Westinghouse

Flexitest® Switch Type FT-1

For Multi-Circuit Testing of Switchboard Relays, Meters, and Instruments

Application

The type FT-1 Flexitest switch permits quick and easy multi-circuit testing of switchboard relays, meters and instruments by any conventional system. Although designed for switchboard mounting, it is also available built into the case of switchboard relays and meters.

Advantages

Maximum Flexibility: Connections can be made by either spring clip leads or test plugs. Individual knife blade switches can be operated independently, or two or more can be interlocked to suit testing requirements.

Fast and Reliable: When test plugs are used, any number of circuits may be tested in rapid succession since one plug properly connected can test all instruments or meters of a particular type.

Safe and Convenient: All testing operations are performed at the front of the switchboard.

Construction

Base and cover are of molded polycarbonate which provides a tough, yet flexible and insulated enclosure. Screw type terminal connections are located at the rear of the switch, and are separated by polycarbonate barriers which provide adequate insulation and wiring space. The individual test switches are of knife-blade type, and are also separated by barriers which are part of the molded base.

Switch handles are of black molded phenolic material, and each has a dovetail indentation to hold circuit identification card. A hole is provided in each handle to allow the insertion of a horizontal interlocking bar to mechanically interlock 2, 3, 4, 5, and 10 switch handles.

Provision is made to automatically short-circuit current transformer circuits when the knife switches are opened preparatory to inserting the test plug.

The FT-1 Flexitest switch is built in a maximum of switch units, with test plugs to match. Two types are available: one, a single knife blade type for potential, trip or control circuits; the other for current circuits. The second type contains the necessary current transformer short-circuiting features.

Relays, meters and instruments may be checked and calibrated (under service conditions or by means of phantom load) against portable standards connected in series with the relays, meters or instruments undergoing test.

Mounting

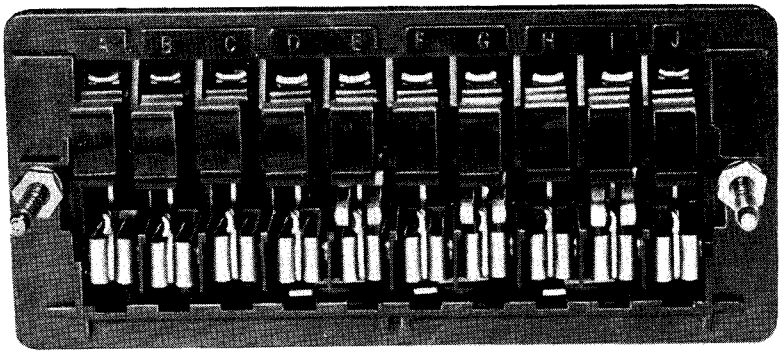
The FT-1 switch is semi-flush mounted on the front of the switchboard panel, facilitating inspection and test.

Test Plugs

Separate Source: The separate source test plug permits rapid calibration and check of relays, meters and instruments from separate power sources. When this plug is used, all test switches must be opened, to disconnect the normal power sources from the devices being tested.

Series: For "in service" testing. This plug is used to connect devices measuring the currents and voltage being applied to the switchboard relays, meters and instruments without interrupting or short-circuiting the circuit. Only those test switches in parallel with the current jack must be open before inserting the jack.

Current Circuits: This plug is used to connect current measuring devices in series with an individual current circuit of the test switch.



Ten Unit Switch With Cover Removed

July, 1971
Supersedes DB 41-075C dated February, 1970
E, D, C/2012/DB

Westinghouse

Standard Ratings①

Number of Poles		Switch Unit Location (Front View)										Switch Style Number	Series Test Plug Style Number
Potential	Current	A	B	C	D	E	F	G	H	I	J		
2 Pole													
2	0	P	P									291B954G13	129A062G10Ⓢ
2	0				P			P				129A534G01	129A062G10Ⓢ
0	0		C	C								498A026G01	129A062G07
0	2						C	C				129A531G01	129A062G08
0	2								C	C		291B954G12	129A062G01
4 Pole													
4	0	P	P	P							P	498A022G01	129A062G10Ⓢ
4	0	P	P							P	P	129A538G01	129A062G10Ⓢ
4	0	P							P	P	P	129A506G01Ⓢ	129A062G10Ⓢ
4	0			P	P	P	P					129A524G01	129A062G10Ⓢ
2	2	P	P						C	C		291B956G18	129A062G01
2	2	P							C	C	P	129A507G01Ⓢ	129A062G01
0	4		C	C	C	C						498A027G01	129A062G09
0	4						C	C	C	C		291B956G13	129A062G02
5 Pole													
5	0	P	P						P	P	P	129A505G01	129A062G10Ⓢ
3	2	P	P						C	C	P	129A533G01	129A062G01
3	2	P	C	C	P						P	129A508G01	129A062G07
1	4		C	C		C		C			P	498A002G01	.....
0	5	C		C		C		C		C		129A555G01	.....
6 Pole													
6	0	P	P	P	P					P	P	129A550G01	129A062G10Ⓢ
6	0	P	P	P					P	P	P	129A504G01Ⓢ	129A062G10Ⓢ
6	0				P	P	P	P	P	P		188A416G01	129A062G10Ⓢ
4	2	P					P	P	C	C	P	129A509G01Ⓢ	129A062G01
3	3	P	P					C	C	C	P	129A543G01	129A062G02
2	4	P					C	C	C	C	P	129A537G01	129A062G02
0	6	C		C		C			C	C	C	188A304G01	.....
0	6		C	C		C	C		C	C		498A014G01	.....
0	6			C	C	C	C	C	C			129A523G01Ⓢ	.....
0	6				C	C	C	C	C	C		129A516G01Ⓢ	129A062G03Ⓢ
0	6				C	C	C	C	C	C		188A454G01	.....
7 Pole													
7	0	P	P	P	P			P	P	P		498A013G01	129A062G10Ⓢ
7	0	P	P	P	P				P	P	P	129A547G01	129A062G10Ⓢ
7	0	P	P	P				P	P	P	P	129A526G01	129A062G10Ⓢ
7	0	P			P	P	P	P	P	P		291B959G19	129A062G10Ⓢ
7	0	P			P	P	P		P	P	P	129A503G01Ⓢ	129A062G10Ⓢ
5	2	P	P	P	P	P			C	C		291B959G18	129A062G01
5	2	P	P				C	C	P	P	P	129A510G01	129A062G08
5	2	P	C	C	P				P	P	P	188A261G01	129A062G07
4	3	P	P	C		C		C		P	P	188A477G01	292B319G24
3	4	P	P	P			C	C	C	C		498A008G01	129A062G02
3	4	P	P				C	C	C	C	P	129A511G01	129A062G02
3	4	P	C	C		C		C		P	P	188A618G01	.....

Typical Switch Assemblies (Front View)

5 Potential, No Current

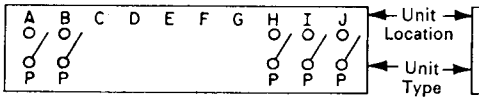


Fig. 1

3 Potential, 2 Current Shorting

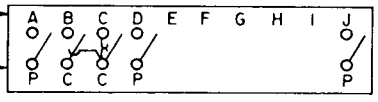


Fig. 2

No Potential, 6 Current Shorting

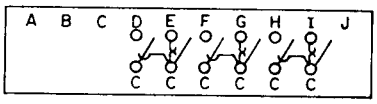


Fig. 3

① P = Potential, C = Current Non-Shorting, CC = Current Shorting

Ⓢ Denotes item available from stock

Flexitest Switch Type FT-1

For Multi-Circuit Testing of Switchboard Relays, Meters, and Instruments

Standard Ratings

Number of Poles		Switch Unit Location (Front View)										Switch Style Number	Series Test Plug Style Number
Poten-tial	Cur-rent	A	B	C	D	E	F	G	H	I	J		
8 Pole													
8	0	P	P	P	P	P			P	P	P	129A546G01	129A062G10Ⓢ
8	0	P	P	P	P			P	P	P	P	129A502G01	129A062G10Ⓢ
8	0	P			P	P	P	P	P	P	P	129A549G01	129A062G10Ⓢ
6	2	P	P	P	P	P			C	C	P	188A632G01	129A062G01
6	2	P	P	P			C	C	P	P	P	291B960G26	129A062G08
4	4	P	P	P	P		C	C	C	C		129A544G01	129A062G02
4	4	P	P		C	C	C	C		P	P	498A016G01	.....
4	4	P	P		C	C	C	C		P	P	129A530G01	129A062G12
4	4	P	C	C	P			P	C	C	P	129A512G01Ⓢ	129A062G06Ⓢ
4	4			P	P	P	C	C	C	C	P	629A315G01	129A062G02
2	6		C	C	C	C	C	C	P	P		129A525G01	129A062G09
2	6		C	C	C	C	C	C		P	P	129A521G01	129A062G09
1	7	P		C	C	C	C	C	C	C		498A019G01	292B319G22
0	8	C	C	C	C			C	C	C	C	188A229G01	.....
0	8		C	C	C	C	C	C	C	C		498A004G01	.....
0	8		C	C	C	C	C	C	C	C		129A517G01Ⓢ	292B319G22
9 Pole													
9	0	P	P	P	P		P	P	P	P	P	129A551G01	129A062G10Ⓢ
9	0	P	P		P	P	P	P	P	P	P	129A548G01	129A062G10Ⓢ
6	3	P	P	P	P	P		C	C	C	P	629A483G01	.....
5	4	P	P	P	P	P	C	C	C	C		129A545G01	129A062G02
5	4	P	P	P	P		C	C	C	C	P	188A633G01	129A062G02
3	6	P	P		C	C	C	C	C	C	P	129A515G01	129A062G03Ⓢ
0	9	C	C	C	C	C	C	C	C	C		498A021G01	.....
10 Pole													
10	0	P	P	P	P	P	P	P	P	P	P	129A501G01Ⓢ	129A062G10Ⓢ
9	1	C	P	P	P	P	P	P	P	P	P	498A011G01	.....
8	2	P	P	P	P	P	P	P	C	C	P	129A542G01Ⓢ	129A062G01
7	3	P	P	P	P	P	P	C	C	C	P	129A553G01	.....
6	4	P	P	P	P	P	C	C	C	C	P	129A532G01Ⓢ	129A062G02
6	4	P	P	P	C	C	P	P	C	C	P	129A520G01Ⓢ	129A062G05
6	4	P	C	C	P	P	P	P	C	C	P	129A513G01Ⓢ	129A062G06Ⓢ
6	4	C	C	C	C	P	P	P	P	P	P	498A015G01	.....
4	6	P	P	P	C	C	C	C	C	C	P	129A514G01Ⓢ	292B319G23Ⓢ
4	6	P	C	C	P	C	C	P	C	C	P	129A528G01Ⓢ	.....
3	7	P	P	C	C	C	C	C	C	C	P	129A535G01Ⓢ	292B319G22
2	8	C	C	C	C	C	C	C	C	P	P	837A101G01Ⓢ	.....
2	8	P	C	C	C	C	C	C	C	C	P	129A519G01	.....
2	8	P	C	C	C	C	C	C	C	C	P	129A518G01Ⓢ	292B319G22
1	9	C	C	C	C	C	C	C	C	C	P	129A541G01	.....
0	10	C	C	C	C	C	C	C	C	C	C	129A529G01	.....
0	10	C	C	C	C	C	C	C	C	C	C	498A020G01Ⓢ	.....

2 Potential, 8 Current Shorting

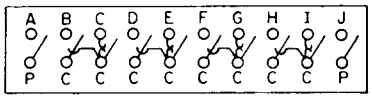


Fig. 4

10 Pole, 5 Current Shorting Pairs

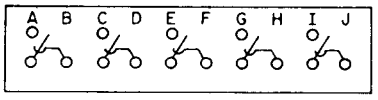


Fig. 5

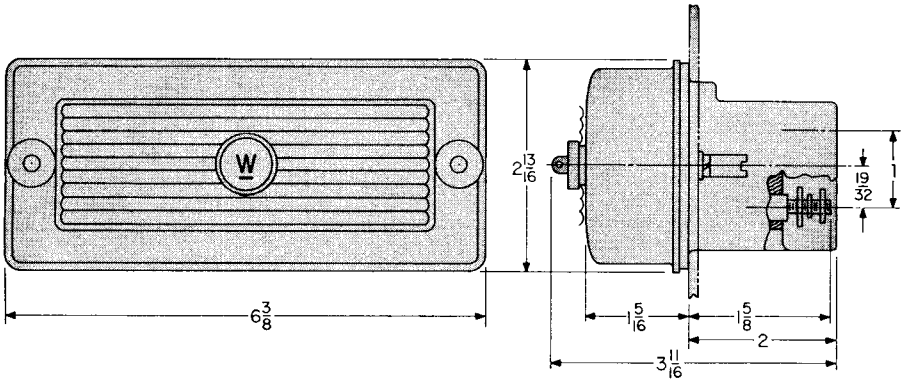
Flexitest Switch Type FT-1

For Multi-Circuit Testing of Switchboard Relays, Meters, and Instruments

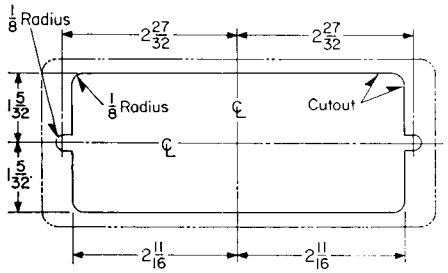
Accessory Devices

Description	Style Number
Series Test Plug for "in service" testing	See Standard Ratings
Separate Source Test Plug for test using separate supply source	1164 046Ⓢ
Individual Current Circuit Test Plug for test of one current circuit	07B4618G04Ⓢ
Interlock Bar: for 2 adjacent switch units	1270 547
for 3 adjacent switch units	1164 048
for 4 adjacent switch units	02C9834G03
for 5 adjacent switch units	02C9834G04
for 10 adjacent switch units	02C9834G05
Nut Driver: for FT-1 Flexitest Switch	877A821H01Ⓢ

Outline Dimensions (In Inches)



Drilling Plan



Weights (Pounds)

	Net	Shipping
FT-1 Switch	1¾	3
Series Test Plug	1½	3
Separate Source Test Plug	1½	3

Further Information

Prices: PL 41-020

For further data concerning the construction and use of series test plugs and separate test plugs, see Descriptive Bulletin 41-075.

Westinghouse Electric Corporation
Relay-Instrument Division: Newark Plant, Newark, N. J. 07101
Printed in USA

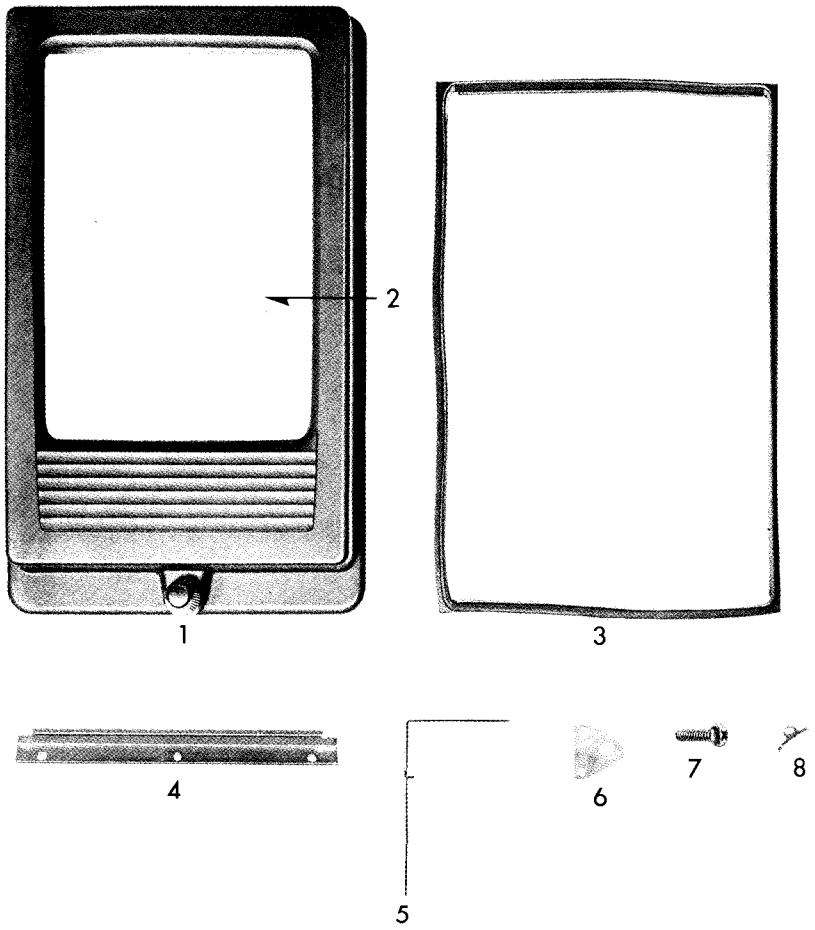
Westinghouse

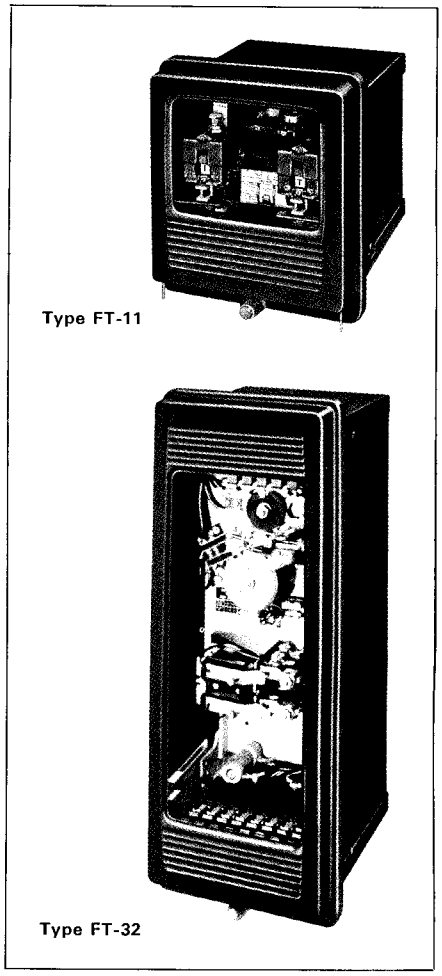
Universal Flexitest® Cases

Types FT-11, 21, 22, 31, 32, 41, 42

Ordering Information

- Give style number and name of part.
- Give the complete nameplate reading.
- State method of shipment desired.
- Send all orders or correspondence to nearest sales office of the company.





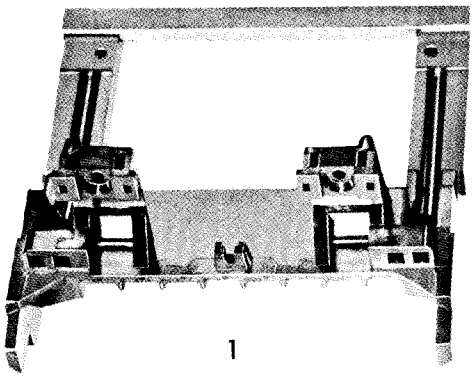
Reference Number	Description of Part	Style Number of Part			
		Type FT-11	FT-21, FT-22	FT-31, FT-32	FT-41, FT-42
1	Cover assembly	③	③	③	③
2	Window glass (for dimensions see footnote ⑤)	1730 645	1730 647	1875 690	1730 646
3	Gasket	1875 022	1875 023	1875 024	1875 025
4	Hinge	52D629H03	52D6292H03	52D6292H03	52D6292H03
5	Reset lever	③	③	③	③
6	Washer to retain reset lever	877A649H02	877A649H02	877A649H02	877A649H02
7	Screw to retain reset lever	1875 313	1875 313	1875 313	1875 313
7	Screw for hinge	57D4483H03	57D4483H03	57D4483H03	57D4483H03
8	Clip to hold glass	184A258H01	184A258H01	184A258H01	184A258H01
①	Cement used to cement glass to cover	④	④	④	④
①	Screw for glass clip #4 x 3/16 round head steel sheet metal screw, finish 22AA03②	877A585H01	877A585H01	877A585H01	877A585H01

Parts indented are included in the part under which they are indented.

① Not illustrated. ② Nickel plated finish.
③ When ordering, specify style and type of relay for which part is required.
④ Buy from Minnesota Mining and Mfg. Co. #EC-870 in 5 ounce tube.
⑤ Glass dimensions: FT-11 (3¾ x 3³⁹⁄₆₄); FT-21, 22 (4¾ x 6⁵¹⁄₆₄); FT-31, 32 (4¾ x 11⁵⁄₁₆); FT-41, 42 (4¾ x 14³⁄₆₄).

September, 1973
Supersedes RPD 41-076A1 dated December, 1972
E, D, C/2780

Westinghouse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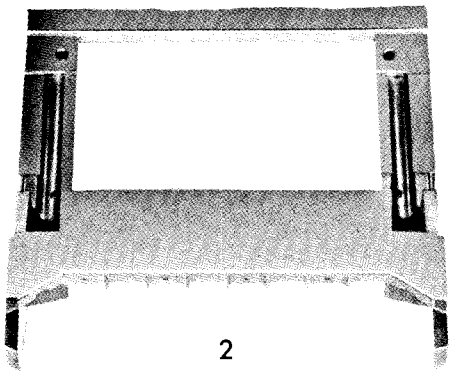
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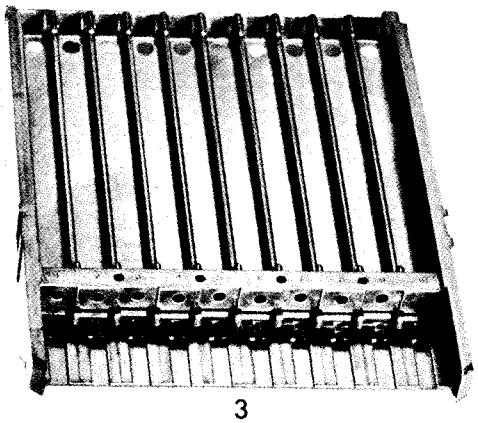
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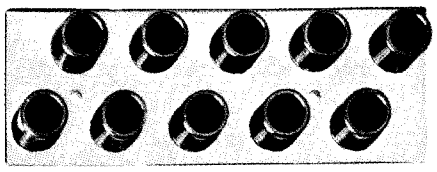
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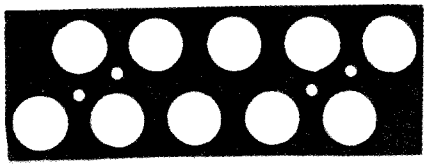
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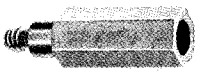
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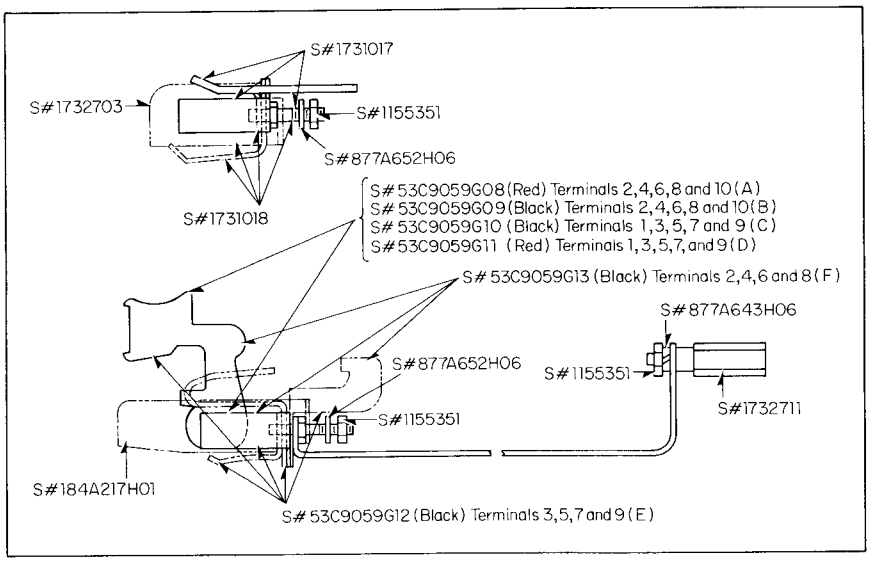
7


8

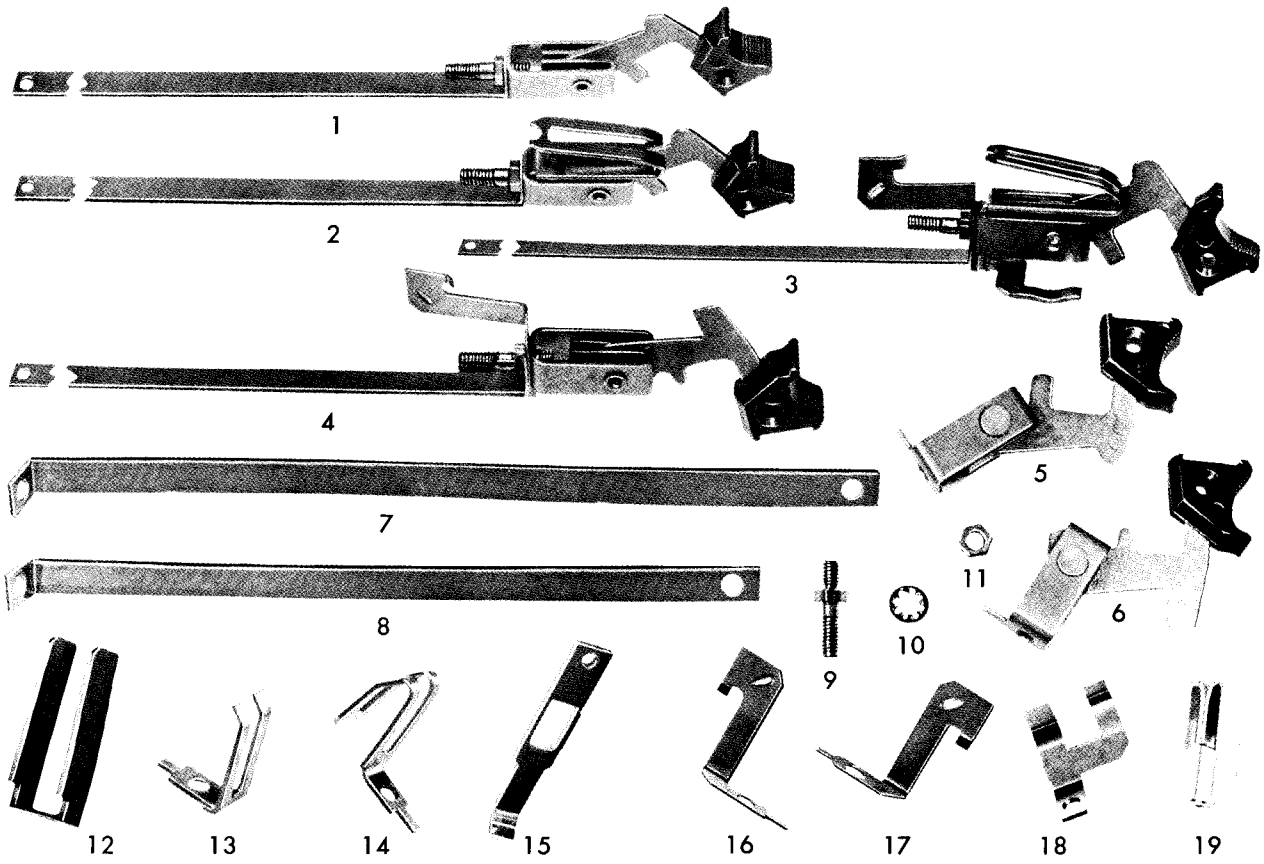

9



Reference Number	Description of Part	Style Number
1	Switch jaw block insulation with pedestals	55B6759G02
2	Switch jaw block insulation without pedestals	1732 784
3	Switch blade block insulation	1732 783
4	Terminal block⑥	1732 731
5	Gasket for terminal block	1732 702
6	Terminal	1732 711
7	Speed nut	1731 016
8	Expansion nut	1731 042
9	Self tapping screw	1875 304
10-11	Switch blade and jaw kit assembly	
A	Trip (red)	3500A28G13
B	Potential (black)	3500A28G09
C	Potential (black)	3500A28G10
D	Trip (red)	3500A28G14
E	Current SC (black)	3500A28G11
F	Current SC (black)	3500A28G12

⑥ Knock out holes as required.

Universal Flexitest⑦ Cases

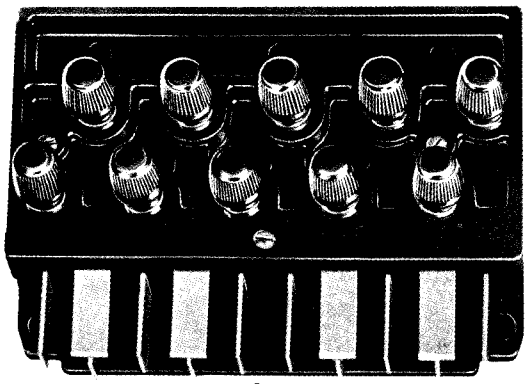


Reference Number	Description of Part	Style Number
⑦1	Switch blade with short connector strap – red handle	53C9059G08
⑦1	Switch blade with short connector strap – black handle	53C9059G09
⑧1	Switch blade with long connector strap – black handle	53C9059G10
⑧1	Switch blade with long connector strap – red handle	53C9059G11
⑨2	Switch blade with long connector strap and current jack spring – black handle	53C9059G14
⑩2	Switch blade with short connector strap and current jack spring – black handle	288B721G01
⑨3	Switch blade with long connector strap, auxiliary short circuit spring and current jack spring – black handle	53C9059G12
⑩4	Switch blade with short connector strap and auxiliary short circuit spring – black handle	53C9059G13
5	Switch blade and hinge assembly tapped – with black handle	53C9041G08
5	Switch blade and hinge assembly tapped – with red handle	53C9041G07
5	Switch blade and hinge assembly not tapped – with black handle	53C9041G09
6	Switch blade and hinge assembly tapped – with black handle	53C9041G05
7	Connector strap – long	1732 753
8	Connector strap – short	1732 752
9	Stud	1732 713
10	Shakeproof washer	109A953H06
11	Nut for stud	1155 351
12	Barrier – long (2.05 inch) for switch blades – all except top block FT-22	184A217H01
12	Barrier – short (1.8 inch) for switch blades – FT-22 top block only	184A380H01
12	Barrier – short (1.4 inch) for switch jaw block only	1732 703
⑪	L-shaped barrier for switch jaw block (5000 volt insulation only)	183A452H01
13	Current jack connector (for switch jaw block)	184A277H01
14	Current jack spring – not tapped	184A244H01
14	Current jack spring – tapped	184A244H02
15	Connector clip	1732 710
16	Contact spring, left, front view	1732 721
17	Contact spring, right, front view	1732 722
18	Short circuit spring, blade operated short-circuiting switch	187A704H01
19	Switch jaw	1732 706

⑦ Used in block positions 2-4-6-8-10.
⑧ Used in block positions 1-3-5-7-9.
⑨ Used in block positions 3-5-7-9.
⑩ Used in block positions 2-4-6-8.
⑪ Not illustrated.

