



# HEAVY MAINTENANCE INSTRUCTIONS INDICATION PANEL TYPE FM329

## CONTENTS

	Page
INTRODUCTION .....	2-13-114
SCOPE .....	2-13-114
DESCRIPTION .....	2-13-114
OPERATION .....	2-13-114
MAINTENANCE AND REPAIR .....	2-13-114
GENERAL .....	2-13-114
PANEL REMOVAL FROM THE CAR .....	2-13-114
DISASSEMBLY .....	2-13-115
ADJUSTMENT AND TEST .....	2-13-115
Equipment Required .....	2-13-115
Drawings Required .....	2-13-115
Test Procedure .....	2-13-118
ASSEMBLY .....	2-13-119
INSTALLING THE PANEL ON THE CAR .....	2-13-120
SPECIAL TOOLS .....	2-13-120

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

**Verify numbers for parts, tools, or material by using the Renewal Parts or Tool Catalogs, or contact your General Electric representative for assistance. Do not order from this publication.**

## INTRODUCTION

### SCOPE

This publication contains information necessary to maintain, repair, and test the 17FM329A1 & B1 indication panels.

### DESCRIPTION

The FM329 panel consists of a metal frame on which components, such as switches, meters, indicating lights, counters, a connecting cable and plug are mounted. (See Fig. 13-66 and 13-67).

### OPERATION

With the panel connected into the car system and the panel switches on, power is transmitted to the various panel meters and indicating lights. The operator or maintenance personnel can see, by the indicating lights and meters, if the equipment is operating correctly, or not operating at all. If the equipment is not operating, the panel has a built-in latching feature which displays the last condition of operation just prior to equipment shutdown.

## MAINTENANCE AND REPAIR

### GENERAL (See Fig. 13-68)

This panel normally requires very little maintenance. However, periodically, perform the following:

1. Blow out any foreign material with dry compressed air (29 psi maximum).
2. Examine all wiring for damage such as charred, frayed, or cracked insulation.
3. Check all electrical connections and mounting hardware to be sure they are secure.
4. Push test switch (SW2), with power on, to see that indicating lights function properly and light up.

### PANEL REMOVAL FROM THE CAR (See Fig. 13-69)

1. Open the key-locked door covering the panel and open the Electronic Locker No. 1.
2. Disconnect the car wiring from the panel by unplugging the connector. Disconnect the ground shunt from the mounting bracket by removing the mounting hardware.

