

DATA SET 109F USED IN DATREX* SERVICE

INSTALLATION AND CONNECTIONS

1. GENERAL

1.01 This practice provides information on the installation and connection procedures required when providing DATREX service using the Data Set 109F.

*Service Mark of the Bell System.

1.02 The data station will be shipped from the distributing house with the data set already installed in the teletypewriter. Installation of the station requires that the line be correctly connected, the line pads adjusted to provide the proper current level, verification that the proper options or features are provided, and power supplied to the data station.

1.03 A 3-conductor cord is used to connect the TTY to a 117-volt 60-Hz ac power supply. The customer must furnish a 3-wire outlet that is not under control of a switch.

2. TOOLS AND APPARATUS

2.01 The data station is assembled at the distributing house; therefore, the only special equipment required is a KS-14510-L5 or equivalent volt-ohm-milliammeter. This meter is required to set the resistor pads to provide the proper line current.

3. OPTION CONNECTIONS

3.01 Before any connections are made to the station, a check should be made to determine that the station is equipped with the proper features and options necessary for this installation. The service order should indicate the features and options being provided for this service.

3.02 The options provided by Data Set 109F are given in Table A which shows the letter designation assigned to these options. Table A also indicates the options that are "factory furnished" ie, the data set is shipped

with the options installed. Table A shows only the options that are applicable to DATREX service.

3.03 The additional features that can be provided by the Data Set 109F are indicated by the assigned list numbers associated with each data set. Table B shows the feature provided by each list number and the combination of list numbers that are available for DATREX service. Table B also indicates the applicable wiring table and corresponding figure that can be used to check the options and features being provided by a data set.

3.04 To determine if the proper options and features are provided, refer to the service order and Table B. After determining the features and options required by the service order, look up the applicable figure and connection diagram given by Table B.

Note: Options are installed in the Data Set 109F by first making the connections required to install either the W or V options. The additional options are then installed by making the connection indicated in the applicable option column.

3.05 The physical location of the terminals and leads referred to in wiring Tables C through H and Fig. 1 through 6 are shown by Fig. 7 and 8.

3.06 After checking the data set connections and verifying that the required features and options have been provided, the data station is ready for installation.

3.07 When the data set is used in a single access DATREX service, the 635T2 key in position 3 (ie, D) must be equipped with the stop button P-23F594. This stop button is stored in position 5 (ie, B) at the factory. When properly equipped with the stop button, improper operation of the data set is prevented since the position 3 button is blocked.

TABLE A

FEATURE OR OPTION	DESIGNATION	
DATREX arrangement	N (See Note)	
Receiver arranged for space crossover shift	Z (See Note)	
Receiver arranged for mark crossover shift	Y	
No crossover shift	X	
Full-duplex operation	W (See Note)	
Half-duplex operation	V	
Motor stops upon reception of an end-of-transmission character (EOT) and transmission of a timed space signal (send space timer — SST)	EOT	R (See Note)
	SST	T
	EOT & SST	S

Note: The options that are indicated by this note are factory furnished, ie, factory installed options. The data set is shipped with these options already installed. In order to provide a different feature or option, the wiring of the data set will have to be changed.

TABLE B

FEATURE	CODE	DATREX	
		TABLE	FIGURE
Basic data set (CP EU2 and keystrip)	L1	C	1
Data set equipped with ET1 circuit pack (EOT and send space timer)	L1/2	D	2
Data set equipped with rotary dial option	L1/3	E	3
Data set equipped with TOUCH-TONE® dial option (includes ET2 circuit pack)	L1/4	F	4
Data set equipped with ET1 circuit pack and rotary dial option	L1/2/3	G	5
Data set equipped with ET1 circuit pack and TOUCH-TONE dial option (includes ET2 circuit pack)	L1/2/4	H	6

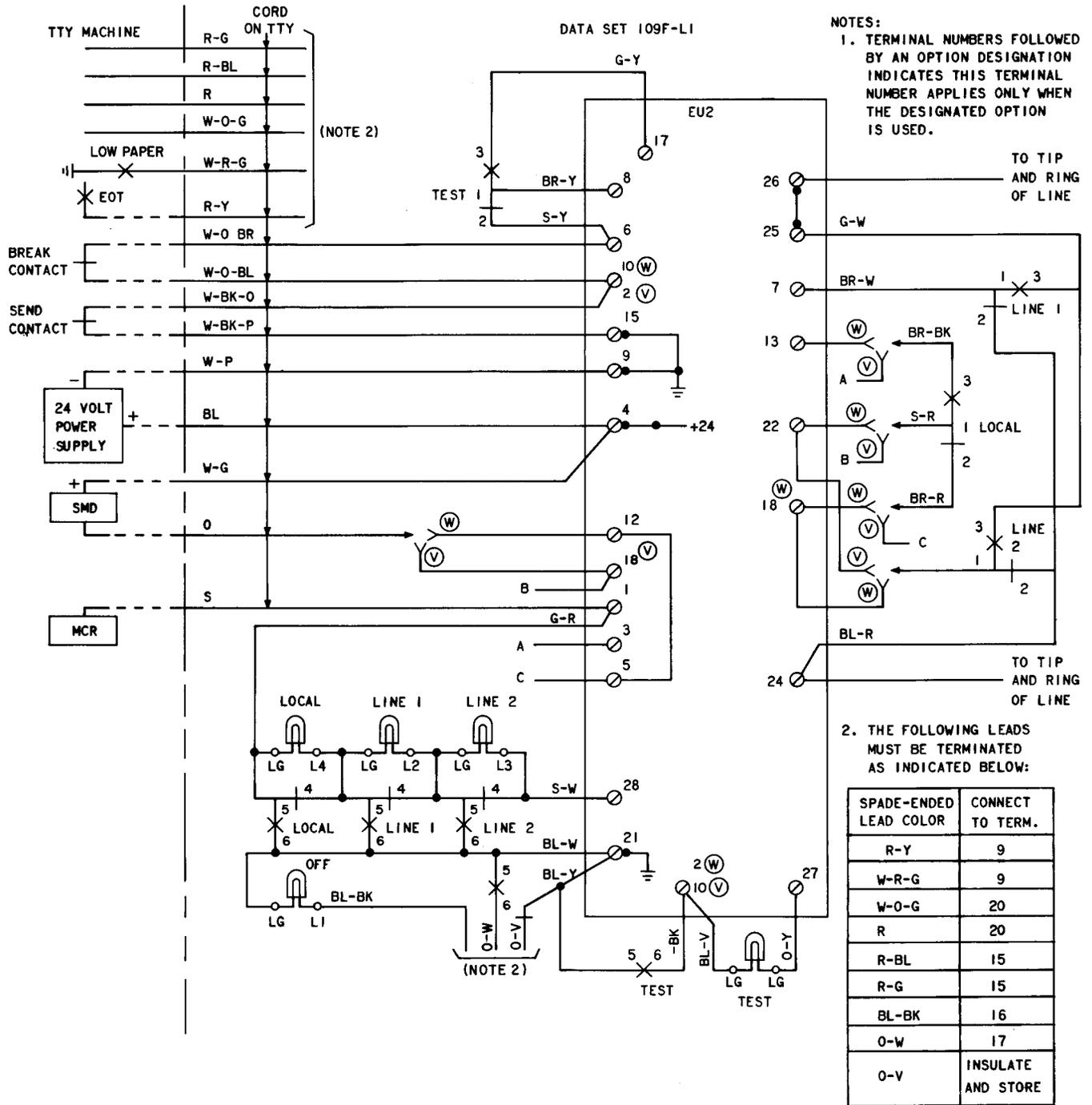


Fig. 1 — Data Set 109F-L1 — DATREX Arrangement

TABLE C

OPTION CONNECTIONS FOR DATA SET 109F-L1 — DATREX SERVICE

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)	
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V
CA1	BL-W	21	21
	O-W	17	17
	G-W	25	25
	BR-W	7	7
	S-W	28	28
	BL-R	24	24
	O-R	18	22
	G-R	1	1
	BR-R	18	5
	S-R	22	18
	BL-BK	16	16
	BR-BK	13	3
	R-BL	See Note	See Note
	R-BR	Note	Note
R-O	3	3	
R-G			
CA2	BL-V	2	10
	O-Y	27	27
	BR-Y	8	8
	S-Y	6	6
	G-Y	17	17
	O-V	See Note 3	See Note 3
	BL-Y	21	21
S-BK	2	10	
Teletype-writer Call Control Unit	W-O-BR	6	6
	W-O-BL	10	2
	W-BK-O	10	2
	W-BK-P	15	15
	W-R-G	9	9
	R-G	15	15
	R-B	15	15
	R-O-G	20	20
	R	20	20
	R-Y	9	9
	W-P	9	9
	BL	4	4
	W-G	4	4
O	12	18	
S	1	1	
Tip and Ring (to metallic loop)	—	26	26
	—	24	24

