April 2002
Supersedes DB-41-077
Dated April, 1998

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

Flexitest Switch Type FT-1

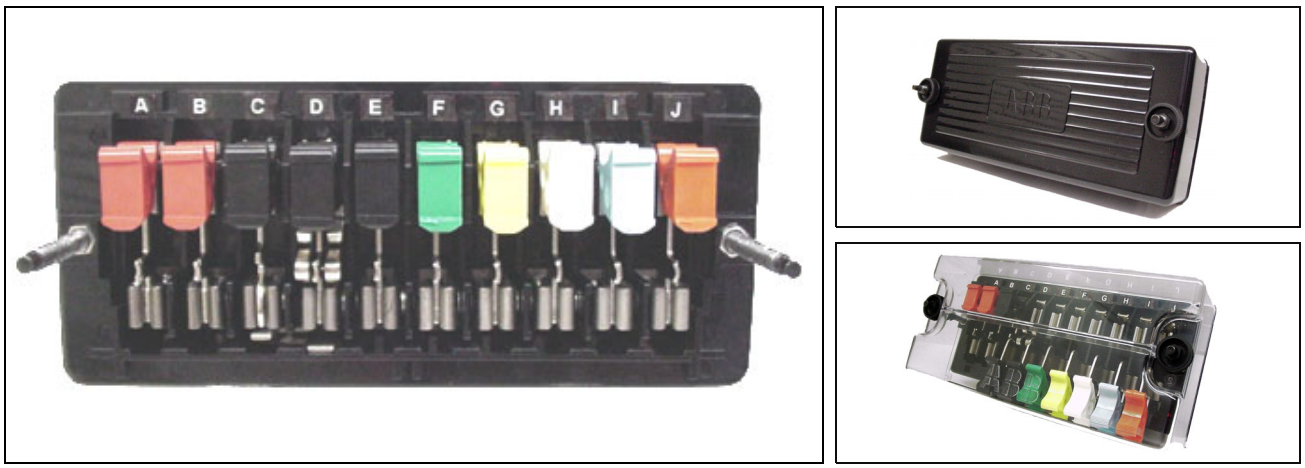


Figure 1. FT-1 Flexitest Switch (Front View)

APPLICATION

The ABB Type FT-1 Flexitest Switches and ABB Test Plugs are designed and manufactured to allow quick and easy multi-circuit testing of protective relays, meters and instruments by any conventional system.

Advantages

The Type FT-1 Switches and related Test Plugs have all the features necessary for applications involving the measurement of individual currents and voltages associated with substation instrumentation and protection devices. The make before break current short circuit feature also allows test personnel to quickly and safely isolate equipment from current transformer (ct) circuits.

Safe and Convenient

The semi-flush mounted FT-1 Switch provides fast, safe and reliable access to components and circuits on panel boards and switchboards without disconnecting existing wiring. All measurements and tests can be performed at the front of the switchboard without taking any devices out of service.

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.

Maximum Flexibility

The FT-1 Switch is built with a maximum of ten individual poles or switch units. The switches can be assembled in a variety of different arrangements, to match customer requirements.

ABB Test Plugs are used in conjunction with the FT-1 Switch to enable easy measurement, calibration, verification or maintenance of relays, meters or instruments.

Voltage measurements can also be made directly on the FT-1 Switch (without disturbing existing connections). There is a test clip located on the top of each pole that allows connection with standard spring clip test leads.

Security

With the cover in place, a meter type lead seal can be placed through either of the cover studs of the FT-1 Switch to prevent unauthorized access to the switch. As an additional feature, a clear cover is available that can also be installed and locked with the switchblades in the open position.

SPECIFICATIONS

Ratings

The FT-1 Switch is rated at 600 volts and 30 amps. It is UL recognized, and meets or exceeds all the requirements in ANSI/IEEE C37-90 standard.

Mounting

FT-1 Switches are designed for semi-flush mounting on the front of switchboard panels, facilitating inspection and accessibility.

Weight	Net lbs.	Net (kg)	Shipping lbs.	Shipping (kg)
FT-1 Switch	1.75	(.79)	3	(1.4)
In Service Series Test Plug	1.5	(.68)	3	(1.4)
Separate Source Test Plug	1.5	(.68)	3	(1.4)
Individual Current Circuit Test plug	0.1	(.045)	1	(0.45)

FT-1 SWITCH CONSTRUCTION

Base

The base of the FT-1 Flexitest Switch is made of a molded polycarbonate material, which provides a tough, insulated enclosure. Barriers are molded into the base (front and rear) to separate the switch units from one another. The barriers provide insulation between poles, and also ample wiring space between terminals.