Universal Flexitest®
Cases

Renewal Parts for Ten-Circuit Test Plug



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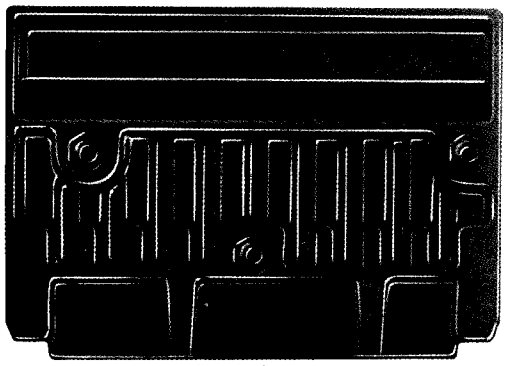

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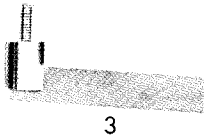

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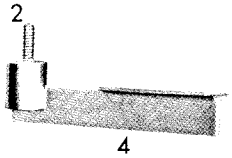

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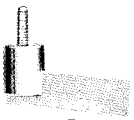

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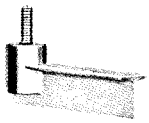

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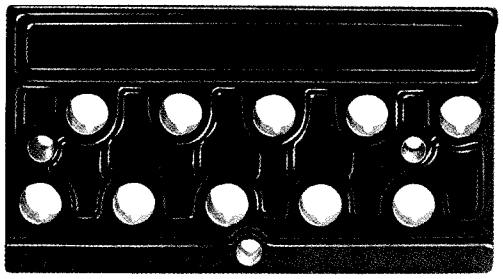
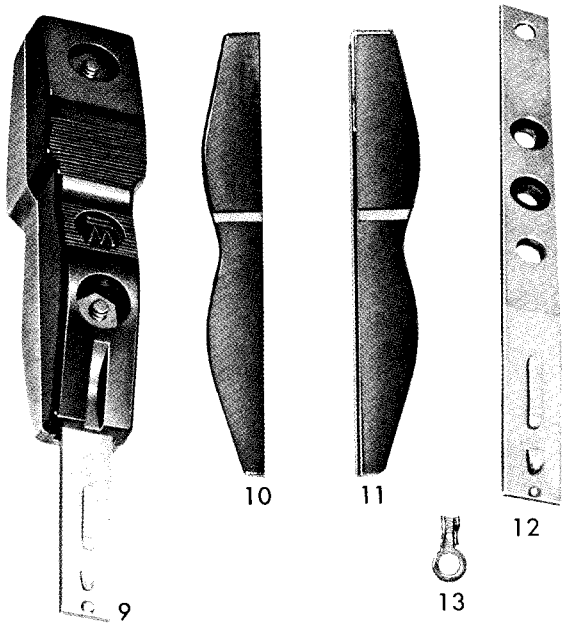


8

Reference Number	Description of Part	Style Number
1	Ten-circuit test plug	1164 046
2	Bottom insulation	1340 791
3	Stud and blade, long	1537 729
4	Stud and blade, t-shaped, long	1537 731
5	Stud and blade, short	1537 728
6	Stud and blade, t-shaped, short	1537 730
7	Nut	1725 785
8	Top insulation	1340 792

Parts indented are included in the part under which they are indented.

Renewal Parts for Ammeter Test Plug



9 10 11 12 13

Reference Number	Description of Part	Style Number
9	Ammeter test plug	07B4618G04
10	Insulation, black (2 required)	01C6115H03
11	Insulation, red (2 required)	01C6115H04
12	Blade assembly	07B4618G03
13	Terminal clip	324 091

Parts indented are included in the part under which they are indented.

Renewal Parts for Interlocking Bar for Switch

15 14 15

Reference Number	Description of Part	Style Number
14	Tie bar – 2-switch blade	1270 537
14	Tie bar – 3-switch blade	1270 538
14	Tie Bar – 4-switch blade	1340 225
15	.112-40 x ¼ flat head steel machine screw	877A525H03

Westinghouse Electric Corporation
Relay Instrument Division, Newark, N. J.
Printed in USA

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

RELAYS IN TYPE FT11, FT21, FT22, FT31, FT32, FT41, FT42 CASES

The type FT (Flexitest) cases are dust-proof enclosures combining relay units and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are three main units of the type FT case: the case, cover, and chassis. The case is an all-steel welded housing containing the hinge half of the knife-blade test switches and the terminals for external connections. The cover is a molded phenolic frame with a clear glass window, a thumb nut, a reset lever, and a hinge. The hinge fits over the top flange of the case. The thumb nut, which fastens to a stud on the bottom flange of the case, holds the cover securely in place on the case. The chassis is a steel frame that supports the relay elements and the contact jaw half of the test switches. This slides in and out of the case. The electrical connections between the base and chassis are completed through the closed knife-blades.

There are four different size cases available. These are designated the FT11, FT21 or 22, FT31 or 32, and the FT41 or 42. The first digit of the designation represents the physical size and the second the number of terminal blocks. One terminal block can accommodate up to ten terminals. The case may be either semi-flush or projection mounted.

REMOVING CHASSIS

To remove the chassis, first remove the cover by unscrewing the captive thumb nut at the bottom and lifting the cover hinge off the top flange of the case. This exposes the relay units and all the test switches for inspection and testing. The next step is to open the test switches. *Always open the red handle switches first before any of the black handle switches or the cam action latches.* This opens the trip circuit to prevent accidental tripout. Then open all the remaining switches. The order of opening the remaining switches is not important. In opening the test switches they should be moved all the way back against the stops. With all the switches fully opened, release the cam action latch or latches and pull outward. The chassis can be set on a test bench for easy inspection, maintenance and test.

After removing the chassis a duplicate chassis may be inserted in the case or the blade portion of the switches can be closed and the cover put in place without the chassis. The chassis-operated auxiliary shorting switch remains closed with chassis out to prevent open circuiting the current transformers when the current test switches are closed. The operation of the auxiliary shorting switch is visible from the front of the relay, when the chassis is in place.

When the chassis is to be put back in the case, the above procedure is to be followed in the reversed order. *The red handle switch should not be closed until after the chassis has been latched in place and all of the black handle switches closed.*

ELECTRICAL CIRCUITS

Each terminal in the base connects through a test switch to the relay units in the chassis as shown on the internal schematic diagrams. The relay terminals are identified by numbers marked on the outside of the case. The test switch positions are identified by numbers marked on the molded blocks.

The potential and control circuits through the relay are disconnected from the external circuit by opening the associated test switches. Opening the current test switch short-circuits the current transformer secondary and disconnects one side of the relay coil but leaves the other side of the coil connected to the external circuit through the current test jack jaws. This circuit can be isolated by inserting the current test plug (without external connections), or by inserting the ten circuit test plug. Both switches of the current test switch pair must be open when using the current test plug in this manner to short-circuit the current transformer secondary.

TESTING

The relays can be tested in service, in the case

but with the external circuits isolated or out of the case as follows:

TESTING IN SERVICE

The ammeter test plug can be inserted in the current test jaws after opening the knife-blade switch to check the current through the relay, as shown in Fig. 1. This plug consists of two conducting strips separated by an insulating strip. The ammeter is connected to these strips by terminal screws and the leads are carried out through holes in the back of the insulated handle.

Voltages between the potential circuits can be measured conveniently by clamping #2 clip leads on the projecting clip lead lug on the contact jaw.

TESTING IN CASE

With all blades in the full open position, the ten circuit test plug Fig. 4 can be inserted in the contact jaws. This connects the relay units to a set of binding posts and completely isolates the relay circuits from the external connections by means of an insulating barrier on the plug. The external test circuits are connected to these binding posts. The plug is inserted in the bottom test jaws with the binding posts up and in the top test switch jaws with the binding posts down.

The external test circuits may be made to the relay units by #2 test clip leads instead of the test plug. When connecting an external test circuit to the current elements using clip leads, care should be taken to see that the current test jack jaws are open so that the relay is completely isolated from the external circuits. Suggested means for isolating this circuit are outlined above, under "Electrical Circuits".

TESTING OUT OF CASE

With the chassis removed from the case, relay units may be tested by using the ten circuit test plug or by #2 test clip leads as described above. Any critical factory calibration is made with the chassis in the case and removing the chassis from the case may change the calibration values of these relays.

An internal schematic is available for each individual relay showing the schematic internal wiring. The outlines of the various cases are shown in Fig. 5 to Fig. 11.

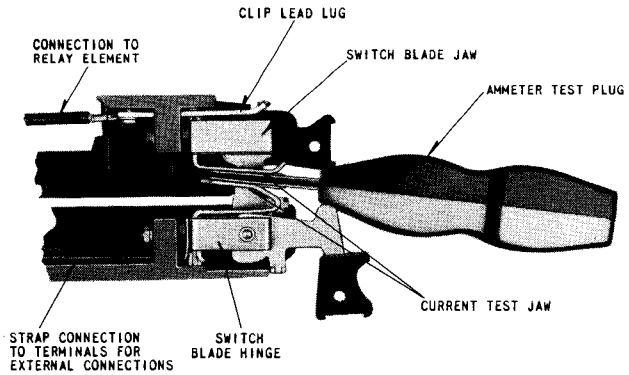


Fig. 1. Ammeter Test Plug in Testing Positions

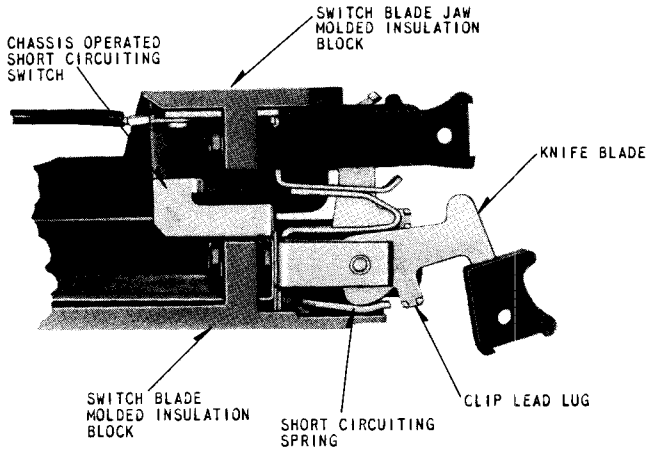


Fig. 2. Short Circuiting Switch

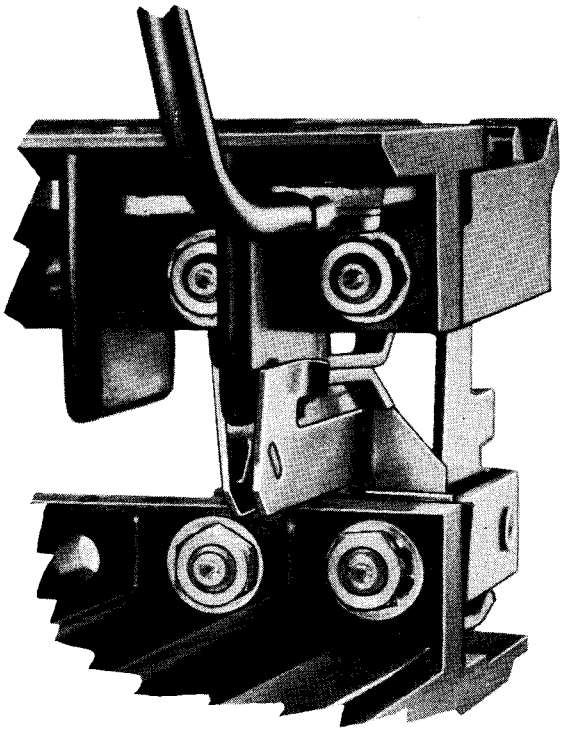


Fig. 3. Auxiliary Short Circuiting Switch (Enlarged View)

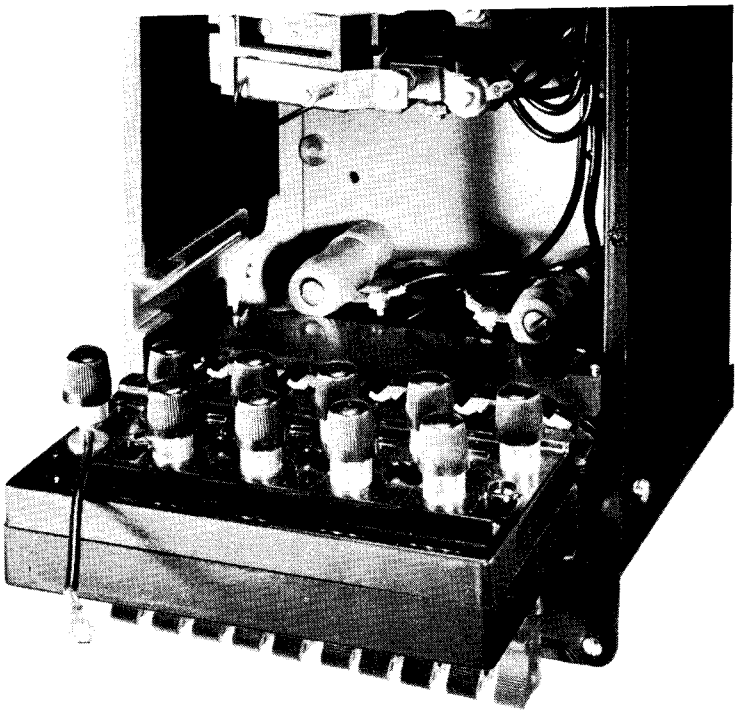
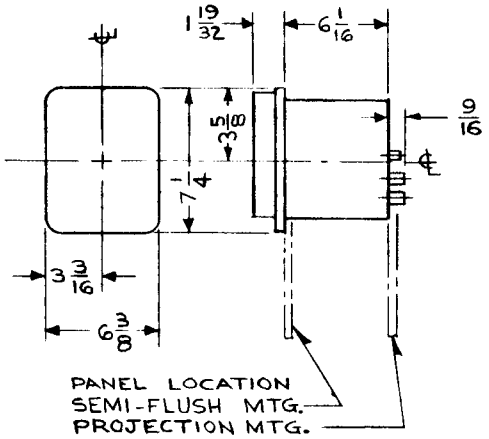
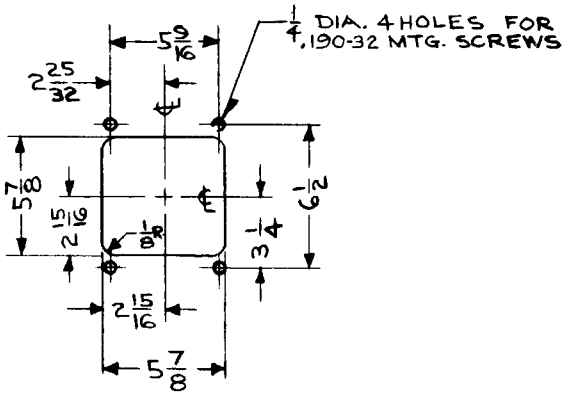
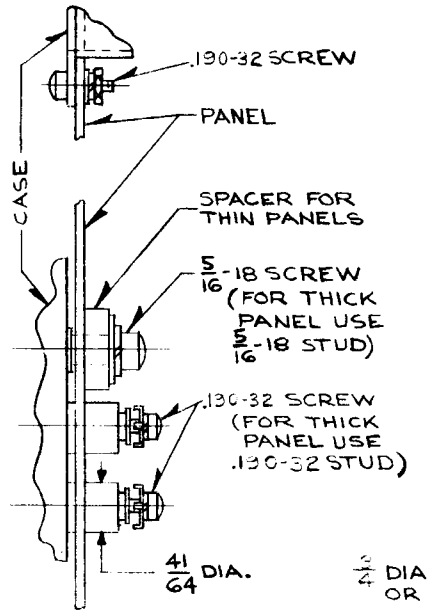
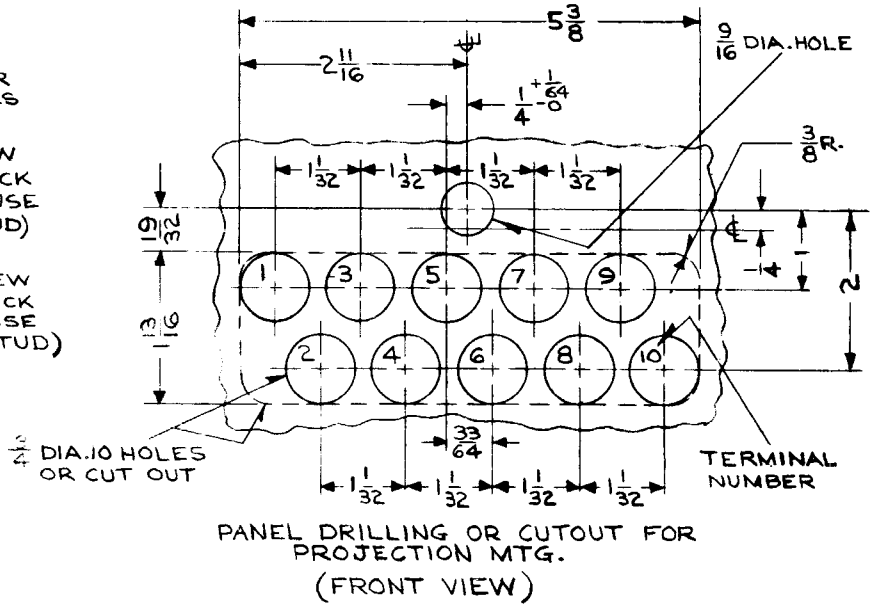


