TYPE N1 CARRIER TELEPHONE SYSTEM — TERMINAL EQUIPMENT
PRELIMINARY TESTS
MODIFICATION OF CHANNEL UNITS FOR IMPROVED TRANSMISSION

This section gives the information necessary for modifying the N carrier channel units, presently in service, for improved transmission performance and is reissued to include the latest modification procedures available.

It is recommended that the units be rewired according to the appropriate step-by-step procedure outlined below. Fig. 1 shows schematically the improved channel unit. Fig. 2 illustrates a typical carrier frequency subassembly.

The section is divided in Parts A, B and C; Part A giving the complete modification of regulators and modulators for ED-92904-30 units made prior to March, 1960; Part B giving the complete regulator and modulator modification for all ED-92319-30 and ED-92691-30 units and, (C) the modulator and miscellaneous regulator resistor changes for ED-92904-30 units made post March, 1960.

Units made after Sept. 1961 will include in manufacture all the changes.

A — MODIFICATION OF REGULATOR AND MODULATOR CHANNEL UNITS WITH REGULATOR CIRCUIT PER ED-92904-30

STEP	PROCEDURE
1	On the minaplas assembly located on top side of channel unit subassembly: (a) Cut all of the leads soldered to the pigtail apparatus terminations. Cut as close as possible to the pigtail terminations. (Strapping between components need not be cut.) (b) The slate and slate-white leads should be unsoldered or cut as close as possible to the pigtail terminations. (c) Remove the assembly and discard.
2	Unsolder resistor R124 (301 ohms), located on transformer T103 and jack J104. Retain the resistor for Step 5.
3	On jack J104 (R1): (a) Cut the green wire 2 inches from the jack. (b) Skin the end of the wire connected to jack J104 (R1) and solder it to terminal 3 of transformer T103.
4	Remove the green lead from jack J105 (R2).
5	On potentiometer R119: (a) Unsolder the black lead from terminal 2 and the green lead (connected to FL101 terminal 5) from terminal 1. (b) Disconnect the black lead from 20-pin connector jack B (J101) pin 4.

STEP	PROCEDURE
	(c) Add a black lead No. 24BG wire 4 inches long between 20-pin connector jack B pin 4 and terminal 1 of potentiometer. Do not solder terminal 1 [see Step 5(e)].
	(d) Connect the green lead, disconnected in Step 5(a), to terminal 2 of the potentiometer. Do not solder [see Step 5(e)].
	(e) Assemble the resistor R124 (301 ohms) retained in Step 2 above. Solder it between terminals 1 and 2 of the potentiometer.
	(f) Dress the resistor in close to the casting.
6	Remove the KS-13814, L2 capacitor C109 (0.01 MF), located on pins 4 and 7 on the electron tube V102. Discard the capacitor.
7	Resistor R116 (10,000 ohms) is located on electron tube V102 and an adjacent ground lug. Disconnect the ground end of the resistor from the ground lug.
8	Connect the 535AB capacitor C109 (0.1 MF), furnished with the modification kit, to pins 4 and 7 on the electron tube V102 and solder it in place.
9	3/4-inch plastic tape (black or gray 2-3/4" long). Press the 3/4-inch plastic tape (black or gray, 2-3/4 inches long) to the casting from the rear boss forward along the outside edge of the casting surface from which the regulator assembly was removed.
10	Locate the new minaplas regulator assembly (Fig. 3) in place without fastening the screws. Orient the capacitor C117 on top and position it towards the front of the casting. Solder the following leads to the inside terminations: (towards center of casting).
	(a) Red lead from R127 to terminal 4 of transformer T102 and red lead from 20-pin connector jack B (J101) pin 13 to resistor R127.
	(b) Green lead from R128 to jack J105. Do not solder jack end (see Step 18).
11	Connect the leads to the minaplas assembly pigtail apparatus terminations (located towards the center of the casting) as follows:
	(a) Green lead (cut in Step 3) from terminal 1 of potentiometer R119 to resistor R129. Do not solder.
	(b) Green lead from terminal 0 of inductor L102 to resistor R131.
	(c) Black lead from pin 1 on the electron tube V102 to resistor R129. Solder.
	(d) Green lead (longer of two green leads) from terminal 1 of transformer T102 to varistor CR105. Remove the remaining green lead.
	(e) Green lead (longer of two green leads) from terminal 3 of transformer T102 to varistor CR103. Remove the remaining green lead.
12	Fasten the minaplas regulator assembly in place and clear the mounting surface from any possible lead interferences.
13	Reverse the slate and slate-white leads connected to pins 6 and 9 on 20-pin connector jack B (J101) to pins 9 and 6, respectively.
14	(a) Solder the loose end of resistor R116 (10,000 ohms) to the strap (located on the inside wall of the minaplas assembly) connected in series with capacitor C117.
	(b) Dress the resistor within the confines of the casting.
15	Solder the slate lead from pin 9 on 20-pin connector jack B (J101) to the inside termination of resistor R132 on the minaplas assembly.