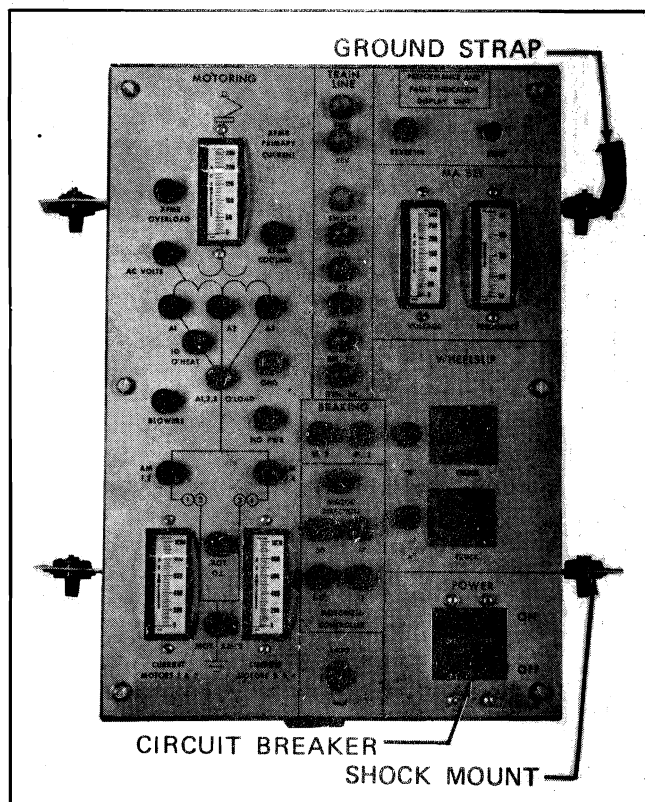


FIG. 13-66. INDICATING PANEL FM329 FRONT VIEW. E-19827

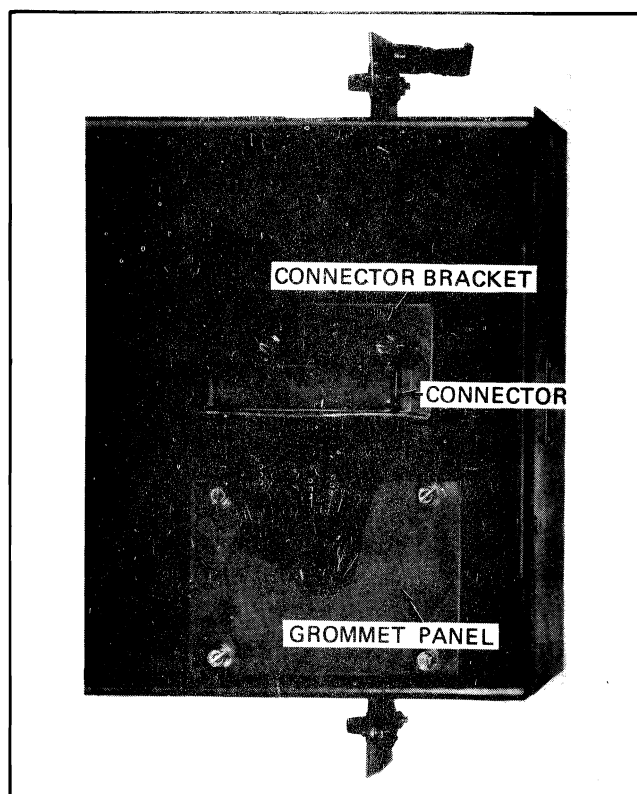
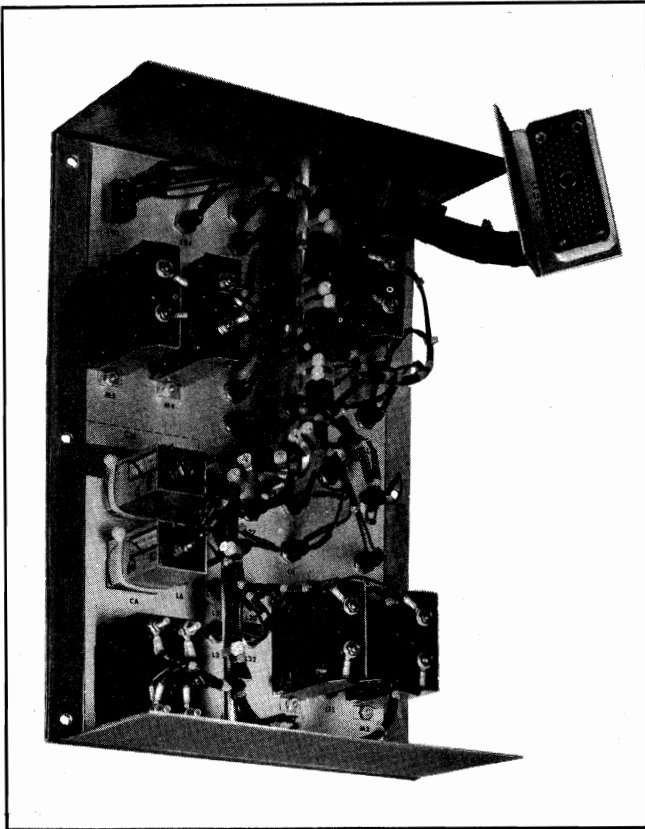


FIG. 13-67. INDICATING PANEL FM329 BACK VIEW. E-19828



**FIG. 13-68. INDICATING PANEL FM329 COMPONENT VIEW. E-19829**

3. Remove the four sets of mounting hardware from the inside of the shock mounts.
4. Lift the panel off the mounting brackets and remove to a suitable work area.