TABLE C — Cont

Note 1: The Z, Y, and X options are provided by screw switches which are opened (screws turned out) or closed (screws turned in) to install the options as follows:

- The Z option is installed by closing the Z switch and opening the Y switch (see Fig. 9).
- The Y option is installed by closing the Y switch and opening the Z switch (see Fig. 9).
- The X option is installed by opening both the Z switch and Y switch (see Fig. 9).

Note 2: In addition to the connections required to install the W and V option, screw switch W must be closed when the W option is provided and open when the V option is provided (see Fig. 9).

Note 3: These leads must be insulated and stored.

TABLE D

OPTION CONNECTIONS FOR DATA SET 109F-L1/2 — DATREX SERVICE

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)				
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V	TERMINALS FOR OPTION R	TERMINALS FOR OPTION S	TERMINALS FOR OPTION T
CA1	BL-W	21	21			
	O-W	17	17			
	G-W			19	19	25
	BR-W	7	7			
	S-W	28	28			
	BL-R	24	24			
	O-R	18	22			
	G-R			35	35	1
	BR-R	18	5			
	S-R	22	18			
	BL-BK			34	34	16
	BR-BK	13	3			
	R-BL	See Note 3	See Note 3			
	R-O	3	3			
R-G						
R-BR						
CA2	BL-V	2	10			
	O-Y	27	27			
	BR-Y	8	8			
	S-Y	6	6			
	G-Y	17	17			
	O-V	See Note 3	See Note 3			
	BL-Y	21	21			
S-BK	2	10				

TABLE D—Cont

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)				
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V	TERMINALS FOR OPTION R	TERMINALS FOR OPTION S	TERMINALS FOR OPTION T
Teletype-writer Call Control Unit	R-G	15	15			
	R-BL	15	15			
	R	20	20			
	W-O-G	20	20			
	W-O-BR			6	33	33
	W-O-BL			(See Notes 4 and 5)	31	31
	W-BK-O	10	2			
	W-BK-P	15	15			
	W-R-G	9	9			
	W-P	9	9			
	BL	4	4			
	W-G	4	4			
O	12	18				
S	1	1				
R-Y	36	36				
Circuit Pack ET1	37	9	9			
	38			31	(See Notes 4 & 5)	(See Notes 4 & 5)
	39			31	6	6
	40	11	11			
	41			1	1	35
	42			19	19	32
43			25	25	32	
Tip and Ring (to metallic loop)	—	26	26			
	—	24	24			

Note 1: The Z, Y, and X options are provided by screw switches which are opened (screws turned out) or closed (screws turned in) to install the options as follows:

- The Z option is installed by closing the Z switch and opening the Y switch (see Fig. 9).
- The Y option is installed by closing the Y switch and opening the Z switch (see Fig. 9).
- The X option is installed by opening both the Z switch and Y switch (see Fig. 9).

Note 2: In addition to the connections required to install the W and V option, screw switch W must be closed when the W option is provided and open when the V option is provided (see Fig. 9).

Note 3: These leads must be insulated and stored.

Note 4: To install the option in this column in conjunction with option W, connect to terminal 10 on CP EU2.

Note 5: To install the option in this column in conjunction with option V, connect to terminal 2 on CP EU2.