STEP	PROCEDURE
16	Connect the leads to the minaplas assembly pigtail apparatus terminations (located on outside of casting) as follows: (a) Green lead from terminal 4 of transformer T103 to the capacitor C112 (−). (b) Red lead from terminal 4 of transformer T102 and red lead from resistor R111 (1000 ohms — located on the underside of the casting) to resistor R131. (c) Slate-white lead from pin 6 on 20-pin connector jack B (J101) to resistor R127.
17	Solder a black lead from the minaplas assembly R135 to terminal 1 of transformer T103.
18	Solder the green lead of the minaplas assembly C116 to jack J105 [in addition to Step 10(b)]. Solder.
19	On the left side of the casting, remove the FH screw holding the shield assembly P-36B063. Remove the shield exposing the minaplas assembly. See Fig. 2.
20	Remove the RH screw and the lockwasher mounting transformer T101. Discard the screw.
21	On the remaining mounting screw, bend the ground terminal upwards to provide sufficient clearance for an X1581-3 Cambridge Thermonic Corporation terminal TP7 (furnished with the modification kit).
22	Reusing the lockwasher, assemble the terminal in the transformer mounting hole. See Fig. 2.
23	Disconnect the green lead from resistor R122 (82,500 ohms) on the minaplas assembly, exposed in Step 19, and solder to resistor R101 (2100 ohms) on the end having the blue lead terminated on pin 17 of 20-pin connector jack B (J101) and dress the lead against the minaplas assembly. See Fig. 7.
24	Connect and solder green lead from R126 to TP7.
25	Disconnect R122 (82,500 ohms) and discard. Disconnect red lead from R122 to R105 and discard. See Fig. 7.
26	Disconnect R104 (.110 meg) and replace with a new 145A resistor (27,400 ohms). See Fig. 7.
27	Connect and solder green lead from TP7 to R104.
28	Dress the leads to avoid interference with the shield assembly and assemble the shield assembly and the FH screw.
	Identification of Channel Unit Subassemblies The channel unit subassembly is identified with a number plate per Fig. 6-1.
29	Apply trichloroethylene, sparingly with a brush, to the back of the number plate immediately before placing the plate onto the handle.
30	Roll or press the plate onto the handle of the casting.
31	Rubber stamp a 3/8-inch long dash horizontally across M1 and its recessed area and add a 1/8-inch character "F" located 1/8-inch to the right of the depressed area on the front face of the casting.
32	Add a 1/8-inch character "B" on the casting next to the jack originally specified as R2.

STEP	PROCEDURE
33	Using the method described in Steps 29 and 30 above, add the CAUTION plate per Fig. 6 to the side of transformer T102 which is at the left of the B jack.
34	The completed channel subassembly shall meet the requirements specified in the Bell System Practices covering channel tests.

B — MODIFICATION OF REGULATOR AND MODULATOR CHANNEL UNITS WITH REGULATOR CIRCUITS PER ED-92319-30 AND ED-92691-30

STEP	PROCEDURE
1	On the minaplas assembly located on the top side of the channel unit subassembly: (a) Cut all of the leads soldered to the pigtail apparatus terminations (strapping between components need not be cut). (b) Cut the pigtail end of capacitor C111 (.01 MF) at terminal 0 of inductor L102. Do not disconnect short green lead. (c) Remove the assembly and discard.
2	Unsolder varistors CR102, 103, 104, and 105, located on transformer T102, and discard.
3	Position inductor L102 as follows: (a) On the underside of the casting — remove the BH screw holding the shield P-200252. Remove the shield, exposing the FH screw used for mounting the inductor. (b) Loosen the inductor mounting screw and rotate the inductor 180° clockwise. (c) Tighten the FH screw.
4	Remove resistor R124 (301 ohms), located on transformer T103 and jack J104 (R1), and retain it for Step 8.
5	Remove the loose green leads from terminal 4 of transformer T103.
6	On jack J104 (R1) cut the green wire about 2 inches from the jack. Skin one end of the green wire still connected to jack J104 (R1) and solder it to terminal 3 of transformer T103.
7	Remove the green lead from jack J105 (R2).
8	On potentiometer R119: (a) Unsolder the black lead from terminal 2 and the green lead (connected to FL101 terminal 5) from terminal 1. (b) Disconnect the black lead from pin 4 (for ED-92691-30) or pin 7 (for ED-92319-30) of 20-pin connector jack B (J101). (c) Add a black lead No. 24 gauge BG wire 4 inches long between jack B, pin 4 (for ED-92691-30) or pin 7 (for ED-92319-30) and terminal 1 of the potentiometer. (d) Connect the green lead of (a) to terminal 2 of the potentiometer. (e) Solder resistor R124 (301 ohms) retained in Step 4 between terminals 1 and 2. Dress the resistor in close to the casting.