**DISASSEMBLY (See Fig. 13-66, 13-67, 13-68)**

1. Remove the wires from the connector.
2. Remove the two bolts which hold the connector plug to the base plate of the panel. Remove the four bolts which hold the grommet plate to the base.
3. Remove the ten bolts which hold the panel face plate (with components) to the base.
4. Carefully lift the face plate off the base, being careful to guide the connector and connector base plate through the opening in the panel base plate.
5. To change a bulb in the light fixture, unscrew the lens and pull out on the bulb. Scrap the old bulb.

6. To remove the light assembly from the panel, unsolder the wires, remove the mounting hardware from the light assembly, and push the light assembly out through the front panel.

7. To remove the meters from the panel, disconnect the wires by removing the hardware. Then, remove the four sets of mounting hardware fastening the meter to the bracket. Push the meter out through the front panel.

8. To remove the counters from the panel, unsolder the wires, then remove the holding springs. Push the counter out through the front panel.

9. To remove the switch from the panel, unsolder the wires and remove the mounting hardware from the front of the panel. Push the switch out through the front panel.

10. To remove the circuit breaker from the panel, remove the four sets of mounting hardware to remove the wires. Remove the four sets of mounting hardware from the panel and push the circuit breaker out through the panel.

11. To remove the rubber shock mounts from the panel, remove the two sets of mounting hardware. Scrap the defective mounts.

**ADJUSTMENT AND TEST**

Remove the FM329 panel from the car. In order to test the FM329 panel, it is necessary to connect an FL134 panel with it.

**Equipment Required**

1. FM134 electronic panel
2. 37.5 vdc power source, 0-10 amps
3. Current source, 1000 Hz, 0-200 ma square wave
4. AC ammeter, 0-200 ma  $\pm$  1%
5. AC voltmeter, 0-300 v  $\pm$  1%
6. Shunt, 50 ohms  $\pm$  1%, 5 watt.