Cover

The cover of the FT-1 Switch provides a tough insulated enclosure for the switch and is also made of a polycarbonate material. FT-1 standard styles come with a black opaque cover, but an optional clear cover is also available. This clear switch cover affords the user the unique option of intentionally leaving switch handles in the open position and replacing the cover. Maintaining the provision for a meter seal when some handles are in the open position allows the user to service electrical equipment while still complying with OSHA tag and lock procedures.

The clear cover can be ordered on new FT-1 Switches or ordered separately for retrofit to existing FT-1 Switches. Users will maintain the same ease of accessibility as with the black opaque cover.

The cover thumb nut has been modified so that a 1/4” nut driver can be used to loosen & tighten it. This is the same size nut driver that is used on the hex head terminal screws of the standard FT-1 Switch.

Poles

FT-1 Switches are available in combinations of anywhere from 1 to a maximum of 10 individual poles or switch units. Each pole is identified by a letter (A to J) visible along the top of the base from left to right (See Fig. 1).The individual switch units are of a knife blade type. There are two different types of switch units available: potential poles and current poles. Potential poles (P, T, . . .) are configured as single, non-shorting knife blades for use in potential, trip, or control circuits. Current poles are typically configured in sets of two, (C-C), for use with current circuits; and consist of a current test jack, a shorting spring, a shorting blade, and a non-shorting blade. (See Fig. 2) The positions of the short circuit springs are visible from the front of the switch.

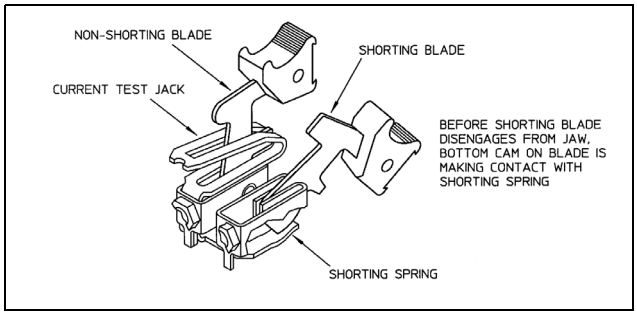


Figure 2. Blade assembly of two position pole “C-C” (Rear View, outside of base)

Switch Handles

Switch handles are made of a molded phenolic material, and are typically black for potential and current circuits, and red for trip circuits. They are also available in a variety of different colors. Each handle has a dovetail indentation to hold a circuit identification label. Knife blade switches can be operated independently, or ganged together with a horizontal interlocking bar, to suit testing needs. (See Fig. 3)

A hole runs through the middle of each switch handle to allow insertion of interlocking bars that can mechanically tie 2, 3, 4, 5, 6 or 10 switch handles together. Interlocking Bars are sold separately. (See “ACCESSORIES – ORDERING INFORMATION” on page 8.)

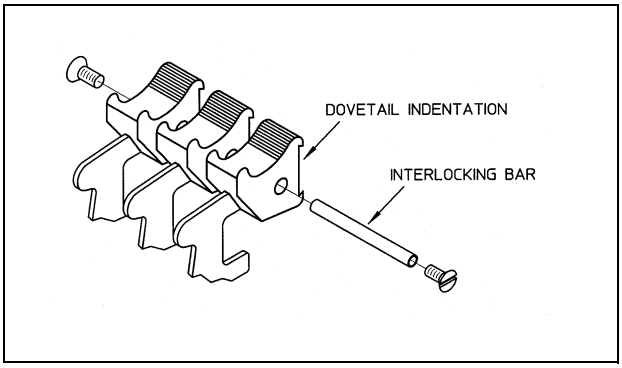


Figure 3. Switch Handles

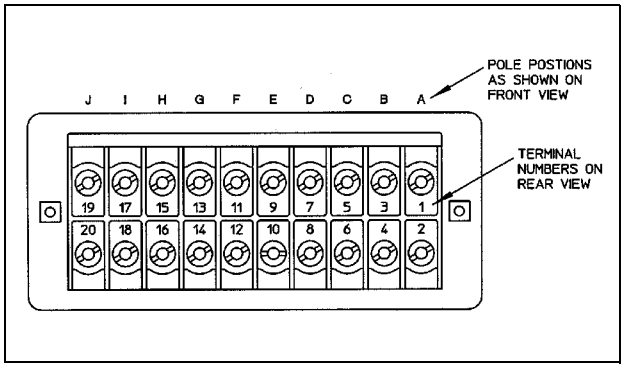


Figure 4. FT-1 Switch (rear view)