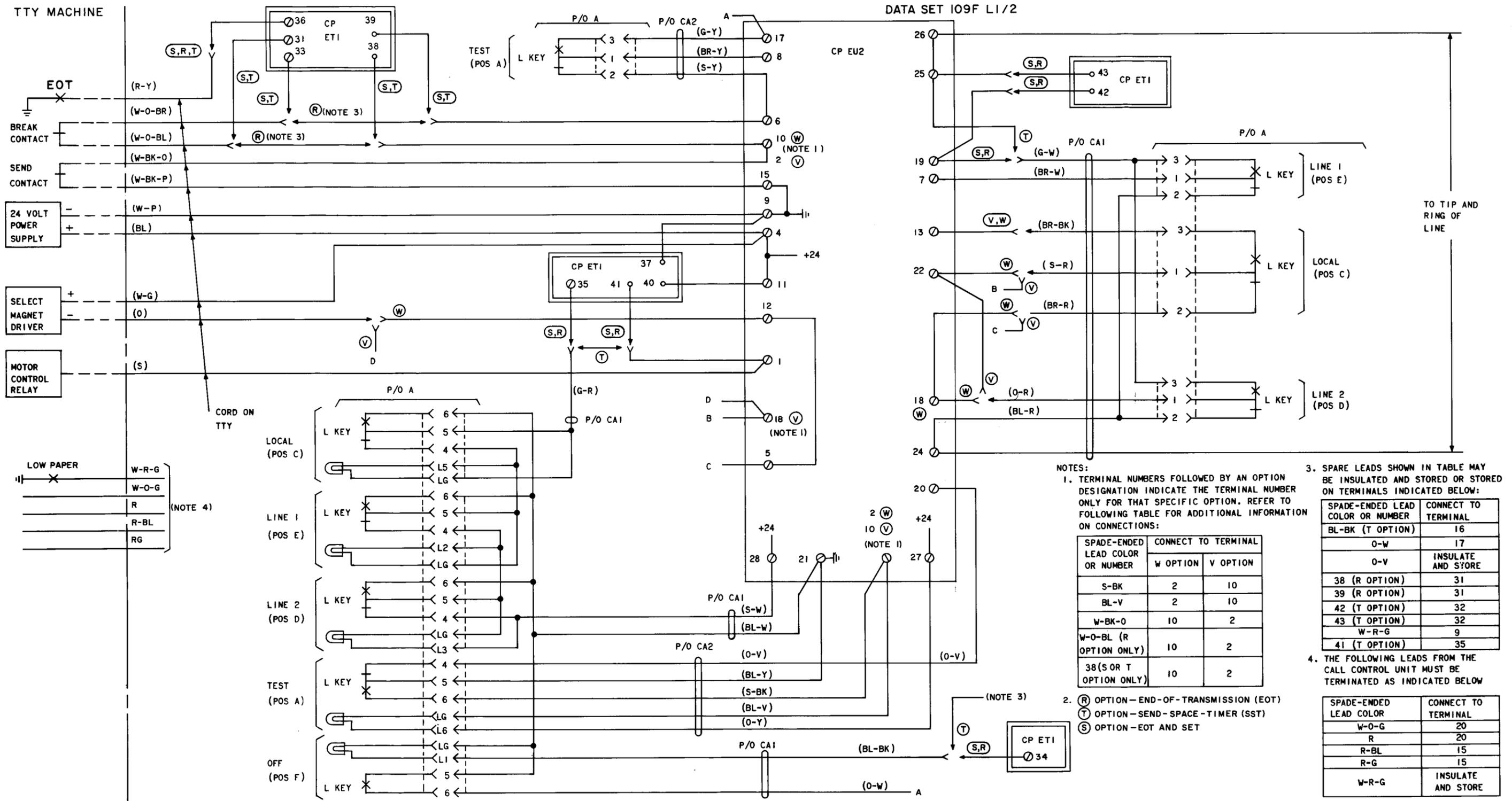


Fig. 2 — Data Set 109F-L1/2 — DATREX Arrangement

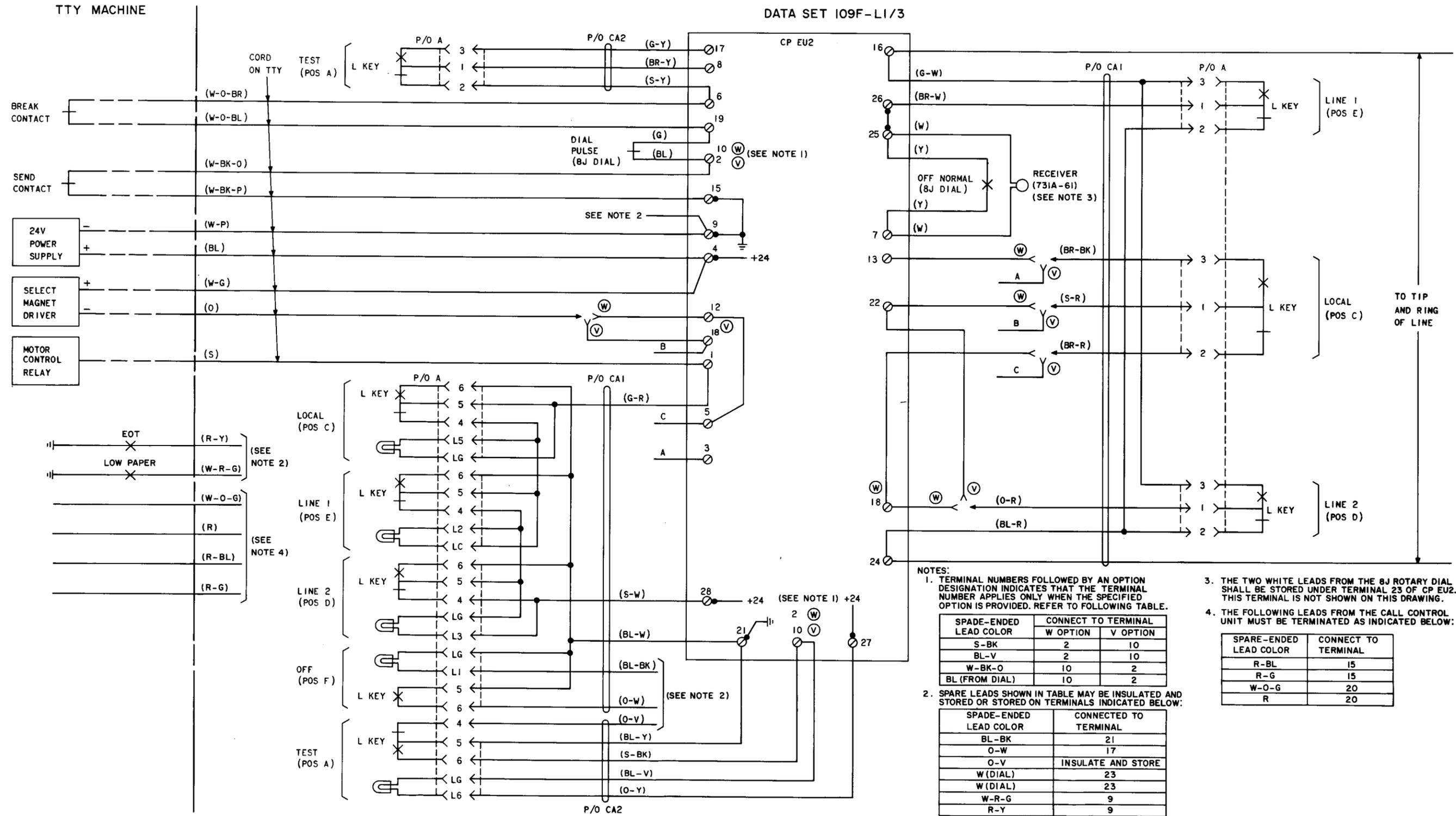


Fig. 3 — Data Set 109F-L1/3 — DATREX Arrangement

TABLE E

OPTION CONNECTIONS FOR DATA SET 109F-L1/3—DATREX SERVICE

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)	
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V
CA1	BL-W	21	21
	O-W	17	17
	G-W	16	16
	BR-W	26	26
	S-W	28	28
	BL-R	24	24
	O-R	18	22
	G-R	1	1
	BR-R	18	5
	S-R	22	18
	BL-BK	21	21
	BR-BK	13	3
	R-BL R-BR R-O R-G	See Note 3	See Note 3
CA2	BL-V	2	10
	O-Y	27	27
	BR-Y	8	8
	S-Y	6	6
	G-Y	17	17
	O-V	See Note 3	See Note 3
	BL-Y	21	21
	S-BK	2	10
Teletype- writer Call Control Unit	W-O-BR	6	6
	W-O-BL	19	19
	W-BK-O	10	2
	W-O-G	20	20
	R	20	20
	R-BL	15	15

TABLE E—Cont

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)	
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V
Teletype-writer Call Control Unit — Cont	R-G	15	15
	W-BK-P	15	15
	W-R-G	9	9
	W-P	9	9
	BL	4	4
	W-G	4	4
	O	12	18
	S	1	1
	R-Y	9	9
731A Receiver	W	25	25
	W	7	7
8J Rotary Dial	W	(See Note 4)	(See Note 4)
	W	(See Note 4)	(See Note 4)
	Y	25	25
	Y	7	7
	BL	10	2
	G	19	19
Tip and Ring (to metallic loop)	—	16	16
	—	24	24

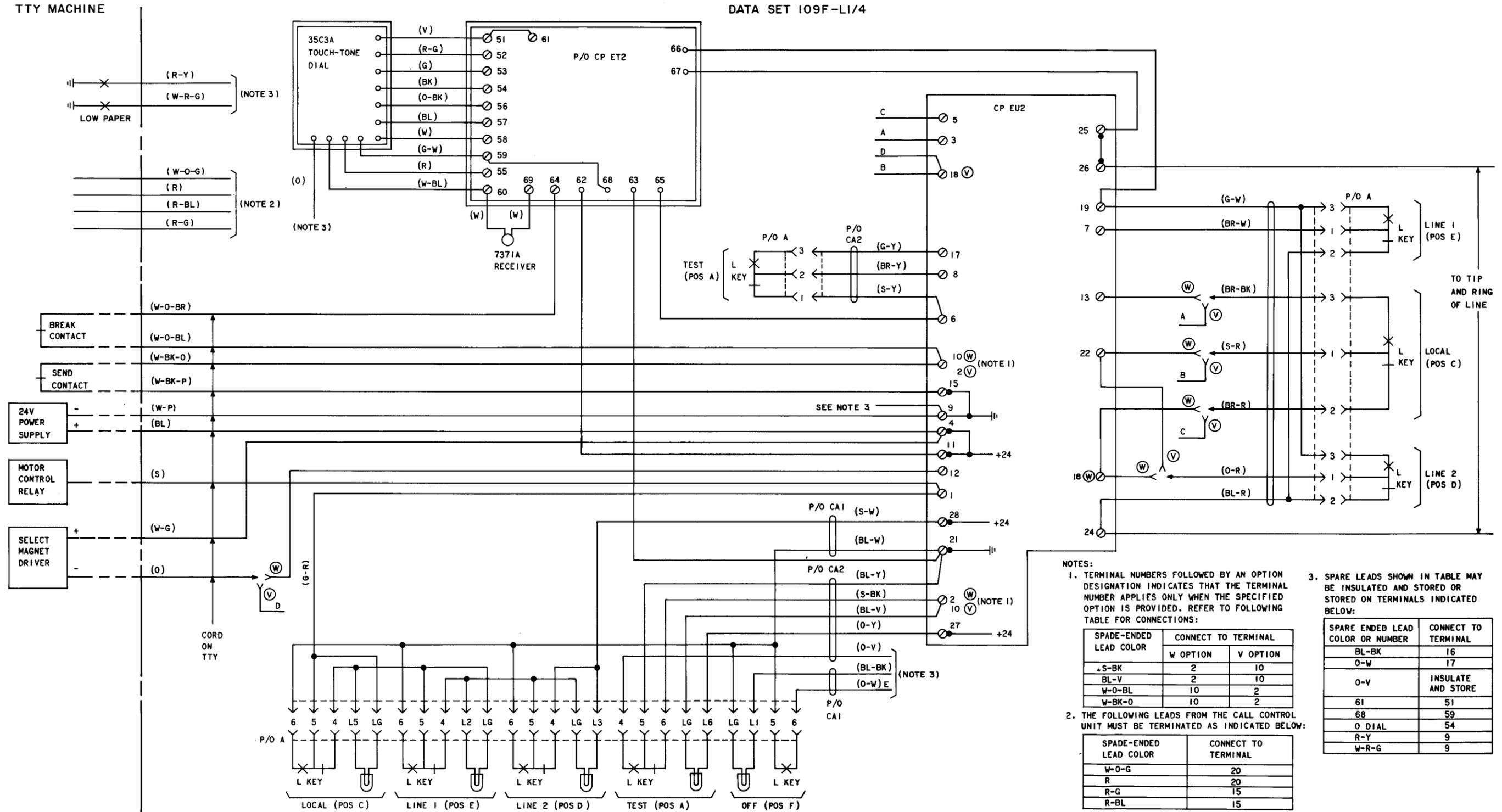
Note 1: The Z, Y, and X options are provided by screw switches which are opened (screws turned out) or closed (screws turned in) to install the options as follows:

- The Z option is installed by closing the Z switch and opening the Y switch (see Fig. 9).
- The Y option is installed by closing the Y switch and opening the Z switch (see Fig. 9).
- The X option is installed by opening both the Z switch and Y switch (see Fig. 9).

Note 2: In addition to the connections required to install the W and V options, screw switch W must be closed when the W option is provided and open when the V option is provided (see Fig. 9).

Note 3: These leads must be insulated and stored.

Note 4: The J8 dial leads are stored under terminal 23 of CP EU2. This terminal is not shown in Fig. 5.



- NOTES:**
1. TERMINAL NUMBERS FOLLOWED BY AN OPTION DESIGNATION INDICATES THAT THE TERMINAL NUMBER APPLIES ONLY WHEN THE SPECIFIED OPTION IS PROVIDED. REFER TO FOLLOWING TABLE FOR CONNECTIONS:
 2. THE FOLLOWING LEADS FROM THE CALL CONTROL UNIT MUST BE TERMINATED AS INDICATED BELOW:
 3. SPARE LEADS SHOWN IN TABLE MAY BE INSULATED AND STORED OR STORED ON TERMINALS INDICATED BELOW:

SPADE-ENDED LEAD COLOR	CONNECT TO TERMINAL	
	W OPTION	V OPTION
S-BK	2	10
BL-V	2	10
W-O-BL	10	2
W-BK-O	10	2

SPADE-ENDED LEAD COLOR	CONNECT TO TERMINAL
W-O-G	20
R	20
R-G	15
R-BL	15

SPARE ENDED LEAD COLOR OR NUMBER	CONNECT TO TERMINAL
BL-BK	16
O-W	17
O-V	INSULATE AND STORE
61	51
68	59
O DIAL	54
R-Y	9
W-R-G	9

Fig. 4 — Data Set 109F-L1/4 — DATREX Arrangement

TABLE F
OPTION CONNECTIONS FOR DATA SET 109F-L1/4—DATREX SERVICE

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)	
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V
CA1	BL-W	21	21
	O-W	17	17
	G-W	19	19
	BR-W	7	7
	S-W	28	28
	BL-R	24	24
	O-R	18	22
	G-R	1	1
	BR-R	18	5
	S-R	22	18
	BL-BK	16	16
	BR-BK	13	3
	R-BL	See Note 3	See Note 3
	R-BR		
R-O			
R-G			
CA2	BL-V	2	10
	O-Y	27	27
	BR-Y	8	8
	S-Y	6	6
	G-Y	17	17
	O-V	See Note 3	See Note 3
	BL-Y	21	21
	S-BK	2	10
Teletype-writer Call Control Unit	W-P	9	9
	BL	4	4
	W-G	4	4
	R-BL	15	15
	R-G	15	15
	W-O-G	20	20

TABLE F—Cont

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)	
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V
Teletype-writer Call Control Unit — Cont	R	20	20
	W-O-BR	64	64
	W-O-BL	10	2
	W-BK-O	10	2
	W-BK-P	15	15
	W-R-G	9	9
	O	12	18
	S	1	1
731A Receiver	R-Y	9	9
	W	60	60
35C3A TOUCH-TONE Dial	W	69	69
	V	51	51
	R-G	52	52
	G	53	53
	BK	54	54
	O-BK	56	56
	BL	57	57
	W	58	58
	G-W	59	59
	R	55	55
Circuit Pack ET2	W-BL	60	60
	O	54	54
	61	51	51
	62	11	11
	63	21	21
	65	6	6
	66	19	19
67	25	25	
68	59	59	

TABLE F—Cont

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)	
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V
Tip and Ring (to metallic loop)	—	26	26
	—	24	24

Note 1: The Z, Y, and X options are provided by screw switches which are opened (screws turned out) or closed (screws turned in) to install the options as follows:

- The Z option is installed by closing the Z switch and opening the Y switch (see Fig. 9).
- The Y option is installed by closing the Y switch and opening the Z switch (see Fig. 9).
- The X option is installed by opening both the Z switch and Y switch (see Fig. 9).

Note 2: In addition to the connections required to install the W and V options, screw switch W must be closed when the W option is provided and open when the V option is provided (see Fig. 9).

Note 3: These leads must be insulated and stored.

TABLE G

OPTION CONNECTIONS FOR DATA SET 109F-L1/2/3—DATREX SERVICE

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)				
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V	TERMINALS FOR OPTION R	TERMINALS FOR OPTION S	TERMINALS FOR OPTION T
CA1	BL-W	21	21			
	O-W	17	17			
	G-W			32	32	16
	BR-W	26	26			
	S-W	28	28			
	BL-R	24	24			
	O-R	18	22			
	G-R			35	35	1
	BR-R	18	5			
	S-R	22	18			
	BL-BK			34	34	21
	BR-BK	13	3			
	R-BL	See Note 3	See Note 3			
	R-BR	See Note 3	See Note 3			
R-O	3	3				
R-G						

TABLE G—Cont

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)				
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V	TERMINALS FOR OPTION R	TERMINALS FOR OPTION S	TERMINALS FOR OPTION T
CA2	BL-V	2	10			
	O-Y	27	27			
	BR-Y	8	8			
	S-Y	6	6			
	G-Y	17	17			
	O-V	See Note 3	See Note 3			
	BL-Y	21	21			
	S-BK	2	10			
Teletype-writer Call Control Unit	W-P	9	9			
	BL	4	4			
	W-G	4	4			
	O	12	18			
	S	1	1			
	R-Y	36	36			
	R-BL	15	15			
	R-G	15	15			
	W-O-G	20	20			
	R	20	20			
	W-R-G	9	9			
	W-O-BR			6	33	33
	W-O-BL			19	31	31
W-BK-O	10	2				
W-BK-P	15	15				
Circuit Pack ET1	37	9	9			
	38			31	19	19
	39			31	6	6
	40	11	11			
	41			1	1	35
	42	32	32			
	43			16	16	32

TABLE G — Cont

LEADS FROM CORD	SPADE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)				
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V	TERMINALS FOR OPTION R	TERMINALS FOR OPTION S	TERMINALS FOR OPTION T
731A Receiver	W	25	25			
	W	7	7			
8J Rotary Dial	W	(See Note 4)	(See Note 4)			
	W	(See Note 4)	(See Note 4)			
	Y	25	25			
	Y	7	7			
	BL	10	2			
	G	19	19			
Tip and Ring (to metallic loop)	—	16	16			
	—	24	24			