Fig. 4. Multi-Circuit Test Plug in Testing Position









NOTE : ALL DIMENSIONS
IN INCHES

57-D-7900

Fig. 5. Outline and Drilling Plan for the Type FT11 Case

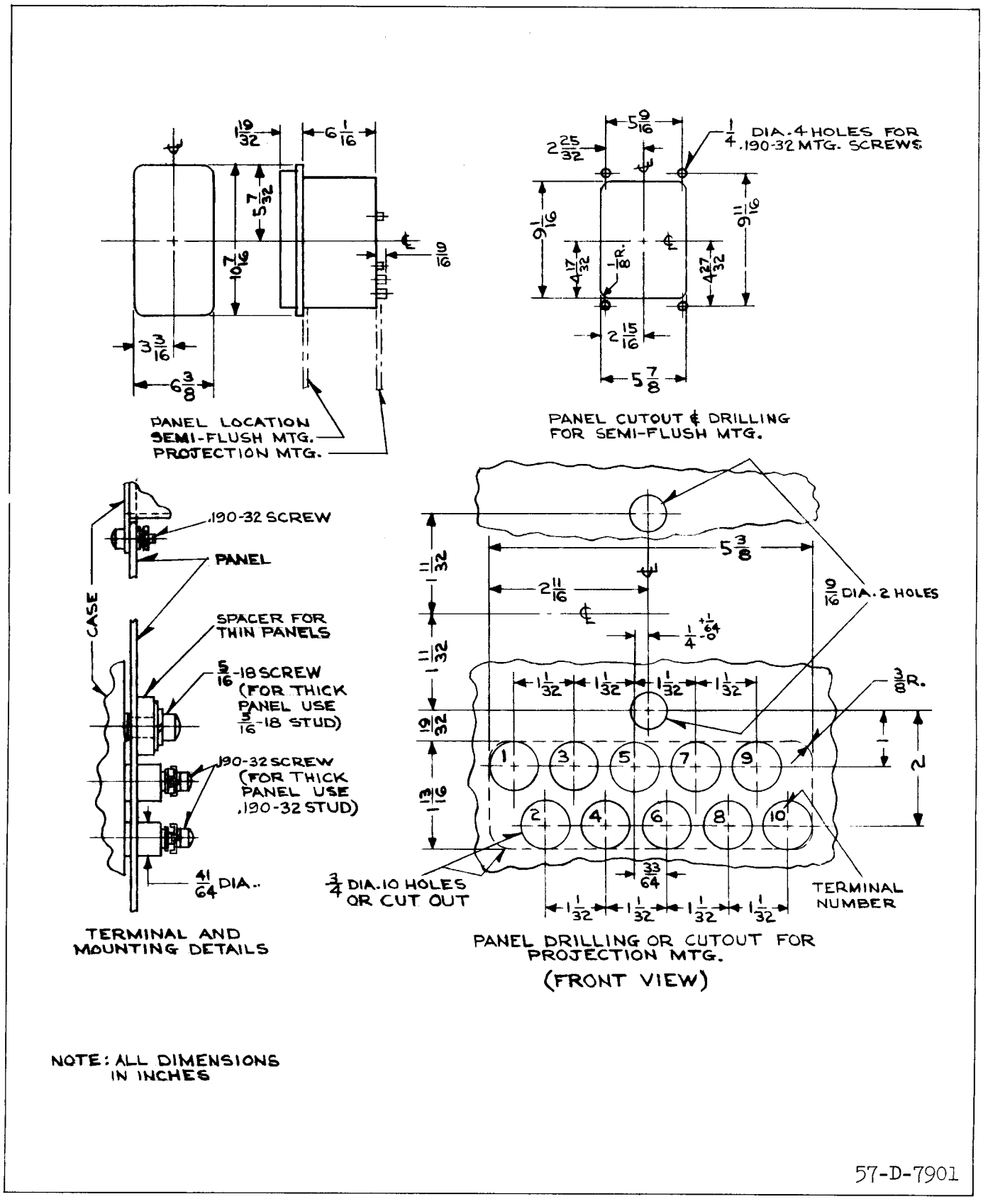


Fig. 6. Outline and Drilling Plan for the Type FT21 Case

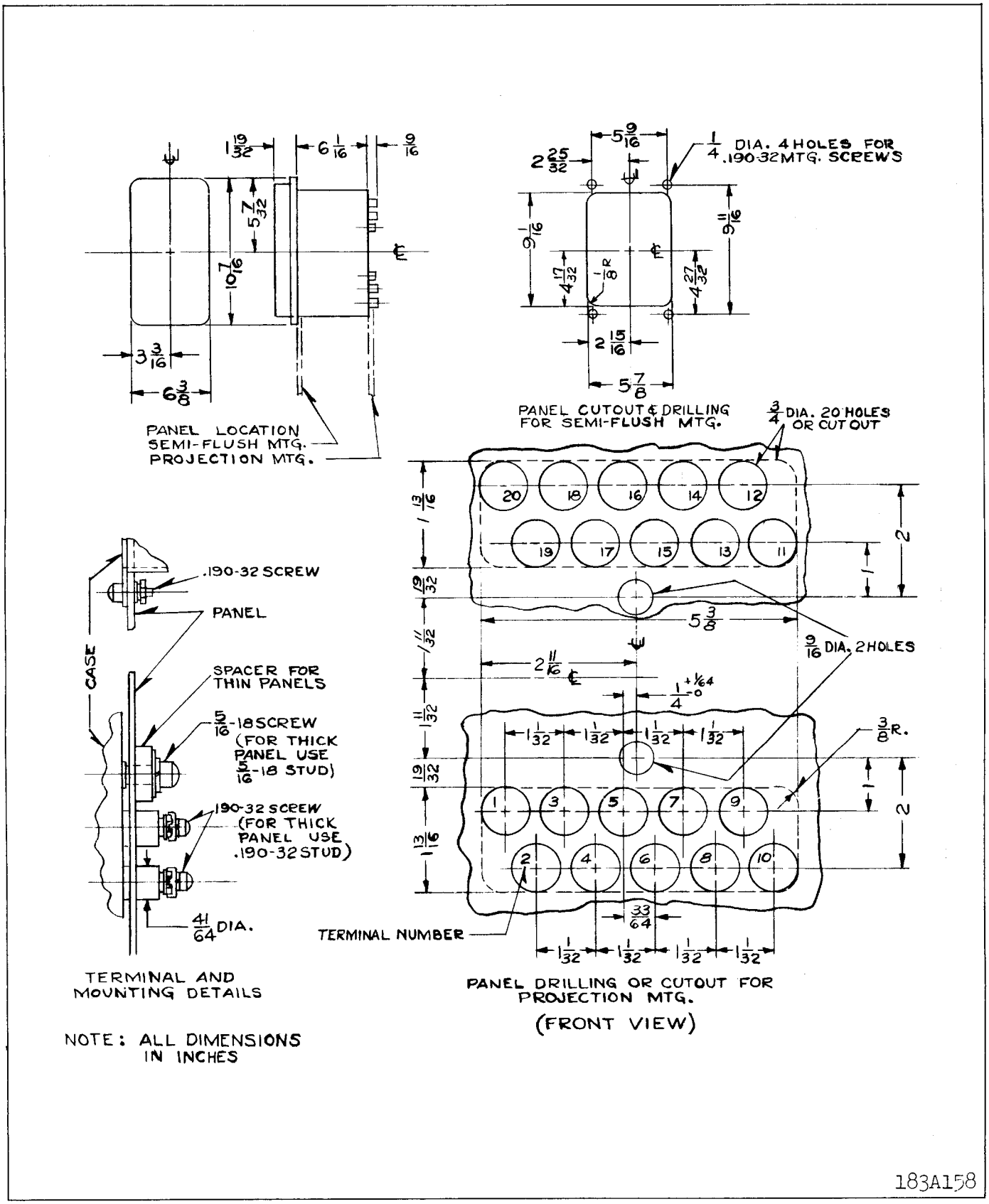


Fig. 7. Outline and Drilling Plan for the Type FT22 Case

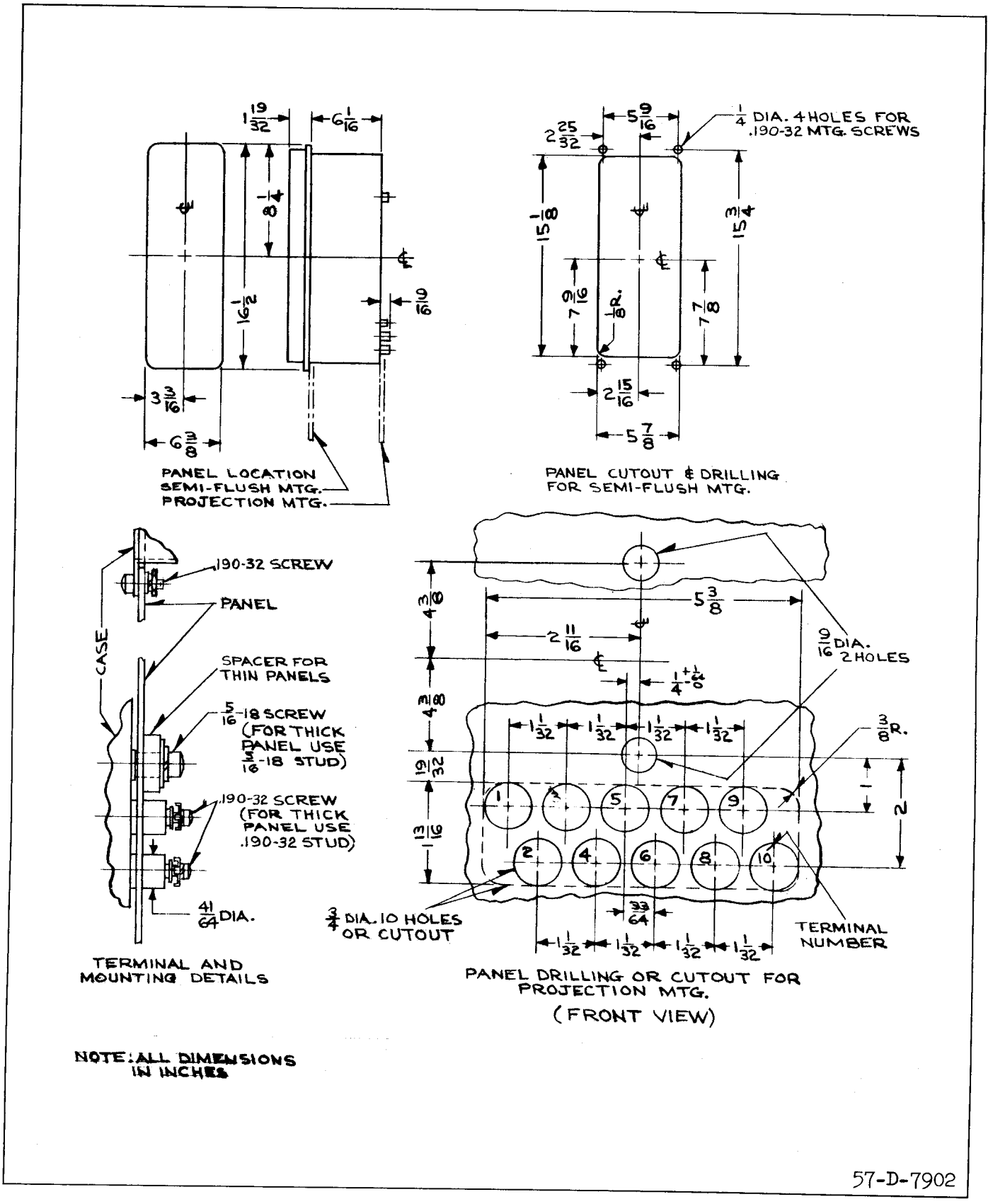


Fig. 8. Outline and Drilling Plan for the Type FT31 Case

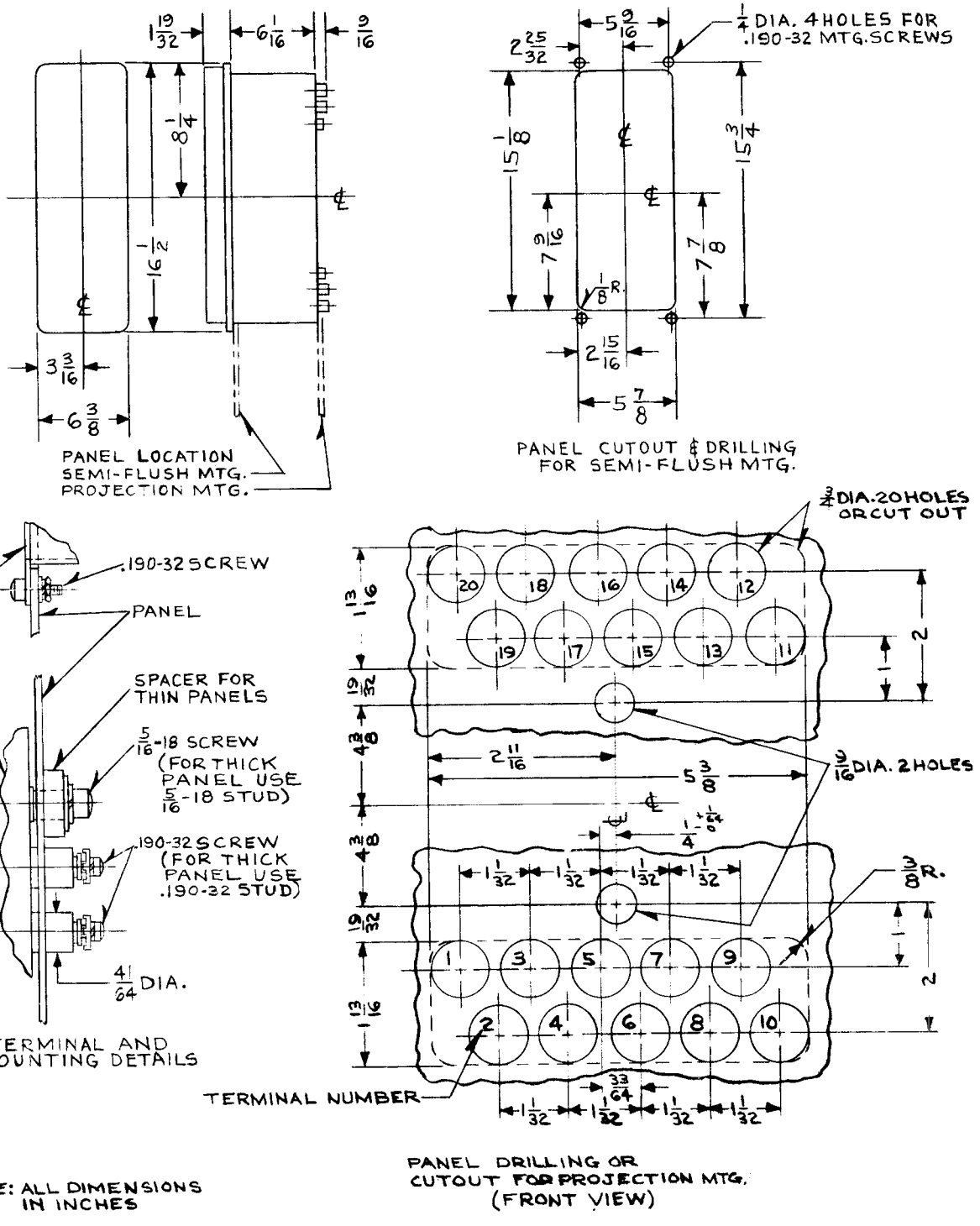


Fig. 9. Outline and Drilling Plan for the Type FT32 Case

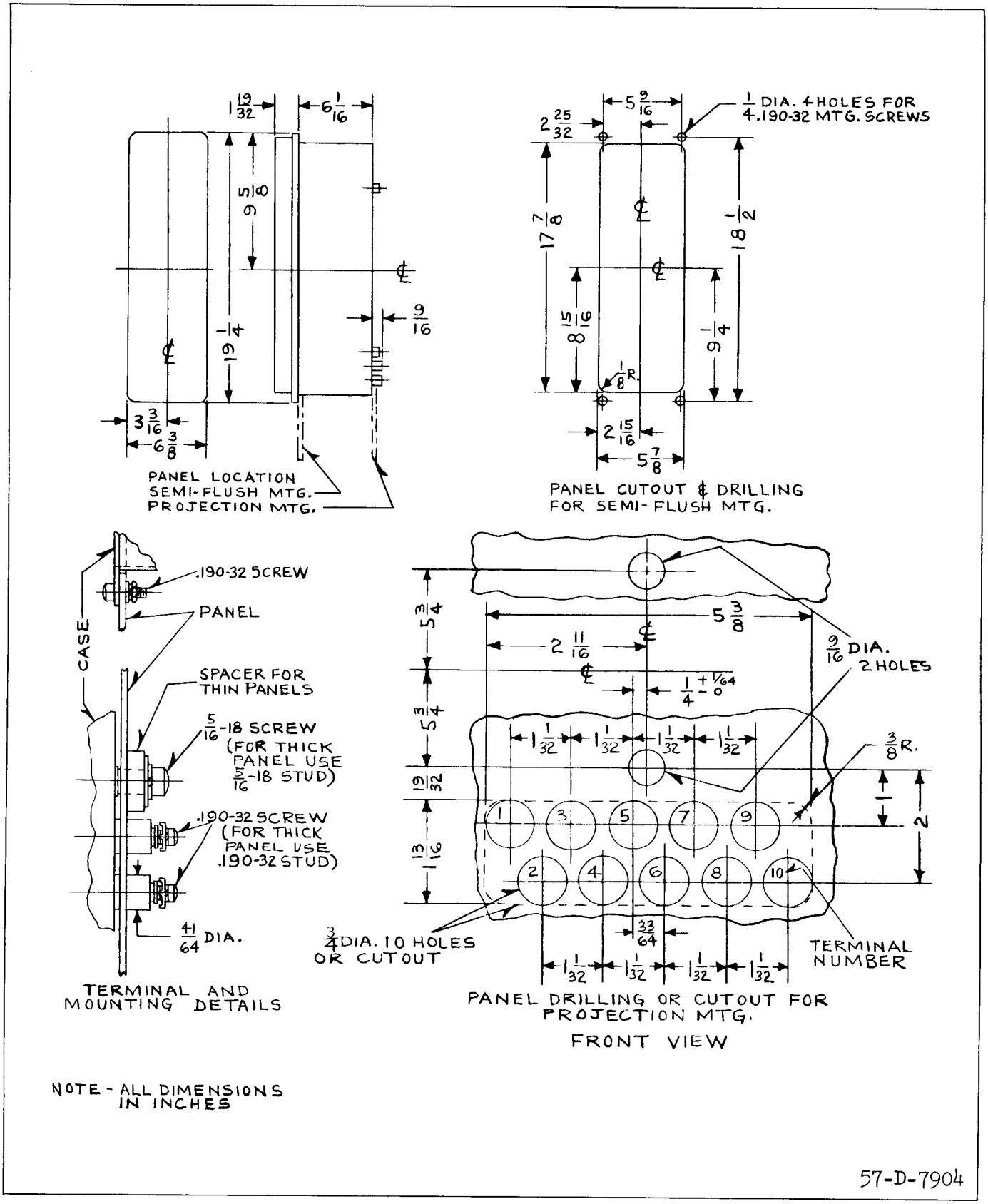


Fig. 10. Outline and Drilling Plan for the Type FT41 Case

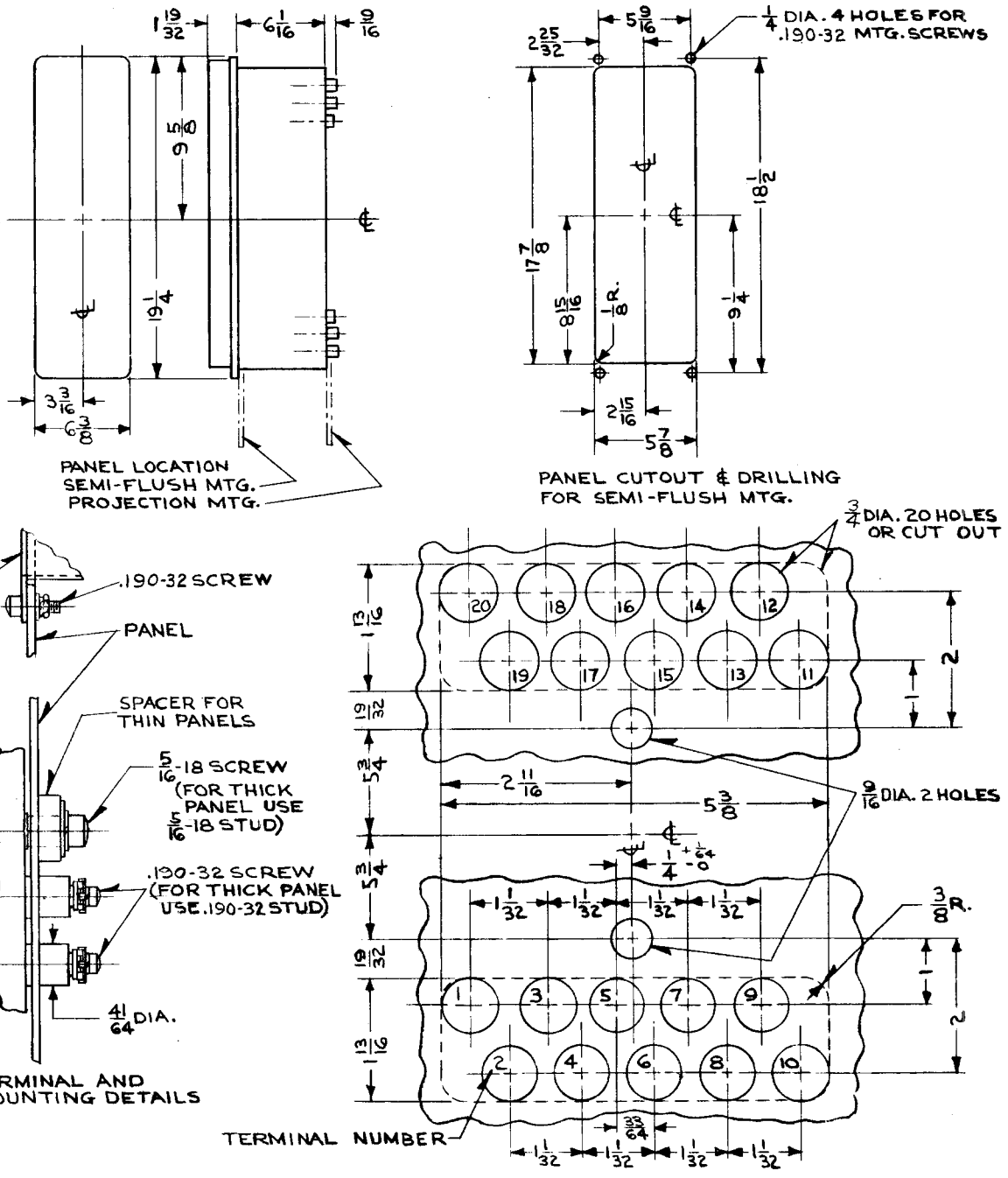


Fig. 11. Outline and Drilling Plan for the Type FT42 Case

WESTINGHOUSE ELECTRIC CORPORATION

RELAY DEPARTMENT **NEWARK, N. J.**

Printed in U. S. A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

RELAYS IN TYPE FT11, FT21, FT22, FT31, FT32, FT41, FT42 CASES

The type FT (Flexitest) cases are dust-proof enclosures combining relay units and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are three main units of the type FT case: the case, cover, and chassis. The case is an all-steel welded housing containing the hinge half of the knife-blade test switches and the terminals for external connections. The cover is a molded phenolic frame with a clear glass window, a thumb nut, a reset lever, and a hook * shaped support. The support fits over the top flange of the case. The thumb nut, which fastens to a stud on the bottom flange of the case, holds the cover securely in place on the case. The chassis is a steel frame that supports the relay elements and the contact jaw half of the test switches. This slides in and out of the case. The electrical connections between the base and chassis are completed through the closed knife-blades.

There are four different size cases available. These are designated the FT11, FT21 or 22, FT31 or 32, and the FT41 or 42. The first digit of the designation represents the physical size and the second the number of terminal blocks. One terminal block can accommodate up to ten terminals. The case may be either semi-flush or projection mounted.

REMOVING CHASSIS

To remove the chassis, first remove the cover by unscrewing the captive thumb nut at the bottom * and lifting the cover support off the top flange of the case. This exposes the relay units and all the test switches for inspection and testing. The next step is to open the test switches. *Always open the red handle switches first before any of the black handle switches or the cam action latches.* This opens the trip circuit to prevent accidental tripout. Then open all the remaining switches. The order of opening the remaining switches is not important. In opening the test switches they should be moved all the way back against the stops. With all the switches fully opened, release the cam action latch or latches and pull outward. The chassis can be set on a test bench for easy inspection, maintenance and test.

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ELECTRICAL CIRCUITS

Each terminal in the base connects through a test switch to the relay units in the chassis as shown on the internal schematic diagrams. The relay terminals are identified by numbers marked on the outside of the case. The test switch positions are identified by numbers marked on the molded blocks.

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TESTING

The relays can be tested in service, in the case

but with the external circuits isolated or out of the case as follows:

TESTING IN SERVICE

The ammeter test plug can be inserted in the current test jaws after opening the knife-blade switch to check the current through the relay, as shown in Fig. 1. This plug consists of two conducting strips separated by an insulating strip. The ammeter is connected to these strips by terminal screws and the leads are carried out through holes in the back of the insulated handle.

Voltages between the potential circuits can be measured conveniently by clamping #2 clip leads on the projecting clip lead lug on the contact jaw.

TESTING IN CASE

With all blades in the full open position, the ten circuit test plug Fig. 4 can be inserted in the contact jaws. This connects the relay units to a set of binding posts and completely isolates the relay circuits from the external connections by means of an insulating barrier on the plug. The external test circuits are connected to these binding posts. The plug is inserted in the bottom test jaws with the binding posts up and in the top test switch jaws with the binding posts down.

The external test circuits may be made to the relay units by #2 test clip leads instead of the test plug. When connecting an external test circuit to the current elements using clip leads, care should be taken to see that the current test jack jaws are open so that the relay is completely isolated from the external circuits. Suggested means for isolating this circuit are outlined above, under "Electrical Circuits".

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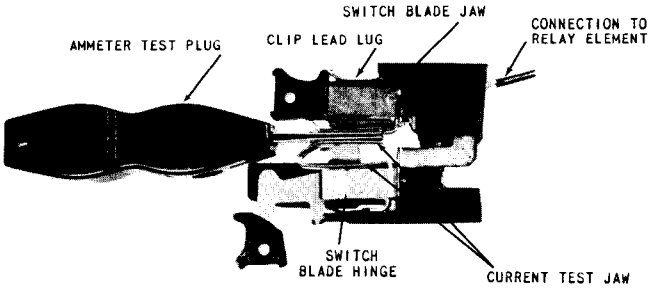
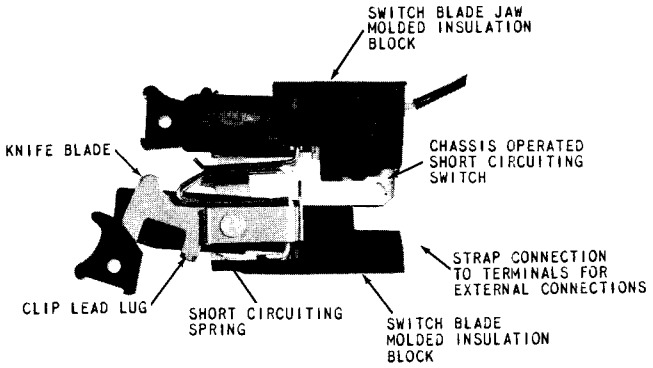
An internal schematic is available for each individual relay showing the schematic internal wiring. The outlines of the various cases are shown in Fig. 5 to Fig. 11.



* *Fig. 1. Ammeter Test Plug in Testing Positions*



* *Fig. 2. Short Circuiting Switch*

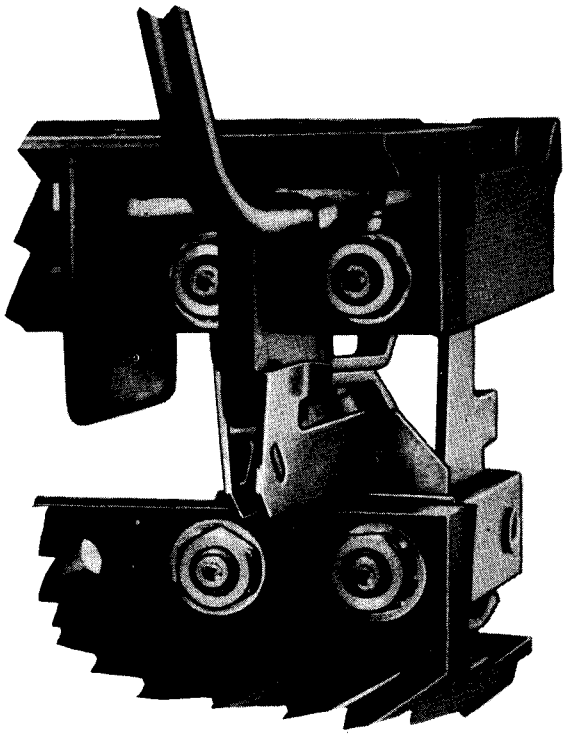
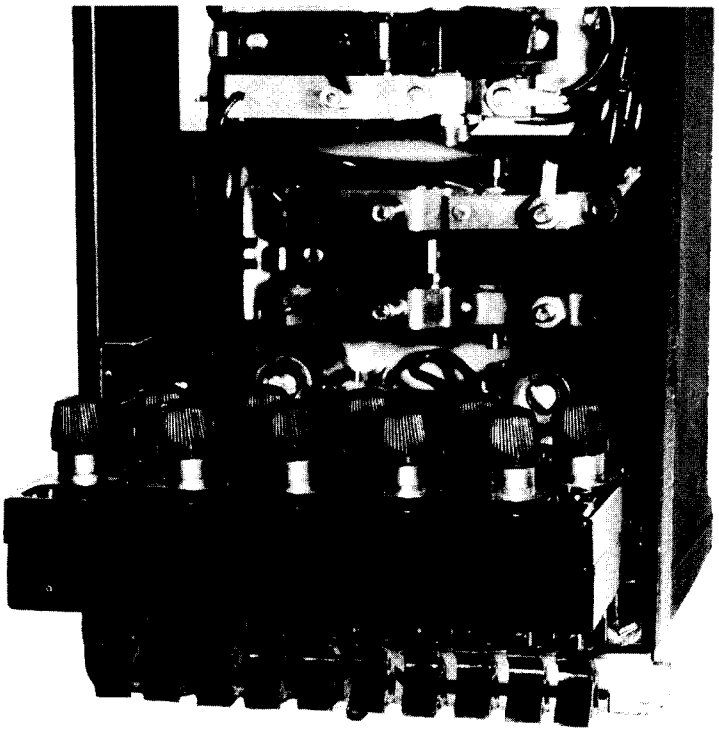
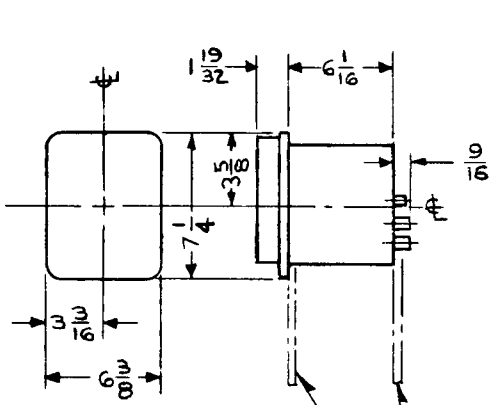
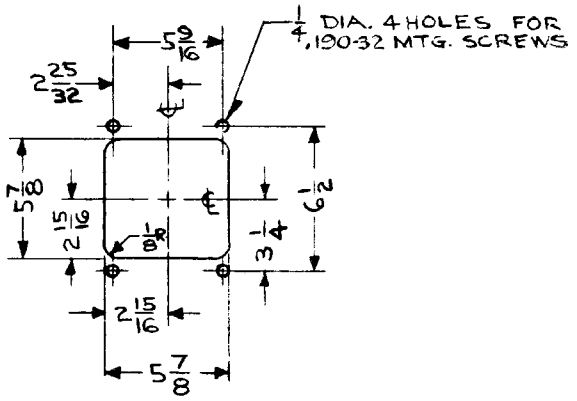


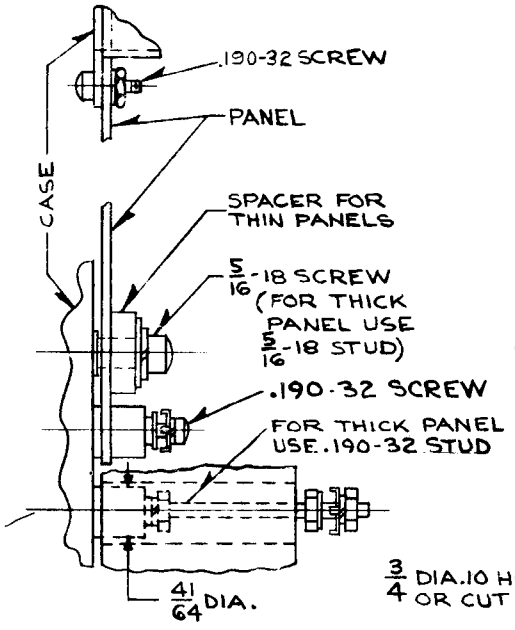
Fig. 3. Auxiliary Short Circuiting Switch (Enlarged View)



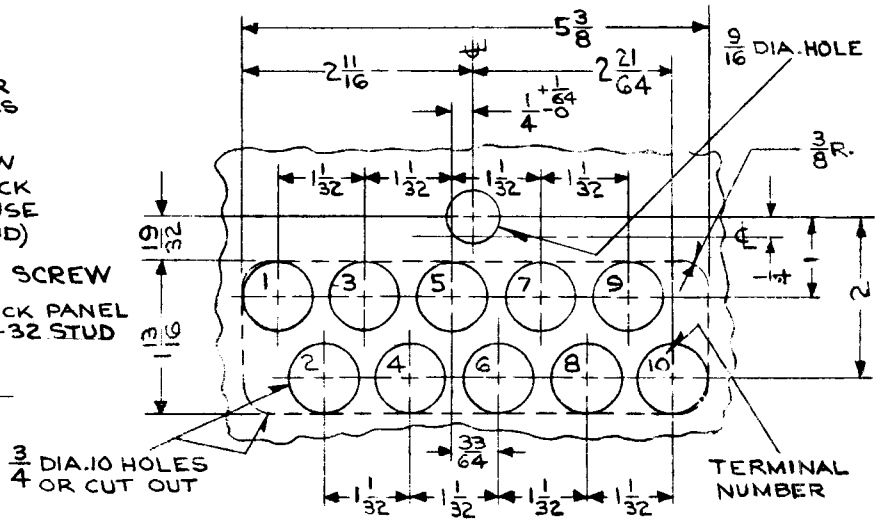
* *Fig. 4. Multi-Circuit Test Plug in Testing Position*







TERMINAL AND
MOUNTING DETAILS

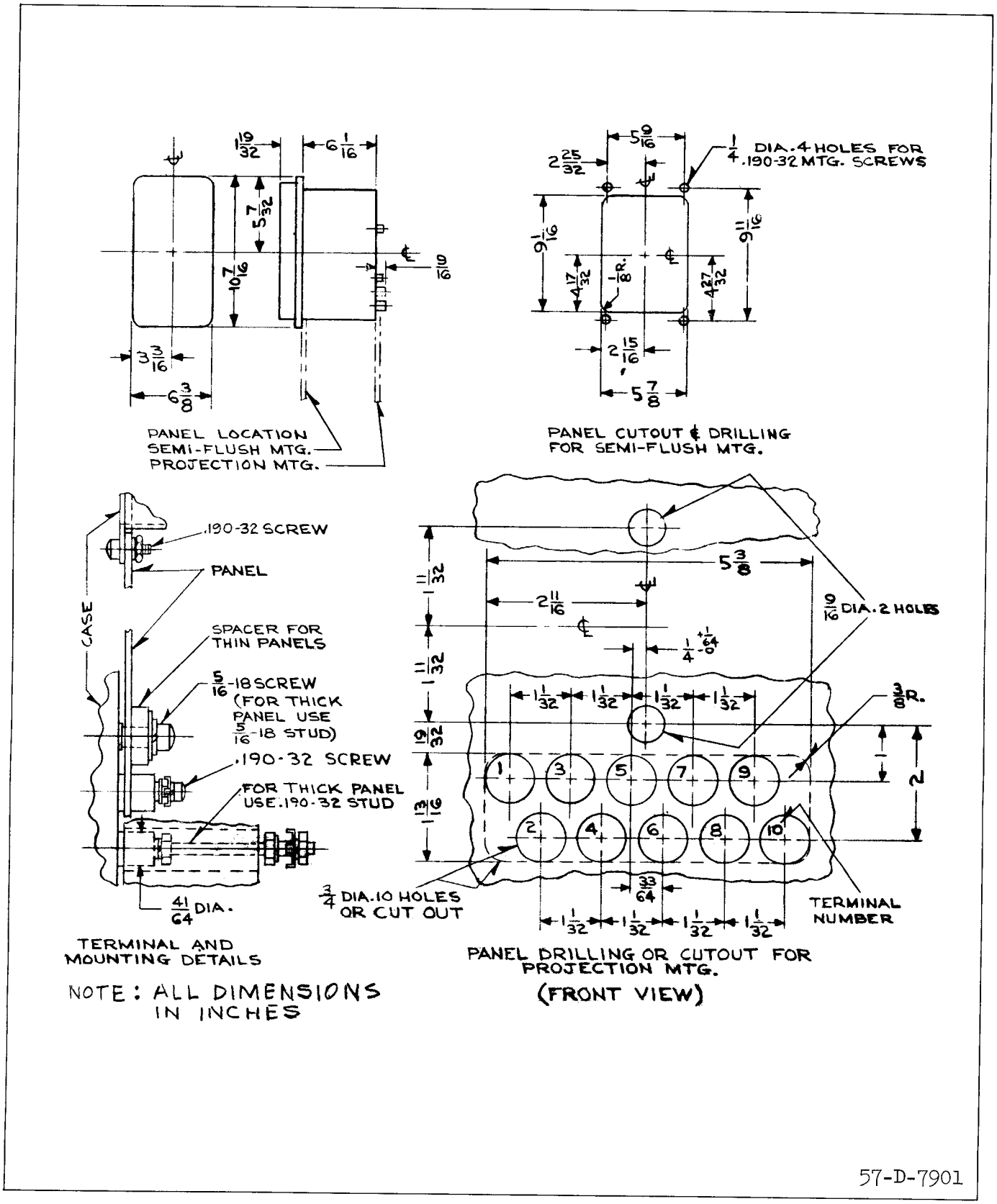


PANEL DRILLING OR CUTOUT FOR
PROJECTION MTG.
(FRONT VIEW)

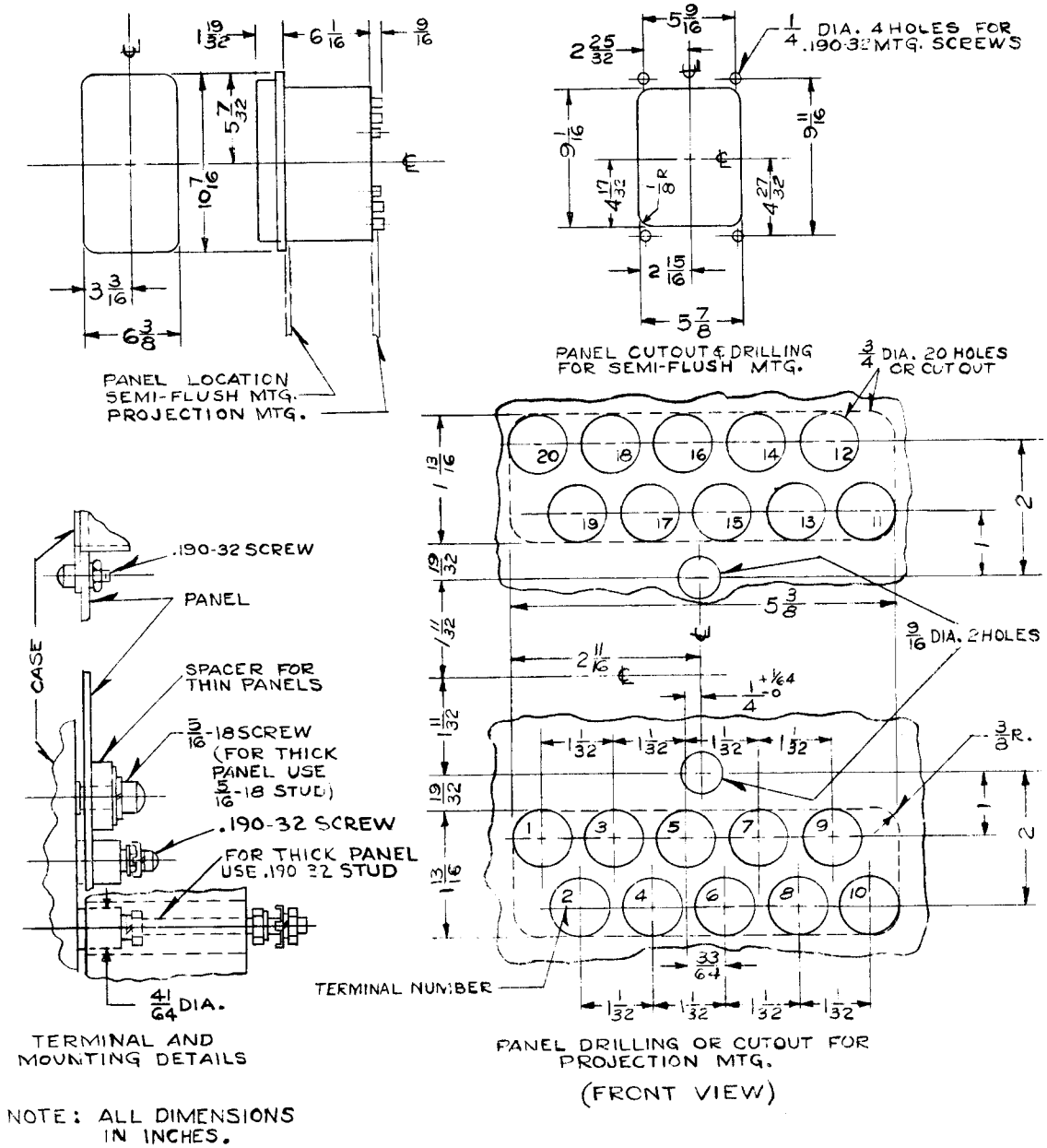
NOTE: ALL DIMENSIONS
IN INCHES.