Terminals

Connection terminals are located at the rear of the switch. Terminals are numbered 1 to 20 for easy identification (rear view). Each pair of numbered terminals is associated with a matching pole designated by a letter on the front of the switch. (See Fig. 4)

FT-1 SWITCH ORDERING INFORMATION

Style Number Prefix	Style Number	Description	Photo
None (Standard)	See Table 3	Black Cover Screw Terminals	
S	See Table 3	Black Cover Stud & Nut Terminals	
C	See Table 3	Clear Cover Screw Terminals	
CS	See Table 3	Clear Cover Stud & Nut Terminals	
R, RS	For FT-19R Applications only (See DB 41-078)		

Ordering Information

- FT-1 Switches may be ordered by style number. Table 3 starting on page 9 provides a comprehensive selection guide of existing styles.

- An FT-1 Switch with black cover and screw terminals will be supplied when ordering the standard style number as listed on Table 3, (Example: 129A501G01). An optional clear cover will be supplied instead of the black cover by using style number prefix “C”, (Example: C129A501G01).

- Optional stud and nut terminals will be supplied by using style number prefix “S”, (Example: S129A501G01).

- Optional clear cover and optional stud and nut terminals will be supplied by using style number prefix “CS”, (Example: CS129A501G01).

- For FT-1 Switch requirements that cannot be matched up to an existing style number on Table 3, it is recommended that the customer find a style number that comes closest to meeting the necessary requirements. Enter description only to order the new FT-1 Switch as similar-to (existing style) except stating the different characteristic(s) required.

- Customers may also place the order by providing a complete Switch Arrangement definition, Example: P P P C-C C-C C-C P. (See Switch Arrangement section below.)

Switch Arrangement

- FT-1 Switches are available in any combination of 1 to 10 poles.

- Pole positions are identified from left to right on the front view of the switch by the letters “A” through “J”.

- Pole designations are used to identify each type of pole. To develop a complete Switch Arrangement that describes a unique FT-1 Switch, arrange pole designation sequentially from left to right (A-J).

- Every pole position has to be defined by a “Pole Designation” (“X” is used to designate empty pole positions).

- Some current Pole Designations span more than one pole position.

- A space is the delimiter between Pole Designations, (Example: P P P C-C C-C C-C P is the complete Switch Arrangement definition for style number 129A514G01).

- See Tables 1 & 2 for a complete listing of available Pole Designations, and their definitions.

Note: All switch arrangements developed or ordered should be checked for adequate current transformer shorting when applied to current transformer circuits.

Terminals

- All required terminal hardware is supplied with each FT-1 Switch.

- Screw Terminals are provided with standard FT-1 Switch styles. They require customer connections be made with a hex washer head screw. (See Fig. 5)

- Stud and Nut Terminals are an optional feature. Customer connections are made with two washers and a nut. (See Fig. 5) A special nut driver can be purchased from ABB to connect to stud terminals. (See “ACCESSORIES – ORDERING INFORMATION” on page 8)

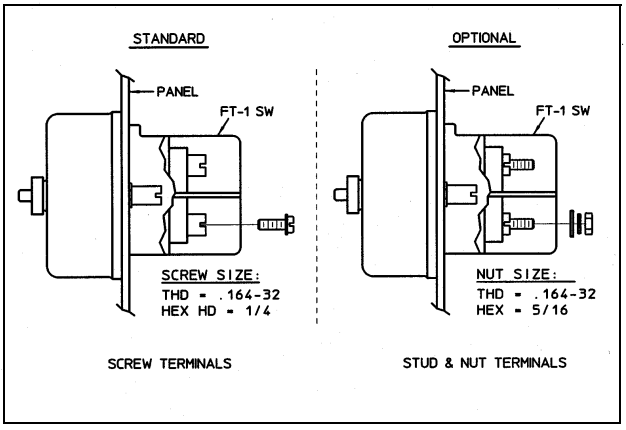
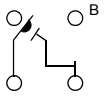
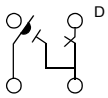
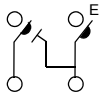
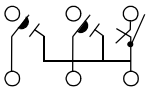


Figure 5. Standard and Optional Terminals

Table 1 - CURRENT POLES

POLE DESIGNATIONS	HANDLE COLOR	SCHEMATIC DIAGRAM	DESCRIPTION
C†	BLACK		NON-SHORTING, WITH TEST JACK
R†	RED		
C-C ‡	BLACK		CURRENT, SHORTING, WITH CURRENT TEST JACK
R-R	RED		
C-A	BLACK		CURRENT, SHORTING, WITHOUT CURRENT TEST JACK
C-B	BLACK		CURRENT, SHORTING, WITHOUT CURRENT TEST JACK, WITHOUT JAW OR BLADE AT “B”
C-D	BLACK		CURRENT, SHORTING, WITH CURRENT TEST JACK, WITHOUT BLADE AT “D”
C-E	BLACK		CURRENT, SHORTING, WITHOUT CURRENT TEST JACK WITH SHORTING BLADE ALSO AT “E”
C-C-C ††	BLACK		CURRENT, SHORTING, WITH CURRENT TEST JACK (2 POSITION SHORTING SPRING)