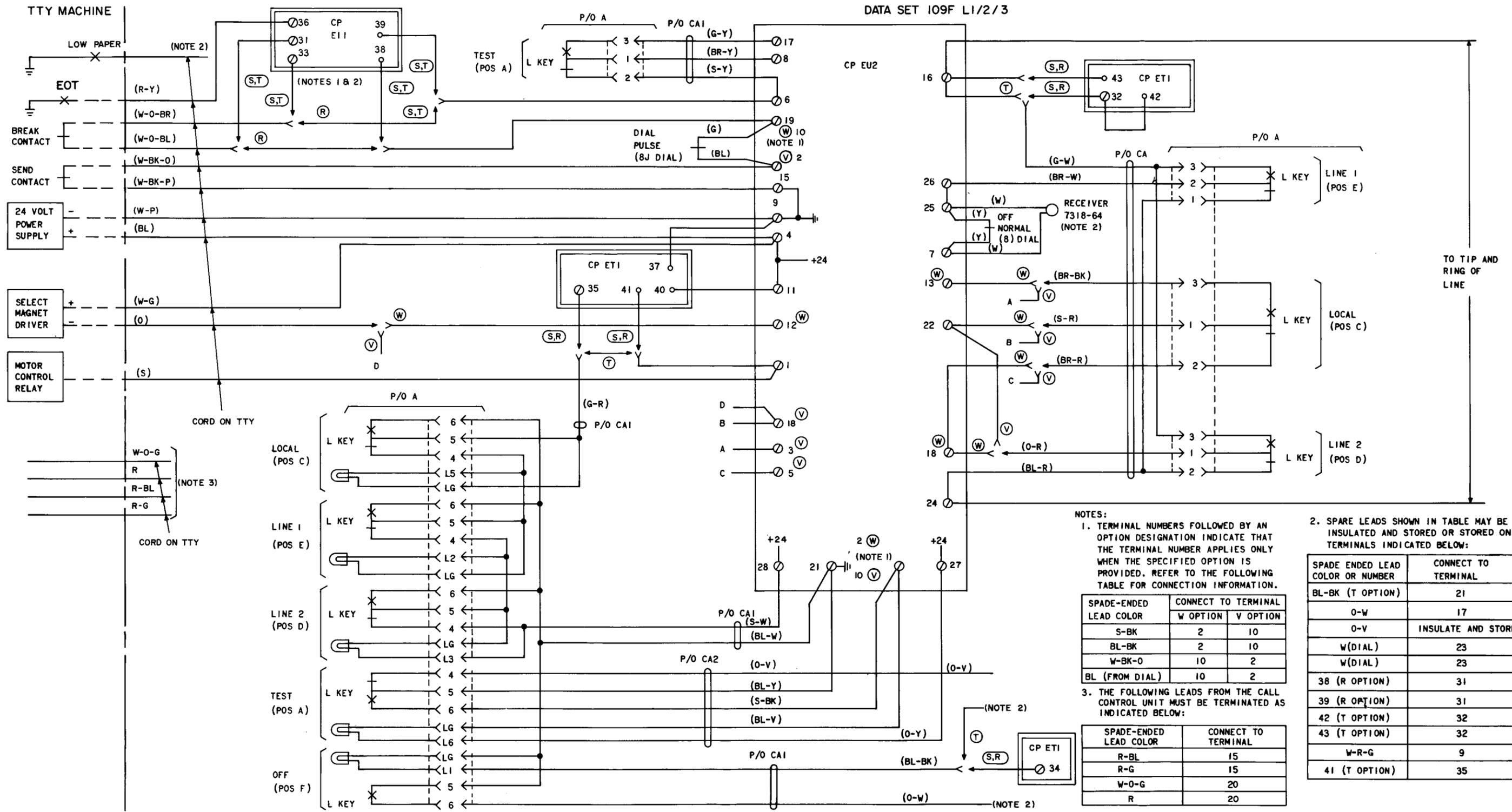
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- The Y option is installed by closing the Y switch and opening the Z switch (see Fig. 9).
- The X option is installed by opening both the Z switch and Y switch (see Fig. 9).

Note 2: In addition to the connections required to install the W and V options, screw switch W must be closed when the W option is provided and open when the V option is provided (see Fig. 9).

Note 3: These leads must be insulated stored.

Note 4: The J8 dial leads are stored under terminal 23 of CP EU2. This connection is not shown on Fig. 5.



- NOTES:
1. TERMINAL NUMBERS FOLLOWED BY AN OPTION DESIGNATION INDICATE THAT THE TERMINAL NUMBER APPLIES ONLY WHEN THE SPECIFIED OPTION IS PROVIDED. REFER TO THE FOLLOWING TABLE FOR CONNECTION INFORMATION.
 2. SPARE LEADS SHOWN IN TABLE MAY BE INSULATED AND STORED OR STORED ON TERMINALS INDICATED BELOW:
 3. THE FOLLOWING LEADS FROM THE CALL CONTROL UNIT MUST BE TERMINATED AS INDICATED BELOW:

SPADE-ENDED LEAD COLOR	CONNECT TO TERMINAL	
	W OPTION	V OPTION
S-BK	2	10
BL-BK	2	10
W-BK-0	10	2
BL (FROM DIAL)	10	2

SPADE-ENDED LEAD COLOR	CONNECT TO TERMINAL
R-BL	15
R-G	15
W-0-G	20
R	20

SPADE ENDED LEAD COLOR OR NUMBER	CONNECT TO TERMINAL
BL-BK (T OPTION)	21
0-W	17
0-V	INSULATE AND STORE
W(DIAL)	23
W(DIAL)	23
38 (R OPTION)	31
39 (R OPTION)	31
42 (T OPTION)	32
43 (T OPTION)	32
W-R-G	9
41 (T OPTION)	35