57-D-7900

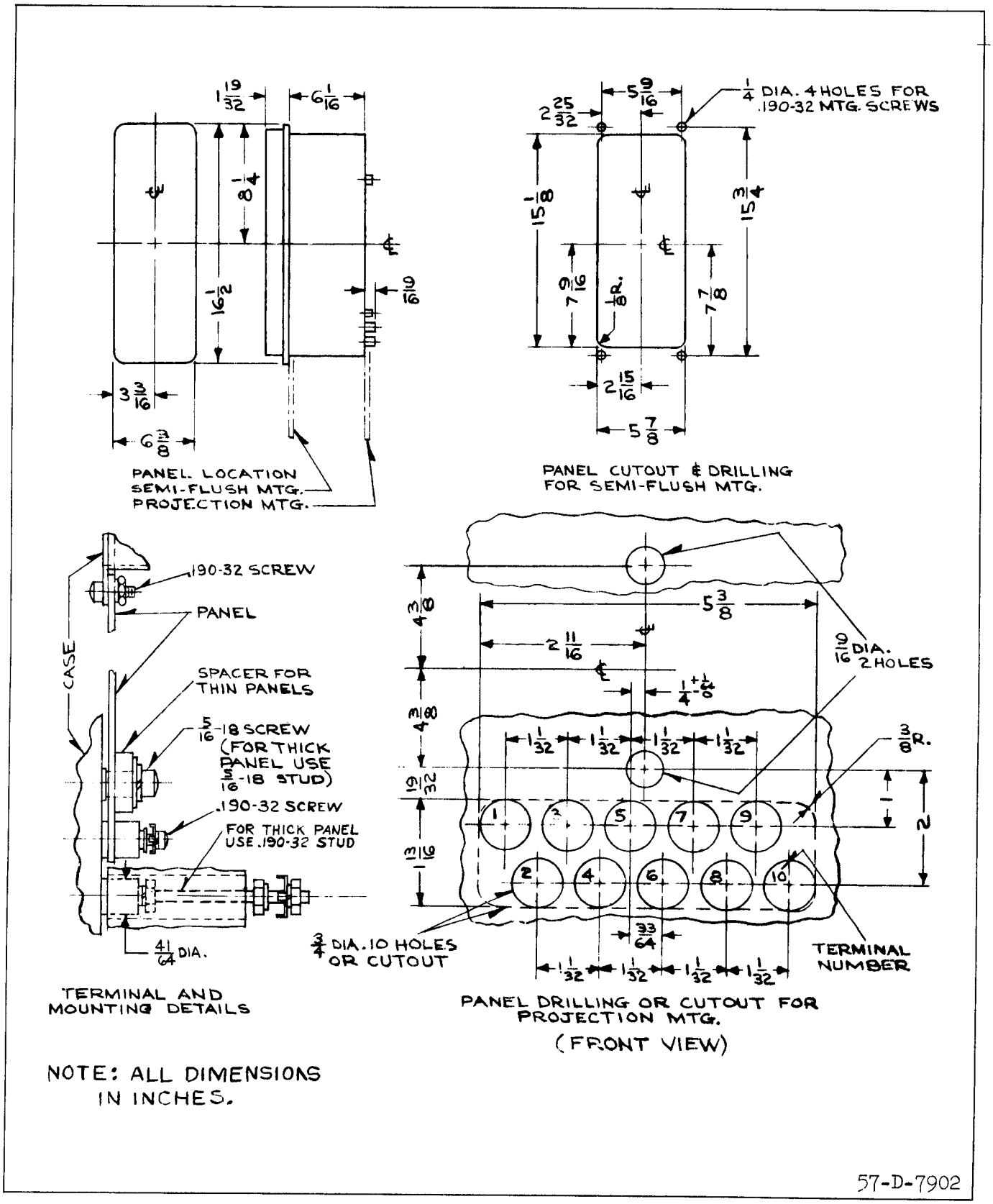
* *Fig. 5. Outline and Drilling Plan for the Type FT11 Case*



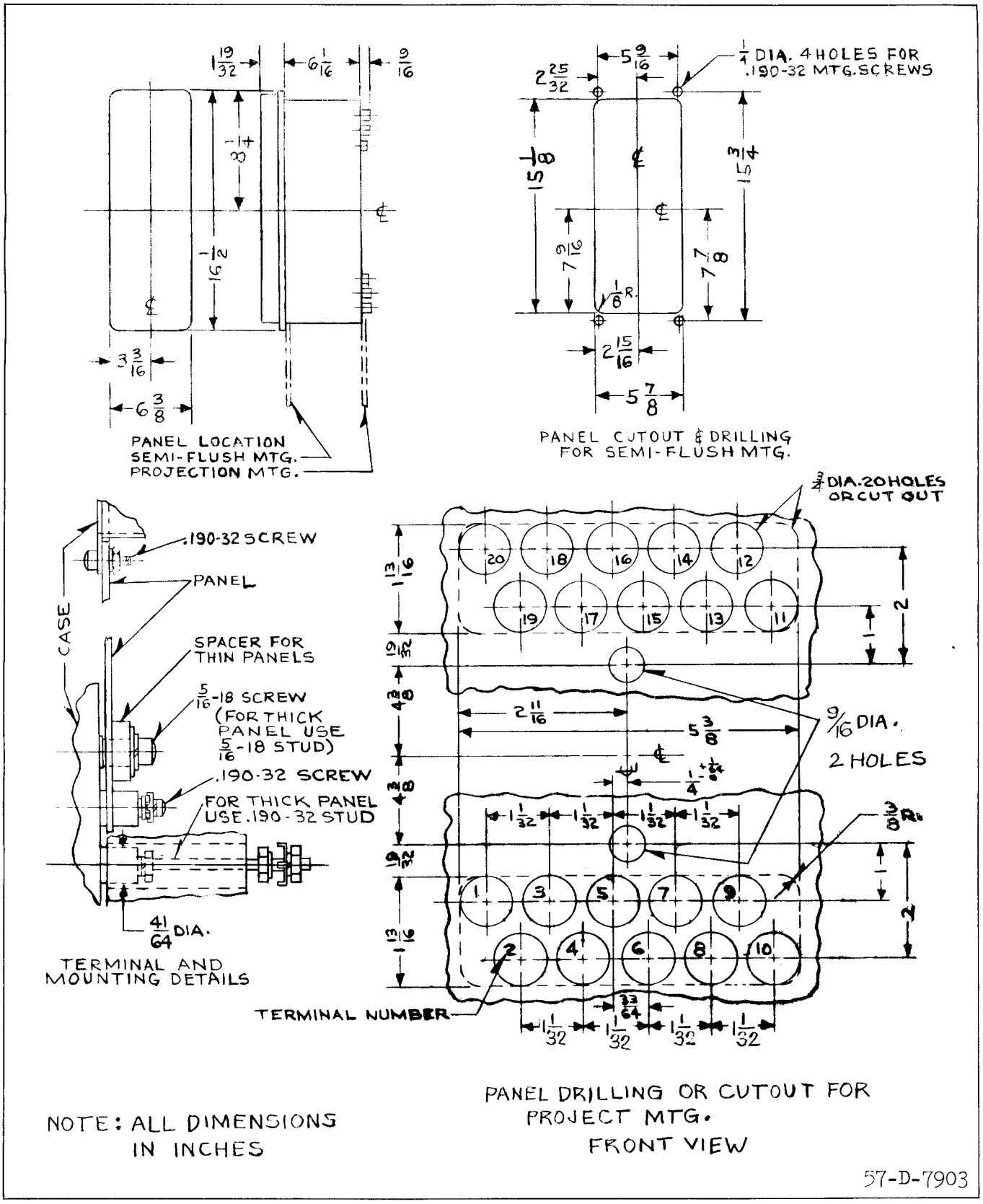
* *Fig. 6. Outline and Drilling Plan for the Type FT21 Case*



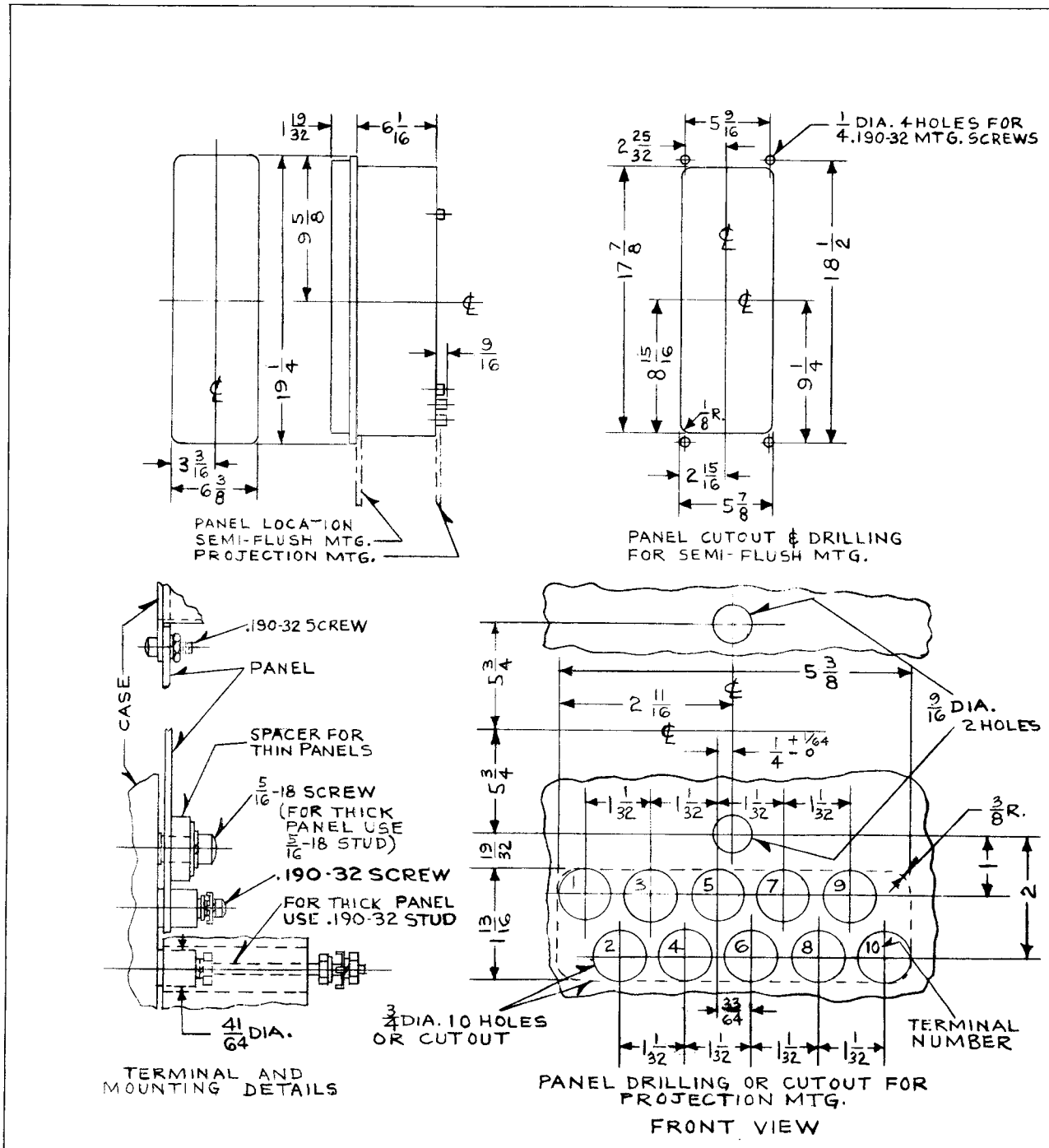
* *Fig. 7. Outline and Drilling Plan for the Type FT22 Case*



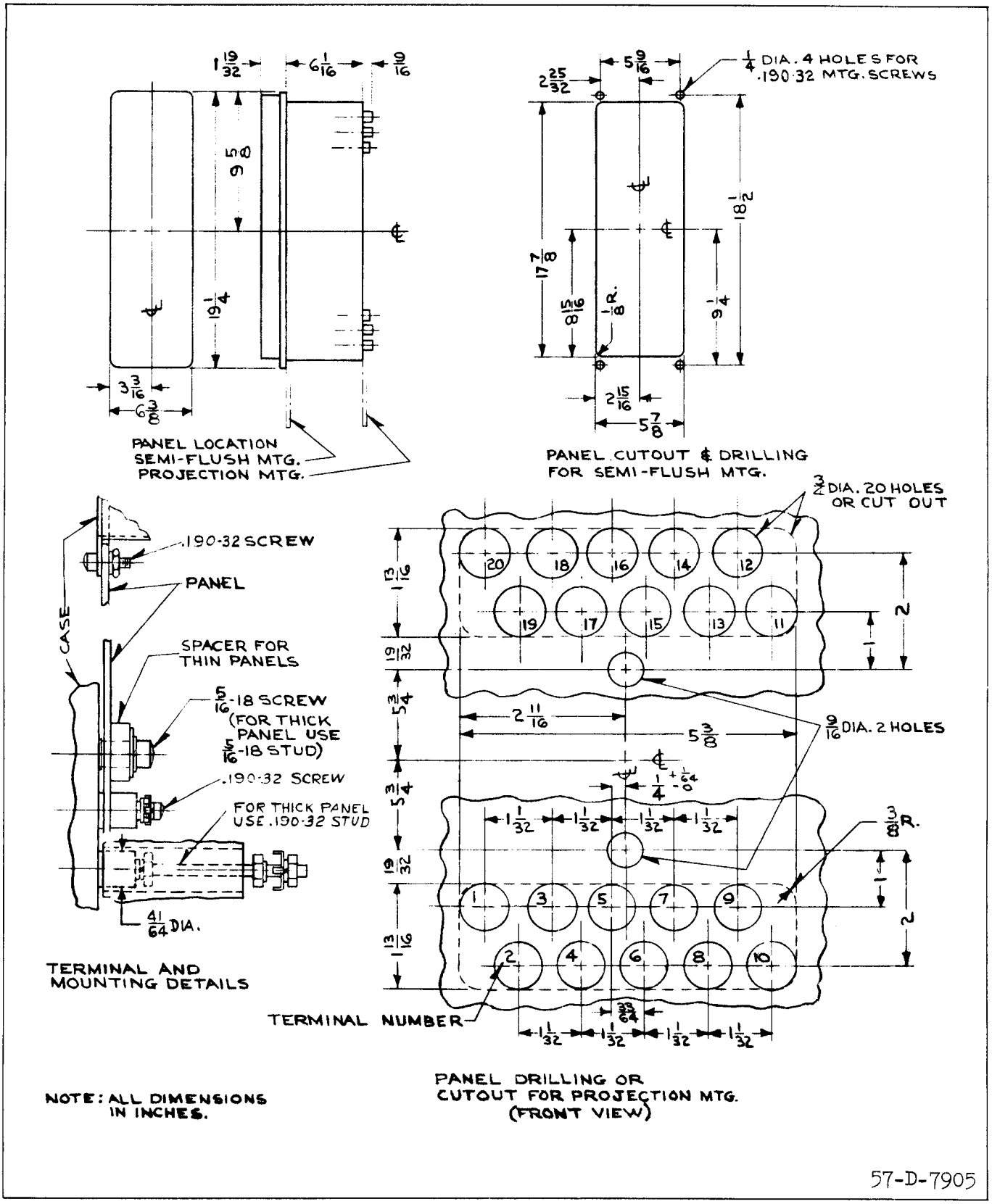
* *Fig. 8. Outline and Drilling Plan for the Type FT31 Case*



* *Fig. 9. Outline and Drilling Plan for the Type FT32 Case*



* *Fig. 10. Outline and Drilling Plan for the Type FT41 Case*



* *Fig. 11. Outline and Drilling Plan for the Type FT42 Case*

WESTINGHOUSE ELECTRIC CORPORATION
RELAY DEPARTMENT **NEWARK, N. J.**
Printed in U. S. A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

RELAYS IN TYPE FT11, FT21, FT22, FT31, FT32, FT41, FT42 CASES

The type FT (Flexitest) cases are dust-proof enclosures combining relay units and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are three main units of the type FT case: the case, cover, and chassis. The case is an all-steel welded housing containing the hinge half of the knife-blade test switches and the terminals for external connections. The cover is a molded phenolic frame with a clear glass window, a thumb nut, a reset lever, and a hook shaped support. The support fits over the top flange of the case. The thumb nut, which fastens to a stud on the bottom flange of the case, holds the cover securely in place on the case. The chassis is a steel frame that supports the relay elements and the contact jaw half of the test switches. This slides in and out of the case. The electrical connections between the base and chassis are completed through the closed knife-blades.

There are four different size cases available. These are designated the FT11, FT21 or 22, FT31 or 32, and the FT41 or 42. The first digit of the designation represents the physical size and the second the number of terminal blocks. One terminal block can accommodate up to ten terminals. The case may be either semi-flush or projection mounted.

REMOVING CHASSIS

To remove the chassis, first remove the cover by unscrewing the captive thumb nut at the bottom and lifting the cover support off the top flange of the case. This exposes the relay units and all the test switches for inspection and testing. The next step is to open the test switches. *Always open the red handle switches first before any of the black handle switches or the cam action latches.* This opens the trip circuit to prevent accidental tripout. Then open all the remaining switches. The order of opening the remaining switches is not important. In opening the test switches they should be moved all the way back against the stops. With all the switches fully opened, release the cam action latches and pull outward. The chassis can be set on a test bench for easy inspection, maintenance and test.

After removing the chassis a duplicate chassis may be inserted in the case or the blade portion of the switches can be closed and the cover put in place without the chassis. The chassis-operated auxiliary shorting switch remains closed with chassis out to prevent open circuiting the current transformers when the current test switches are closed. The operation of the auxiliary shorting switch is visible from the front of the relay, when the chassis is in place.

When the chassis is to be put back in the case, the above procedure is to be followed in the reversed order. *The red handle switch should not be closed until after the chassis has been latched in place and all of the black handle switches closed.*

ELECTRICAL CIRCUITS

Each terminal in the base connects through a test switch to the relay units in the chassis as shown on the internal schematic diagrams. The relay terminals are identified by numbers marked on the outside of the case. The test switch positions are identified by numbers marked on the molded blocks.

The potential and control circuits through the relay are disconnected from the external circuit by opening the associated test switches. Opening the current test switch short-circuits the current transformer secondary and disconnects one side of the relay coil but leaves the other side of the coil connected to the external circuit through the current test jack jaws. This circuit can be isolated by inserting the current test plug (without external connections), or by inserting the ten circuit test plug. Both switches of the current test switch pair must be open when using the current test plug in this manner to short-circuit the current transformer secondary.

TESTING

The relays can be tested in service, in the case

but with the external circuits isolated or out of the case as follows:

TESTING IN SERVICE

The ammeter test plug can be inserted in the current test jaws after opening the knife-blade switch to check the current through the relay, as shown in Fig. 1. This plug consists of two conducting strips separated by an insulating strip. The ammeter is connected to these strips by terminal screws and the leads are carried out through holes in the back of the insulated handle.

Voltages between the potential circuits can be measured conveniently by clamping #2 clip leads on the projecting clip lead lug on the contact jaw.

TESTING IN CASE

With all blades in the full open position, the ten circuit test plug Fig. 4 can be inserted in the contact jaws. This connects the relay units to a set of binding posts and completely isolates the relay circuits from the external connections by means of an insulating barrier on the plug. The external test circuits are connected to these binding posts. The plug is inserted in the bottom test jaws with the binding posts up and in the top test switch jaws with the binding posts down.

The external test circuits may be made to the relay units by #2 test clip leads instead of the test plug. When connecting an external test circuit to the current elements using clip leads, care should be taken to see that the current test jack jaws are open so that the relay is completely isolated from the external circuits. Suggested means for isolating this circuit are outlined above, under "Electrical Circuits".

TESTING OUT OF CASE

With the chassis removed from the case, relay units may be tested by using the ten circuit test plug or by #2 test clip leads as described above. Any critical factory calibration is made with the chassis in the case and removing the chassis from the case may change the calibration values of these relays.

An internal schematic is available for each individual relay showing the schematic internal wiring. The outlines of the various cases are shown in Fig. 5 to Fig. 11.

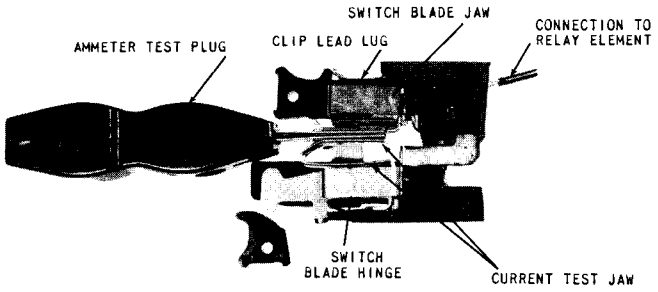


Fig. 1. Ammeter Test Plug in Testing Positions

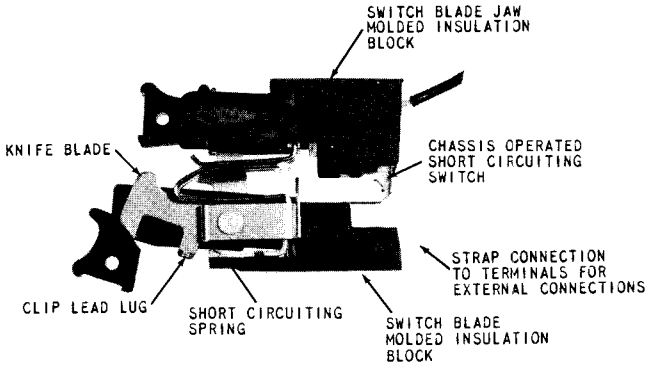


Fig. 2. Short Circuiting Switch

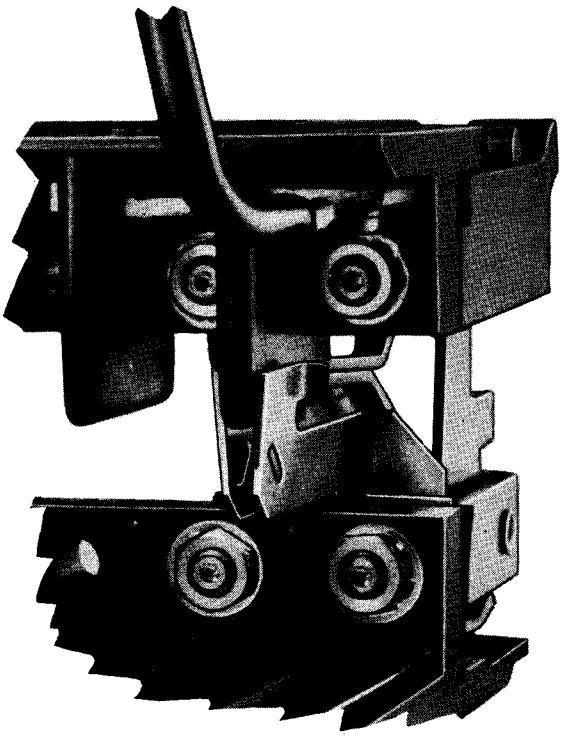


Fig. 3. Auxiliary Short Circuiting Switch (Enlarged View)

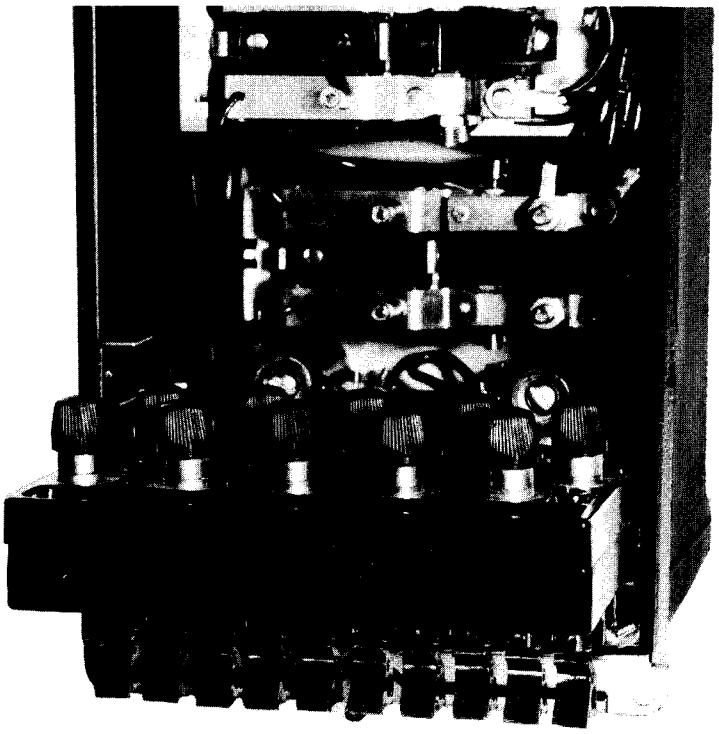
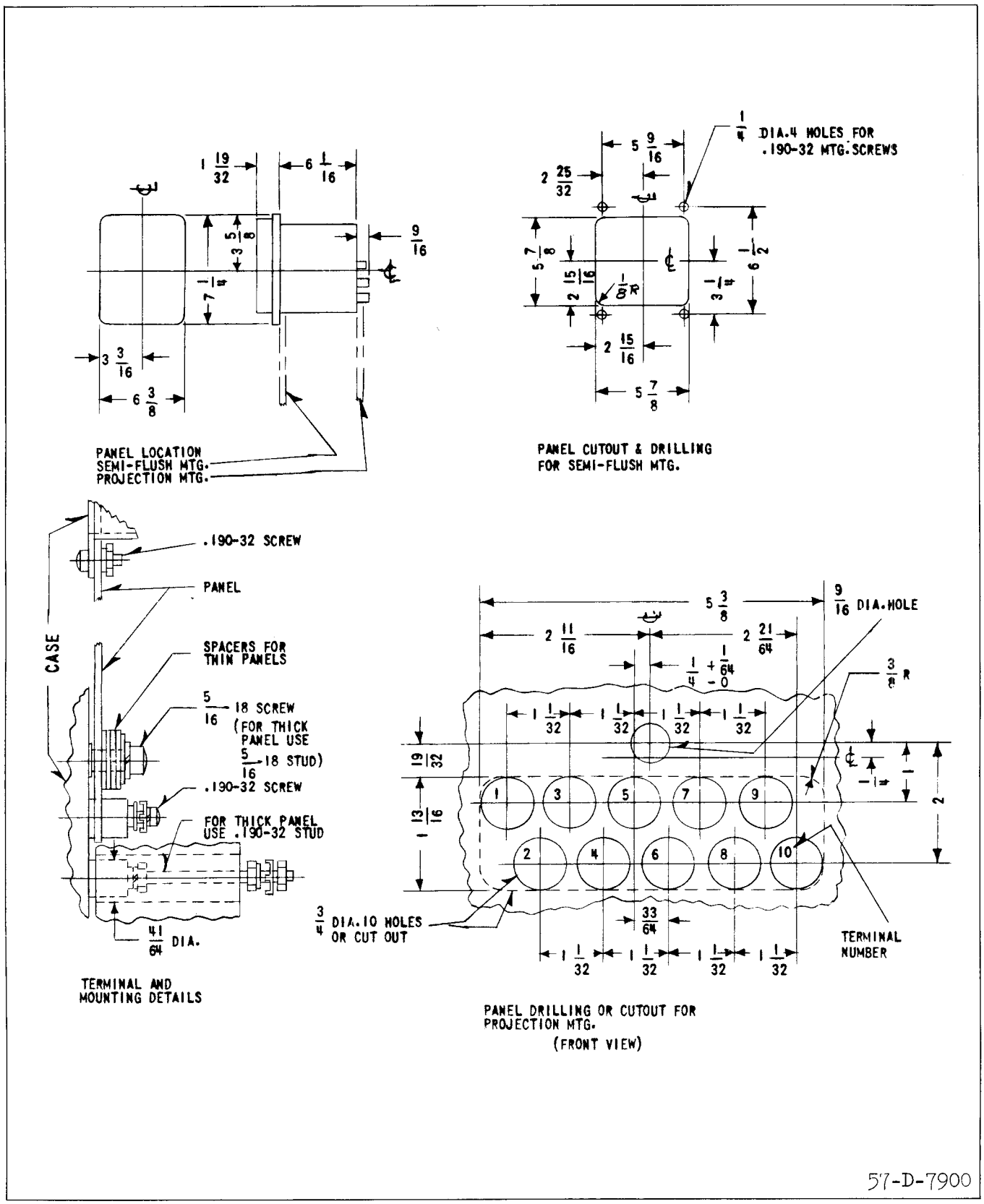
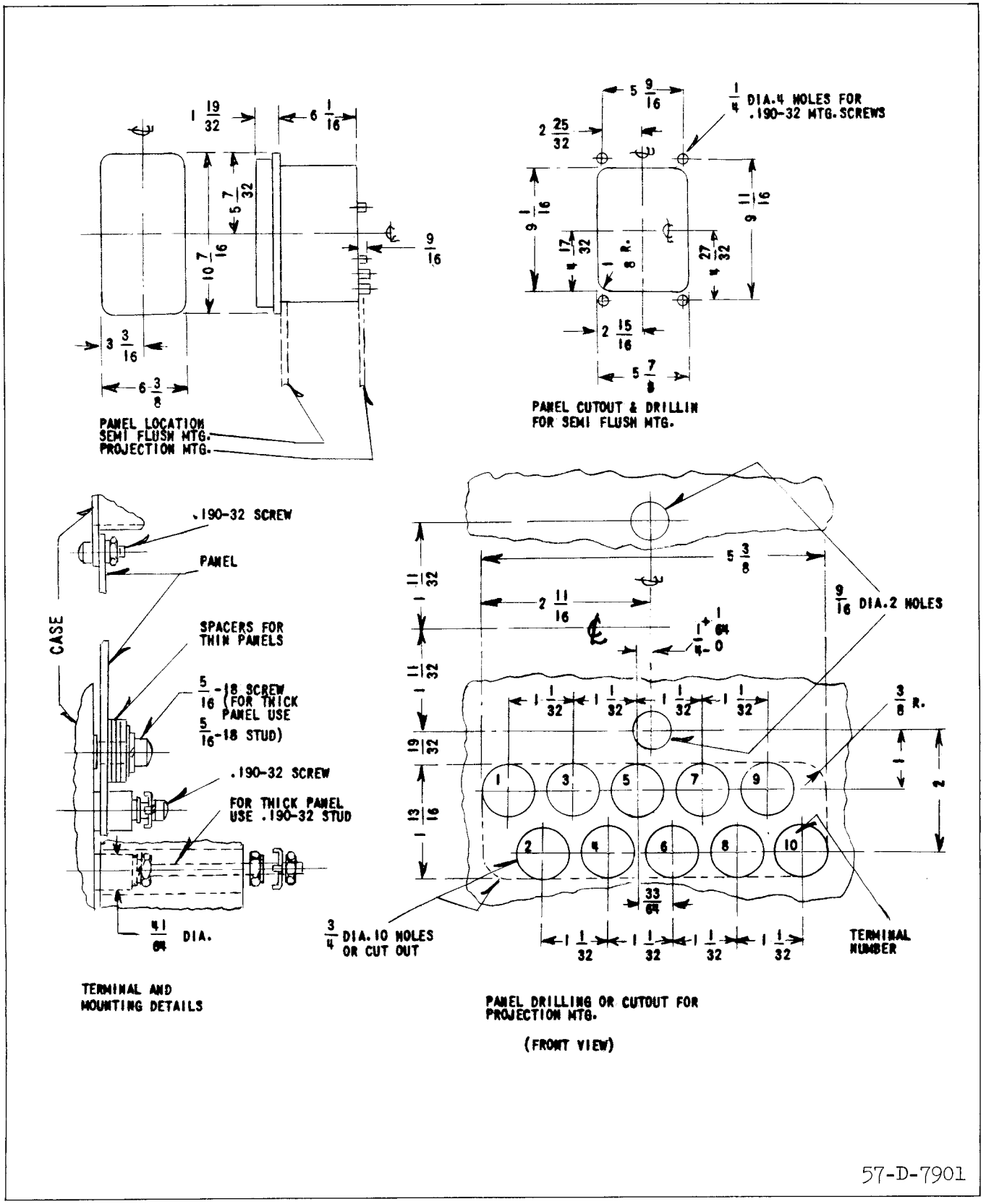


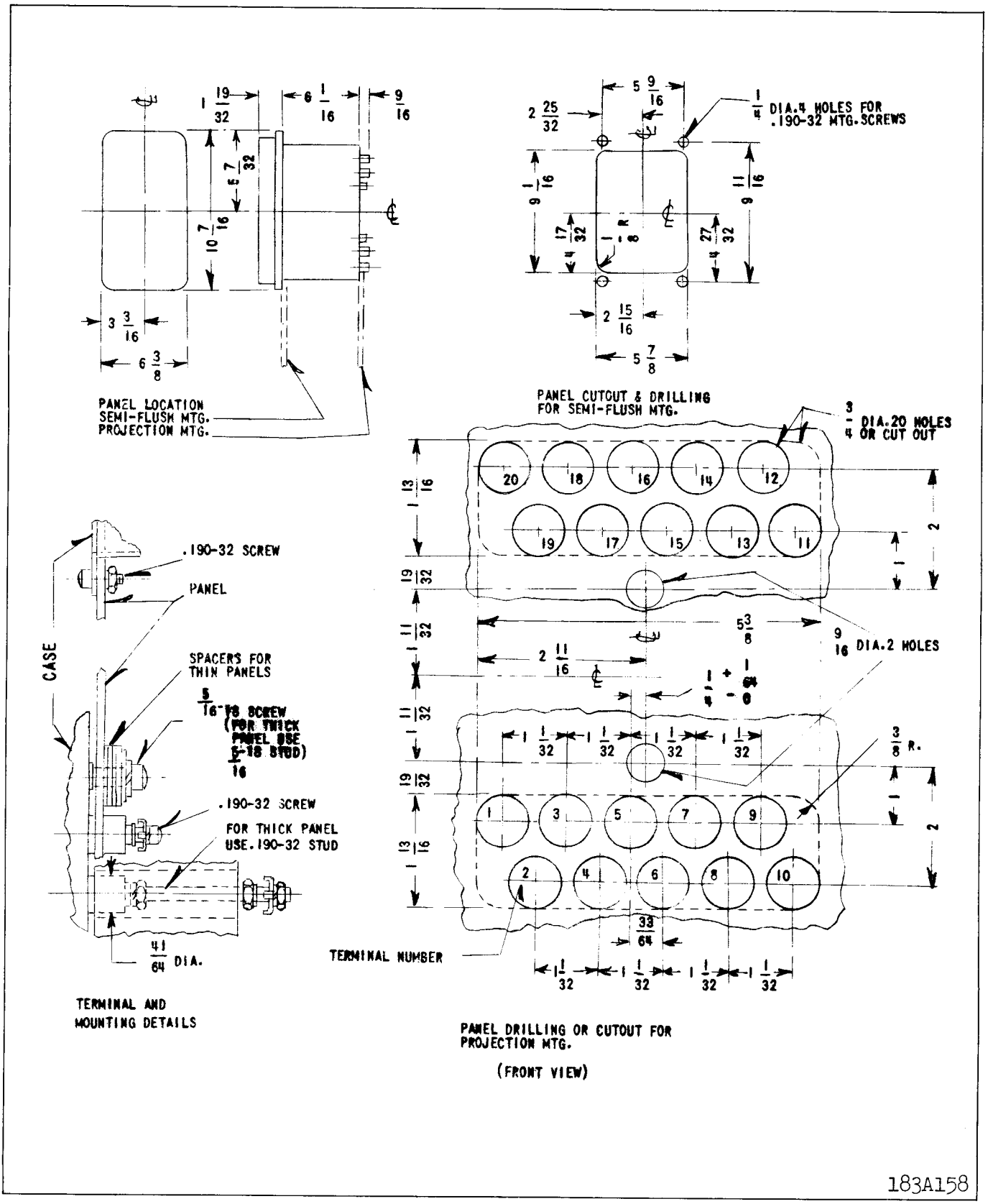
Fig. 4. Multi-Circuit Test Plug in Testing Position