**Drawings Required**

1. Interconnection diagram for FL134 (See Fig. 13-65)
2. Wiring - FM329 panel (See Fig. 13-70).

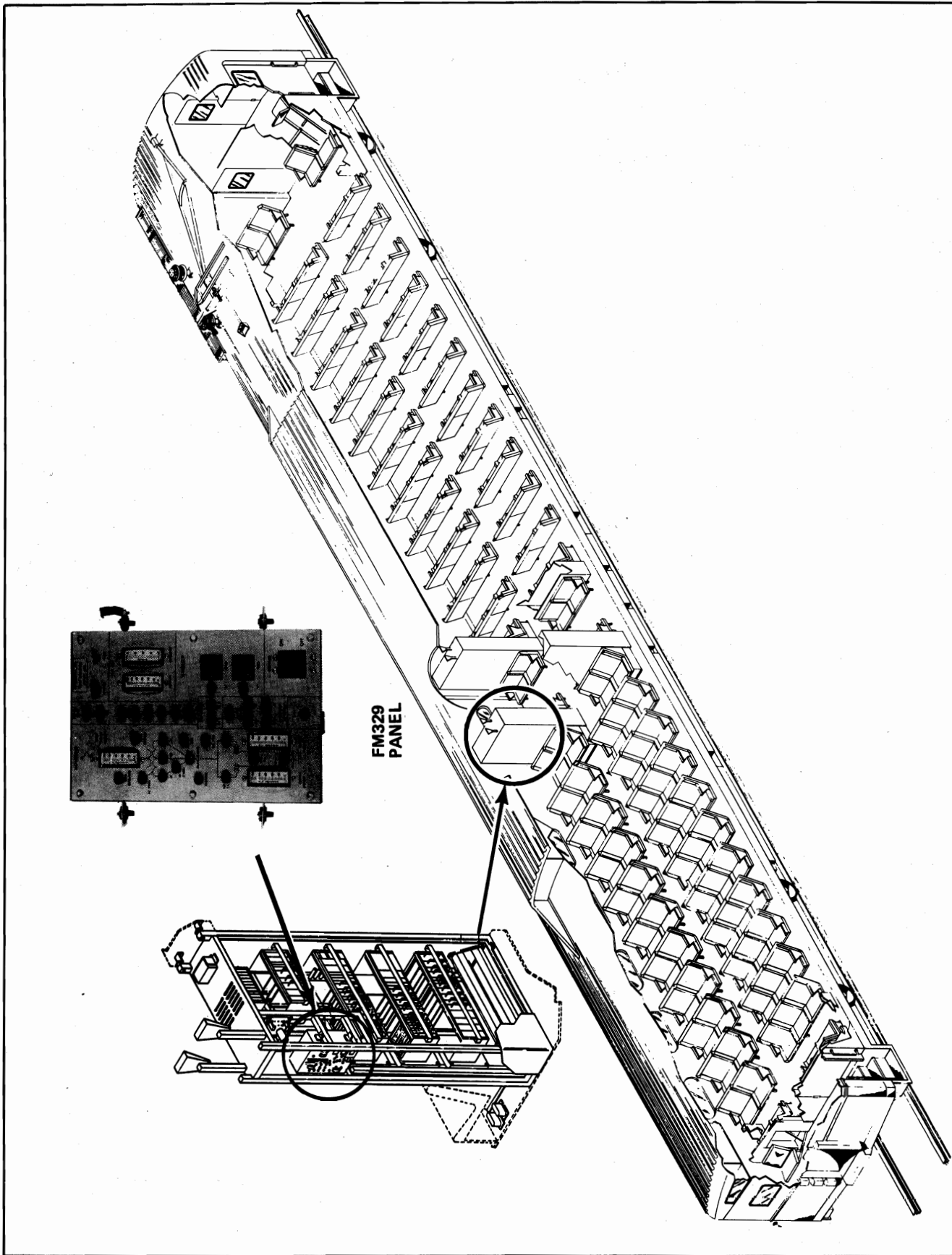
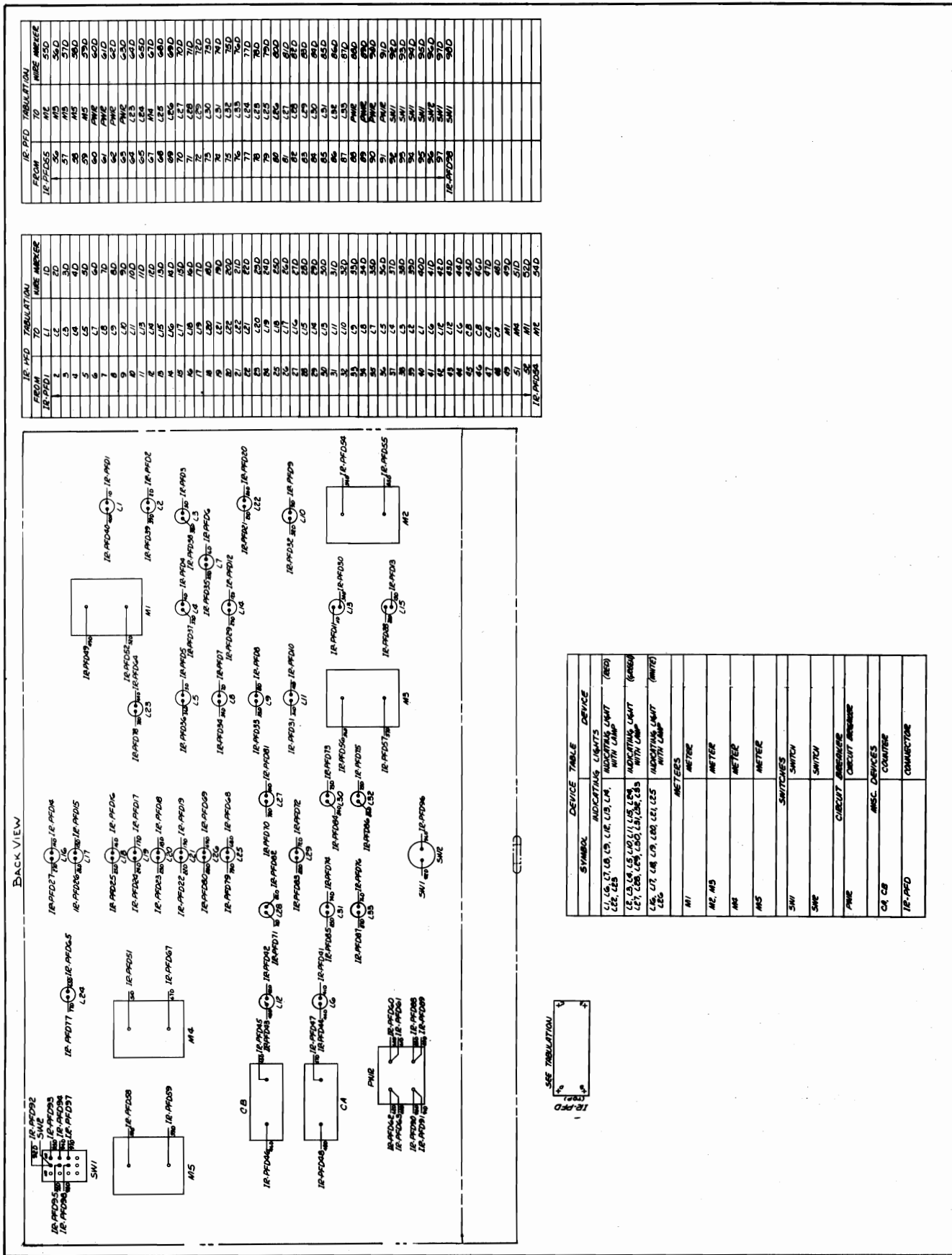