Fig. 5 — Data Set 109F-L1/2/3 — DATREX Arrangement

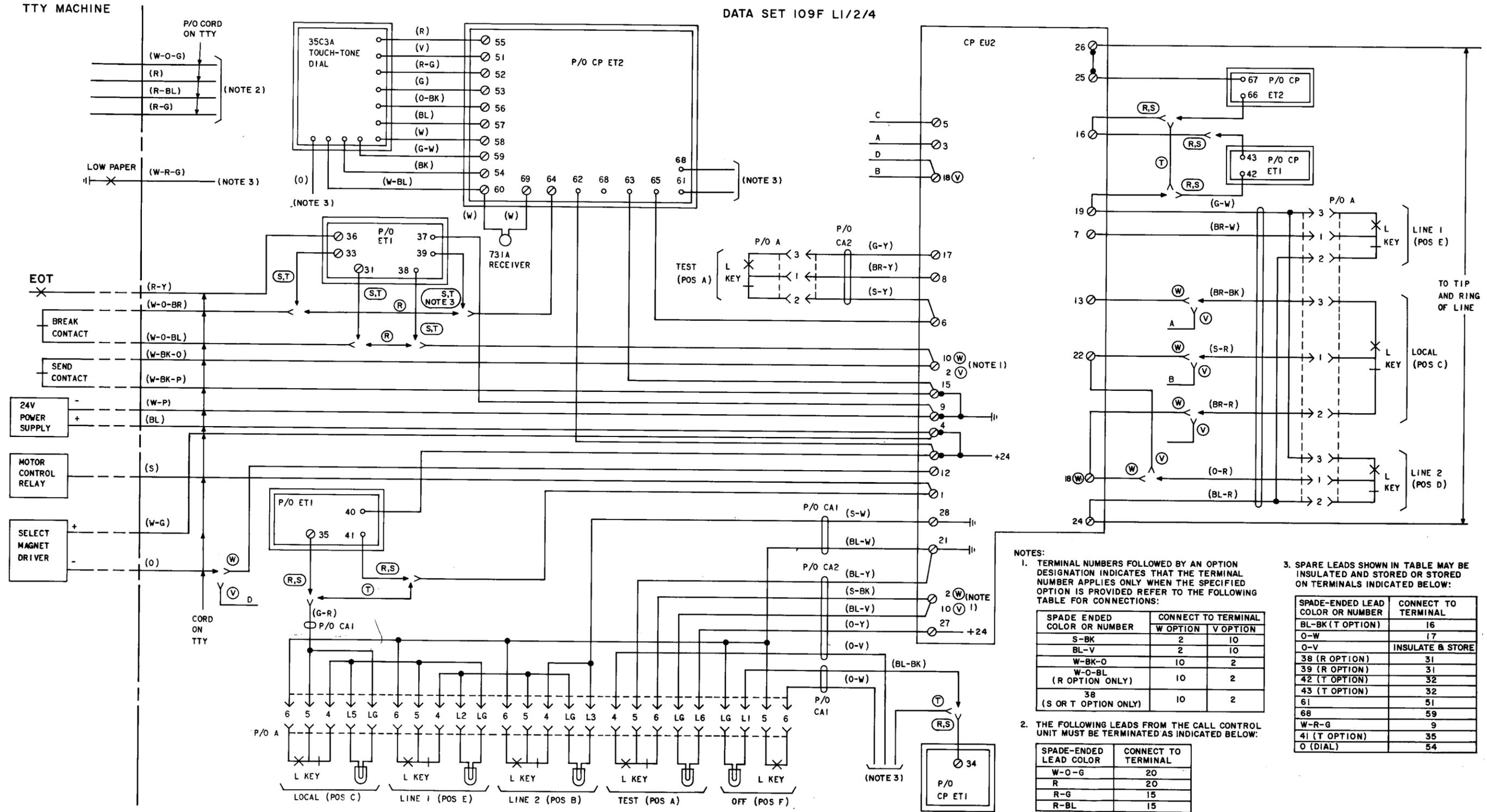


Fig. 6 — Data Set 109F-L1/2/4 — DATREX Arrangement

TABLE H
OPTION CONNECTIONS FOR DATA SET 109F-L1/2/4—DATREX SERVICE

LEADS FROM CORD	SPARE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)				
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V	TERMINALS FOR OPTION R	TERMINALS FOR OPTION S	TERMINALS FOR OPTION T
CA1	BL-W	21	21			
	O-W	17	17			
	G-W	19	19			
	BR-W	7	7			
	S-W	28	28			
	BL-R	24	24			
	O-R	18	22			
	G-R			35	35	1
	BR-R	18	5			
	S-R	22	18			
	BL-BK			34	34	16
	BR-BK	13	3			
	R-BL	See Note	See Note			
	R-BR	Note	Note			
	R-O	3	3			
R-G						
CA2	BL-V	2	10			
	O-Y	27	27			
	BR-Y	8	8			
	S-Y	6	6			
	G-Y	17	17			
	O-V	See Note 3	See Note 3			
	BL-Y	21	21			
	S-BK	2	10			
Teletype-writer Call Control Unit	W-R-G	9	9			
	R-BL	15	15			
	R-G	15	15			
	R	20	20			
	W-O-G	20	20			
	W-O-BR			64	33	33
	W-O-BL			(See Notes 4 and 5)	31	31
	W-BK-O	10	2			
	W-BL-P	15	15			
	W-P	9	9			
	BL	4	4			
	W-G	4	4			
	O	12	18			
	S	1	1			
	R-Y	36	36			
731A Receiver	W	60	60			
	W	69	69			

TABLE H—Cont

LEADS FROM CORD	SPARE-ENDED LEAD COLOR	CONNECTIONS REQUIRED TO INSTALL OPTIONS (See Notes 1 and 2)				
		TERMINALS FOR OPTION W	TERMINALS FOR OPTION V	TERMINALS FOR OPTION R	TERMINALS FOR OPTION S	TERMINALS FOR OPTION T
35C3A TOUCH-TONE Dial	V	51	51			
	R-G	52	52			
	G	53	53			
	BK	54	54			
	O-BK	56	56			
	BL	57	57			
	W	58	58			
	G-W	59	59			
	R	55	55			
	W-BL	60	60			
O	54	54				
Circuit Pack ET2	61	51	51			
	62	11	11			
	63	21	21			
	65	6	6			
	66			16	16	19
	67	25	25			
68	59	59				
Circuit Pack ET1	37	9	9			
	38			31	(See Notes 4 and 5)	(See Notes 4 and 5)
	39			31	64	64
	40	11	11			
	41			1	1	35
	42			19	19	32
	43			16	16	32
Tip and Ring (to metallic loop)	—	26	26			
	—	24	24			

Note 1: The Z, Y, and X options are provided by screw switches which are opened (screws turned out) or closed (screws turned in) to install the options as follows:

- The Z option is installed by closing the Z switch and opening the Y switch (see Fig. 9).
- The Y option is installed by closing the Y switch and opening the Z switch (see Fig. 9).
- The X option is installed by opening both the Z switch and Y switch (see Fig. 9).

Note 2: In addition to the connections required to install the W and V options, screw switch W must be closed when the W option is provided and open when the V option is provided (see Fig. 9).

Note 3: These leads must be insulated and stored.

Note 4: To install the option in this column in conjunction with option W, connect the lead to terminal 10 on CP EU2.

Note 5: To install the option in this column in conjunction with option V, connect the lead to terminal 2 on CP EU2.