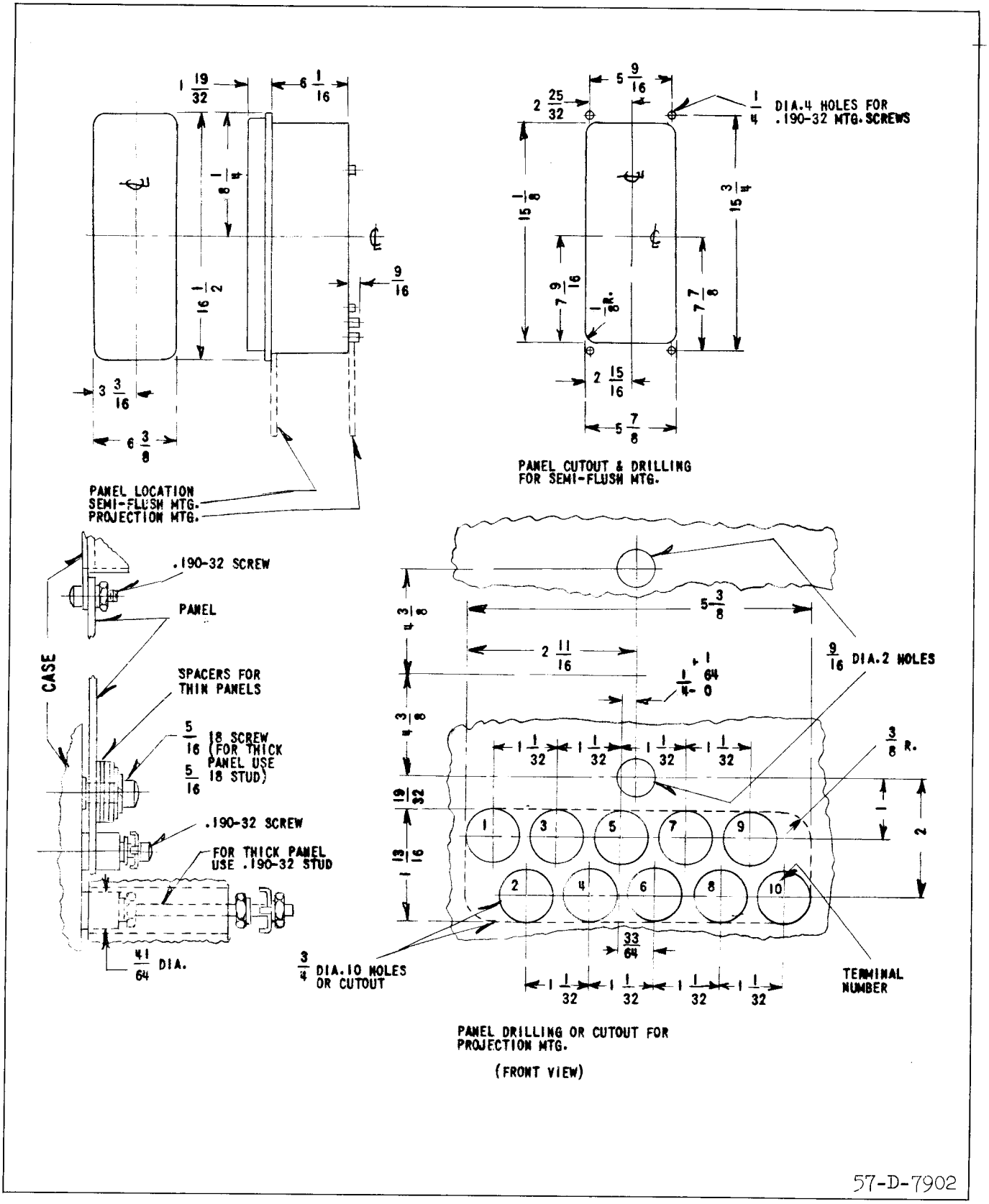
* *Fig. 5. Outline and Drilling Plan for the Type FT11 Case*



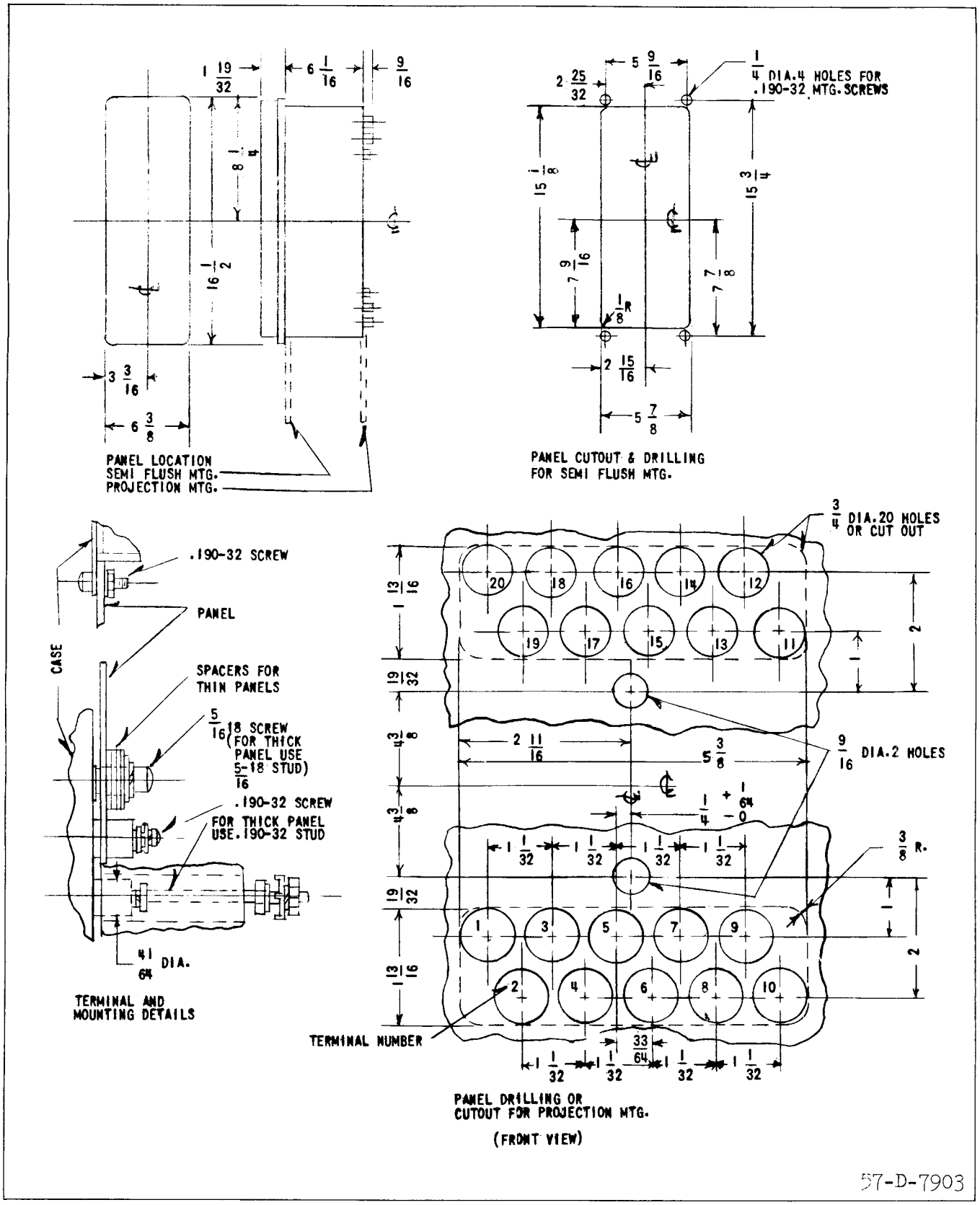
* *Fig. 6. Outline and Drilling Plan for the Type FT21 Case*



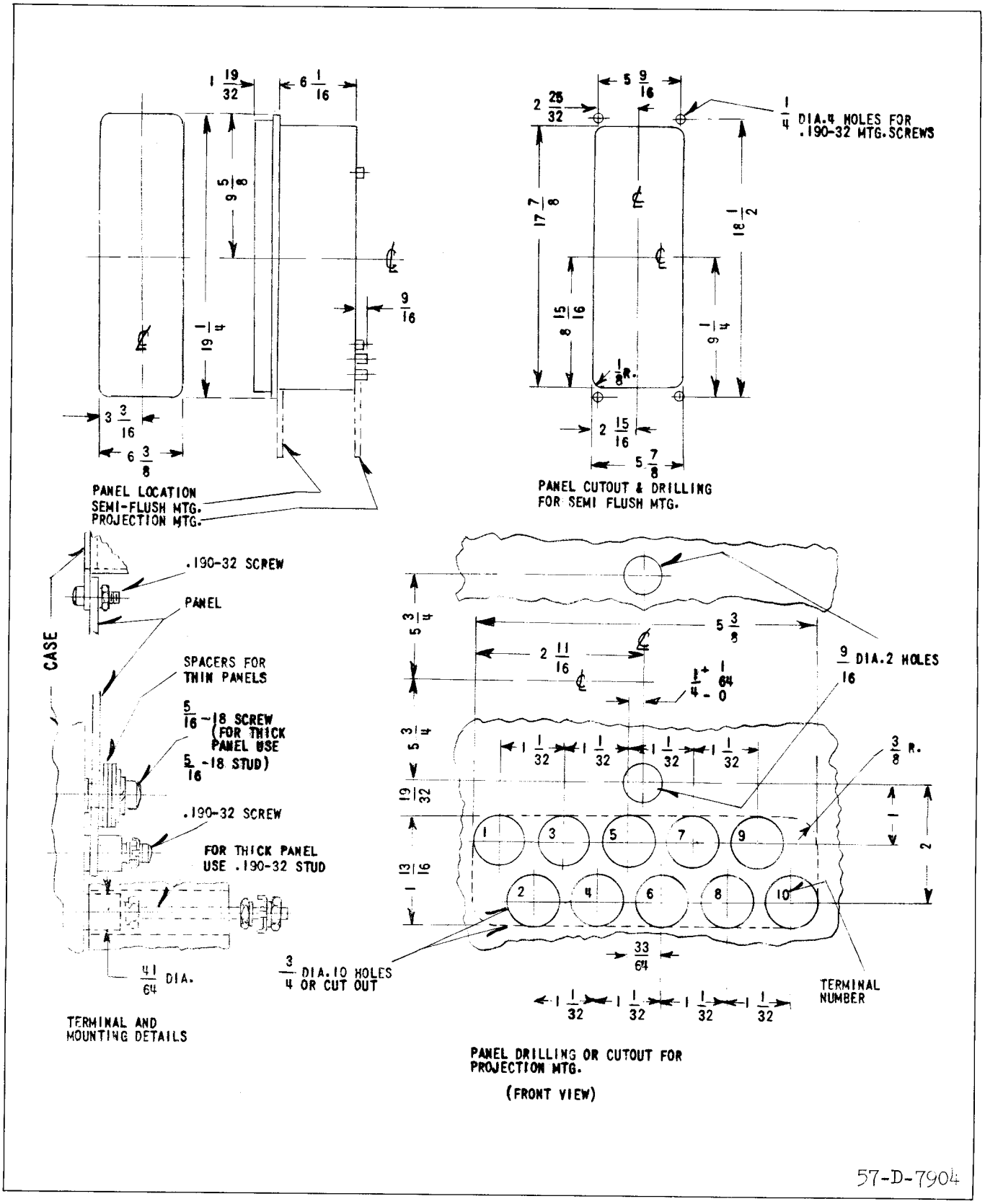
* *Fig. 7. Outline and Drilling Plan for the Type FT22 Case*



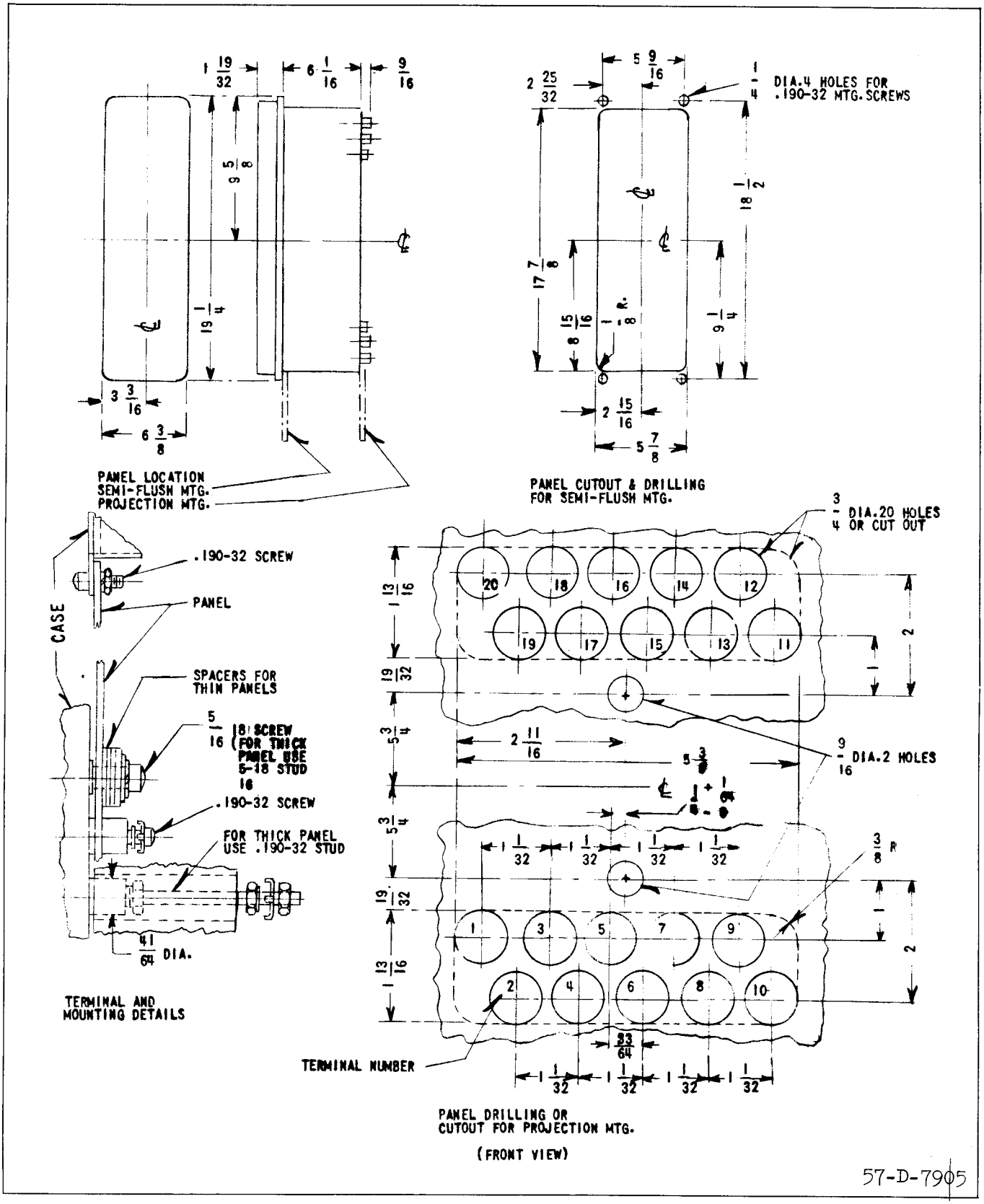
* *Fig. 8. Outline and Drilling Plan for the Type FT31 Case*



* *Fig. 9. Outline and Drilling Plan for the Type FT32 Case*



* *Fig. 10. Outline and Drilling Plan for the Type FT41 Case*



* *Fig. 11. Outline and Drilling Plan for the Type FT42 Case*

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

RELAYS IN TYPE FT11, FT21, FT22, FT31, FT32, FT41, FT42 CASES

The type FT (Flexitest) cases are dust-proof enclosures combining relay units and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are three main units of the type FT case: the case, cover, and chassis. The case is an all-steel welded housing containing the hinge half of the knife-blade test switches and the terminals for external connections. The cover is a molded phenolic frame with a clear glass window, a thumb nut, a reset lever, and a hook shaped support. The support fits over the top flange of the case. The thumb nut, which fastens to a stud on the bottom flange of the case, holds the cover securely in place on the case. The chassis is a steel frame that supports the relay elements and the contact jaw half of the test switches. This slides in and out of the case. The electrical connections between the base and chassis are completed through the closed knife-blades.

There are four different size cases available. These are designated the FT11, FT21 or 22, FT31 or 32, and the FT41 or 42. The first digit of the designation represents the physical size and the second the number of terminal blocks. One terminal block can accommodate up to ten terminals. The case may be either semi-flush or projection mounted.

REMOVING CHASSIS

To remove the chassis, first remove the cover by unscrewing the captive thumb nut at the bottom and lifting the cover support off the top flange of the case. This exposes the relay units and all the test switches for inspection and testing. The next step is to open the test switches. *Always open the red handle switches first before any of the black handle switches or the cam action latches.* This opens the trip circuit to prevent accidental tripout. Then open all the remaining switches. The order of opening the remaining switches is not important. In opening the test switches they should be moved all the way back against the stops. With all the switches fully opened, release the cam action latches and pull outward. The chassis can be set on a test bench for easy inspection, maintenance and test.

After removing the chassis a duplicate chassis may be inserted in the case or the blade portion of the switches can be closed and the cover put in place without the chassis. The chassis-operated auxiliary shorting switch remains closed with chassis out to prevent open circuiting the current transformers when the current test switches are closed. The operation of the auxiliary shorting switch is visible from the front of the relay, when the chassis is in place.

When the chassis is to be put back in the case, the above procedure is to be followed in the reversed order. *The red handle switch should not be closed until after the chassis has been latched in place and all of the black handle switches closed.*

ELECTRICAL CIRCUITS

Each terminal in the base connects through a test switch to the relay units in the chassis as shown on the internal schematic diagrams. The relay terminals are identified by numbers marked on the outside of the case. The test switch positions are identified by numbers marked on the molded blocks.

The potential and control circuits through the relay are disconnected from the external circuit by opening the associated test switches. Opening the current test switch short-circuits the current transformer secondary and disconnects one side of the relay coil but leaves the other side of the coil connected to the external circuit through the current test jack jaws. This circuit can be isolated by inserting the current test plug (without external connections), or by inserting the ten circuit test plug. Both switches of the current test switch pair must be open when using the current test plug in this manner to short-circuit the current transformer secondary.

TESTING

The relays can be tested in service, in the case

but with the external circuits isolated or out of the case as follows:

TESTING IN SERVICE

The ammeter test plug can be inserted in the current test jaws after opening the knife-blade switch to check the current through the relay, as shown in Fig. 1. This plug consists of two conducting strips separated by an insulating strip. The ammeter is connected to these strips by terminal screws and the leads are carried out through holes in the back of the insulated handle.

Voltages between the potential circuits can be measured conveniently by clamping #2 clip leads on the projecting clip lead lug on the contact jaw.

TESTING IN CASE

With all blades in the full open position, the ten circuit test plug Fig. 4 can be inserted in the contact jaws. This connects the relay units to a set of binding posts and completely isolates the relay circuits from the external connections by means of an insulating barrier on the plug. The external test circuits are connected to these binding posts. The plug is inserted in the bottom test jaws with the binding posts up and in the top test switch jaws with the binding posts down.

The external test circuits may be made to the relay units by #2 test clip leads instead of the test plug. When connecting an external test circuit to the current elements using clip leads, care should be taken to see that the current test jack jaws are open so that the relay is completely isolated from the external circuits. Suggested means for isolating this circuit are outlined above, under "Electrical Circuits".

TESTING OUT OF CASE

With the chassis removed from the case, relay units may be tested by using the ten circuit test plug or by #2 test clip leads as described above. Any critical factory calibration is made with the chassis in the case and removing the chassis from the case may change the calibration values of these relays.

An internal schematic is available for each individual relay showing the schematic internal wiring. The outlines of the various cases are shown in Fig. 5 to Fig. 11.

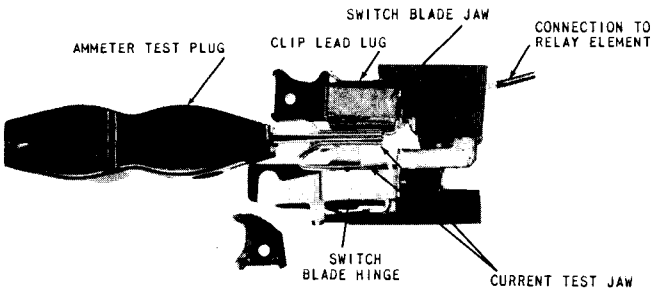


Fig. 1. Ammeter Test Plug in Testing Positions

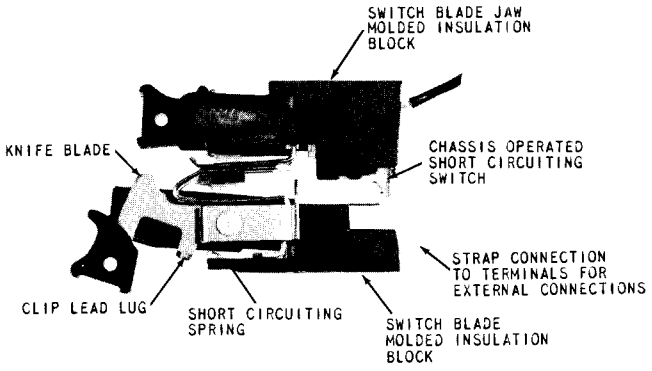


Fig. 2. Short Circuiting Switch

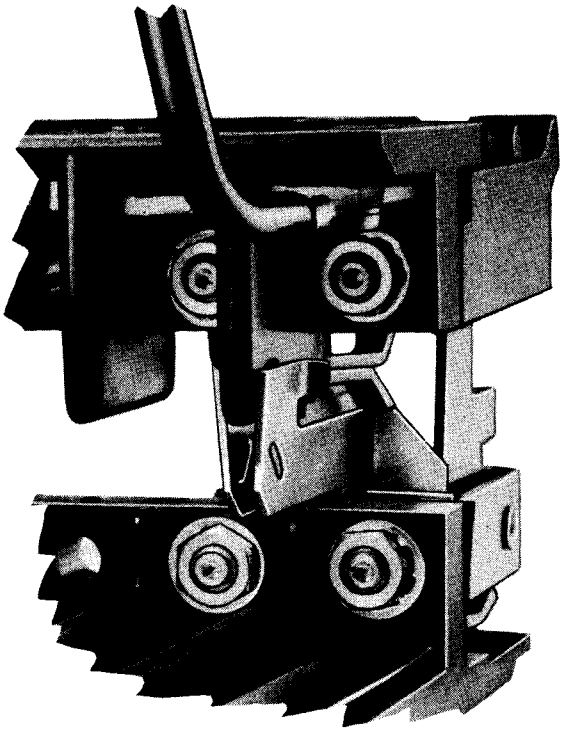


Fig. 3. Auxiliary Short Circuiting Switch (Enlarged View)

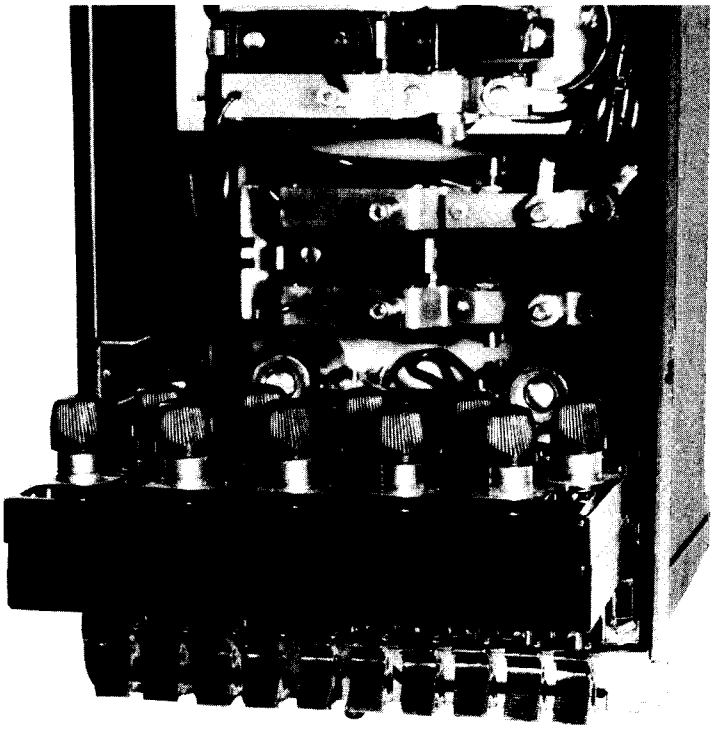
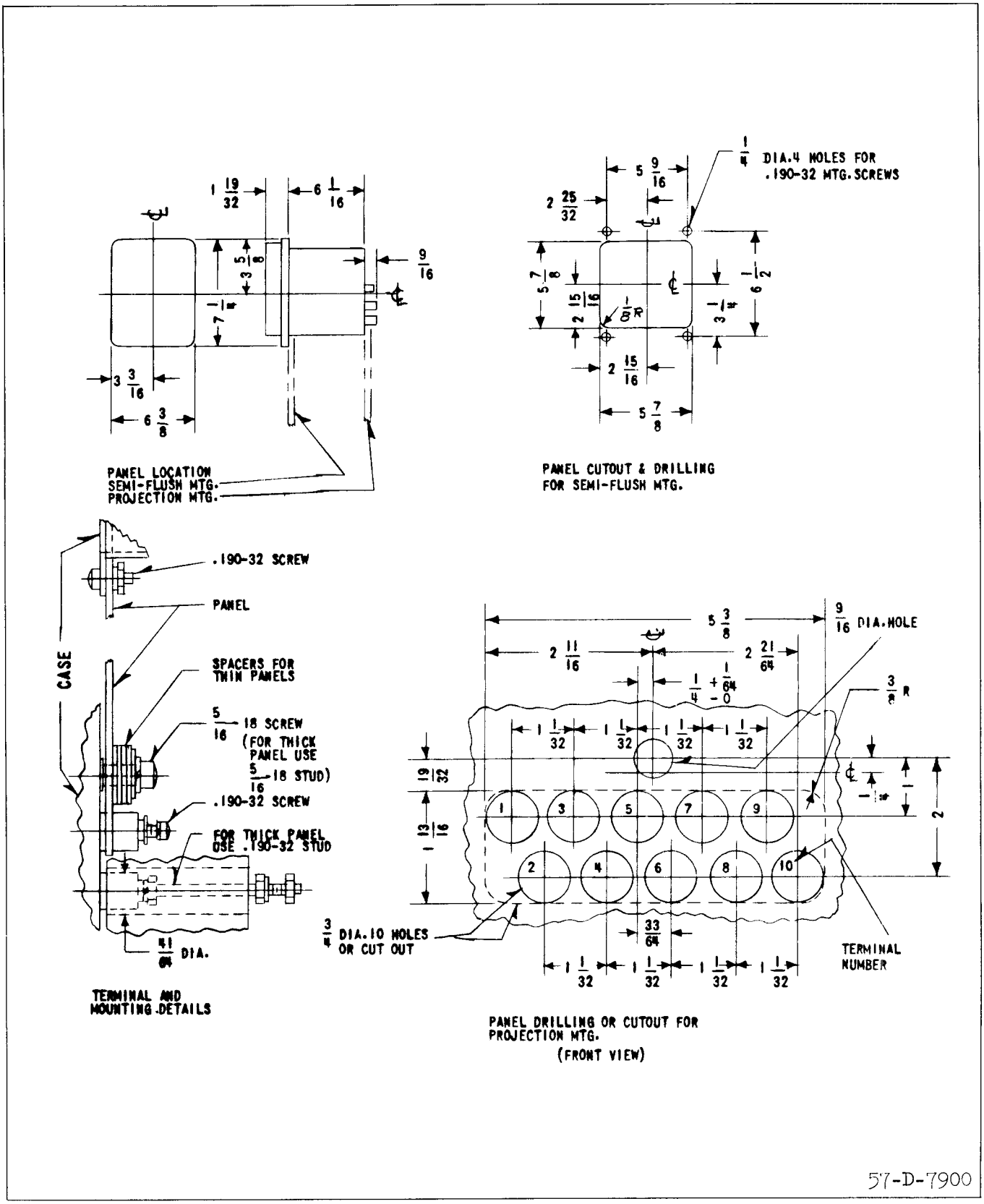
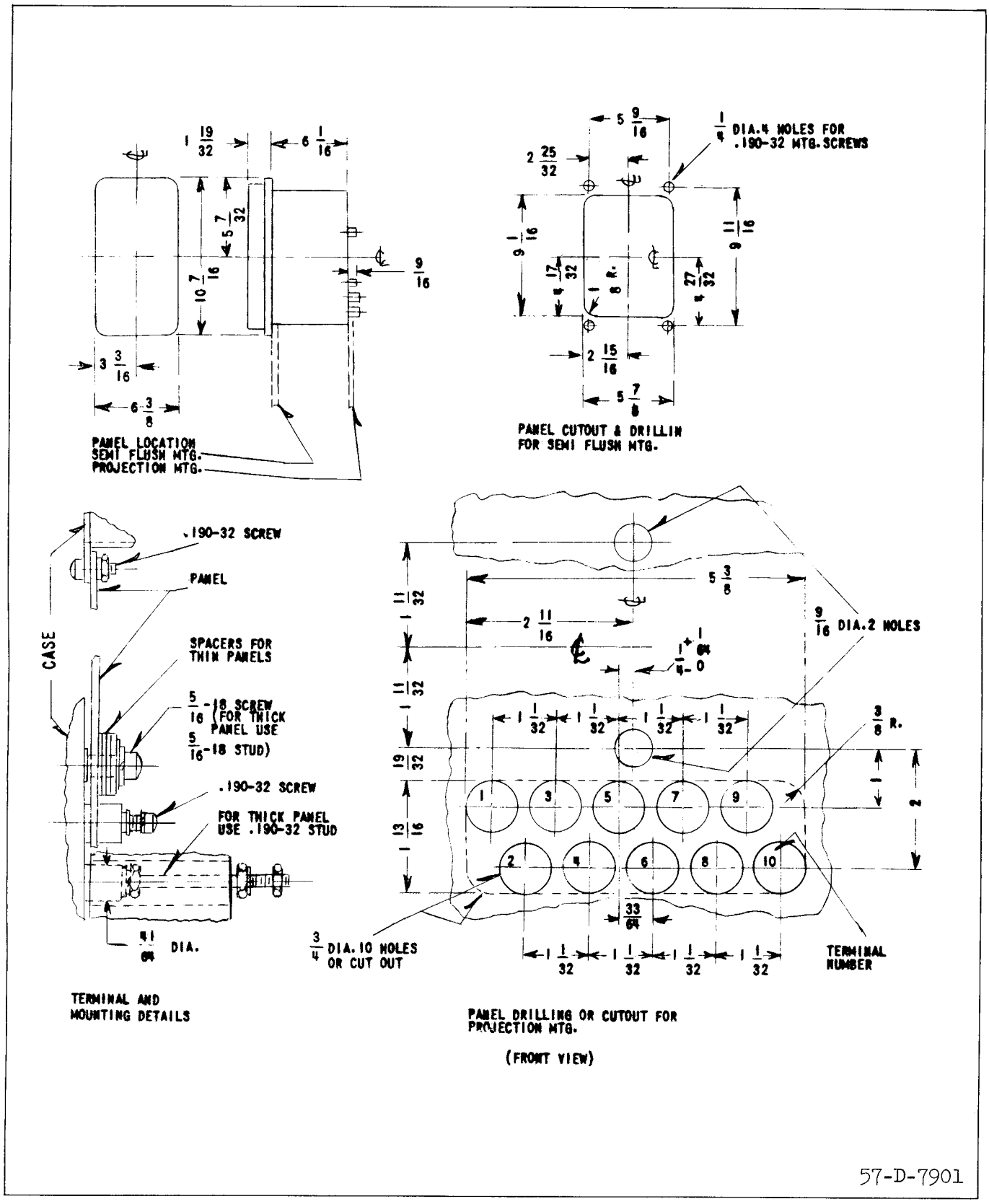


