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**INITIAL SPAN LINE POWERING  
T1 DIGITAL LINE  
DIGITAL TRANSMISSION SYSTEMS**

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This section outlines the procedure for initially powering T1 span lines from a 201 office repeater bay (ORB).

This section is reissued to delete procedures for the initial powering of T1 span lines from a 206 ORB and T1C/T1 ORB. These procedures are now contained in Section 365-800-002 (TOP). Since this reissue is a general revision, no revision arrows have been used to denote significant changes.

When power is supplied locally at the 201 ORB (Fig. 1) the J98710B control unit distributes the power from the bay fuse and alarm panel to the repeatered line. When power is supplied from the opposite end of the span, power looping for the span line is provided by the control unit through the office repeater. Each control unit when plugged into the span terminating assembly (STA) distributes power for one facility when bidirectional line repeaters are used, and distributes power for two facilities in one direction when unidirectional line repeaters are used.

When power is supplied locally, the J98710D fuse and alarm panel distributes the required combination of -48 volts, -130 volts, and +130 volts office battery and ground to the STA and then to the control unit. When power is supplied from the opposite end of the span, the office repeaters may be powered from the span lines or separately from the fuse and alarm panel.

When D1C channel banks are used with the T1 digital lines to handle Traffic Service Position System (TSPS) number 1 traffic, the A and D TSPSs should always be assigned to odd-numbered repeater bay shelves and the B and C TSPSs to even-numbered shelves. This arrangement prevents a failure in one power supply from disrupting both A and B systems if there is a failure in one of the two main power supplies for repeater bays. One power supply is connected to the A and B systems and the other to the B and D systems.

The procedure that follows results in a line current between 130 and 150 mA. On properly engineered and adjusted systems, the line current is within the required limits with normal office battery voltage variations and normal cable temperature variations. On aerial cable systems when cable temperatures exceed 120°F and office battery voltages are more than two percent low, the line current may fall below the prescribed limit and thus, require slight readjustment.

Before measuring the line current, all repeaters in the power loop must be installed according to the appropriate Section in the 640 Division.

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**CHART 1**

**Span Line Powering From a 201 ORB**

**APPARATUS:**

- 1—KS-20599, L4 Digital Multimeter (DMM), Section 084-805-101 or KS-14510 Volt-Ohm-Milliammeter (VOM), Section 100-520-101
- 1—45B Tool (5/16 hexagon socket wrench)
- As Req'd—72A Dummy Fuses (white)
- As Req'd—70R Fuses (red, white strips)

STEP	PROCEDURE
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**Note:** A 208D or 208AB repeater with a 215A adapter may be used in the 201 ORB in place of the 201-type office repeaters.

**A. Preparation**

- 1 Check the span line record card to determine the type of control unit required (unidirectional or bidirectional line repeaters), the line powering option (power looping or power feed), the local power option (office repeater powered separately or in series with the line), and the protection option (required or not).
- 2 Check that the power simplex strapping option is wired according to the carrier layout information (Fig 2, 3, and 4).
- 3 If power looping is required and power to the line is not required, continue with Step 4. If power to the line is required, proceed to Step 8.

**B. Power Looping**

- 4 Connect and solder the proper looping option according to the carrier layout information (Fig. 2, 3, and 5).

## CHART 1 (Contd)

- | STEP | PROCEDURE  |
|------|--|
| 5    | Insert 72A dummy fuses in circuit 1 and circuit 2 positions on the control unit.<br><br><b>Note:</b> Fuses must be inserted by pushing in and turning to the maximum clockwise position so that the two dots on the fuse cap align horizontally.   |
| 6    | Insert a 70R (0.15 amp) or a 72A dummy fuse in the OFFICE RPTR position, as required, according to Fig. 5.   |
| 7    | Proceed to Step 28.  |
|      | <b>C. Power Feed</b>   |
| 8    | Connect and solder the proper power feed option according to the carrier layout information (Fig. 2, 3, and 6).<br><br><b>Note:</b> If terminals A, B, C, and/or D (strapping options 1 and 2 of Fig. 6) are strapped to ground, strap out associated fuse(s) F1, F2, F3, or F4 at fuse holder terminals and replace removed fuse(s) with 72A dummy fuse(s) per SD-97082-01. |
| 9    | Remove the strap from R1, R2, R3, and R4 (Fig. 7) as specified on the span line record card. On R2 and R4 remove the strap from the 110-ohm side only. Then determine the need to remove the strap from the 147-ohm side by means of the following test (Steps 10 through 24).   |
| 10   | Check the span line record card for the specified value of control unit resistance.  |
| 11   | Check the span line record card for the voltage supplies to be used for power feed (-48 volt, -130 volt, and/or +130 volt supply).   |
| 12   | Set the DMM or VOM selector switch(es) to the appropriate voltage scale, and connect the DMM or VOM to miscellaneous terminals of terminal strip A on the rear of the STA as follows. (Read black DC scale if using a VOM.)  |