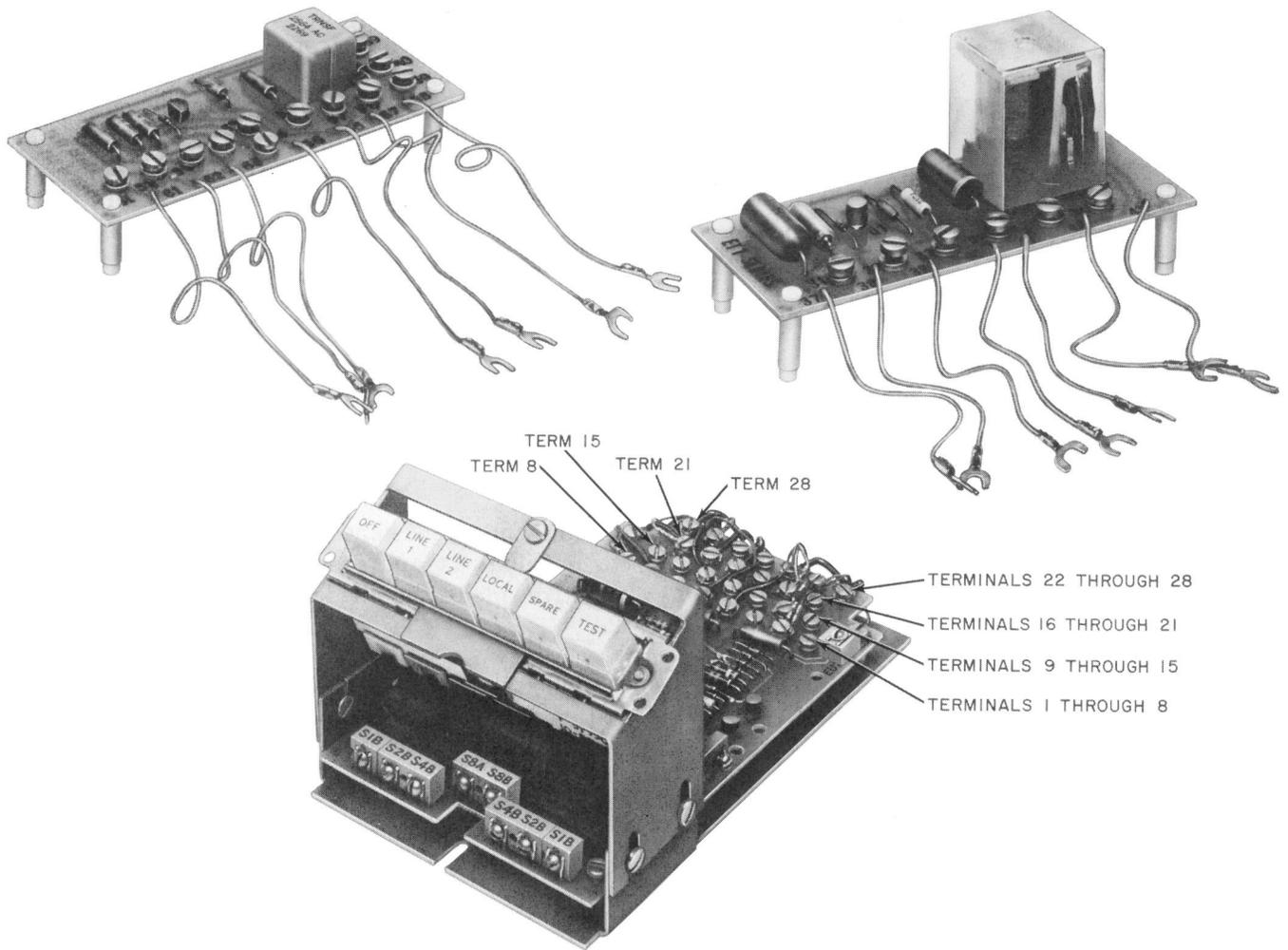


Fig. 7 — Data Set 109F-Type Showing Location and Designation of Screw Terminals

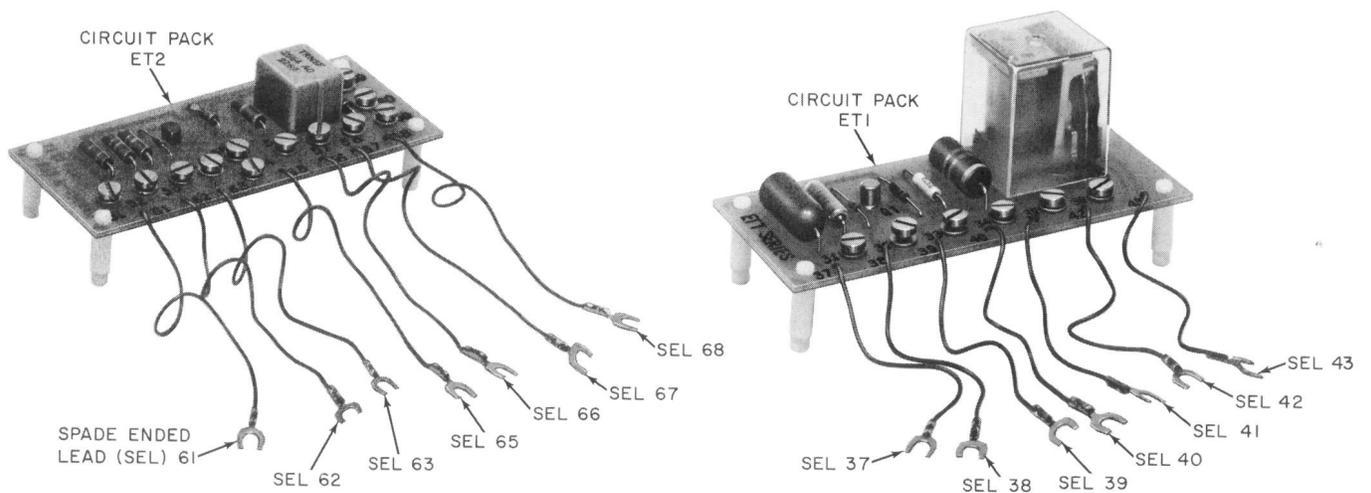


Fig. 8 — CP ET1 and CP ET2 Showing Spade-Ended Leads — Designation

4. INSTALLATION AND CONNECTION PROCEDURES

GENERAL

4.01 When connecting the data set, it is important that the line be correctly polled with respect to the far-end data set. Therefore, the state or condition of the far-end data station must

be considered in order to correctly connect the data set to the line. In the following instructions on connecting the data sets, the far-end station is assumed to be in a marking condition and conventional current flow (positive to negative) is used in determining the required connections. Refer to the following list and Fig. 10 for information on connecting the line to the data set.

DATREX Installation Using:

Data Sets 109F-L1, L1/2, The line must be connected so the current flows to terminal 24 and from terminal 26, ie, the positive side of the line is connected to terminal 24.
L1/2/4, and L1/4

Data Sets 109F-L1/2/3 and The line must be connected so the current flows to terminal 24 and from terminal 16, ie, the positive side of the line is connected to terminal 24.
L1/3

Note: When the far-end station has not been installed, either side of the line may be connected to the designated terminals, and the far-end station will have to be polled correctly at the time of installation.

DETERMINATION OF LOOP RESISTANCE

4.02 In order to ensure proper operation of a system that uses Data Set 109-types, the total resistance must be limited. When full-duplex (FDX) operation is provided, the resistance must be limited to a nominal 2,000 ohms. When half-duplex (HDX) operation is provided, the total resistance may be extended to 2,500 ohms; however, the optimum value is still 2,000 ohms.

4.03 The total resistance of a DATREX concentrator system is made up of the following parts (refer to Fig. 10) :

- The resistance supplied by the line-side data set (A of Fig. 10)
- The resistance of the line loop from the data set to the concentrator (B of Fig. 10)
- The effective resistance of the concentrator (C of Fig. 10 = 400 ohms)
- The resistance of the trunk link (D of Fig. 10, varies with physical location of the station)

- The resistance that can be supplied by the trunk-side data set (E of Fig. 10).

Note: In order for any line-side data set to be connected to and operate with any trunk-side data set, the total resistance presented to the concentrator (made up of trunk-link resistance plus trunk-side data set pad resistance D + E) must be equal for each trunk facility. Since the trunk-link resistance (D) will vary with the physical location of each data station, each trunk-side data set pad (E resistance) will have to be set so that the total resistance presented to the concentrator is equal for all ports of the concentrator.

4.04 When the line-side data station is installed, the effective resistance seen by this data set is the sum total of the resistance presented to the trunk-side concentrator, the concentrator resistance, and the line-loop resistance (ie, B + C + D + E). The line data set pad (A) is adjusted to make the total resistance of the circuit a nominal 2,000 ohms (2,500 ohms when

extended range HDX service is being provided). The resistance (A) is determined and set as follows.

- (1) Obtain the total trunk-concentrator-far-end-data-set resistance. This can be obtained from the service order (C + D + E).
- (2) Short the line loop at the concentrator and measure the resistance of this loop (B) using the KS-14510-L5 volt-ohm-milliammeter.
- (3) Add the resistance obtained in (1) and (2). Refer to Table I and determine the

screw-switch settings required to obtain the total loop resistance required.

Note: The Data Set 109F-type screw switches are designated S1, S2, S4, and S8 for each side of the line. These switches are always closed and opened in pairs, ie, both the S1A and S1B, etc, are opened and closed so that the resistance in both sides of the line will always be equal. (Example: If 788 ohms is to be added to the total circuit resistance S2A, S2B, S4A, and S4B are open; all other switches are closed as indicated in Table I.)

TABLE I
VALUE OF SCREW SWITCH RESISTORS AND
RESISTANCE VALUE FOR ALL SWITCH POSITION COMBINATIONS

RESISTANCE VALUE (A) (OHMS)	SWITCH CONDITION			
	S1 (A & B) 136.2 OHMS*	S2 (A & B) 266 OHMS*	S4 (A & B) 522 OHMS*	S8 (A & B) 1022 OHMS*
0	Closed	Closed	Closed	Closed
136.2	Open	Closed	Closed	Closed
266	Closed	Open	Closed	Closed
402.2	Open	Open	Closed	Closed
522	Closed	Closed	Open	Closed
658.2	Open	Closed	Open	Closed
788	Closed	Open	Open	Closed
924.2	Open	Open	Open	Closed
1022	Closed	Closed	Closed	Open
1158.2	Open	Closed	Closed	Open
1288	Closed	Open	Closed	Open
1424.2	Open	Open	Closed	Open
1544	Closed	Closed	Open	Open
1680.2	Open	Closed	Open	Open
1810	Closed	Open	Open	Open
1946.2	Open	Open	Open	Open

* The A designated screw switches are located in one side of the line, and the B switches are located in the other side of the line. In order to keep the resistances equal in each side of the line, the A and corresponding B switch should be operated as a pair and both either opened or closed. The values given in this table show the total resistance of both switches and a closed or open indication means that both the A and B switches are in the condition indicated.