STEP	PROCEDURE
9	On 20-pin connector jack B (J101): (a) Disconnect the slate and slate-white or blue and blue-white leads from pins 6 and 9 respectively. (b) Discard the slate-white or blue-white lead (see Step 28). (c) Dress and solder the slate or blue lead to pin 9. (d) Skin the remaining loose end.
10	Disconnect the ground end of the resistor R116 (10,000 ohms) from the ground terminal.
11	Remove the KS-13814, L2 capacitor C109 (0.01 MF), located on pins 4 and 7 of the electron tube V102. Discard the capacitor.
12	Connect the 535AB capacitor C109 (0.1 MF) to pins 4 and 7 on the electron tube V102 and solder it in place. (The capacitor is furnished with the modification kit.) Dress the capacitor within the confines of the casting.
13	Sleeve the pigtails and assemble one end of the new resistor R131 (5100 ohms) to terminal 4 of the transformer T102. See Step 19(c). Do not solder T102 end.
14	On the top side of the unit remove the screw holding the modulator assembly.
15	***For ED-92319-30 Units (Fig. 7):*** (a) Disconnect R122 (.2 meg) and discard. Disconnect red lead from R122 to R105 and discard. (b) Disconnect R104 (.332 meg) and discard. Replace R104 with a new 145A resistor (75,000 ohms).
16	***For ED-92691-30 Units (Fig. 7):*** (a) Disconnect R122 (82,500 ohms) and discard. Disconnect red lead from R122 to R105 and discard. (b) Disconnect R104 (.11 meg) and discard. Replace R104 with a new 145A resistor (27,400 ohms).
17	Replace the screw holding the modulator assembly.
18	Obtain 2 pieces of black or gray 3/4-inch plastic tape (one piece 2 inches long; and one piece 2-3/4 inches long). (a) Press the longer piece of tape to the casting and locate it from the rear forward along the outside edge of the casting (notch the tape to avoid covering the tapped holes on ED-92319-30). (b) Press the second piece of tape to cover the round head machine screw located behind the inductor.
19	Locate the new regulator minaplas assembly (Fig. 4 for ED-92319-30, or Fig. 5 for ED-92691-30) in place without fastening the screws. Orient capacitor C117 on top and position it towards the front of the casting. Solder the following leads to and from the minaplas terminations located towards the center of the casting: (a) Green lead from resistor R128 to jack 105 (R2). (b) Green lead (cut in Step 6) from terminal 1 on potentiometer R119 to the resistor R129. Do not solder [see Step 19(d)].

STEP	PROCEDURE
	(c) Red lead from resistor R127 to terminal 4 of transformer T102 and the red lead from pin 13 on 20-pin connector jack B (J101) to resistor R127. These red leads were cut in Step 1. (d) Black lead from pin 1 on the electron tube V102 to the resistor R129. (e) Slate or blue lead from pin 9 on 20-pin connector jack B (J101) to the resistor R132.
20	Form the pigtail terminations upward on the inside wall of the minaplas assembly to provide adequate clearance with the transformer T102.
21	Fasten the minaplas assembly in place. Clear the mounting surface of any possible lead interference.
22	Connect a green lead from varistor CR105 to terminal 1 of transformer T102.
23	Connect a green lead from varistor CR103 to terminal 3 of transformer T102.
24	Insulate and connect the loose end of resistor R116 (10,000 ohms) to the strap (located on the inside wall of minaplas assembly) connected in series with capacitor C117.
25	Insulate and connect the loose end of capacitor C111 to the partial strap on the inside wall of the minaplas assembly.
26	Insulate and connect resistor R131 (5100 ohms) to the strap referred to in Step 25.
27	Connect the green lead from terminal 0 of inductor L102 to the partial strap (same as in Steps 25 and 26).
28	Connect the leads to the minaplas assembly pigtail apparatus terminations located on the outside of the casting as follows: (a) Slate-white or blue-white lead from resistor R127 to pin 6 of 20-pin connector jack B (J101) (follow the path of the lead discarded in Step 9; the old wire may be used to snake this lead). Use same color as was discarded. (b) Green lead from terminal 4 of transformer T103 to capacitor C112 (—). (c) Red lead from terminal 4 of transformer T102 and red lead from resistor R111 (1000 ohms), (located on underside of casting) to the partial strap terminating at resistor R133. The lead from resistor R111 should be dressed along the casting surface. (d) Green lead from varistor CR104 and jack 105 (R2). (e) Solder the black lead from the minaplas assembly resistor R135 to terminal 1 of transformer T103.
29	On the underside of the casting, remove the RH screw and the lockwasher mounting transformer T101. Discard the screw.
30	If required, bend the ground terminal upwards on the remaining mounting screw to provide sufficient clearance for the X1581-3 Cambridge Thermonic Corporation terminal (TP7) furnished with the modification kit.
31	Reusing the lockwasher, assemble the terminal in the transformer mounting hole.
32	Remove the four screws and straps mounting the minaplas assembly and shift the assembly sufficiently to provide access to jack M1 (J102).
33	Disconnect the green lead from jack M1 (J102) and solder it to the standoff assembled in Step 30. Run the lead in front of the adjustment side of potentiometer R125.