† = Current Poles C and R are special Pole Designations developed for test circuits. They are not intended for use in current transformer circuits.
‡ = Typical Pole Designations
†† = Also available as C-C-A, C-C-B. . . up to C-C-C-C

Table 2 - POTENTIAL POLES

POLE DESIGNATIONS	HANDLE COLOR	SCHEMATIC DIAGRAM	DESCRIPTION
P ‡	BLACK		POTENTIAL, NON-SHORTING BLADE
T ‡	RED		
G	GREEN		
Y	YELLOW		
Z	BLUE		
W	WHITE		
O	ORANGE		
L	BLACK		POTENTIAL, LONG BLADE
S	---	---	FIXED SHORTING STRAP
J	---	---	CURRENT JAW, NO BLADE
N	---	---	TERMINAL STUD IN BLADE LOCATION, NO JAW
U	---	---	STUD AND TEST CLIP
X	---	---	EMPTY POLE POSITION

‡ = Typical Pole Designations

TEST PLUGS

In-Service Series Test Plug

WARNING

When using an In-Service Series Test Plug for current measurements, connections from the Test Plug to the measuring instruments must be made before inserting the Test Plug in place.

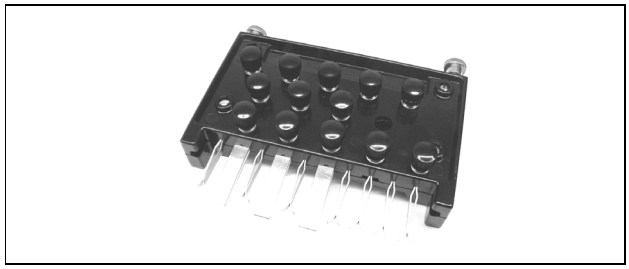


Figure 6. In-Service Series Test Plug

The “In-Service” Series Test Plug with a maximum of 10 positions is designed to match the pole configurations of specific styles of FT Flexitest devices (either FT-1 Switches or FT case relays). Not every switch or relay pole configuration is suitable to accept an In-Service Series Test Plug, but many FT-1 Switch styles do have one already available, See Table 3, page 9, “IN-SERVICE TEST PLUG”.

This Test Plug is typically used to connect devices measuring the currents and voltages being applied to the switchboard relays, meters and instruments without interrupting or short-circuiting the circuit. Only the current test switches with the current jack must be opened before inserting the Series Test Plug.

Individual Current Circuit Test Plug

WARNING

When using an Individual Current Circuit Test Plug for current measurements, connections from the Test Plug to the measuring instruments must be made before inserting the Test Plug in place

The Individual Current Circuit Test Plug is an ammeter type device used to measure current. It can be inserted in the current test jack of FT Flexitest devices after opening the knife blade switch. This plug consists of two conducting strips separated by an insulating strip. The ammeter is connected to these strips by terminal screws and leads carried out through holes in the back of the insulated handle. (See Figs. 7 and 8)

Figure 7. Individual Current Circuit Test Plug

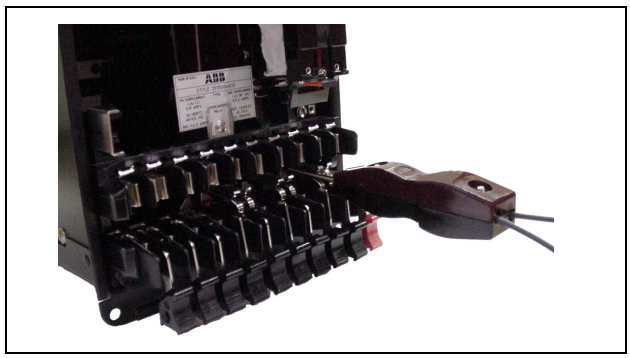


Figure 8. Individual Current Plug inserted into Flexitest Case

Separate Source Test Plug

WARNING

Provision is made only on current poles with shorting springs to automatically short-circuit current transformer circuits when the knife switches are opened prior to inserting the Test Plug.

