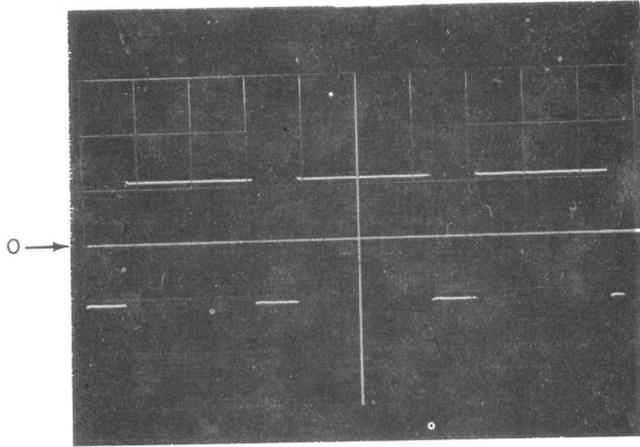


Fig. 35—Waveform—RD Lead (1000 Code)

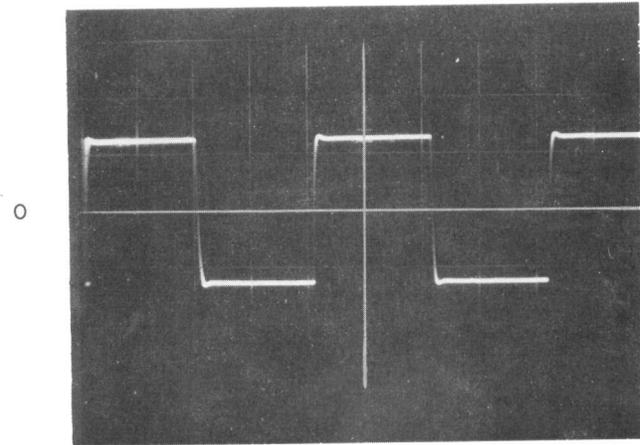


Fig. 36—Waveform—RD Lead (01 Code)