STEP	PROCEDURE
34	Solder a No. 24 gauge BG blue wire 6 inches long, to jack M1 (J102) and connect the other end to the top of resistor R101 (2100 ohms or 2640 ohms) on the end having the blue or green lead terminated at 20-pin connector jack B (J101) pin 17.
35	Dress the green and blue leads to avoid interference with shield P-200252 and replace shield.
36	Connect and solder green lead from R126 to TP7.
37	Reassemble the minaplas assembly. Carefully redress all of the leads disturbed in shifting the assembly.
	Identification of Channel Unit Subassemblies
	The channel unit subassembly is identified with an applicable number plate per Fig. 6-2 or Fig. 6-3.
38	Apply trichloroethylene, sparingly with a brush, to the back of the adhesive-backed number plate, immediately before placing the plate onto the handle.
39	Roll or press the plate onto the handle of the casting.
40	Rubber stamp a 3/8-inch long dash horizontally across designation "M1" and its recessed area and add a 1/8-inch character "F" located 1/8-inch to the right of the depressed area on the front face of the casting.
41	Add a 1/8-inch character B next to the jack originally specified as R2.
42	Using the method described in Steps 38 and 39 above, add the CAUTION plate per Fig. 6 to the side of the transformer T102 which is at the left of the B jack.
	Requirements:
43	The completed channel subassemblies shall meet the requirements specified in the Bell System Practices covering channel tests.

C — MODULATOR AND MISCELLANEOUS RESISTOR CHANGES OF CHANNEL UNITS PER ED-92904-30
Refer to Fig. 3 for component placement.

STEP	PROCEDURE
1	Loosen minaplas assembly on top of channel unit.
2	Remove R127 (.11 meg) located on the bottom of the minaplas assembly loosened in Step 1 and discard and replace with a new KS-13490 L1 resistor (62,000 ohms).
3	Between capacitor C116 and R130 place the new resistor R126 and insert in minaplas by heating pigtails with soldering iron. Strap R126 as shown in Fig. 3. Add green lead as shown in Fig. 3 from R126 to TP7 terminal (see Fig. 2 for TP7 location). Follow wiring path through casting to TP7.
4	On the left side of the casting, remove the FH screw holding the shield assembly P-36B063. Remove shield. (See Fig. 2.)
5	Disconnect R122 (82,500 ohms) and discard. Disconnect red lead from R122 to R105 and discard.

STEP	PROCEDURE
6	Disconnect R104 (.11 meg) and replace with new 145A resistor (27,400 ohms).
7	Dress the leads to avoid interference with the shield assembly and assemble the shield and the FH screw.
8	Identify the modified unit as specified in the kit.