VOLTAGE SUPPLIES	DMM OR VOM + TO TERM	DMM OR VOM - TO TERM	TOTAL VOLTAGE
- 48V, GRD	6	5	48V
+130V, GRD	3	6	130V
- 48V, +130V	3	5	178V
- 130V, +130V	3	1	260V

## CHART 1 (Contd)

STEP	PROCEDURE
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- 13 Watch the meter for several minutes to determine the average voltage. (This is the normal voltage for the office.)
- 14 Determine the difference voltage between the normal voltage (Step 13) and the nominal voltage specified below.

VOLTAGE SUPPLIES	TOTAL VOLTAGE (NOMINAL)
- 48V, GRD	48V
+130V, GRD	130V
- 48V, +130V	178V
- 130V, +130V	260V

- 15 Referring to the following listing, use the difference voltage (Step 14) to obtain the resistance correction value.

DIFFERENCE VOLTAGE	0.0 TO 0.9V	1.0 TO 1.9V	2.0 TO 2.9V	3.0 TO 3.9V	4.0 TO 4.9V	5.0 TO 5.9V
RESISTANCE CORRECTION (OHMS)	0	10	18	25	32	40

- 16 If the resistance correction value (Step 15) is 0, proceed to Step 28; otherwise, continue with Step 17.
- 17 If the normal voltage (Step 13) is **higher** than the nominal voltage (Step 14), add the resistance correction value to the control unit resistance value specified on the span line record card, and proceed to Step 19.
- 18 If the normal voltage (Step 13) is **lower** than the nominal voltage (Step 14), subtract the resistance correction value from the control unit resistance value specified on the span line record card.
- 19 Temporarily strap together the two power feed terminals selected in Step 8 (-48V, GRD, +130V, and/or -130V).
- 20 Insert 70R (0.15 amp) fuses in circuit 1 and circuit 2 positions as required. If one circuit is not used, insert 72A dummy fuses in that circuit position.

## CHART 1 (Contd)

STEP	PROCEDURE
21	Using the 45B tool, loosen the locknuts on the control unit ADJ potentiometers.
22	Set the DMM or VOM selector switch(es) to the appropriate ohm scale, and connect it between circuit 1 or circuit 2 terminals specified below.

	STRAPPING USED IN FIG. 4				CIRCUIT
	A	B	C	D	
CONNECT OHMMETER BETWEEN	S12-S13	P11-S13	S12-P12	P11-P12	1
	P12-S14	P12-S14	S14-S13	S14-S13	2

- 23 Adjust the control unit ADJ potentiometer to obtain the resistance value determined in Step 17 or 18.
- 24 If the ADJ potentiometer is near the end of its range and 110-ohm portion of R2 and/or R4 was cut in Step 9, cut the strap on the 147-ohm portion of R2 or R4.
- 25 Using the 45B tool, tighten the locknuts on the ADJ potentiometers.
- 26 Remove the temporary strap installed in Step 19.
- 27 Remove the fuses that were inserted into the control unit in Step 20.
- 28 Check that the office repeater option is selected for loop condition (201-type or 208AB repeater only).
- 29 Place the control unit in the span terminating assembly.
- 30 Set the DMM selector switches to VDC and 10 or set the VOM selector switch to the 3-VOLTS-DC scale.
- 31 Connect the DMM or VOM negative lead to the white TST jack and the positive lead to the red TST jack on the control unit (Fig. 8).
- Warning: Watch the DMM or VOM when performing Steps 32 and 33. If a negative reading is shown or if the voltage is greater than +2.2 volts, remove the fuses immediately to avoid damaging the repeaters.**
- 32 Insert 70R (0.15 amp) fuses in circuit 1 and circuit 2 positions as required. If one circuit is not used, insert 72A dummy fuses in that circuit position.

## CHART 1 (Contd)

## STEP

## PROCEDURE

- 33 Insert a 70R (0.15 amp) or a 72A dummy fuse in the OFFICE RPTR position, as required, according to Fig. 6.

**D. Check of Line Current**

**Note:** All repeaters being fed power must be in place and the proper power options must be made before checking the line current.

- 34 Read the DMM display or VOM black DC scale.