FIG. 13-69. FM329 PANEL LOCATION ON THE CAR. E-19830



FROM	TO	WIRE NUMBER
1	1	50
2	2	51
3	3	52
4	4	53
5	5	54
6	6	55
7	7	56
8	8	57
9	9	58
10	10	59
11	11	60
12	12	61
13	13	62
14	14	63
15	15	64
16	16	65
17	17	66
18	18	67
19	19	68
20	20	69
21	21	70
22	22	71
23	23	72
24	24	73
25	25	74
26	26	75
27	27	76
28	28	77
29	29	78
30	30	79
31	31	80
32	32	81
33	33	82
34	34	83
35	35	84
36	36	85
37	37	86
38	38	87
39	39	88
40	40	89
41	41	90
42	42	91
43	43	92
44	44	93
45	45	94
46	46	95
47	47	96
48	48	97
49	49	98
50	50	99
51	51	100

FROM	TO	WIRE NUMBER
1	1	50
2	2	51
3	3	52
4	4	53
5	5	54
6	6	55
7	7	56
8	8	57
9	9	58
10	10	59
11	11	60
12	12	61
13	13	62
14	14	63
15	15	64
16	16	65
17	17	66
18	18	67
19	19	68
20	20	69
21	21	70
22	22	71
23	23	72
24	24	73
25	25	74
26	26	75
27	27	76
28	28	77
29	29	78
30	30	79
31	31	80
32	32	81
33	33	82
34	34	83
35	35	84
36	36	85
37	37	86
38	38	87
39	39	88
40	40	89
41	41	90
42	42	91
43	43	92
44	44	93
45	45	94
46	46	95
47	47	96
48	48	97
49	49	98
50	50	99
51	51	100