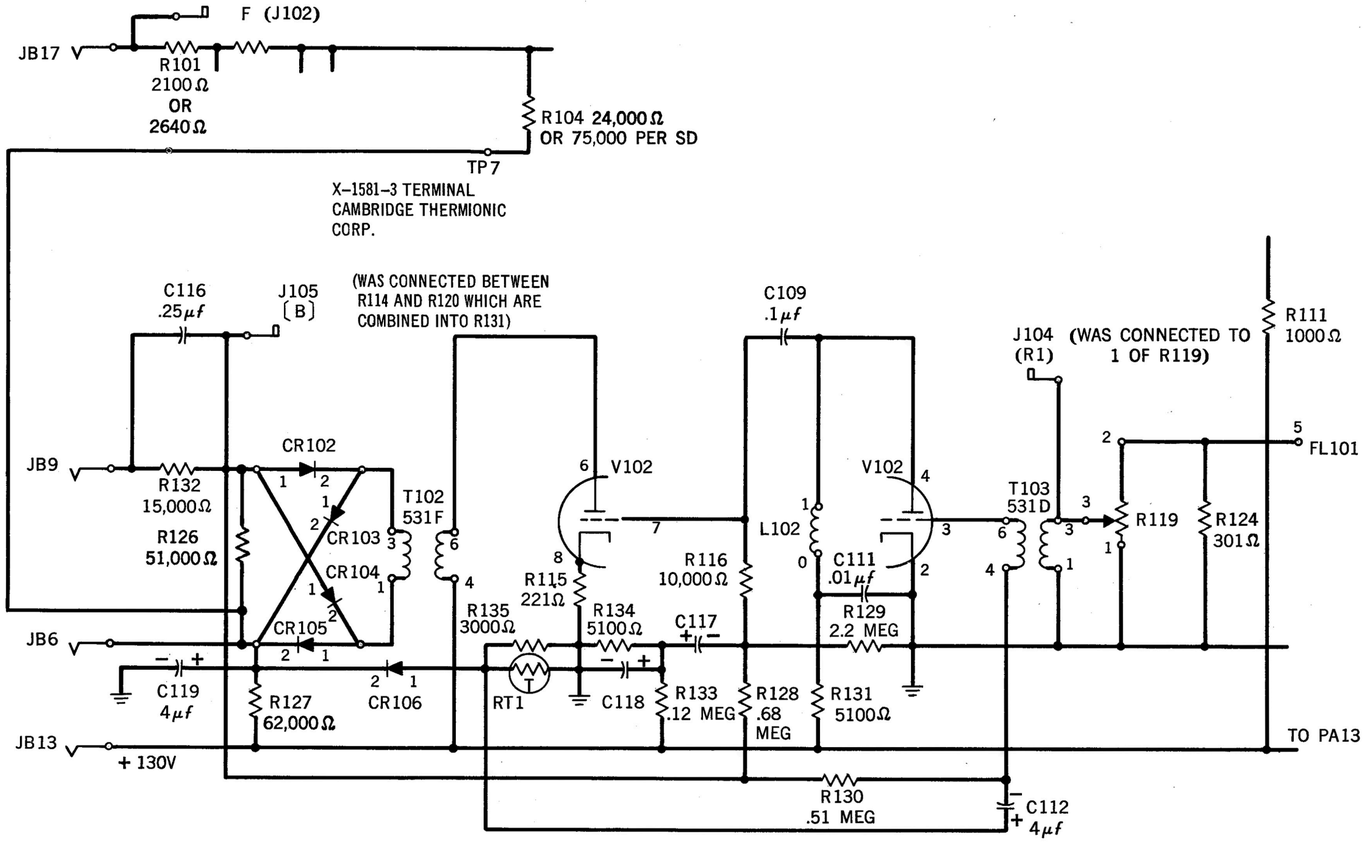


Fig. 1 – Regulation Circuit for Transmission Improvement