**Requirement:** 1.3 through 1.5 volts if using a DMM or 1.2 through 1.6 if using a VOM.

- 35 If the requirement of Step 34 is met, set the ADJ potentiometer for a DMM or VOM indication of 1.4 volts (Note 1) and proceed to Step 42; if not see Note 2.

**Note 1:** For T1 lines that are exposed (aerial) for a considerable distance, the ADJ potentiometer should be set for 1.5 volts in cold weather.

**Note 2:** Inability to obtain the voltage requirement specified above indicates a short or an open in the span; therefore continue with Step 36.

- 36 Note voltage indication obtained in Step 34.

- 37 Turn the ADJ potentiometer counterclockwise and read the meter indication.

**Requirement:** The voltage indication should decrease.

- 38 Reset the ADJ potentiometer to obtain the meter indication noted in Step 36.

**Note:** Failure to obtain the recorded indication means no control and indicates a possible short on the line.

- 39 Remove the lower (+) fuse in the control unit of circuit being powered and read the meter indication.

**Requirement:** Voltage indication should be zero.

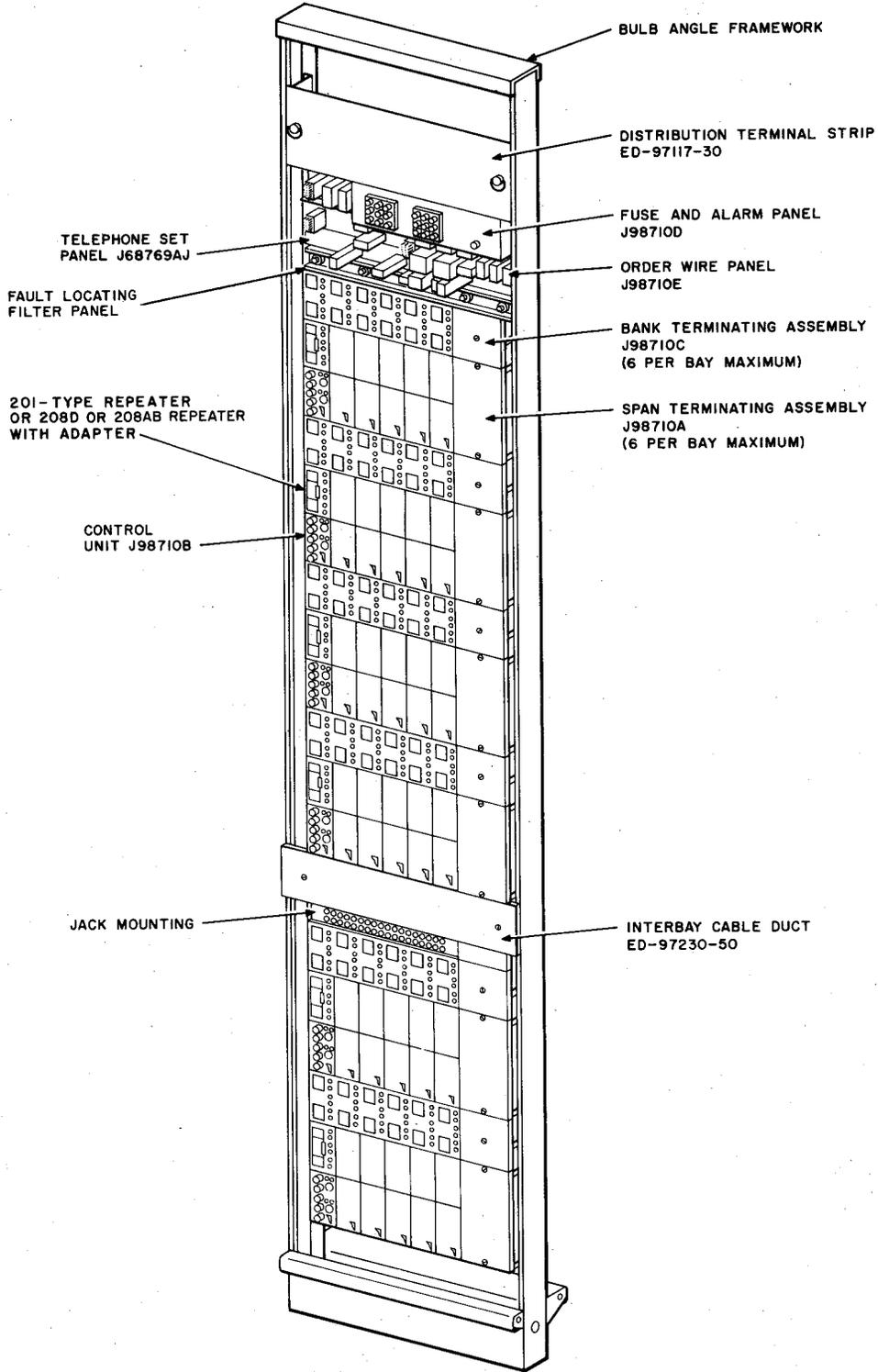
**Note:** Failure to meet the requirement of Step 39 indicates a possible leakage of current or a short to ground in the span.