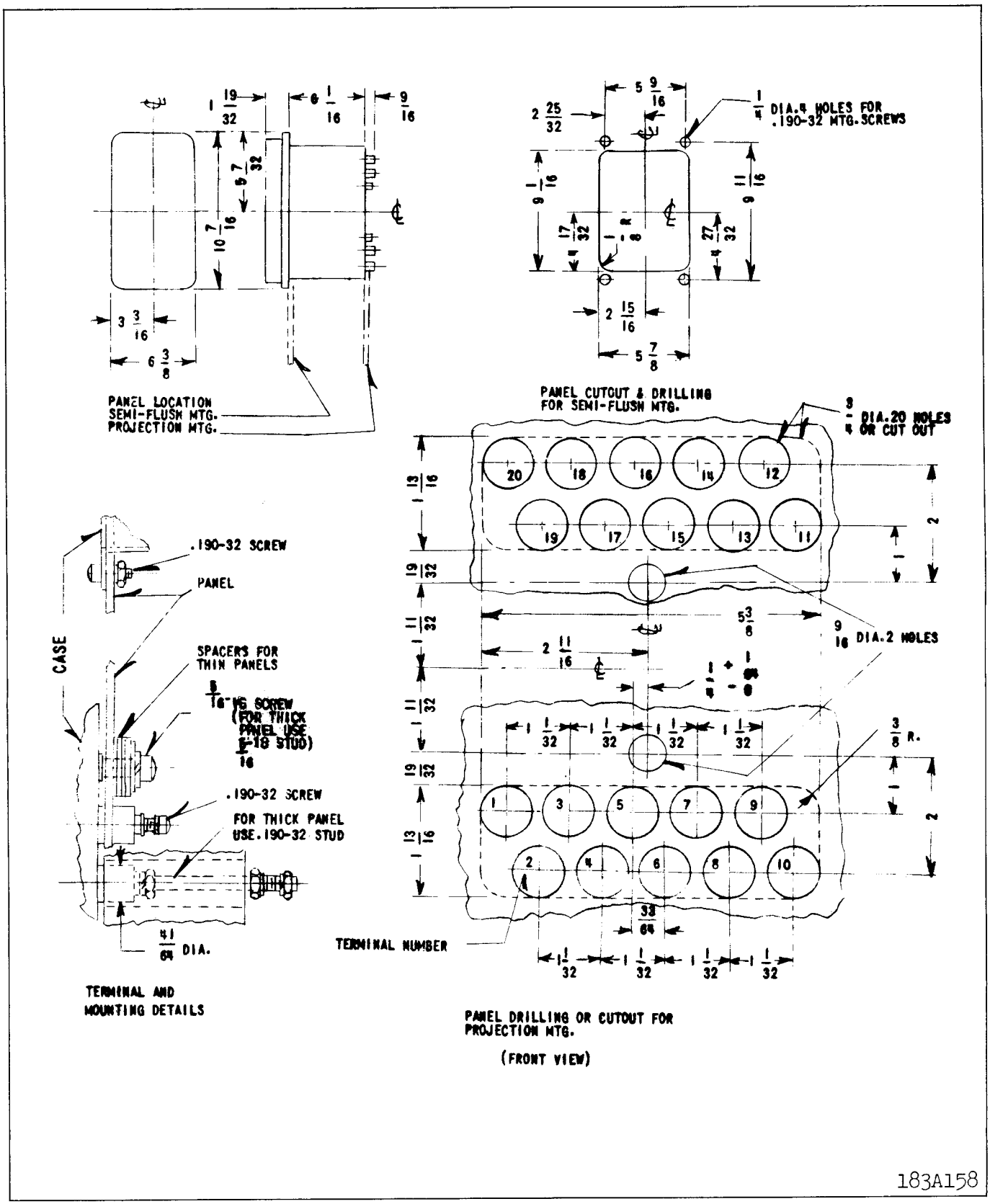
Fig. 4. Multi-Circuit Test Plug in Testing Position



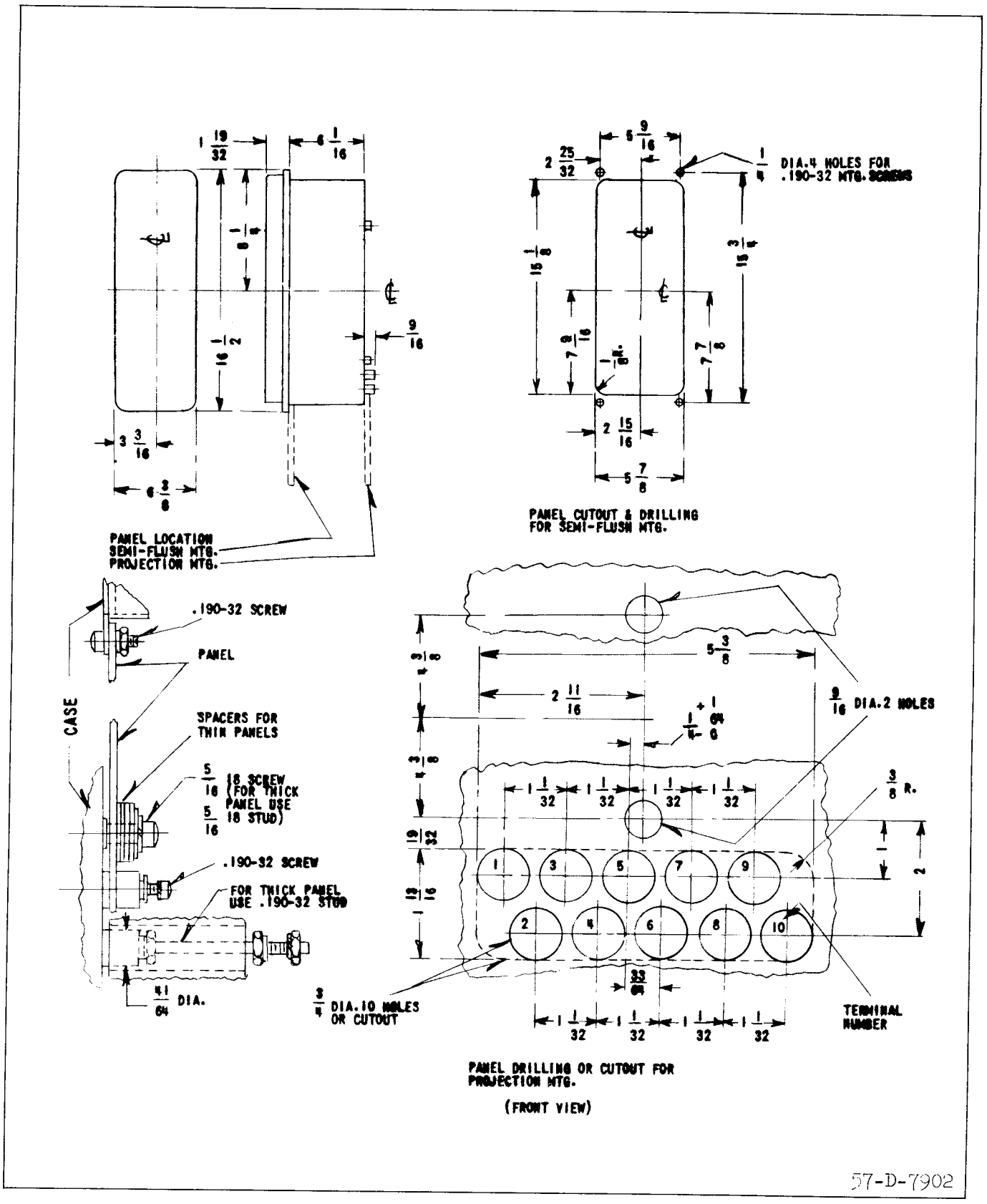
* *Fig. 5. Outline and Drilling Plan for the Type FT11 Case*



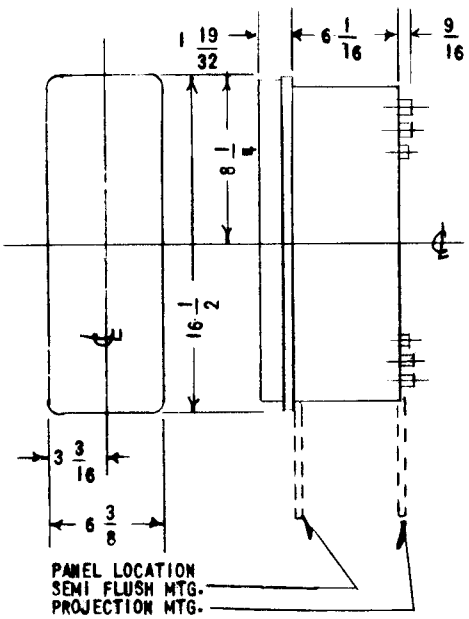
* *Fig. 6. Outline and Drilling Plan for the Type FT21 Case*

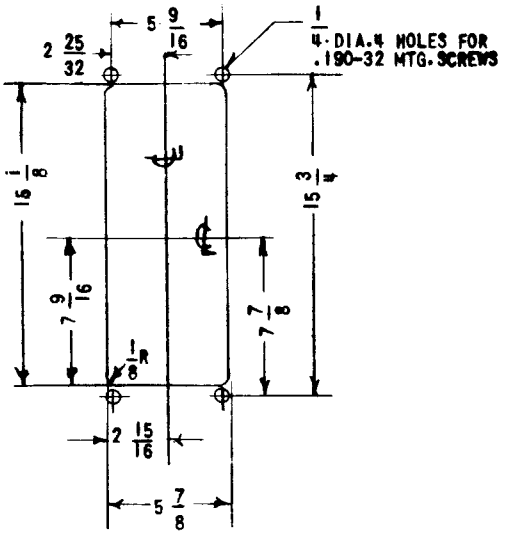


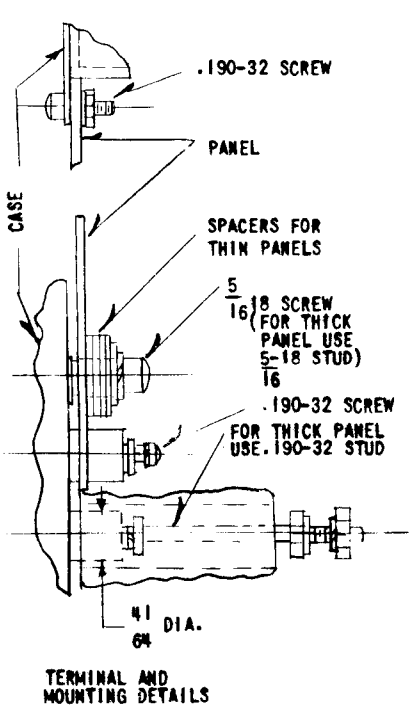
* *Fig. 7. Outline and Drilling Plan for the Type FT22 Case*

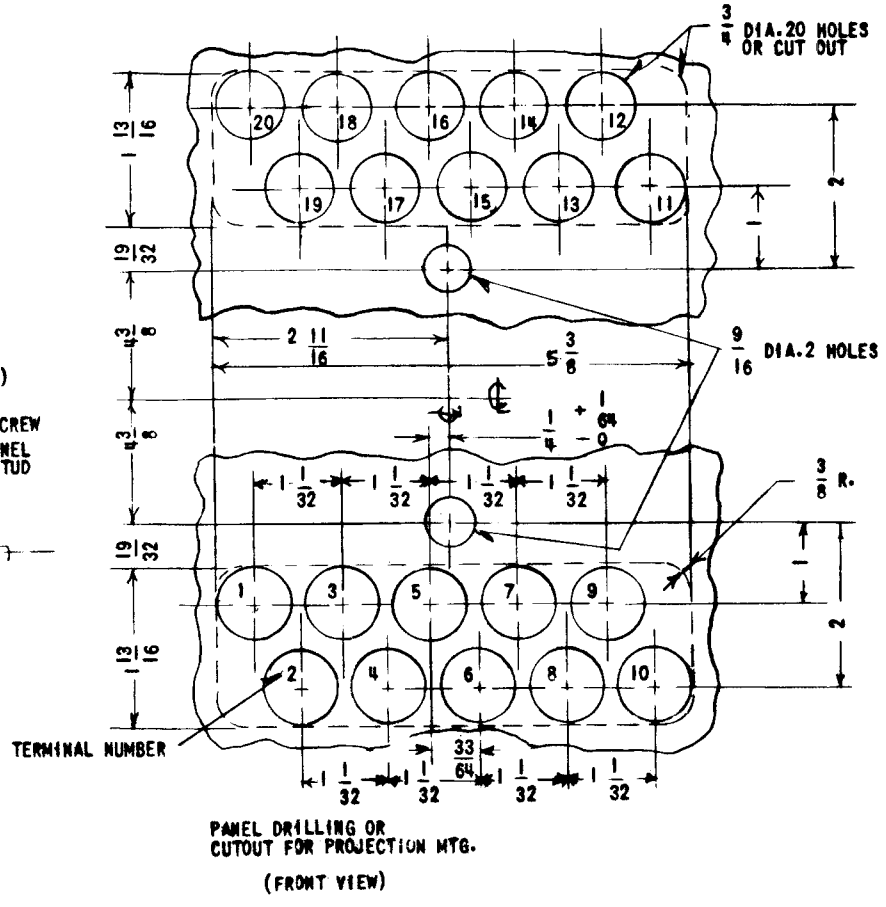


* *Fig. 8. Outline and Drilling Plan for the Type FT31 Case*



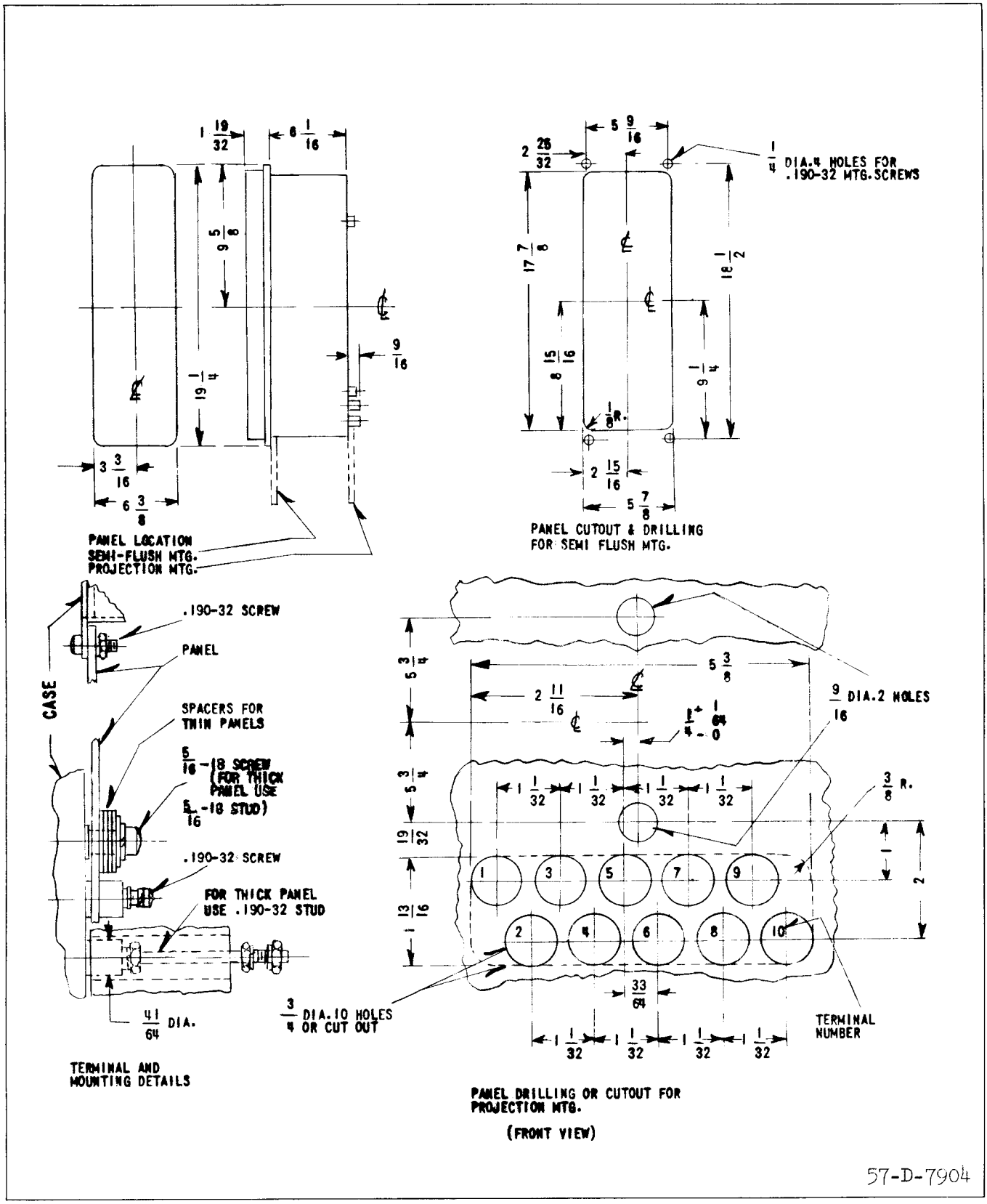




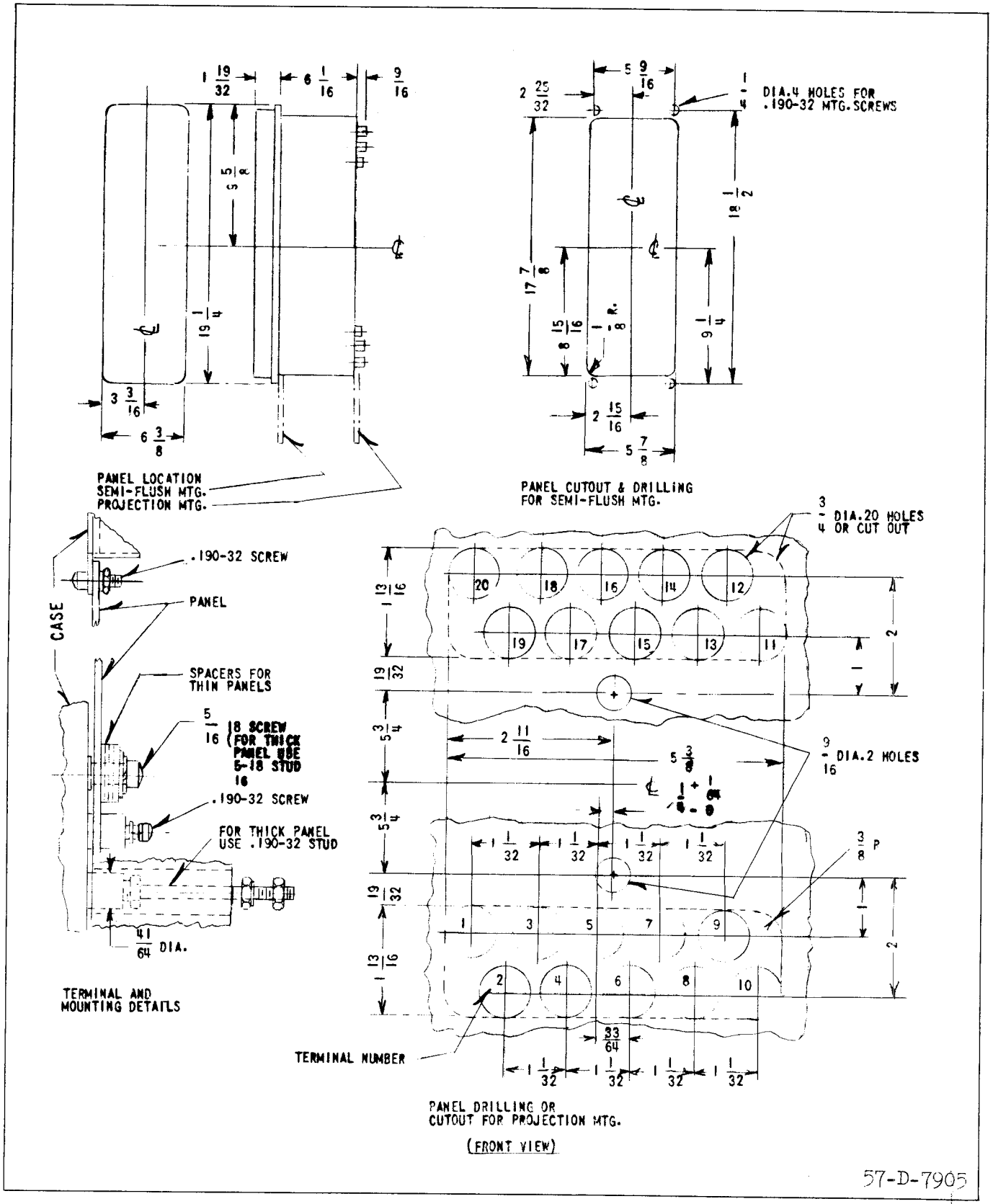


57-D-7903

* *Fig. 9. Outline and Drilling Plan for the Type FT32 Case*



* *Fig. 10. Outline and Drilling Plan for the Type FT41 Case*



* *Fig. 11. Outline and Drilling Plan for the Type FT42 Case*

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

RELAYS IN TYPE FT11, FT21, FT22, FT31, FT32, FT41, FT42 CASES

The type FT (Flexitest) cases are dust-proof enclosures combining relay units and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are three main units of the type FT case: the case, cover, and chassis. The case is an all-steel welded housing containing the hinge half of the knife-blade test switches and the terminals for external connections. The cover is a molded phenolic frame with a clear glass window, a thumb nut, a reset lever, and a hook shaped support. The support fits over the top flange of the case. The thumb nut, which fastens to a stud on the bottom flange of the case, holds the cover securely in place on the case. The chassis is a steel frame that supports the relay elements and the contact jaw half of the test switches. This slides in and out of the case. The electrical connections between the base and chassis are completed through the closed knife-blades.

There are four different size cases available. These are designated the FT11, FT21 or 22, FT31 or 32, and the FT41 or 42. The first digit of the designation represents the physical size and the second the number of terminal blocks. One terminal block can accommodate up to ten terminals. The case may be either semi-flush or projection mounted.

REMOVING CHASSIS

To remove the chassis, first remove the cover by unscrewing the captive thumb nut at the bottom and lifting the cover support off the top flange of the case. This exposes the relay units and all the test switches for inspection and testing. The next step is to open the test switches. *Always open the red handle switches first before any of the black handle switches or the cam action latches.* This opens the trip circuit to prevent accidental tripout. Then open all the remaining switches. The order of opening the remaining switches is not important. In opening the test switches they should be moved all the way back against the stops. With all the switches fully opened, release the cam action latches and pull outward. The chassis can be set on a test bench for easy inspection, maintenance and test.

After removing the chassis a duplicate chassis may be inserted in the case or the blade portion of the switches can be closed and the cover put in place without the chassis. The chassis-operated auxiliary shorting switch remains closed with chassis out to prevent open circuiting the current transformers when the current test switches are closed. The operation of the auxiliary shorting switch is visible from the front of the relay, when the chassis is in place.

When the chassis is to be put back in the case, the above procedure is to be followed in the reversed order. *The red handle switch should not be closed until after the chassis has been latched in place and all of the black handle switches closed.*

ELECTRICAL CIRCUITS

Each terminal in the base connects through a test switch to the relay units in the chassis as shown on the internal schematic diagrams. The relay terminals are identified by numbers marked on the outside of the case. The test switch positions are identified by numbers marked on the molded blocks.

The potential and control circuits through the relay are disconnected from the external circuit by opening the associated test switches. Opening the current test switch short-circuits the current transformer secondary and disconnects one side of the relay coil but leaves the other side of the coil connected to the external circuit through the current test jack jaws. This circuit can be isolated by inserting the current test plug (without external connections), or by inserting the ten circuit test plug. Both switches of the current test switch pair must be open when using the current test plug in this manner to short-circuit the current transformer secondary.

TESTING

The relays can be tested in service, in the case

but with the external circuits isolated or out of the case as follows:

TESTING IN SERVICE

The ammeter test plug can be inserted in the current test jaws after opening the knife-blade switch to check the current through the relay, as shown in Fig. 1. This plug consists of two conducting strips separated by an insulating strip. The ammeter is connected to these strips by terminal screws and the leads are carried out through holes in the back of the insulated handle.

Voltages between the potential circuits can be measured conveniently by clamping #2 clip leads on the projecting clip lead lug on the contact jaw.

TESTING IN CASE

With all blades in the full open position, the ten circuit test plug Fig. 4 can be inserted in the contact jaws. This connects the relay units to a set of binding posts and completely isolates the relay circuits from the external connections by means of an insulating barrier on the plug. The external test circuits are connected to these binding posts. The plug is inserted in the bottom test jaws with the binding posts up and in the top test switch jaws with the binding posts down.

The external test circuits may be made to the relay units by #2 test clip leads instead of the test plug. When connecting an external test circuit to the current elements using clip leads, care should be taken to see that the current test jack jaws are open so that the relay is completely isolated from the external circuits. Suggested means for isolating this circuit are outlined above, under "Electrical Circuits".

TESTING OUT OF CASE

With the chassis removed from the case, relay units may be tested by using the ten circuit test plug or by #2 test clip leads as described above. Any critical factory calibration is made with the chassis in the case and removing the chassis from the case may change the calibration values of these relays.

An internal schematic is available for each individual relay showing the schematic internal wiring. The outlines of the various cases are shown in Fig. 5 to Fig. 11.

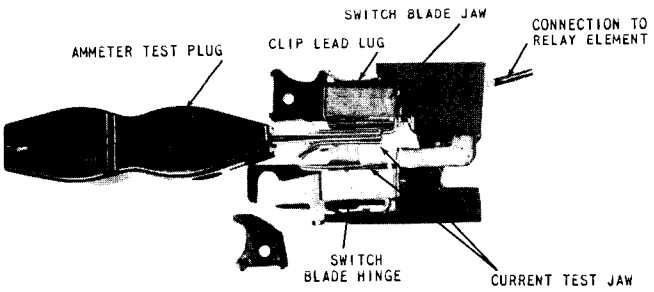


Fig. 1. Ammeter Test Plug in Testing Positions

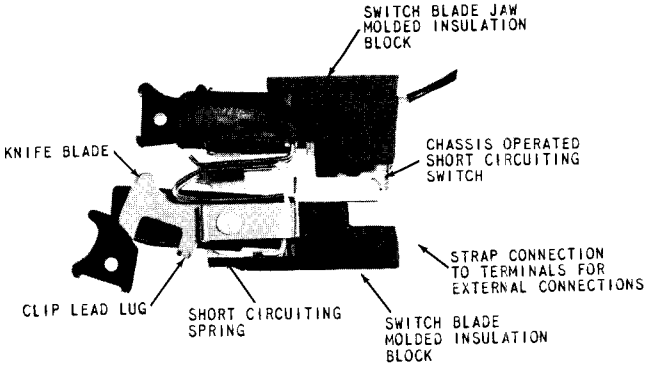


Fig. 2. Short Circuiting Switch

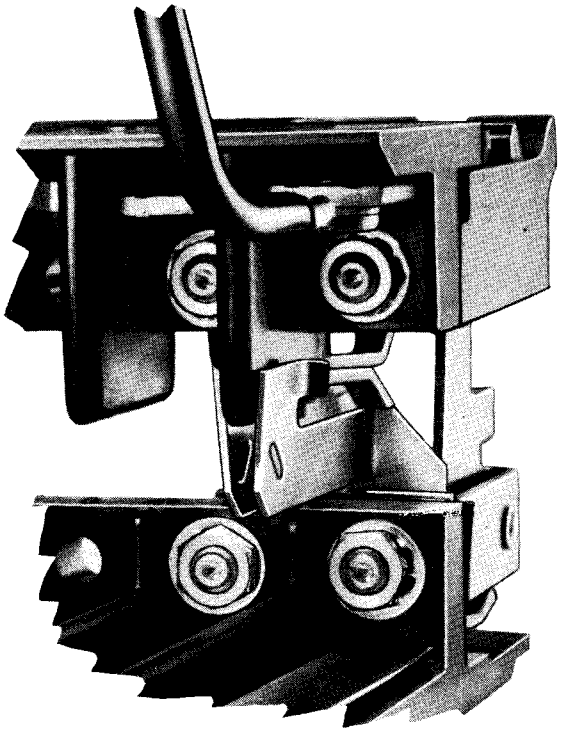


Fig. 3. Auxiliary Short Circuiting Switch (Enlarged View)

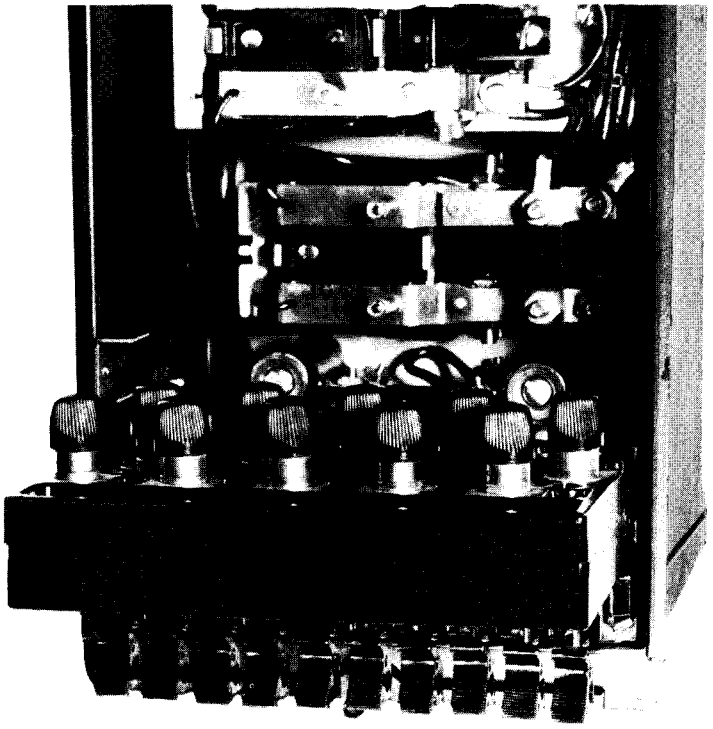
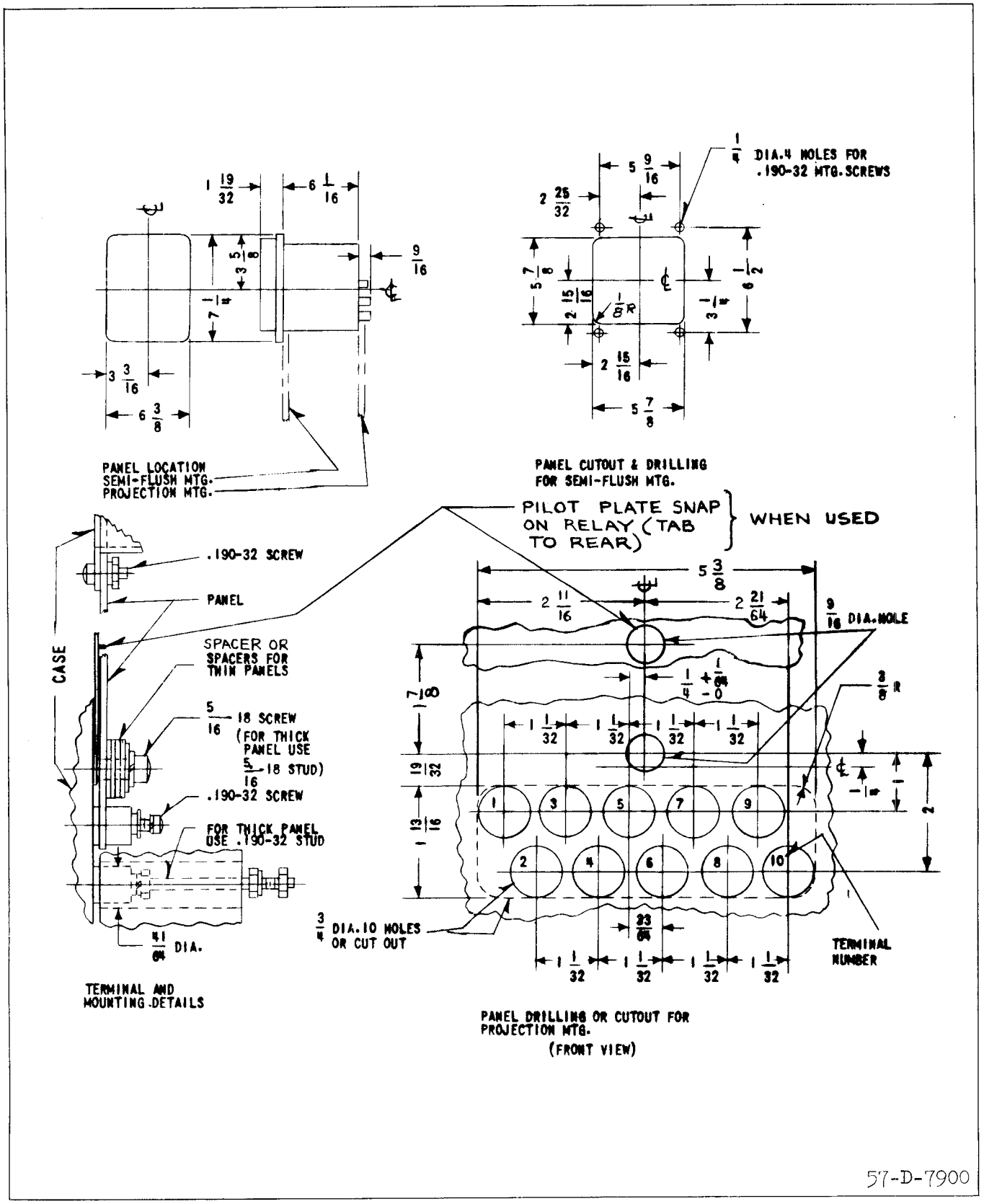