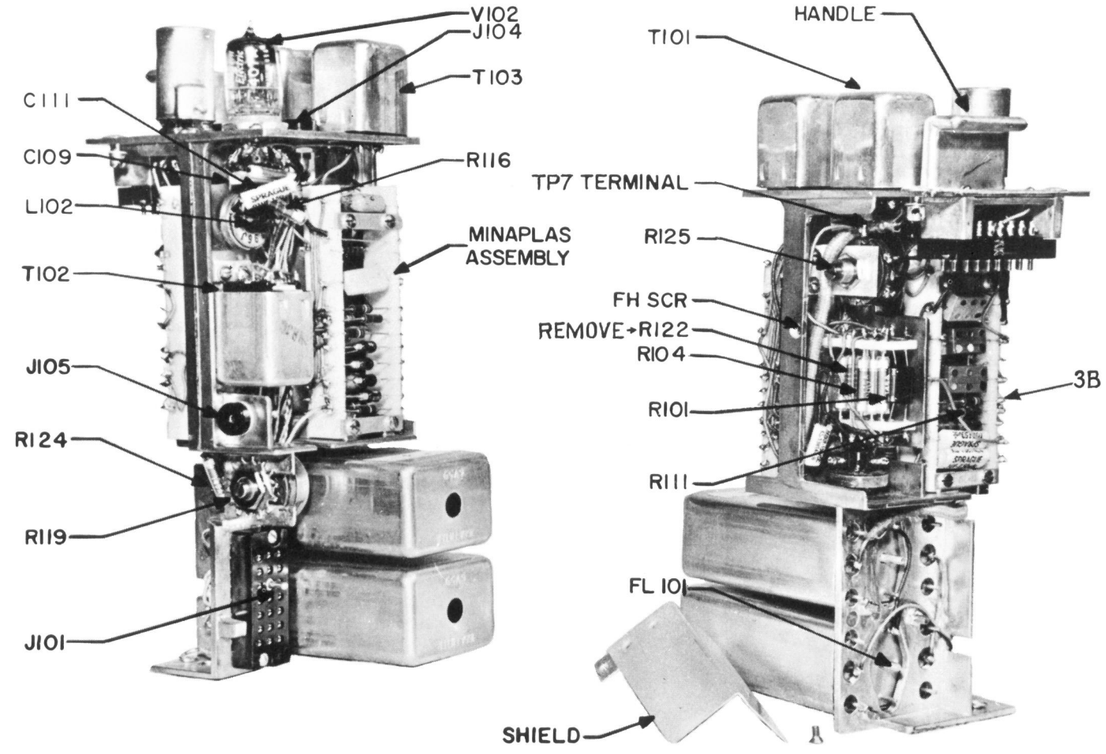
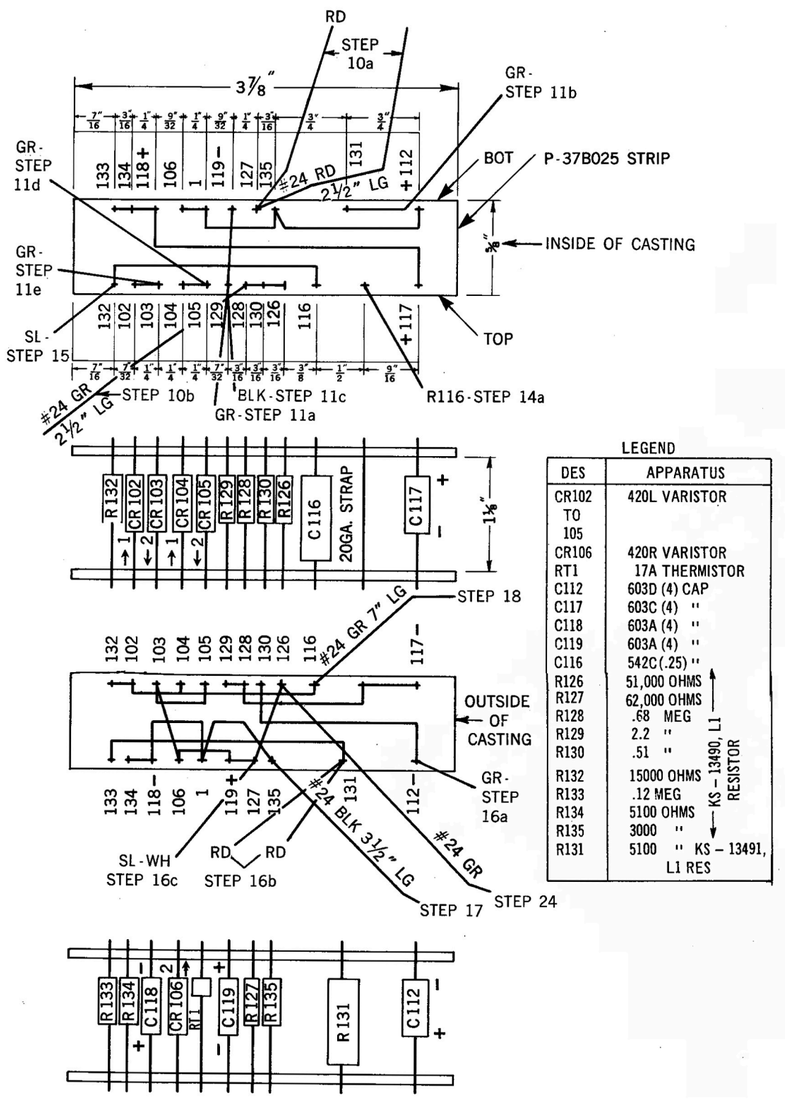