- 40 Reinsert the fuse removed in Step 39, and proceed to Section 365-227-500 to clear trouble.

- 41 After the line trouble has been corrected, remeasure the line current and set the ADJ potentiometer for DMM or VOM indication of 1.4 volts.

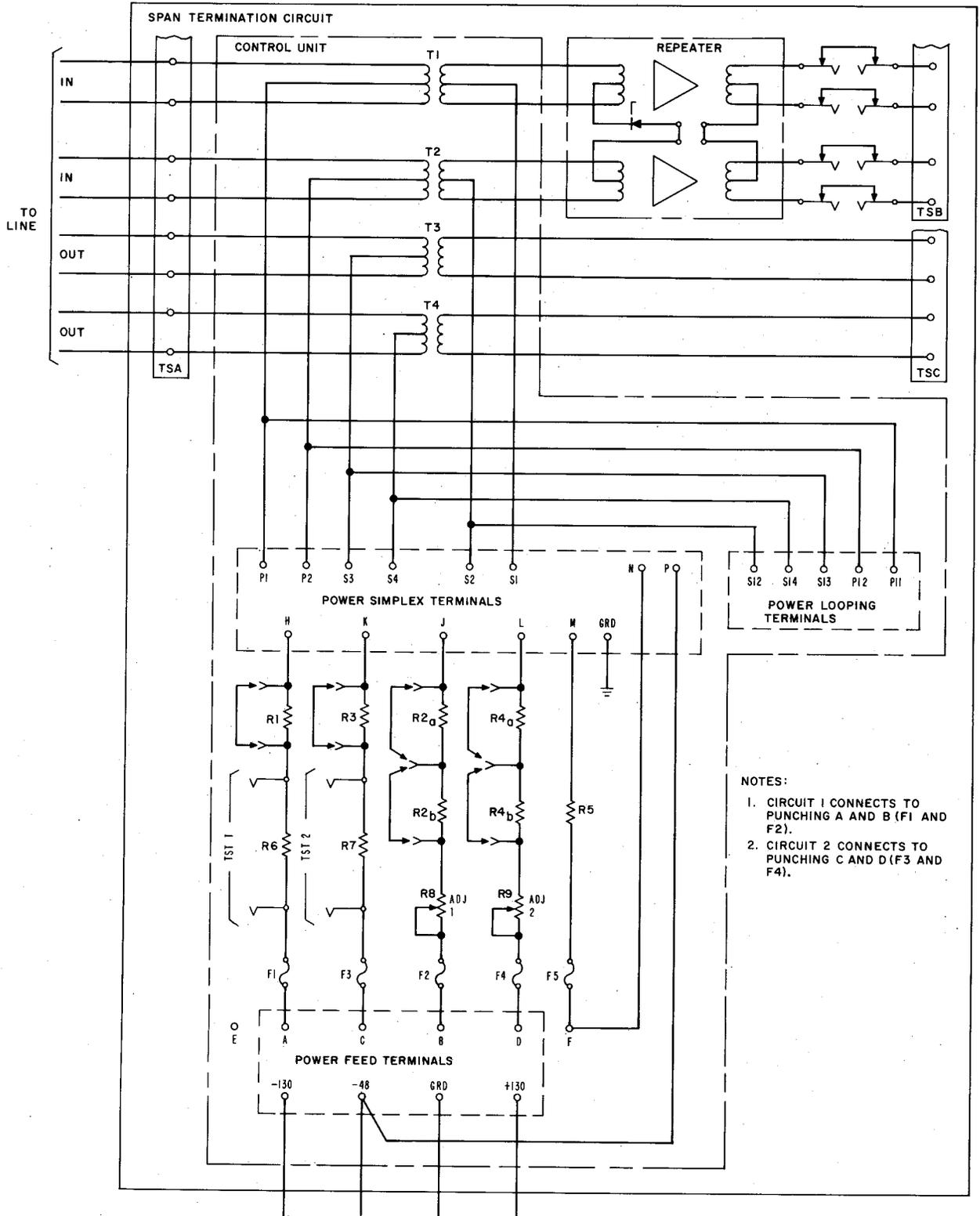
## CHART 1 (Contd)