Fig. 4. Multi-Circuit Test Plug in Testing Position



* *Fig. 5. Outline and Drilling Plan for the Type FT11 Case*

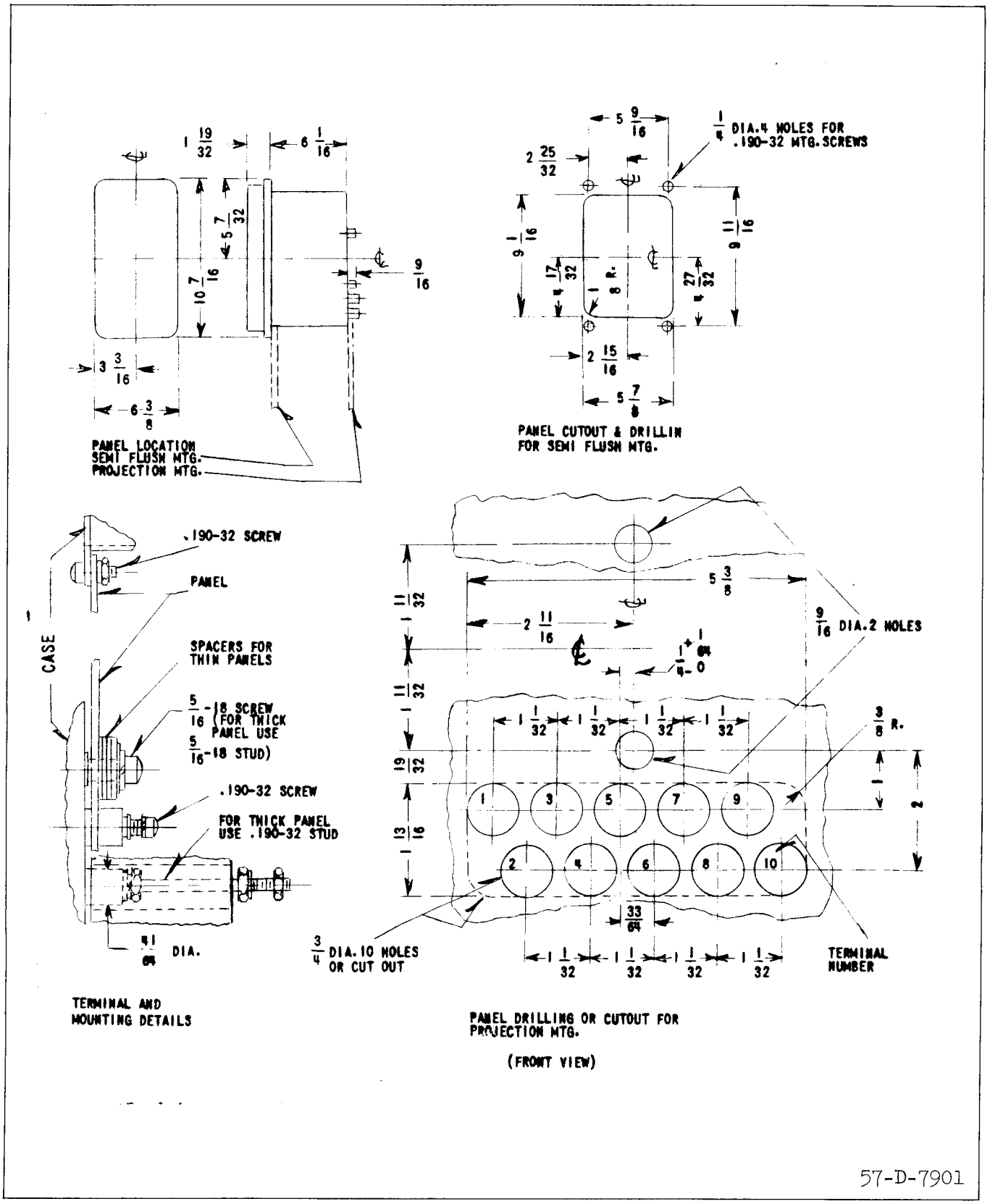


Fig. 6. Outline and Drilling Plan for the Type FT21 Case

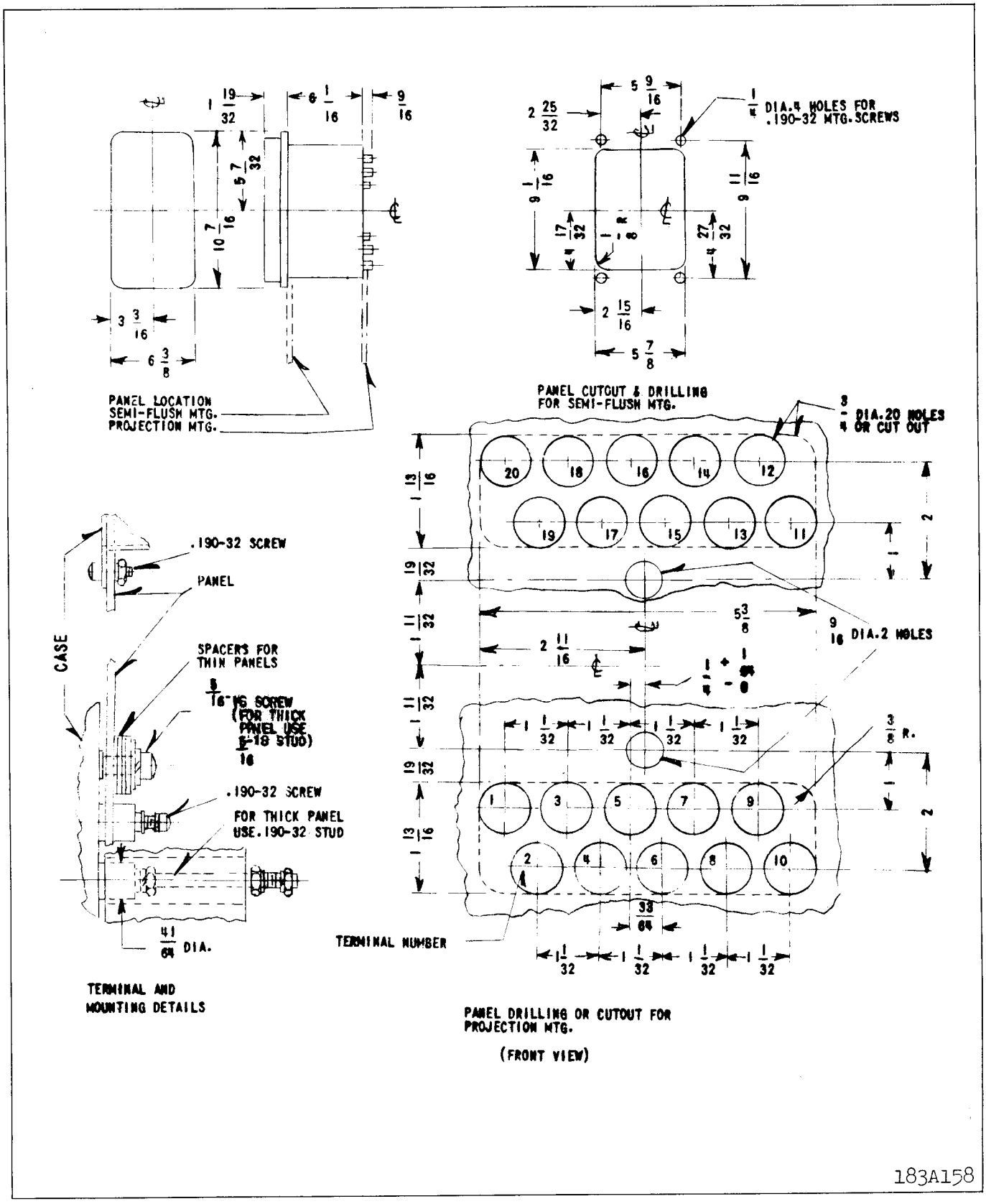
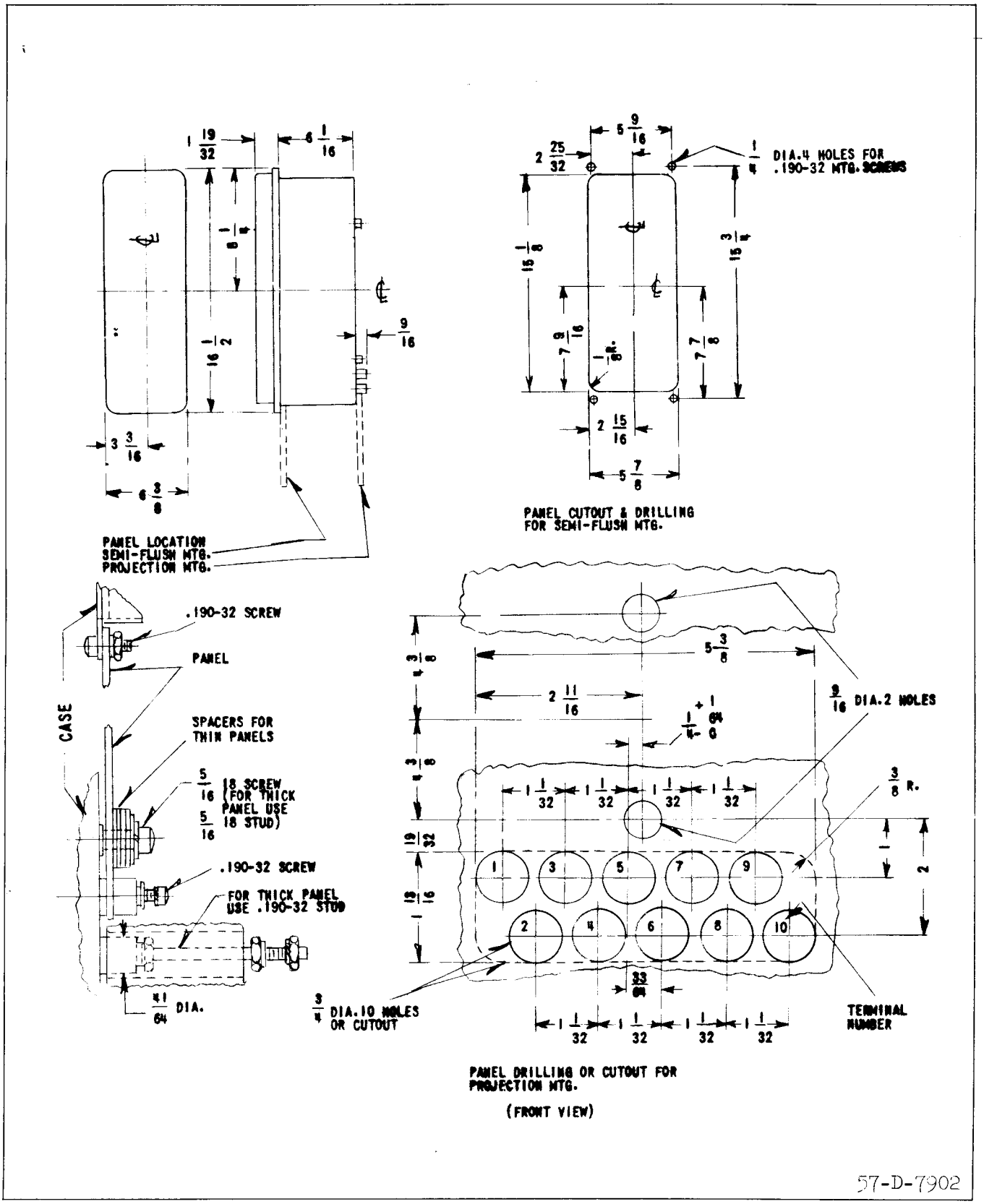


Fig. 7. Outline and Drilling Plan for the Type FT22 Case



* *Fig. 8. Outline and Drilling Plan for the Type FT31 Case*

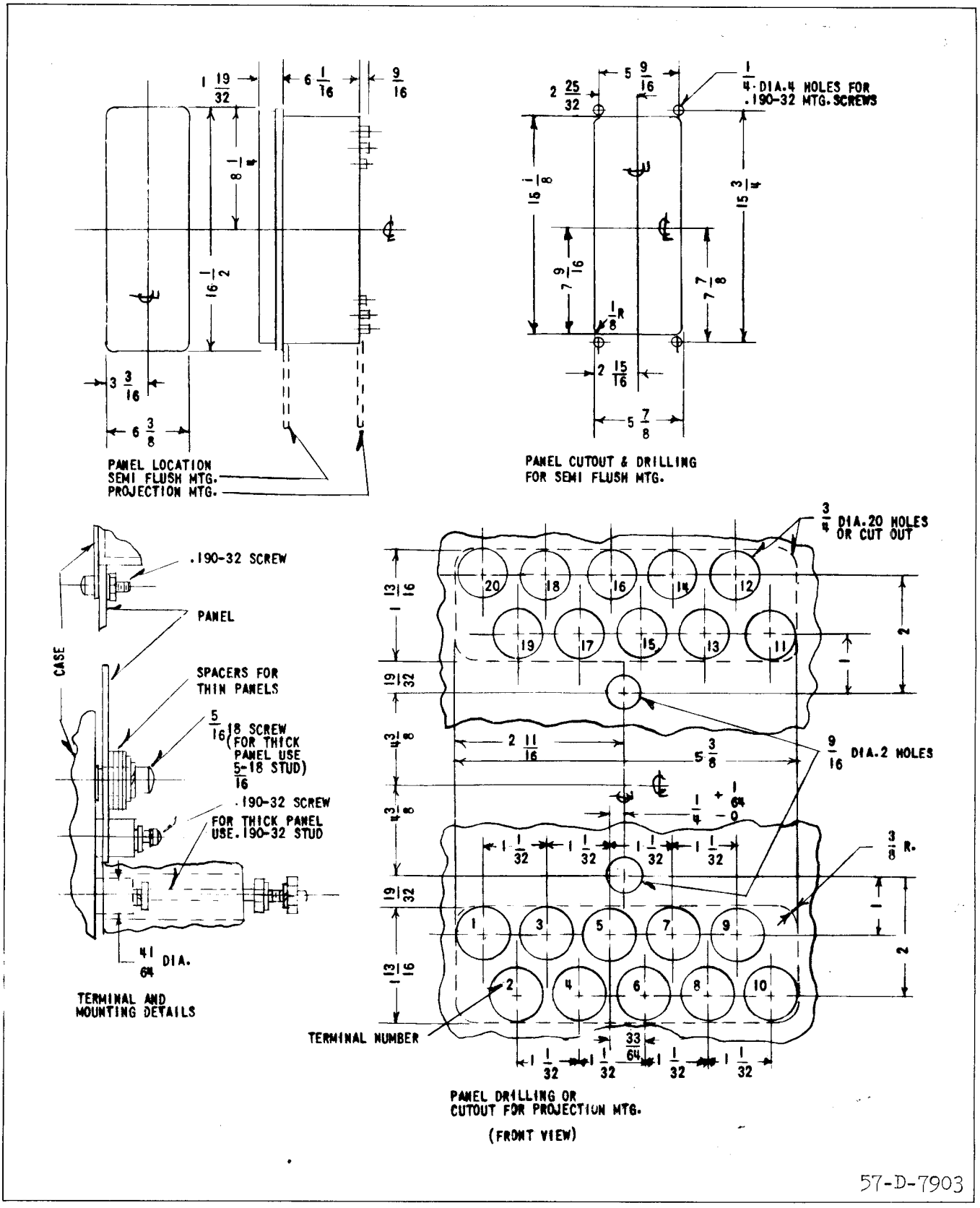


Fig. 9. Outline and Drilling Plan for the Type FT32 Case

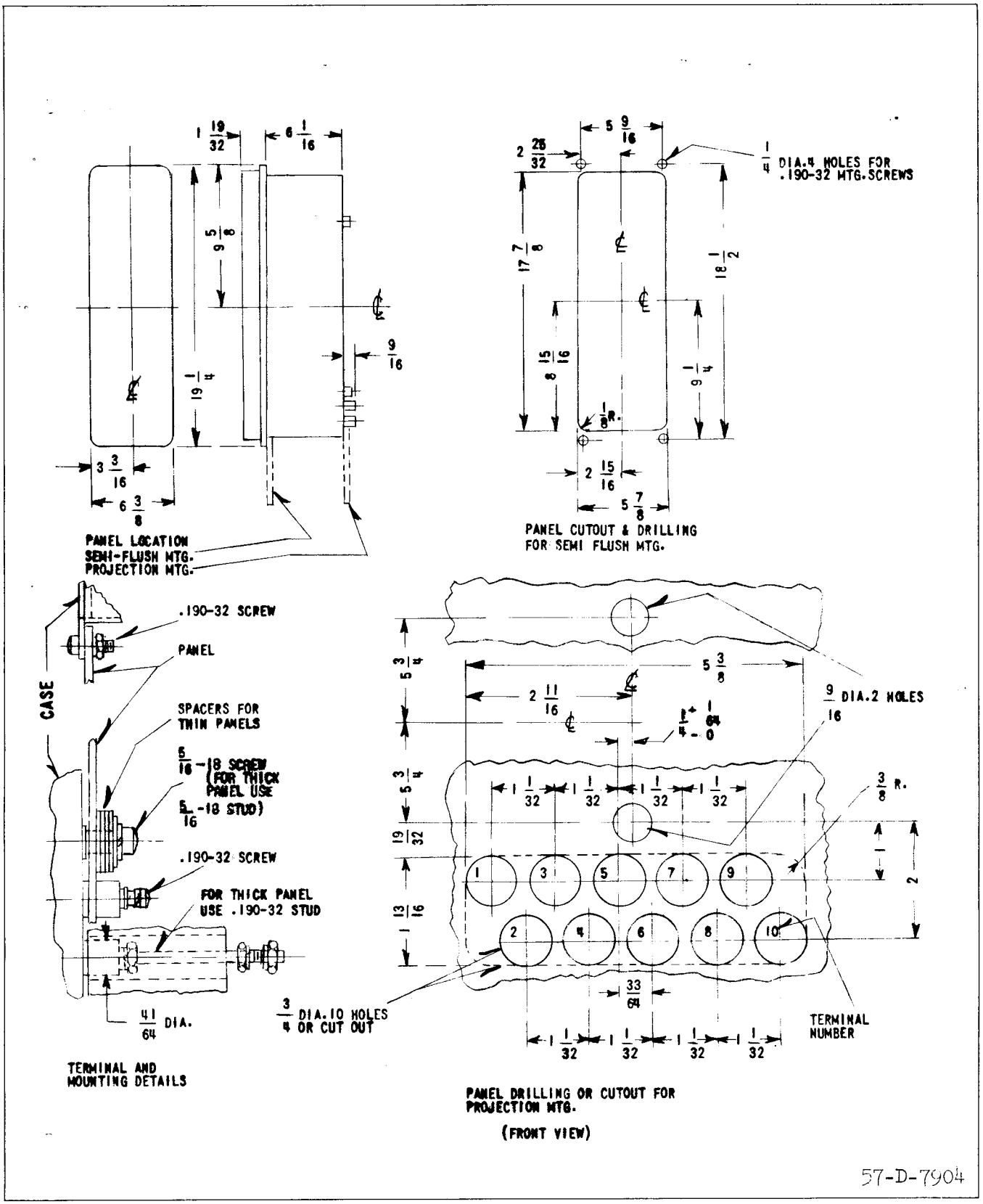


Fig. 10. Outline and Drilling Plan for the Type FT41 Case

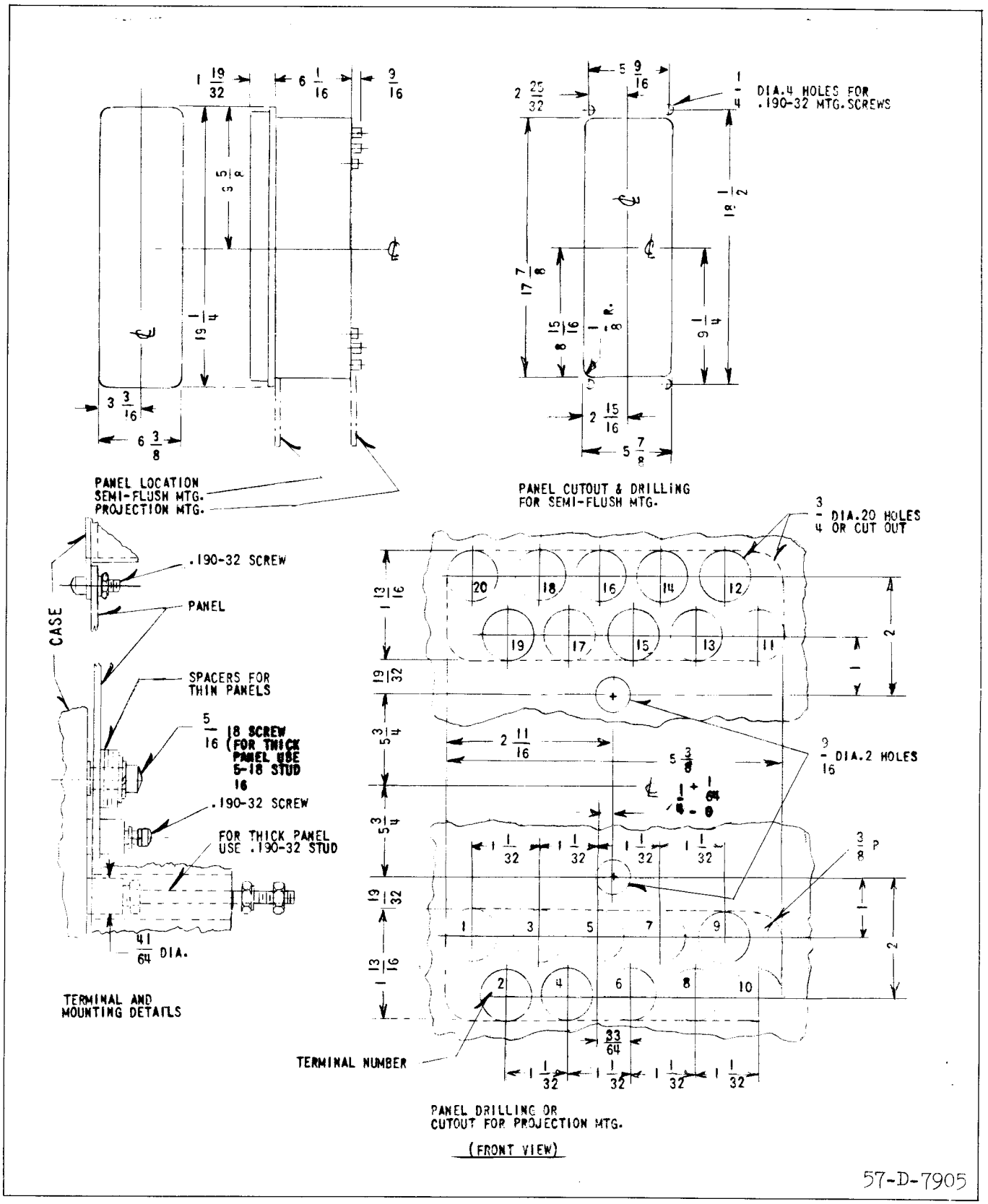


Fig. 11. Outline and Drilling Plan for the Type FT42 Case

WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

RELAYS IN TYPE FT11, FT21, FT22, FT31, FT32, FT41, FT42 CASES

The type FT (Flexitest) cases are dust-proof enclosures combining relay units and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are three main units of the type FT case: the case, cover, and chassis. The case is an all-steel welded housing containing the hinge half of the knife-blade test switches and the terminals for external connections. The cover is a molded phenolic frame with a clear glass window, a thumb nut, a reset lever, and a hook shaped support. The support fits over the top flange of the case. The thumb nut, which fastens to a stud on the bottom flange of the case, holds the cover securely in place on the case. The chassis is a steel frame that supports the relay elements and the contact jaw half of the test switches. This slides in and out of the case. The electrical connections between the base and chassis are completed through the closed knife-blades.

There are four different size cases available. These are designated the FT11, FT21 or 22, FT31 or 32, and the FT41 or 42. The first digit of the designation represents the physical size and the second the number of terminal blocks. One terminal block can accommodate up to ten terminals. The case may be either semi-flush or projection mounted.

REMOVING CHASSIS

To remove the chassis, first remove the cover by unscrewing the captive thumb nut at the bottom and lifting the cover support off the top flange of the case. This exposes the relay units and all the test switches for inspection and testing. The next step is to open the test switches. *Always open the red handle switches first before any of the black handle switches or the cam action latches.* This opens the trip circuit to prevent accidental tripout. Then open all the remaining switches. The order of opening the remaining switches is not important. In opening the test switches they should be moved all the way back against the stops. With all the switches fully opened, release the cam action latches and pull outward. The chassis can be set on a test bench for easy inspection, maintenance and test.

After removing the chassis a duplicate chassis may be inserted in the case or the blade portion of the switches can be closed and the cover put in place without the chassis. The chassis-operated auxiliary shorting switch remains closed with chassis out to prevent open circuiting the current transformers when the current test switches are closed. The operation of the auxiliary shorting switch is visible from the front of the relay, when the chassis is in place.

When the chassis is to be put back in the case, the above procedure is to be followed in the reversed order. *The red handle switch should not be closed until after the chassis has been latched in place and all of the black handle switches closed.*

ELECTRICAL CIRCUITS

Each terminal in the base connects through a test switch to the relay units in the chassis as shown on the internal schematic diagrams. The relay terminals are identified by numbers marked on the outside of the case. The test switch positions are identified by numbers marked on the molded blocks.

The potential and control circuits through the relay are disconnected from the external circuit by opening the associated test switches. Opening the current test switch short-circuits the current transformer secondary and disconnects one side of the relay coil but leaves the other side of the coil connected to the external circuit through the current test jack jaws. This circuit can be isolated by inserting the current test plug (without external connections), or by inserting the ten circuit test plug. Both switches of the current test switch pair must be open when using the current test plug in this manner to short-circuit the current transformer secondary.

TESTING

The relays can be tested in service, in the case

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, the local Westinghouse Electric Corporation representative should be contacted.

SUPERSEDES I.L. 41-076D

EFFECTIVE NOVEMBER 1977

✪ Denotes change from superseded issue.

but with the external circuits isolated or out of the case as follows:

TESTING IN SERVICE

The ammeter test plug can be inserted in the current test jaws after opening the knife-blade switch to check the current through the relay, as shown in Fig. 1. This plug consists of two conducting strips separated by an insulating strip. The ammeter is connected to these strips by terminal screws and the leads are carried out through holes in the back of the insulated handle.

Voltages between the potential circuits can be measured conveniently by clamping #2 clip leads on the projecting clip lead lug on the contact jaw.

TESTING IN CASE

With all blades in the full open position, the ten circuit test plug Fig. 4 can be inserted in the contact jaws. This connects the relay units to a set of binding posts and completely isolates the relay circuits from the external connections by means of an insulating barrier on the plug. The external test circuits are connected to these binding posts. The plug is inserted in the bottom test jaws with the binding posts up and in the top test switch jaws with the binding posts down.

The external test circuits may be made to the relay units by #2 test clip leads instead of the test plug. When connecting an external test circuit to the current elements using clip leads, care should be taken to see that the current test jack jaws are open so that the relay is completely isolated from the external circuits. Suggested means for isolating this circuit are outlined above, under "Electrical Circuits".

TESTING OUT OF CASE

With the chassis removed from the case, relay units may be tested by using the ten circuit test plug or by #2 test clip leads as described above. Any critical factory calibration is made with the chassis in the case and removing the chassis from the case may change the calibration values of these relays.

An internal schematic is available for each individual relay showing the schematic internal wiring. The outlines of the various cases are shown in Fig. 5 to Fig. 11.