SYMBOL	DEVICE TABLE	DEVICE
L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L26, L27, L28, L29, L30, L31, L32, L33, L34, L35, L36, L37, L38, L39, L40, L41, L42, L43, L44, L45, L46, L47, L48, L49, L50, L51, L52, L53, L54, L55, L56, L57, L58, L59, L60, L61, L62, L63, L64, L65, L66, L67, L68, L69, L70, L71, L72, L73, L74, L75, L76, L77, L78, L79, L80, L81, L82, L83, L84, L85, L86, L87, L88, L89, L90, L91, L92, L93, L94, L95, L96, L97, L98, L99, L100	INDICATING LIGHTS	INDICATING LIGHT (RED)
L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L26, L27, L28, L29, L30, L31, L32, L33, L34, L35, L36, L37, L38, L39, L40, L41, L42, L43, L44, L45, L46, L47, L48, L49, L50, L51, L52, L53, L54, L55, L56, L57, L58, L59, L60, L61, L62, L63, L64, L65, L66, L67, L68, L69, L70, L71, L72, L73, L74, L75, L76, L77, L78, L79, L80, L81, L82, L83, L84, L85, L86, L87, L88, L89, L90, L91, L92, L93, L94, L95, L96, L97, L98, L99, L100	INDICATING LIGHTS	INDICATING LIGHT (GREEN)
L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16, L17, L18, L19, L20, L21, L22, L23, L24, L25, L26, L27, L28, L29, L30, L31, L32, L33, L34, L35, L36, L37, L38, L39, L40, L41, L42, L43, L44, L45, L46, L47, L48, L49, L50, L51, L52, L53, L54, L55, L56, L57, L58, L59, L60, L61, L62, L63, L64, L65, L66, L67, L68, L69, L70, L71, L72, L73, L74, L75, L76, L77, L78, L79, L80, L81, L82, L83, L84, L85, L86, L87, L88, L89, L90, L91, L92, L93, L94, L95, L96, L97, L98, L99, L100	INDICATING LIGHTS	INDICATING LIGHT (WHITE)
M1, M2, M3, M4, M5	METERS	METER
SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9, SW10, SW11, SW12, SW13, SW14, SW15, SW16, SW17, SW18, SW19, SW20, SW21, SW22, SW23, SW24, SW25, SW26, SW27, SW28, SW29, SW30, SW31, SW32, SW33, SW34, SW35, SW36, SW37, SW38, SW39, SW40, SW41, SW42, SW43, SW44, SW45, SW46, SW47, SW48, SW49, SW50, SW51, SW52, SW53, SW54, SW55, SW56, SW57, SW58, SW59, SW60, SW61, SW62, SW63, SW64, SW65, SW66, SW67, SW68, SW69, SW70, SW71, SW72, SW73, SW74, SW75, SW76, SW77, SW78, SW79, SW80, SW81, SW82, SW83, SW84, SW85, SW86, SW87, SW88, SW89, SW90, SW91, SW92, SW93, SW94, SW95, SW96, SW97, SW98, SW99, SW100	SWITCHES	SWITCH
CA, CB	CIRCUIT BREAKERS	CIRCUIT BREAKER
IR-PFD	MISC. DEVICES	COUNTER
		CONNECTOR

FIG. 13-70. WIRING DIAGRAM 17FM329A1 PANEL. (41R976034)

**Test Procedure**

1. Connect the FL134 panel to the FM329 panel with required cabling in the car. See Fig. 13-71 for the terminal board layout for the listed test points in the following test procedure. For checkout on the bench, the interconnections between the FL134 and FM329 panels should be made per the schematic 12B106899, sheets 44, 45, 46 and 47.

2. Connect 37.5 volts to terminal board; positive to BFL-B, TB245-C, and negative to TB255L, M. Turn power switch on.

3. At the FM329 panel, push lamp test light switch and observe that all lights come on and both counters count up one.

4. Release the pushbutton. All lights go out except for BLOWERS and XFMR COOLING.

5. Push reset button, and the last two lights go out.

6. Operation of indicating lights may be checked by using Table I.

**NOTE:** Terminal Boards are located on the bottom of the Electric Locker No. 1 and in the underseat locker just forward of the locker.

7. The following lights clamp all other lights in their current condition except Wheelslip "A" and "B" when actuated. The reset button must be pushed to re-enable affected lights.