STEP	PROCEDURE
42	<p><b>Note:</b> For T1 lines that are exposed (aerial) for a considerable distance, the ADJ potentiometer should be set for 1.5 volts in cold weather.</p> <p>If the office repeater is powered separately, check the office repeater by connecting the positive lead of the DMM or VOM to pin 5 and the negative lead to pin 7 on the back of the office repeater connector.</p> <p><b>Requirement:</b> 9.5 through 12.5 volts.</p> <p><b>Note:</b> <i>If the span line (now powered) will not be placed in service immediately, perform one of the following operations to prevent nonintegrated circuit-type repeaters from oscillating:</i> Remove repeater power by removing the Line - and/or LINE + fuse(s) in the control unit, or use a quasi-random signal source (QRSS) to provide a signal to the span line and terminate the span line per Section 365-224-500. The latter method is preferred because the line can be tested without repowering.</p>
43	Disconnect the DMM or VOM.



FULLY EQUIPPED BAY AT TERMINAL OFFICE

Fig. 1—Typical 201 Office Repeater Bay (201 ORB)



- NOTES:
1. CIRCUIT 1 CONNECTS TO PUNCHING A AND B (F1 AND F2).
  2. CIRCUIT 2 CONNECTS TO PUNCHING C AND D (F3 AND F4).

Fig. 2—Power Feed Circuit, 201 ORB

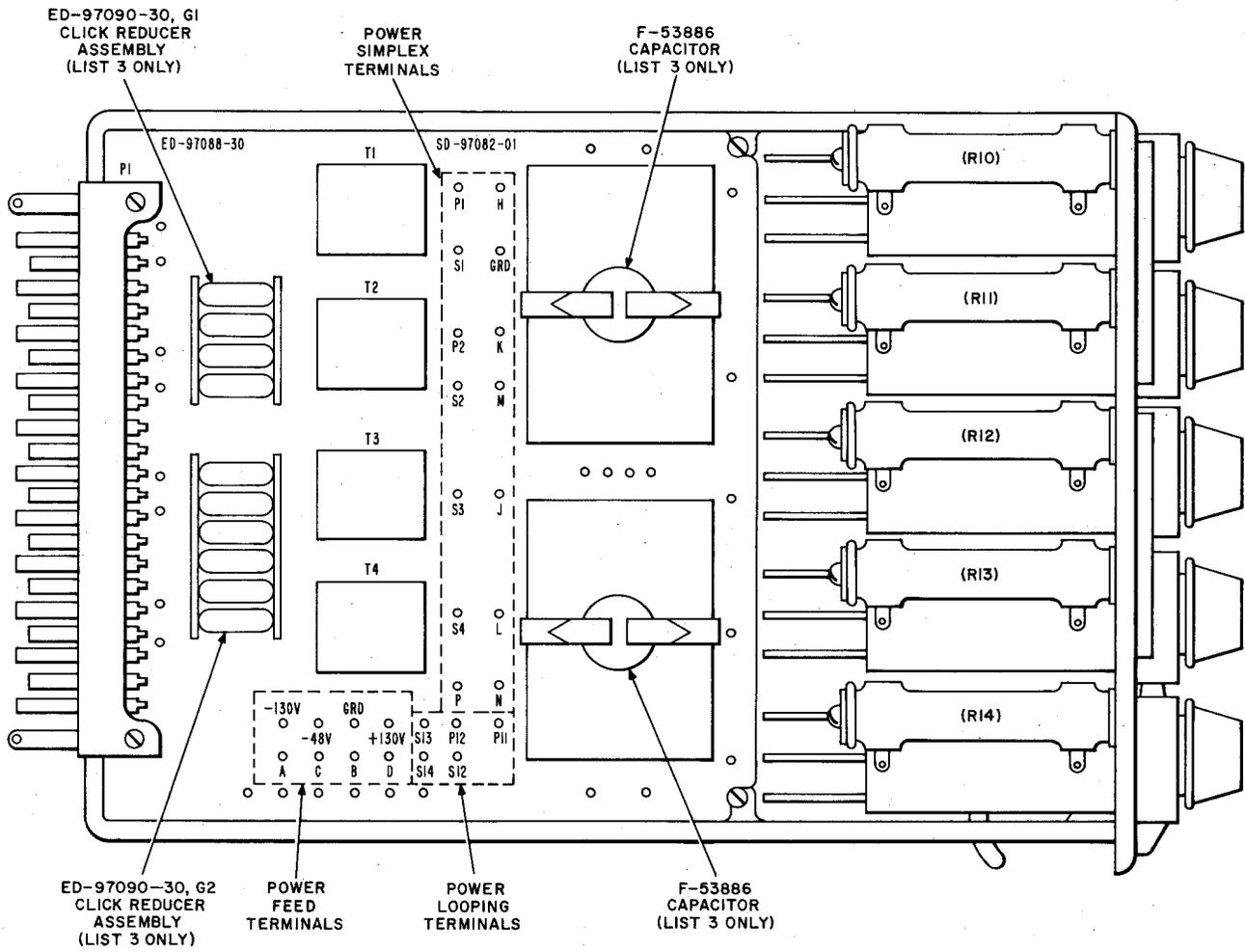
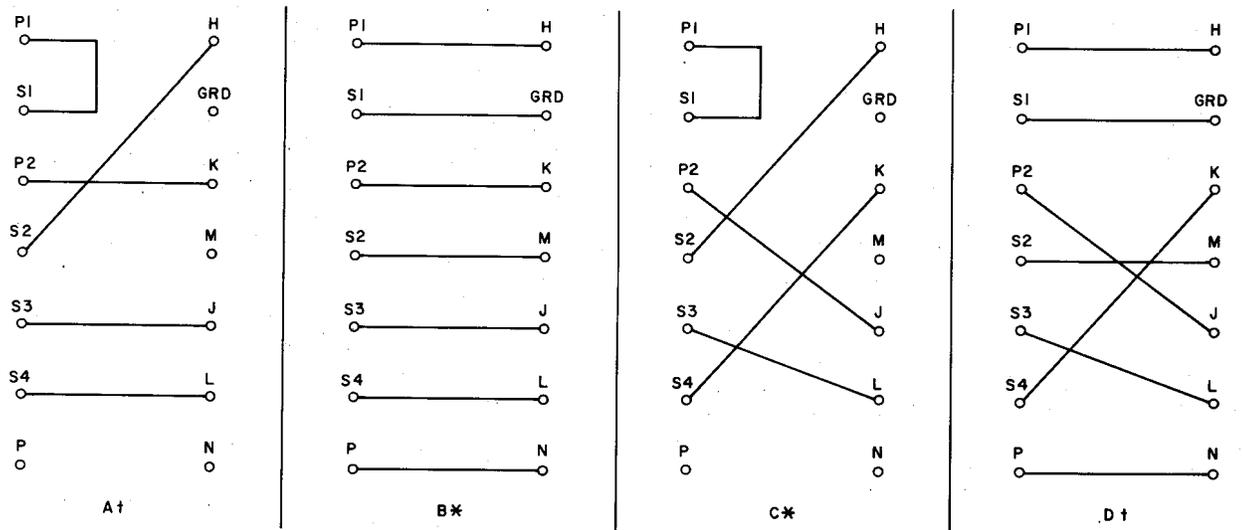