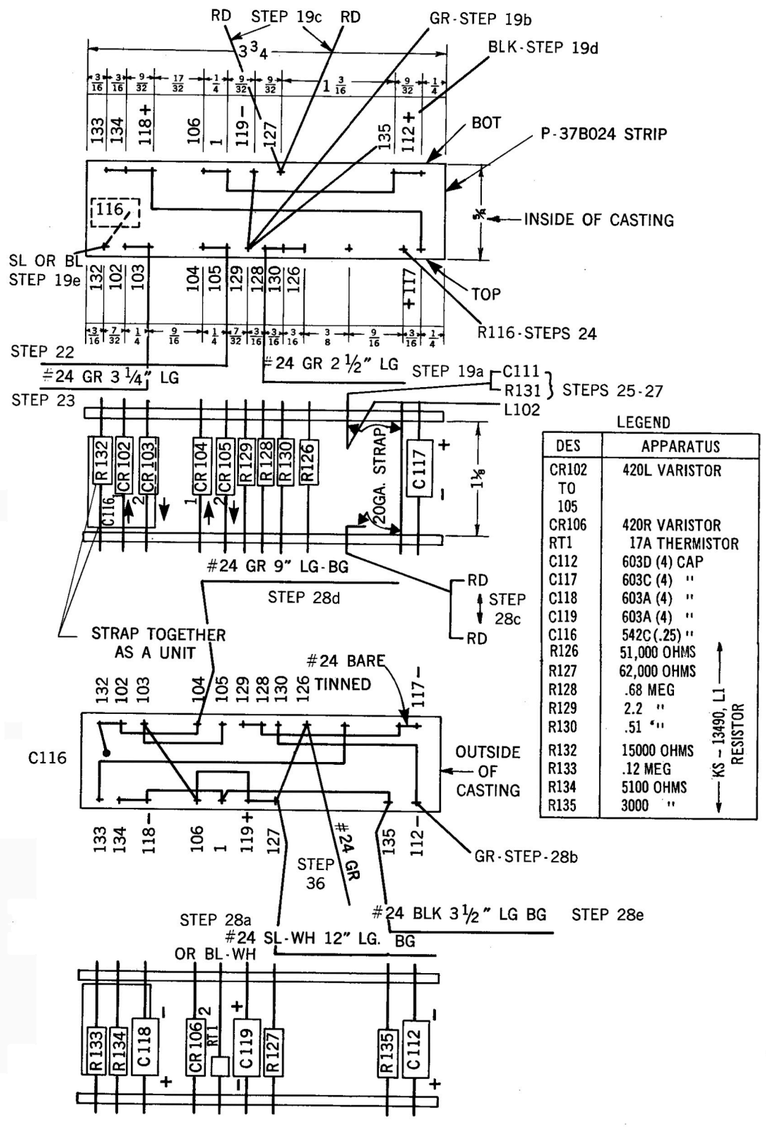
Fig. 2 – Channel Unit Subassembly ED-92904-30



LEGEND	
DES	APPARATUS
CR102 TO 105	420L VARISTOR
CR106	420R VARISTOR
RT1	17A THERMISTOR
C112	603D (4) CAP
C117	603C (4) "
C118	603A (4) "
C119	603A (4) "
C116	542C(.25) "
R126	51,000 OHMS
R127	62,000 OHMS
R128	.68 MEG
R129	2.2 "
R130	.51 "
R132	15000 OHMS
R133	.12 MEG
R134	5100 OHMS
R135	3000 "
R131	5100 " KS – 13491, L1 RES

KS – 13490, L1 RESISTOR

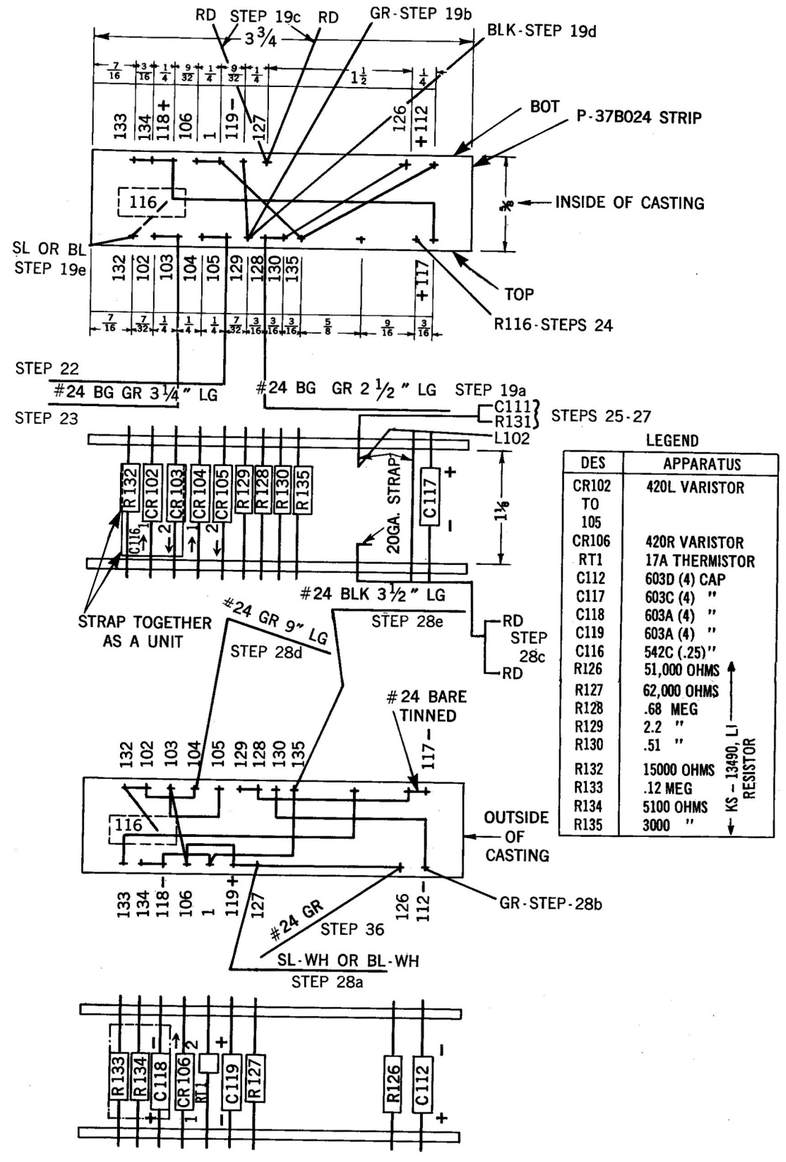
Fig. 3 – Regulation Circuit Minaplas Assembly — Field Modification of ED-92904-30