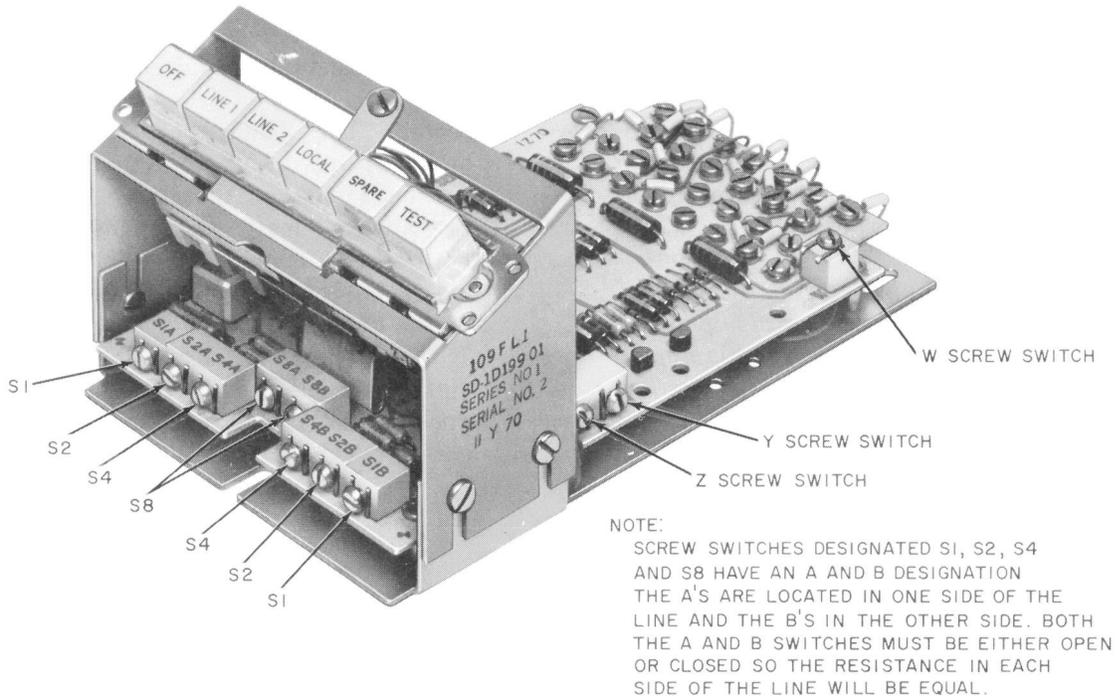


Fig. 9 — Data Set 109F — Location and Designation of Line and Option Screw Switches

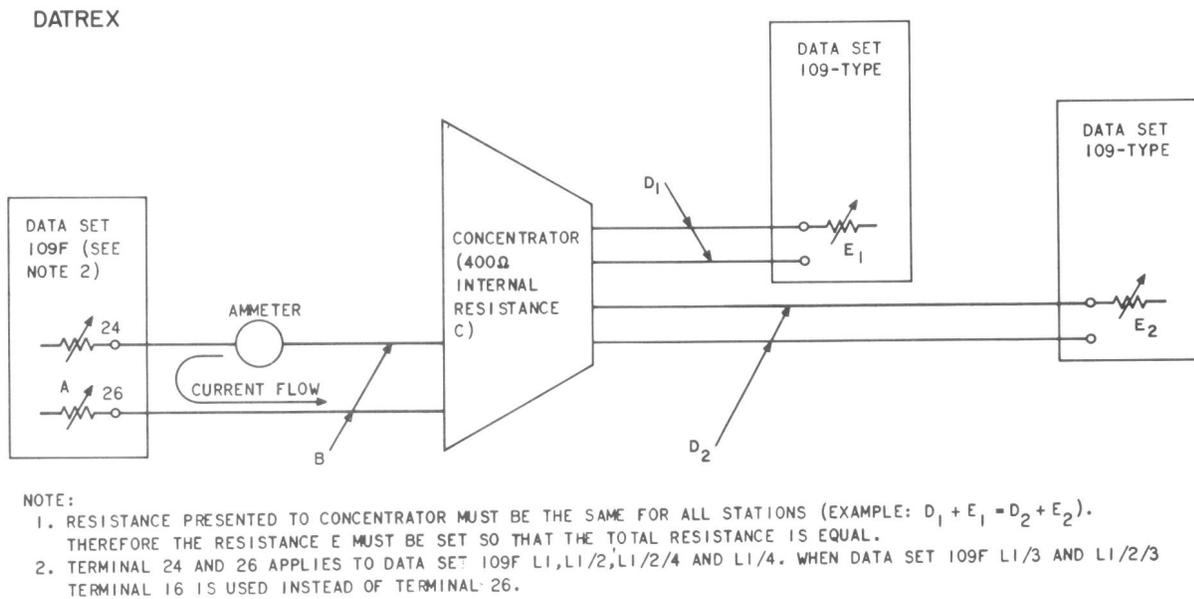


Fig. 10 — Data Set 109F — Line Connection Diagram for DATREX Arrangement

4.05 Make the screw-switch settings as determined in 4.04. The location of the screw switches referred to in this text is shown by Fig. 9.

Note: An alternate method of setting the line data set screw switches is given in 4.06; however, it can be used only when a connection through the concentrator to a trunk side data set can be made.

ALTERNATE METHOD OF ADJUSTING LOOP RESISTANCE

4.06 The following procedure can be used to determine the screw-switch settings required to adjust the loop resistance when an operative Data Set 109F-type is connected to the far end. This procedure may also be used for DATREX installations when a connection can be made through the concentrator to an operative trunk-side data set.

Note: When setting the data set pads by measuring the line current, make sure the data set is connected. If the camp-on current in a DATREX installation is mistaken for a data set connection, the resistance pads will not be set correctly; therefore, care should be taken to make sure the data set is connected at all times during these procedures.

- (1) Connect the KS-14510-L5 volt-ohm-milliammeter in series with the line side of the data station as shown in Fig. 10 and measure the current.
- (2) When the measured current is greater than 3 mA, additional resistance will have to be added to the circuit by opening one or more of the screw switches in each side of the line. If the measured current is less than 3 mA, the screw switches will have to be closed to remove some of the pad resistance.
- (3) The screw switches are designated as S1, S2, S4, and S8 for each side of the line. These switches are always closed and opened in pairs, ie, both of the S1 switches, S2 switches,

etc, are opened and closed so that the resistance will always be equal in both sides of the line. The location of these switches is shown by Fig. 9. Table I gives the resistance provided by these switches.

Note: The S1 screw switches can be thought of as representing a basic unit of resistance and the opening of this screw switch, in each side of the line, will add resistance to the line. Therefore, opening the S2 screw switches adds twice as much resistance as S1, opening the S4 screw switches adds four times the resistance of S1, and opening the S3 screw switches adds eight times the resistance value of S1. Closing the screw switches, of course, removes the resistance in the same increments.

- (4) In order to adjust the line current to 3.0 — 3.2 mA, observe the line current and open or close the S1, S2, S4, or S8 screw switch. By observing the change in the current, the amount of resistance that is required can be judged. This trial and error method can be repeated until a current level between 3.0 and 3.2 mA is obtained. This method provides a quick way of adjusting the loop current when a connection to a far-end data set can be made.

Note: It may be necessary or desirable to split the resistance being added to the loop between the two data sets. When this is the case, the screw-switch settings can be made in the same manner to provide only the part of the resistance at this installation.

4.07 After making the line connections and setting the resistance pad as indicated in the preceding text, installation of the station is completed with the exception of an operational test to verify that it is operating properly.

5. INSTALLATION TESTS

5.01 When a far-end data set is available for testing, the installation can be checked out by operating the data station to verify that it can send and receive messages. A test sentence such

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as "FOX" can be used to verify that both the data set and teletypewriter are operative. When the teletypewriter is suspected of causing a trouble condition, it should be tested in accordance with the applicable practices for the type TTY used in this installation. For specific trouble clearing procedures and tests, refer to the sections entitled Data Set 109F Used in DATREX* Ser-

vice — Maintenance (591-035-301) and Data Set 109F Used in DATREX Service — Test Procedures (591-035-501).

5.02 Successful operation of the data station with the far-end station precludes the necessity of making additional tests to verify the operational status of the installation.