Fig. 3—J98710B Control Unit, Left Side View

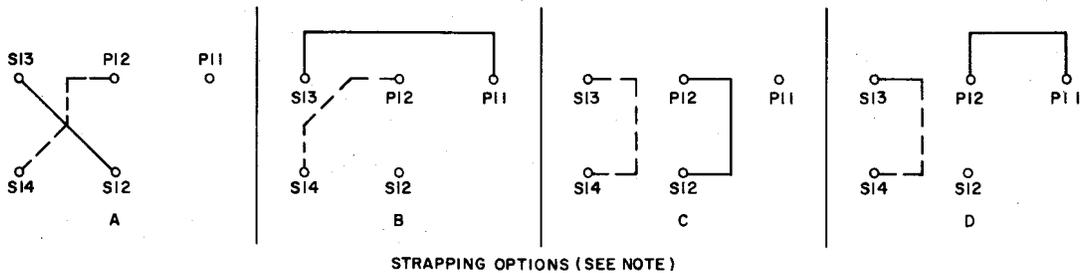


STRAPPING OPTIONS

LINE REPEATER OPERATION	OFFICE REPEATER POWERED	USE STRAPPING	CONTROL UNIT
BIDIRECTIONAL †	IN SERIES WITH LINE	A	J98710B, L1
BIDIRECTIONAL *	SEPARATELY	B	J98710B, L1
UNIDIRECTIONAL *	IN SERIES WITH LINE	C	J98710B, L2
UNIDIRECTIONAL †	SEPARATELY	D	J98710B, L2

\* THESE OPTIONS ARE FACTORY PROVIDED.  
 † THESE OPTIONS MUST BE WIRED LOCALLY.