LEGEND	
DES	APPARATUS
CR102 TO 105	420L VARISTOR
CR106	420R VARISTOR
RT1	17A THERMISTOR
C112	603D (4) CAP
C117	603C (4) "
C118	603A (4) "
C119	603A (4) "
C116	542C(.25) "
R126	51,000 OHMS
R127	62,000 OHMS
R128	.68 MEG
R129	2.2 "
R130	.51 "
R132	15000 OHMS
R133	.12 MEG
R134	5100 OHMS
R135	3000 "

KS – 13490, L1 RESISTOR

Fig. 4 – Regulation Circuit Minaplas Assembly — Field Modification of ED-92319-30



LEGEND	
DES	APPARATUS
CR102 TO 105	420L VARISTOR
CR106	420R VARISTOR
RT1	17A THERMISTOR
C112	603D (4) CAP
C117	603C (4) "
C118	603A (4) "
C119	603A (4) "
C116	542C (.25)"
R126	51,000 OHMS
R127	62,000 OHMS
R128	.68 MEG
R129	2.2 "
R130	.51 "
R132	15000 OHMS
R133	.12 MEG
R134	5100 OHMS
R135	3000 "

KS – 13490, L1 RESISTOR

Fig. 5 – Regulation Circuit Minaplas Assembly — Field Modification of ED-92691-30

Fig. 3, 4, and 5

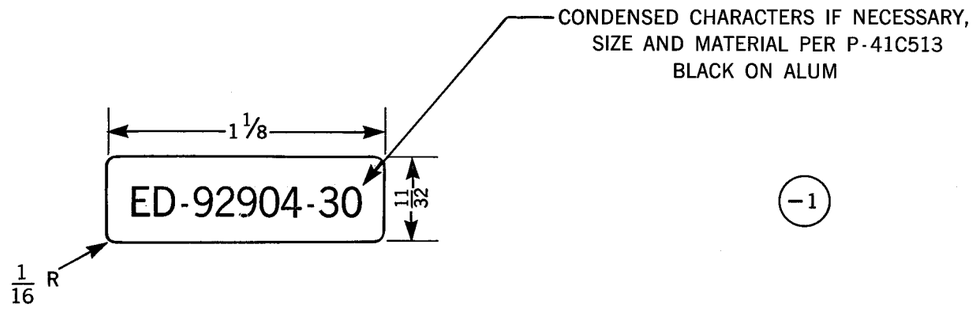
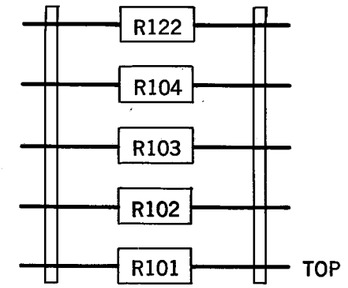
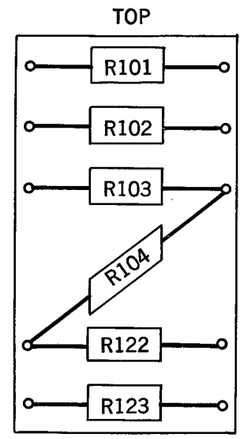


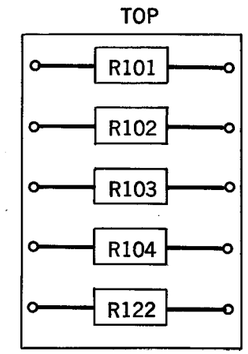
Fig. 6 – Regulator Circuit Subassembly Designation Plates



MINAPLAS ASSEMBLY
ED92904-30



MODULATOR ASSEMBLY
ED92319-30



MODULATOR ASSEMBLY
ED92691-30

Fig. 7

Fig. 6 and 7