Point	Actuation Voltage	Light
TB255-F	+37	MOT O.L.
TB255-G	+37	A1, 2, 3, O'LOAD
TB255-E	+37	GND
TB255-K	+37	NO PWR
TB255-H	+37	XFMR OVERLOAD
TB253-L	0	DYN. BK. } +37 v normal
TB253-K	0	EM. BK. } at these points

**TABLE I**

Point	Action	Result	Action	Results
TB255-J	Apply +37V	AC volts on	Remove voltage	AC volts out
TB252-F	Apply +37V	A1 on	Remove voltage	A1 off
TB252-G	Apply +37V	A2 on	Remove voltage	A2 off
TB252-H	Apply +37V	A3 on	Remove voltage	A3 off
TB253-M	Apply +37V	AM1, 2 on	Remove voltage	AM1, 2 off
TB252-A	Apply +37V	AM3, 4 on	Remove voltage	AM3, 4 off
TB252-M	Apply +37V	Mot. Amps on	Remove voltage	Mot. Amps off
TB253-D	Apply +37V	FWD on	Remove voltage	FWD off
TB253-E	Apply +37V	REV on	Remove voltage	REV off
TB253-F	Apply +37V	SW on	Remove voltage	SW off
TB253-G	Apply +37V	P1 on	Remove voltage	P1 off
TB253-H	Apply +37V	P2 on	Remove voltage	P2 off
TB253-J	Apply +37V	P3 on	Remove voltage	P3 off
TB252-B	Apply +37V	Reverser on	Remove voltage	Reverser off
TB252-L	Apply +37V	B1, 2 on	Remove voltage	B1, 2 off
TB252-D	Apply +37V	P1, 2 on	Remove voltage	P1, 2 off
TB255-D	Apply +37V	Mot. Dir. on	Remove voltage	Mot. Dir. off
RB252-C	Apply +37V	20 on	Remove voltage	20 off
TB255-B	Apply +37V	17 on	Remove voltage	17 off
TB255-A	Apply +37V	1-17 on	Remove voltage	1-17 off
TB255-C	Apply +37V	1 on	Remove voltage	1 off

8. The following two lights are non-latching and will come on for as long as actuation voltage is applied. The respective counter will count up one each time voltage is applied.

point	Actuation Voltage	Light	
TB251-L	+37	"A"	] If actuation voltage is maintained, lights go out when reset is pushed.
TB251-M	+37	"B"	

9. By applying +37 v to TB252-J and 0 v to TB252-K, the "IG O' heat" light comes on and latches all lights in current condition except "A" and "B". Push reset to re-enable.

10. With +37 v to TB252-E and TB260-A, and 0 v to TB245-D, XFMR COOLING light comes on and latches all lights in current condition except "A" and "B". Push reset to re-enable. Also with +37 v to TB252-E and +37 v having been applied (in a pulse) to TB245-D, the light comes on no matter what the condition of TB260-A is. Push reset to re-enable.

11. With +37 v to TB260-A and +37 (pulse) to TB245-D, BLOWERS light comes on when 0 volts is applied to TB245-F and TB245-E, and all lights except "A" and "B" are latched in the current condition. Push RESET to re-enable. Under conditions above except +37 v applied to TB245-E and TB245-F, BLOWERS light comes on and other lights are latched as above. Push reset. Another sufficient condition to activate BLOWERS light is as above but 0 volts to TB245-F and +37 v to TB245-E simultaneously.

12. Push reset to reactivate.

13. Run  $230 \pm 1$  vac, 60 Hz to TB257-F and TB257-G. Read  $230 \pm 4$  v on ma set voltage and  $60 \pm 1$  Hz on ma set frequency.

14. Run 25 Hz or 60 Hz  $20 \pm 0.1$  vac to TB245-A and TB245-B. Read  $200 \pm 4$  amps on XFMR primary current. IMPORTANT: Either frequency must give same indication.

15. Connect  $1000 \pm 1$  Hz square wave to a 50 ohm, 1%, 5 watt shunt across TB248-B and TB250-D. With  $10 \pm 0.1$  volts across shunt, CURRENT MOTORS 1 and 2 should read  $600 \pm 12$  amps.