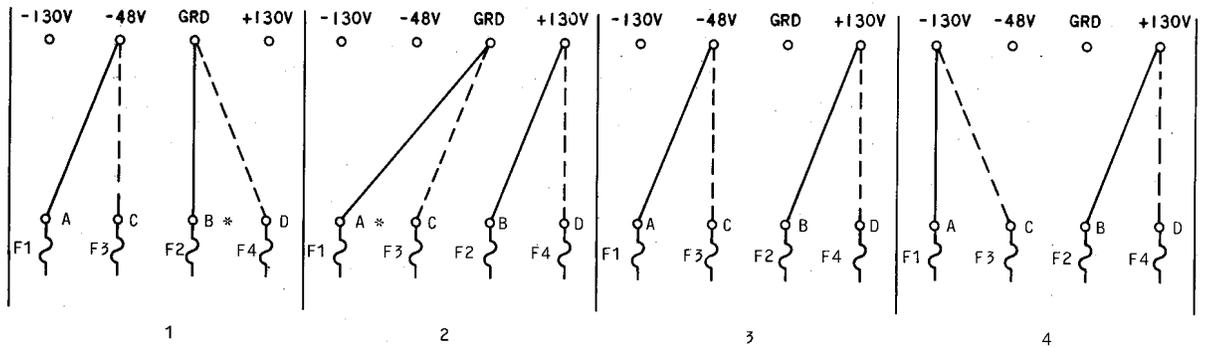
Fig. 4—Power Simplex Options, 201 ORB



LINE REPEATER OPERATION	OFFICE REPEATER POWERED	USE STRAPPING	REFERENCE (SD-97080-01)	OFFICE REPEATER FUSE	CIRCUIT FUSE
BIDIRECTIONAL	IN SERIES WITH LINE	A	FIG. 112B, SKETCH E	72A	72A
BIDIRECTIONAL	SEPARATELY	B	FIG. 112B, SKETCH D	70R	72A
UNIDIRECTIONAL	IN SERIES WITH LINE	C	FIG. 112C, SKETCH D	72A	72A
UNIDIRECTIONAL	SEPARATELY	D	FIG. 112C, SKETCH E	70R	72A

NOTE:  
 USE SOLID LINES FOR CIRCUIT 1. USE DASHED LINES FOR CIRCUIT 2.

Fig. 5—Power Loop Options, 201 ORB



STRAPPING OPTIONS (SEE NOTE 1)

POWER FEED VOLTAGE	USE STRAPPING	CONNECT A AND/OR C TO	CONNECT B AND/OR D TO	OFFICE RPTR FUSE	CIRCUIT FUSE
48	1	-48V*	GRD*	72A OR 70R	72A OR 70R*
130	2	GRD*	+130V	72A OR 70R (NOTE 2)	72A OR 70R*
178	3	-48V	+130V		
260	4	-130V	+130V		

\* ON TERMINALS A, B, C, AND/OR D WHICH ARE STRAPPED TO GROUND, STRAP OUT ASSOCIATED FUSE(S) AT FUSE HOLDER AND INSTALL 72A DUMMY FUSE(S).

**NOTES:**

1. USE SOLID LINES FOR CIRCUIT 1. USE DASHED LINES FOR CIRCUIT 2.
2. IF OFFICE REPEATER IS POWERED SEPARATELY, INSTALL A 70R FUSE IN THE OFFICE REPEATER POSITION. IF THE OFFICE REPEATER IS POWERED IN SERIES WITH THE LINE, INSTALL A 72A DUMMY FUSE IN THE OFFICE REPEATER POSITION.