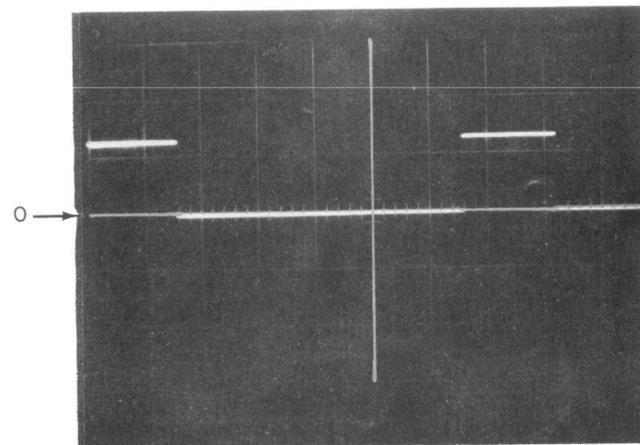


Fig. 37—Waveform—RTSS Lead

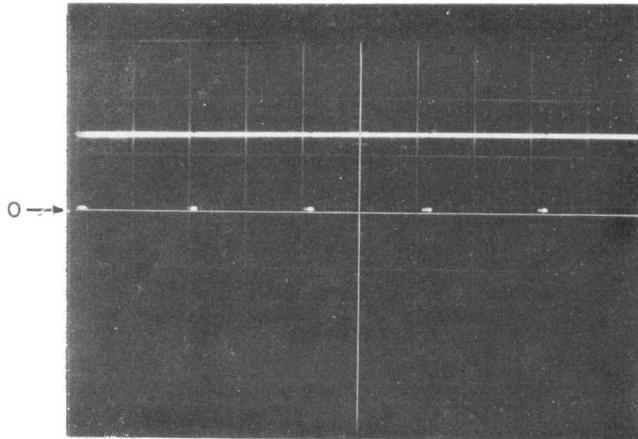


Fig. 38—Waveform—SXG Lead

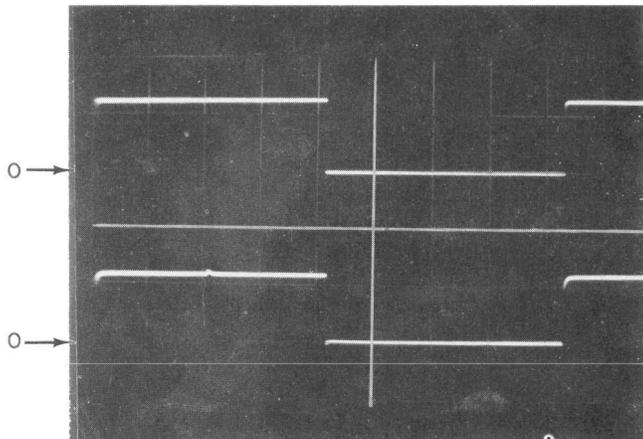


Fig. 39—Waveform—Connect A Probe to ST Lead, B Probe to SR Lead

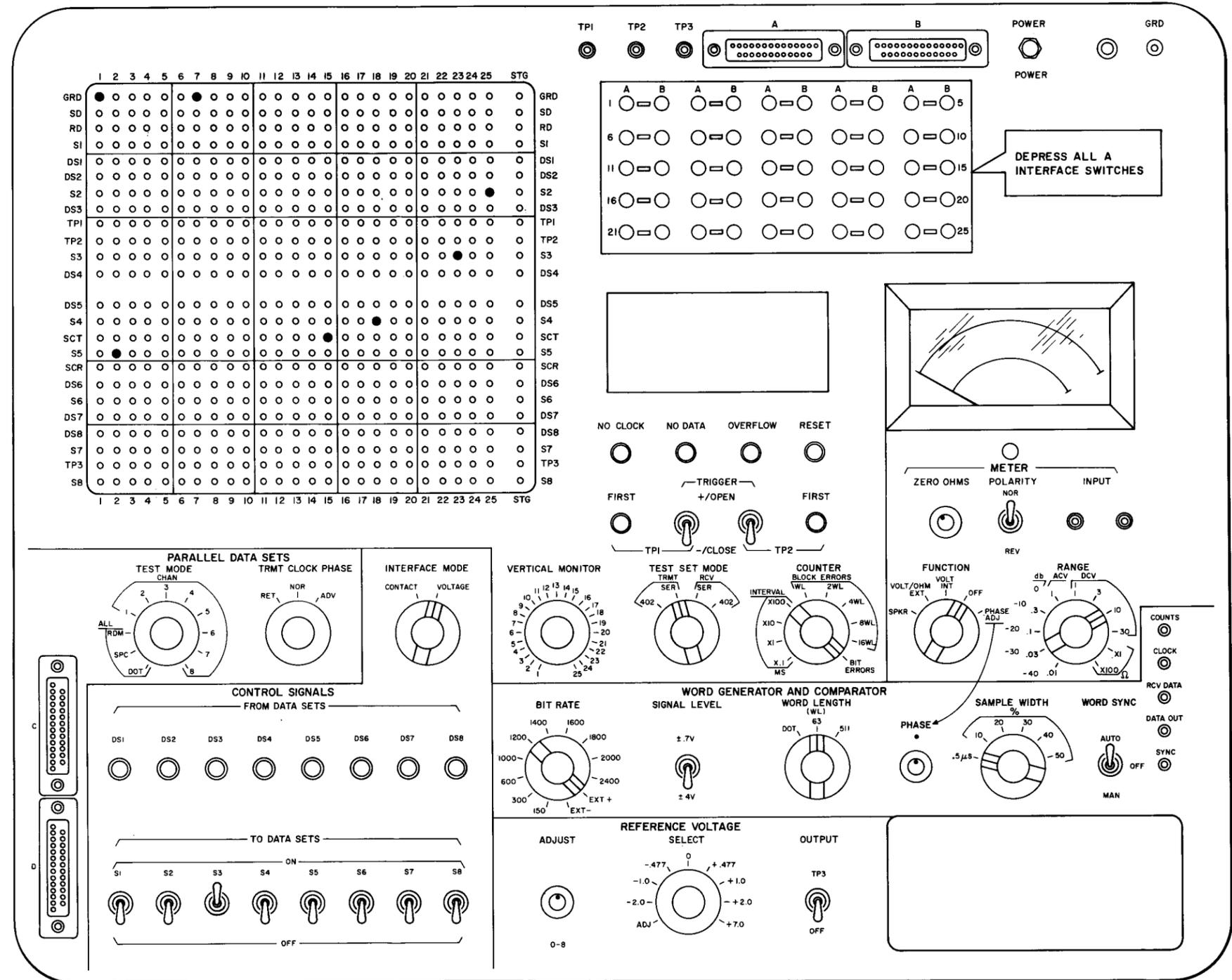


Fig. 40—914B Data Test Set Arrangement for Maintenance Test Procedure