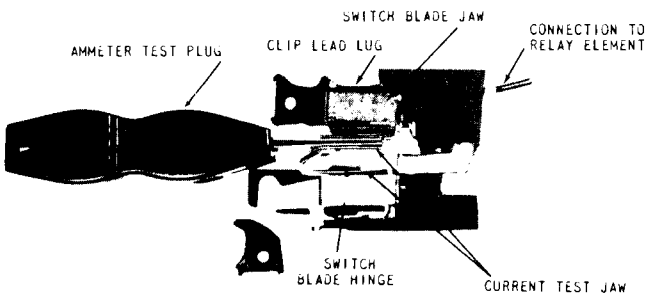


Fig. 1. Ammeter Test Plug in Testing Positions

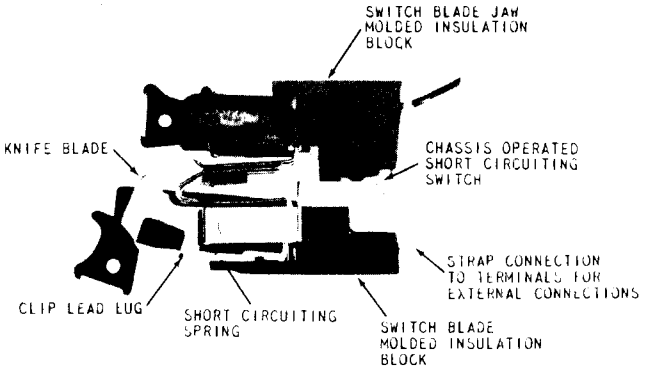


Fig. 2. Short Circuiting Switch

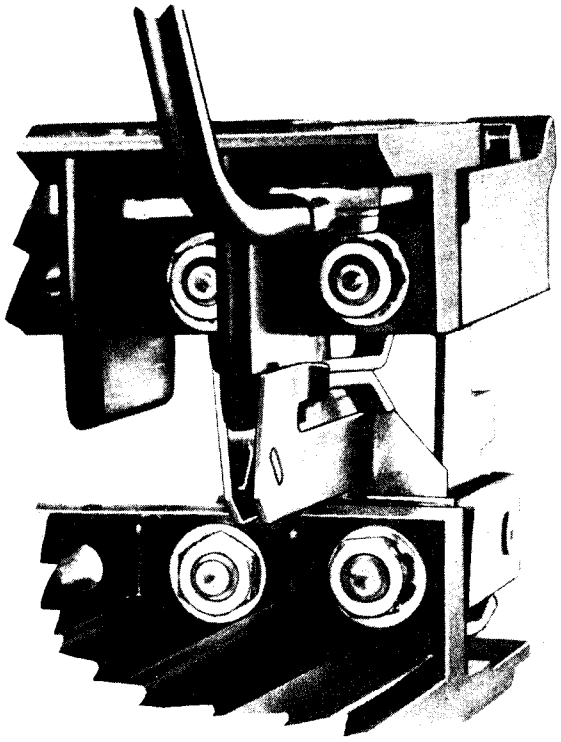


Fig. 3. Auxiliary Short Circuiting Switch (Enlarged View)

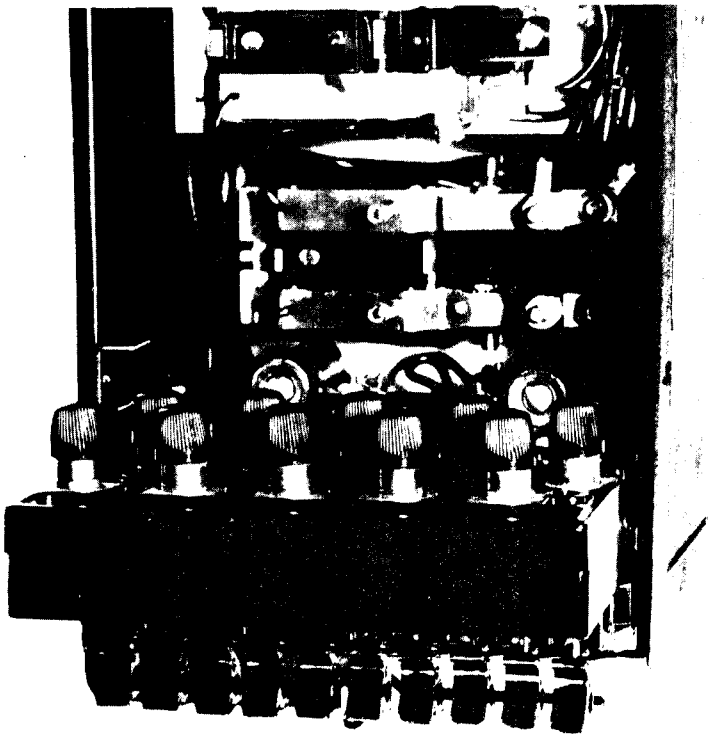


Fig. 4. Multi-Circuit Test Plug in Testing Position

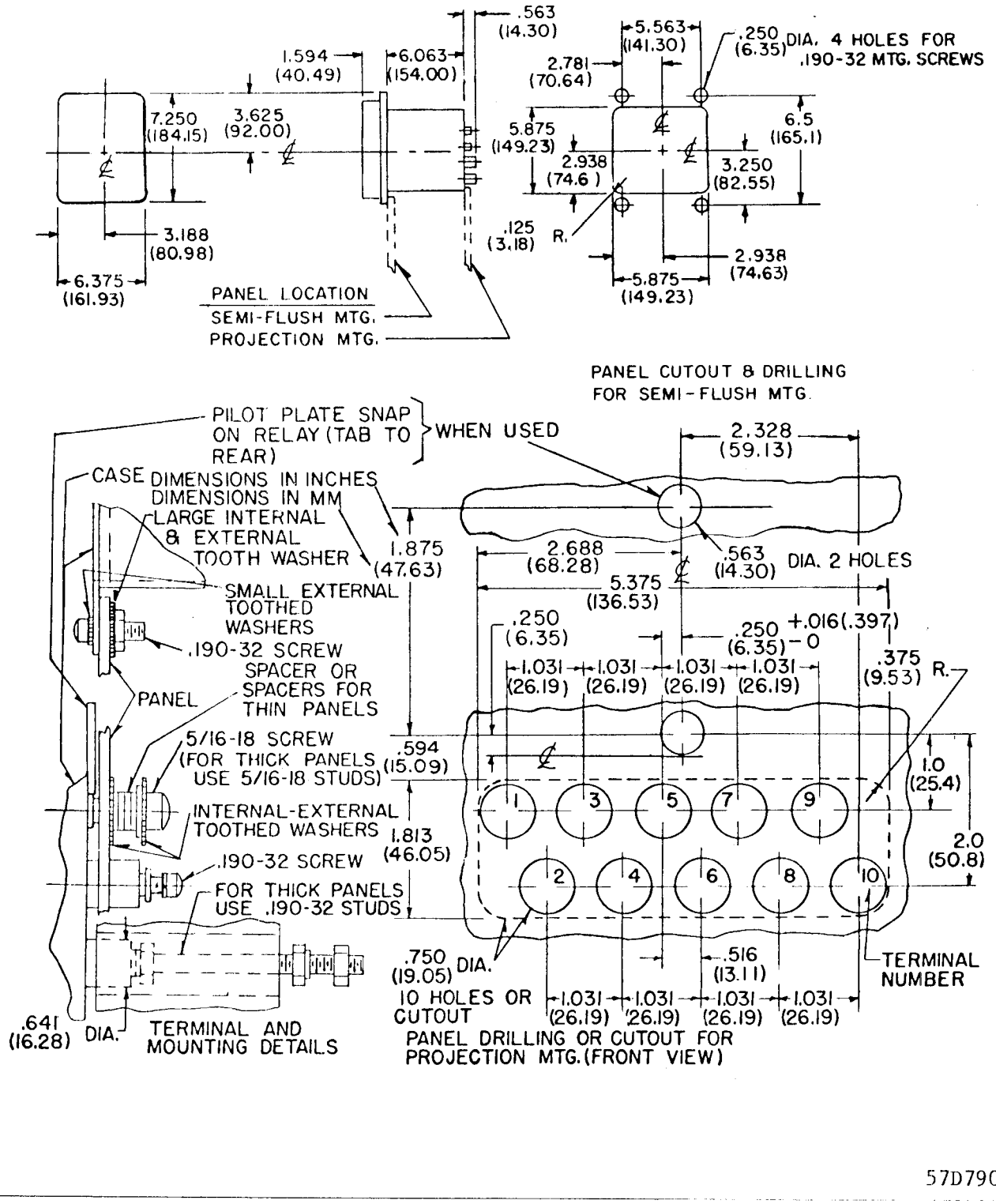


Fig. 5. Outline and Drilling Plan for the Type FT11 Case

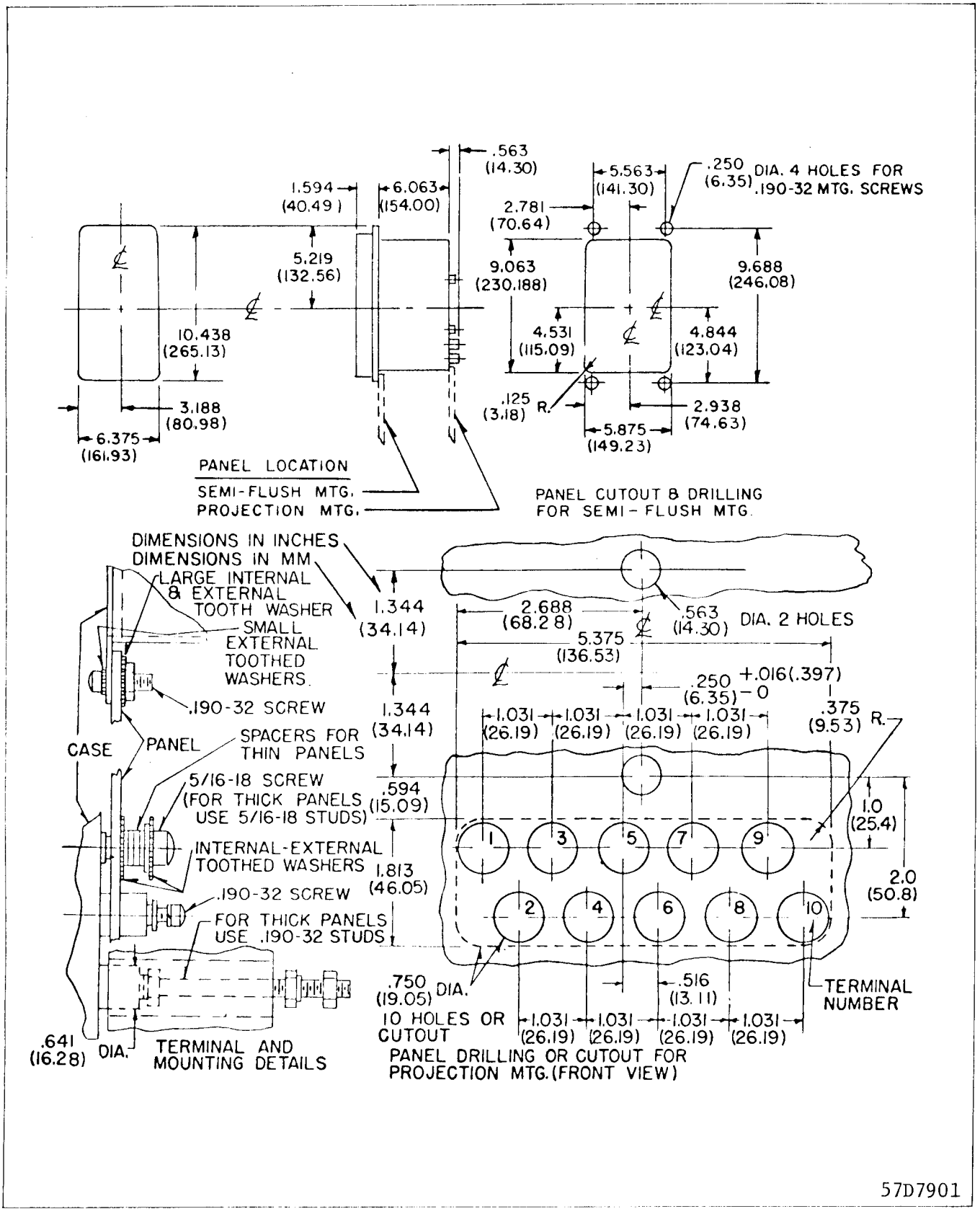
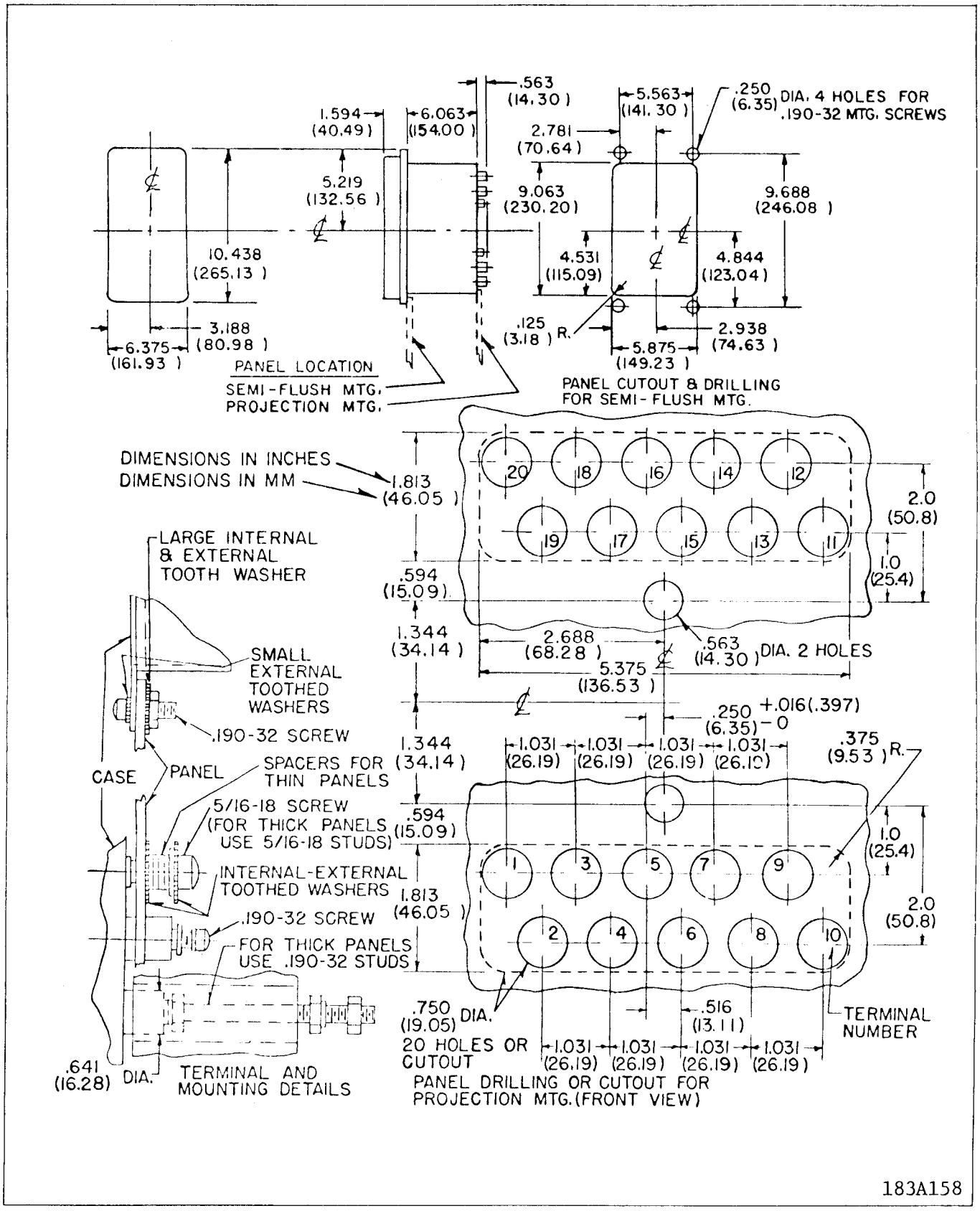
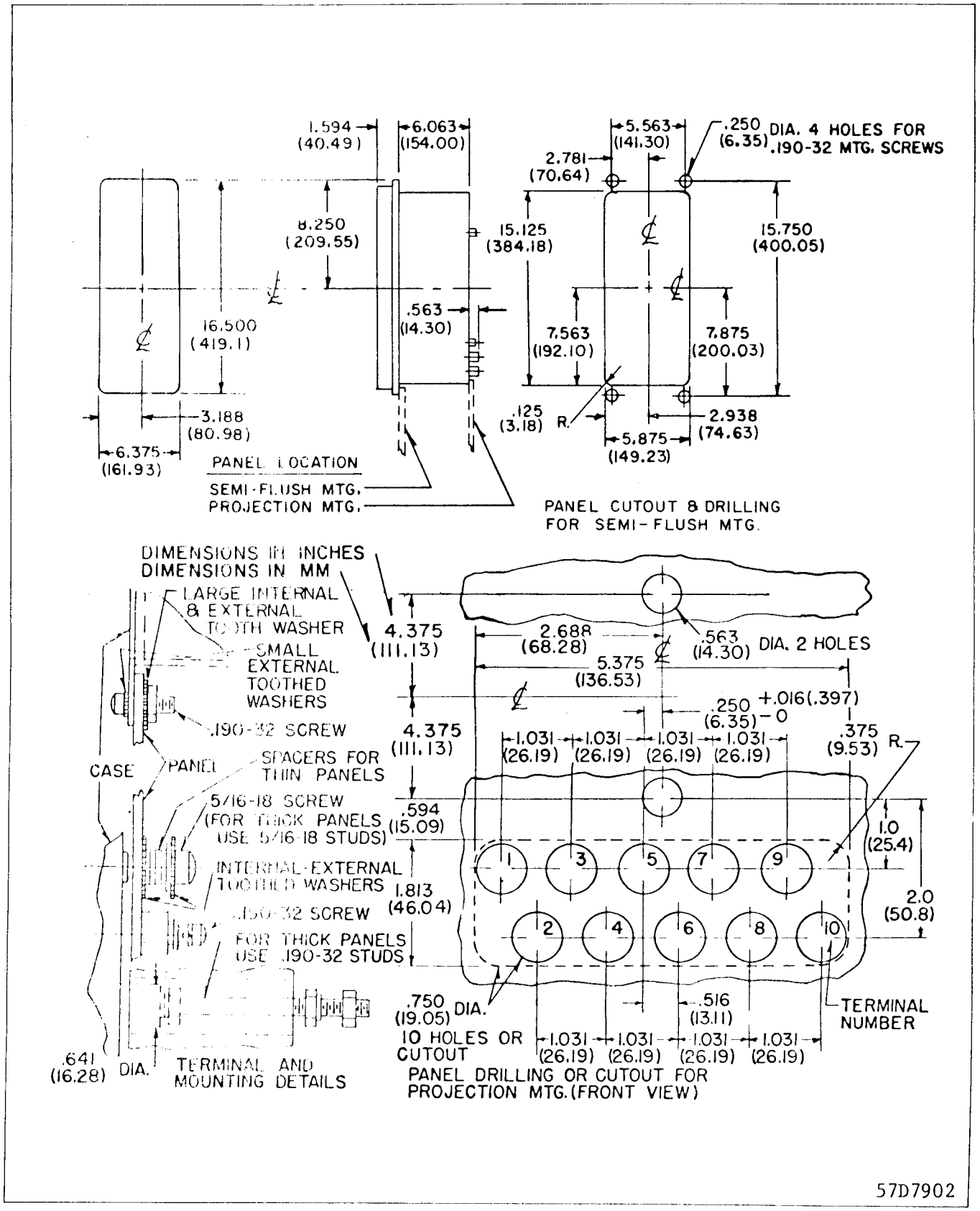


Fig. 6. Outline and Drilling Plan for the Type FT21 Case



✪ *Fig. 7. Outline and Drilling Plan for the Type FT22 Case*



✪ *Fig. 8. Outline and Drilling Plan for the Type FT31 Case*

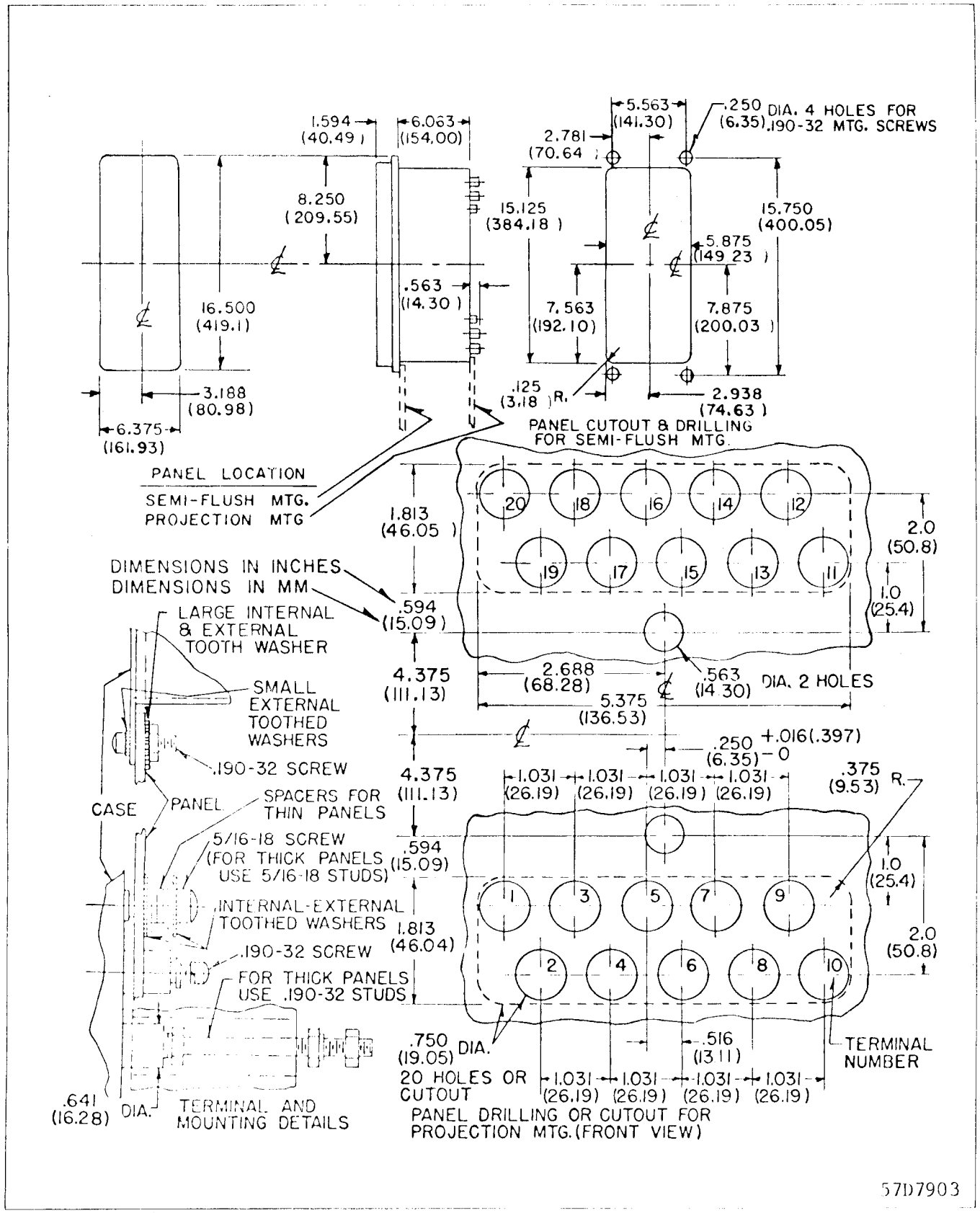


Fig. 9. Outline and Drilling Plan for the Type FT32 Case

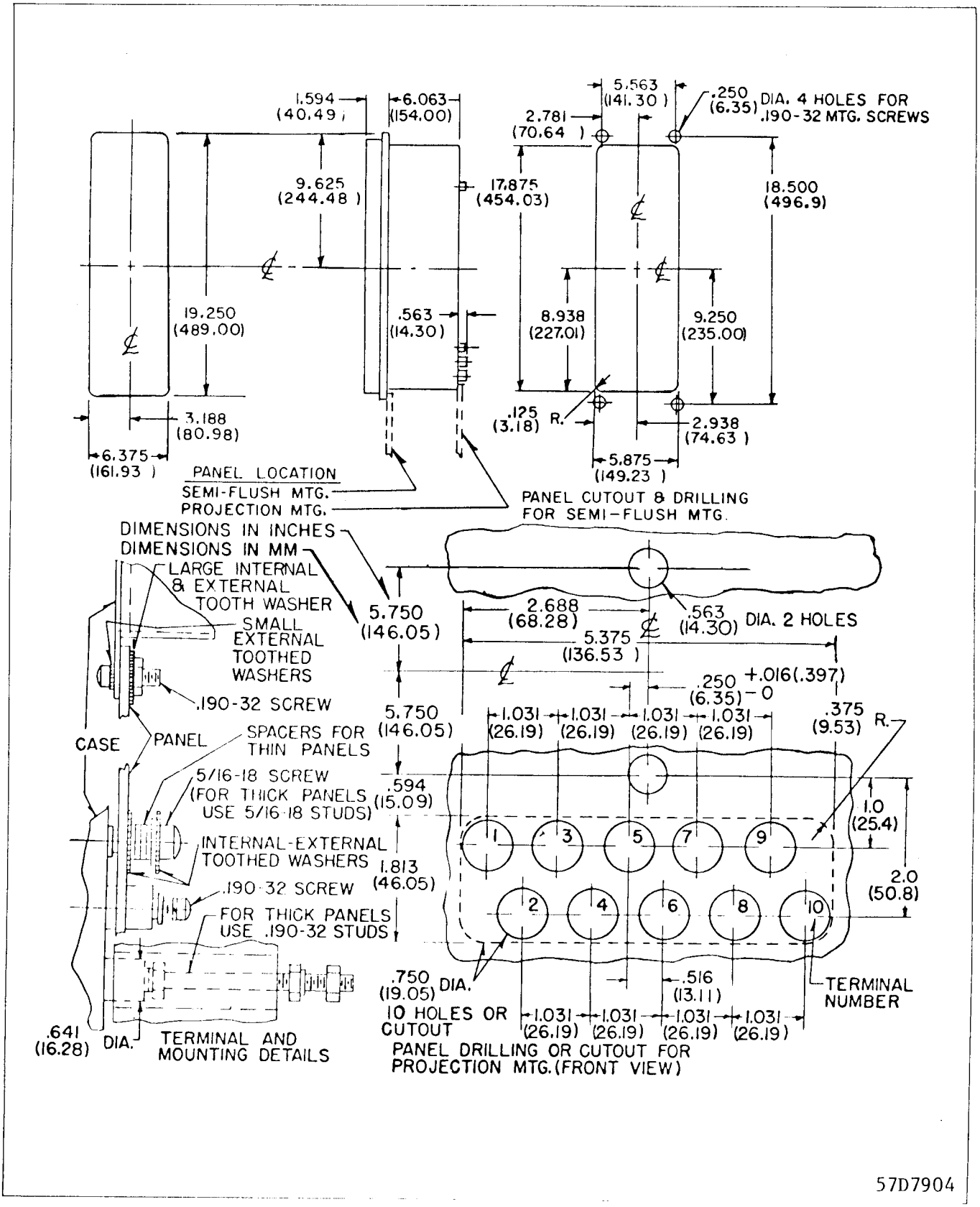


Fig. 10. Outline and Drilling Plan for the Type FT41 Case

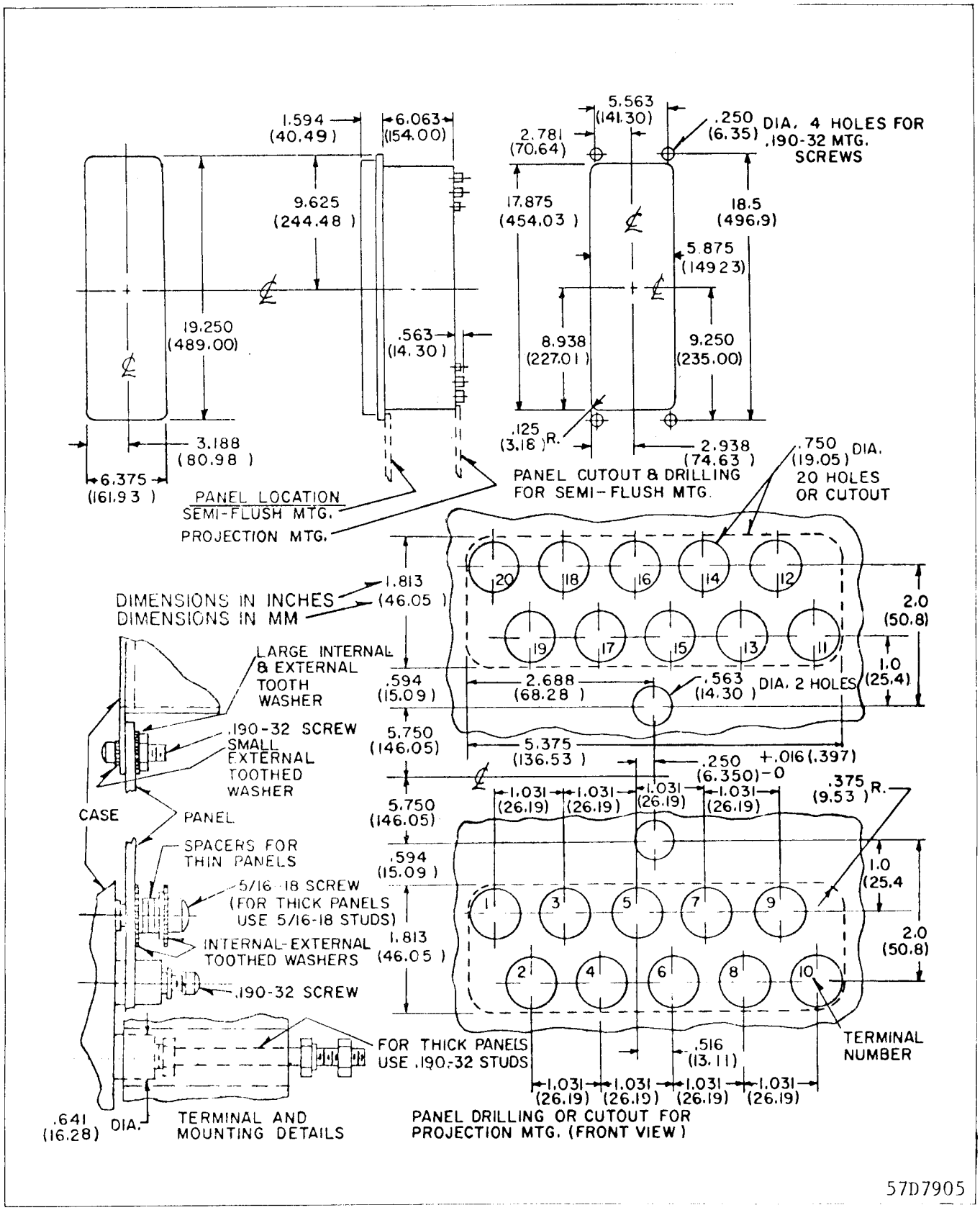
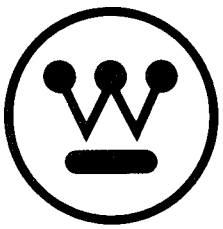


Fig. 11. Outline and Drilling Plan for the Type FT42 Case



WESTINGHOUSE ELECTRIC CORPORATION

RELAY-INSTRUMENT DIVISION

CORAL SPRINGS, FL.

Printed in U.S.A.

I.L. 41-076

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

RELAYS IN TYPE FT11, FT21, FT22, FT31, FT32, FT41, FT42 CASES

The type FT (Flexitest) cases are dust-proof enclosures combining relay units and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are three main units of the type FT case: the case, cover, and chassis. The case is an all-steel welded housing containing the hinge half of the knife-blade test switches and the terminals for external connections. The cover is a molded phenolic frame with a clear glass window, a thumb nut, a reset lever, and a hinge. The hinge fits over the top flange of the case. The thumb nut, which fastens to a stud on the bottom flange of the case, holds the cover securely in place on the case. The chassis is a steel frame that supports the relay elements and the contact jaw half of the test switches. This slides in and out of the case. The electrical connections between the base and chassis are completed through the closed knife-blades.

There are four different size cases available. These are designated the FT11, FT21 or 22, FT31 or 32, and the FT41 or 42. The first digit of the designation represents the physical size and the second the number of terminal blocks. One terminal block can accommodate up to ten terminals. The case may be either semi-flush or projection mounted.

REMOVING CHASSIS

To remove the chassis, first remove the cover by unscrewing the captive thumb nut at the bottom and lifting the cover hinge off the top flange of the case. This exposes the relay units and all the test switches for inspection and testing. The next step is to open the test switches. *Always open the red handle switches first before any of the black handle switches or the cam action latches.* This opens the trip circuit to prevent accidental tripout. Then open all the remaining switches. The order of opening the remaining switches is not important. In opening the test switches they should be moved all the way back against the stops. With all the switches fully opened, release the cam action latch or latches and pull outward. The chassis can be set on a test bench for easy inspection, maintenance and test.

After removing the chassis a duplicate chassis may be inserted in the case or the blade portion of the switches can be closed and the cover put in place without the chassis. The chassis-operated auxiliary shorting switch remains closed with chassis out to prevent open circuiting the current transformers when the current test switches are closed. The operation of the auxiliary shorting switch is visible from the front of the relay, when the chassis is in place.

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TESTING

The relays can be tested in service, in the case

EFFECTIVE JANUARY 1957

NEW INFORMATION

WESTINGHOUSE ELECTRIC CORPORATION
RELAY DEPARTMENT
NEWARK, N. J.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

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TESTING

The relays can be tested in service, in the

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