**Fig. 6—Power Feed Options, 201 ORB**

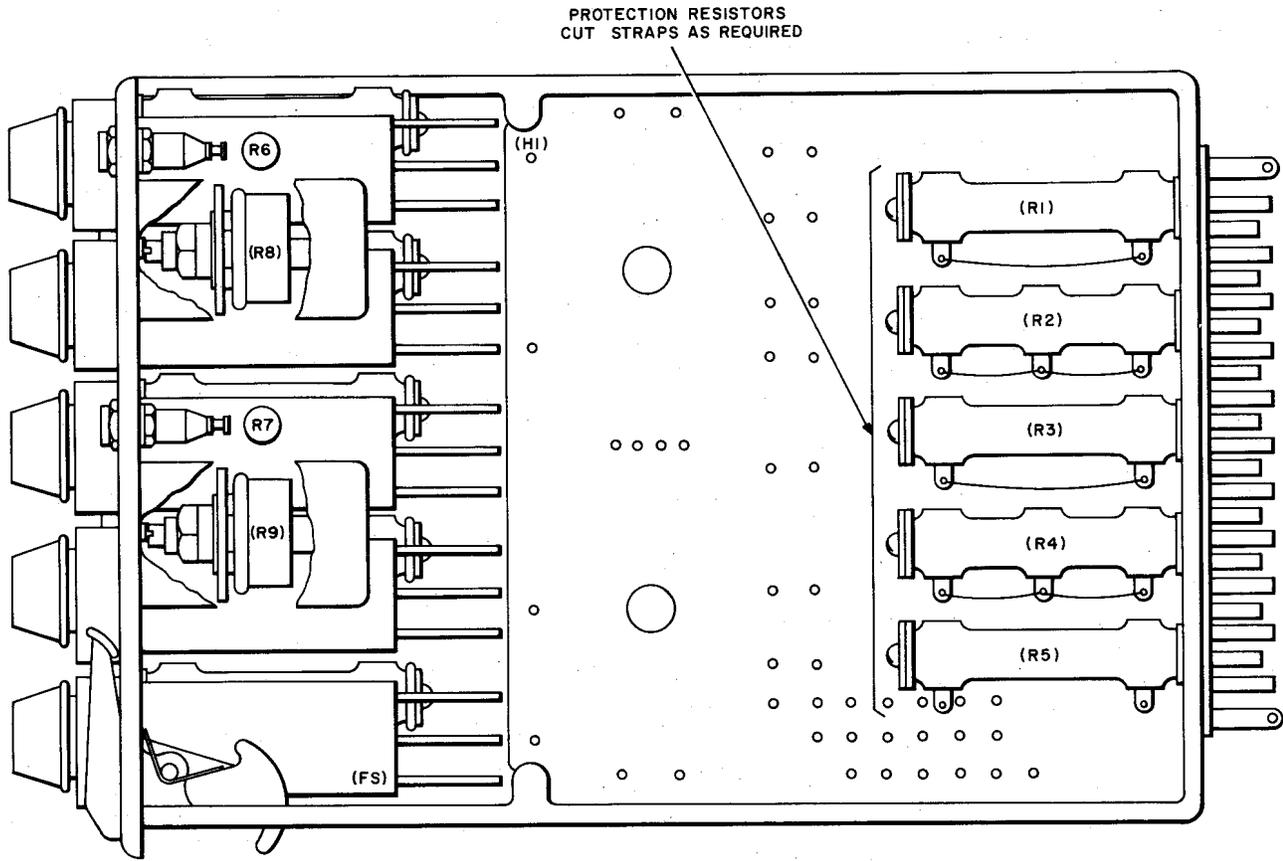


Fig. 7—J98710B Control Unit, Right Side View

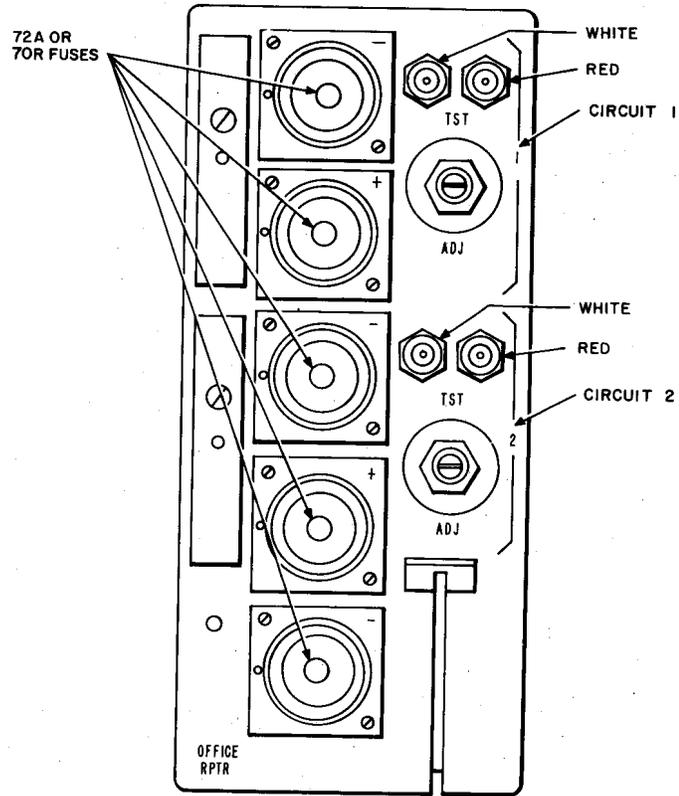


Fig. 8—J98710B Control Unit, Front View