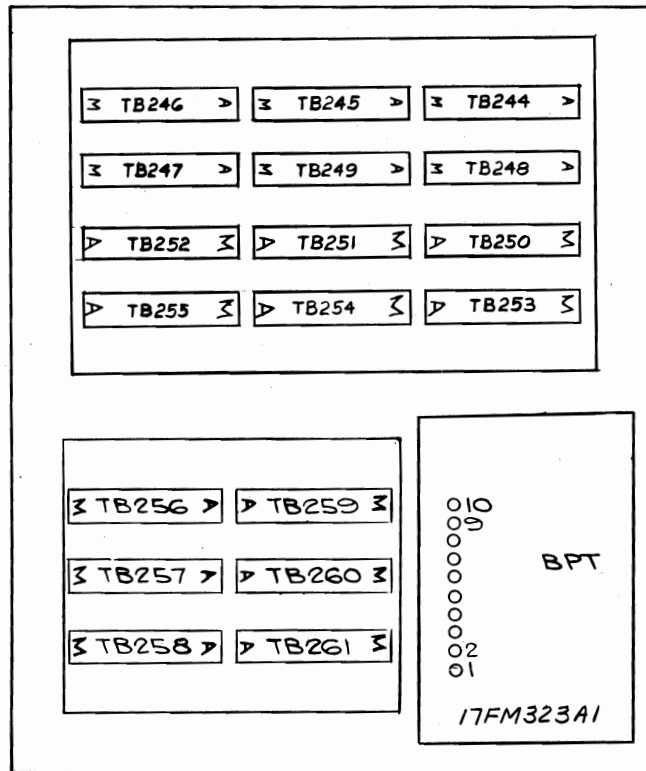


FIG. 13-71. FM329 PANEL TEST POINTS ON TERMINAL BOARDS. (41A267697)

16. Connect 1000 Hz square wave to a 50 ohm, 1%, 5 watt shunt across TB248-E and TB250-E. With  $10 \pm 0.1$  volts across shunt, CURRENT MOTORS 3 and 4 should read  $600 \pm 12$  amps.

17. Restore all circuits to normal after test.

**ASSEMBLY (See Fig. 13-66, 13-67, 13-68)**

1. Install the rubber shock mounts onto the panel, and torque the two sets of mounting hardware to 8-10 in.-lb.
2. Install the circuit breaker into the panel, and torque the four sets of mounting hardware to 14-18 in.-lb.
3. Install the switch into the panel and tighten the mounting hardware.

**NOTE:** Exercise caution so the front panel decal is not damaged by the tool used for tightening the nut.

4. Install the counter in the panel and fasten in place with the holding spring.
5. Install the meter into the panel, and torque the four sets of mounting hardware to 11-13 in.-lb.

6. Install the light assembly into the panel and tighten the mounting hardware.

7. Install the connector onto the bracket, and torque the two sets of mounting hardware to 6-8 in.-lb.

8. Wire the panel per the interconnection diagram Fig. 13-70.

9. Install the grommet plate onto the back cover, and torque the four sets of hardware to 14-18 in.-lb.

10. Install the back cover on the panel and torque the ten sets of hardware to 22-27 in.-lb.

3. Connect the ground shunt onto the mounting bracket, and torque the mounting hardware to 14-18 in.-lb.

4. Connect the car wiring to the panel by plugging in the connector. Tighten the holding screws on the connector to insure a positive connection and mating of the connector.

5. Insure the circuit breaker on the front panel is in the ON position. Push the LAMP TEST button to insure all the indicating lamps are functioning.

6. Push the RESET button to restore the panel to a standby condition.

#### **INSTALLING THE PANEL ON THE CAR**

1. Open the key-locked door covering the panel, and open the Electronic locker No. 1 door.

2. Lift the panel onto the mounting brackets. Insure the rubber mounts seat properly. Torque the four sets of mounting hardware to 14-18 in.-lb.

#### **SPECIAL TOOLS**

None required.