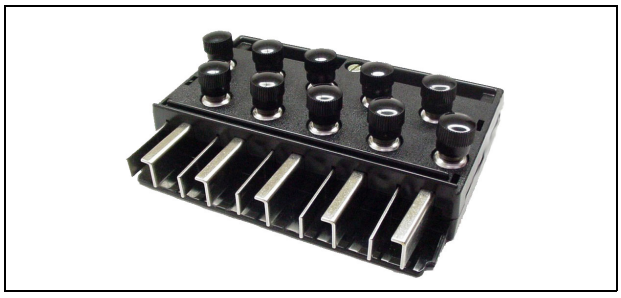


Figure 9. Separate Source Test Plug - 10 Position

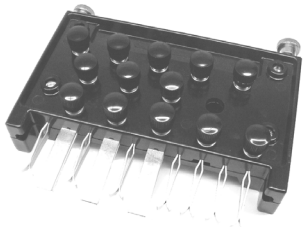
The 10 Position Separate Source Test Plug isolates the external connections from the relay or equipment under test. This test plug provides quick circuit testing, by fitting into the stationary contact jaws of any Flexitest Type FT Case or FT-1 Switch. L-shaped test blades assure quick, accurate alignment between the Test Plug and the stationary contact jaws.

Figure 10. Separate source test plug shown inserted in FT-Case (Bottom Switch Jaws)

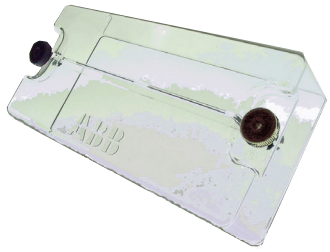
This Test Plug connects the relay inputs and outputs to a set of binding posts on the top of the Test Plug, and completely isolates the relay circuits from the external connections (ct, pt, trip, etc.) by means of an insulated barrier along the bottom of the plug. The external test circuits can then be connected to these binding posts, which are staggered for easy accessibility.

Before inserting the Separate Source Test Plug, all switch- blades must be placed in the full open position. In a Flexitest Type FT Case, the plug is inserted in the bottom switch jaws with the binding posts up and in the top test switch jaws with the binding posts down. (See Fig. 10)

TEST PLUGS – ORDERING INFORMATION

Description	Style Number	Photo
In-Service Series Test Plug (Order to match Flexitest FT relay case or FT-1 Switch arrangement)	See Table 3	
Individual Current Circuit Test Plug (Leads not included)	7B4618G04	
Separate Source Test Plug (10 position)	1164046	

ACCESSORIES – ORDERING INFORMATION

Description	Style Number	Photo
Clear Cover	9676A32G01	
Black Cover	128A973G01	

Description	Style Number	Photo
Nut Driver (For Stud & Nut Terminals only, Prefix “S”)	877A821G01	

Description	Style Number	Photo
Interlocking Bar 2 Position	1270547	
Interlocking Bar 3 Position	1164048	
Interlocking Bar 4 Position	02C9834G03	
Interlocking Bar 5 Position	02C9834G04	
Interlocking Bar 6 Position	02C9834G06	
Interlocking Bar 10 Position	02C9834G05	

Table 3
FT-1 Switch Selection Guide

POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
1 Pole		**A B C D E F G H I J**		
1	0	P	774B542G09	129A062G10
2 Pole		**A B C D E F G H I J**		
2	0	. . . . . P . P	291B954G15	129A062G10
2	0	. . . P . . P . . .	129A534G01	129A062G10
2	0	P P	291B954G13	129A062G10
2	0	T . . . . . T	291B954G14	129A062G10
2	0	T T	291B954G16	129A062G10
2	0	Z Z	9676A38G01	129A062G10
0	2	. . . . . C-C .	291B954G12	129A062G01
0	2	. . . . . C-C . . .	129A531G01	129A062G08
0	2	. C-C	498A026G01	129A062G07
3 Pole		**A B C D E F G H I J**		
3	0	. . . . . P P P	716B871G11	129A062G10
3	0	. . . P P P . . .	716B871G09	129A062G10
3	0	P . . . P . . . P	716B871G12	129A062G10
1	2	C-C . . . . . T	9663A78G01	(1)
0	3	. . . C C C . . .	716B871G10	(1)
4 Pole		**A B C D E F G H I J**		
4	0	. . . T P T P . . .	9676A26G01	129A062G10
4	0	. . . T T T P . . .	9676A27G01	129A062G10
4	0	. . P P P P	129A524G01	129A062G10
4	0	. . T . T . T . T .	291B956G31	129A062G10
4	0	. . T T T T	1586C39G01	129A062G10
4	0	. . T T T T	291B956G32	129A062G10
4	0	P . . . . . P P P	129A506G01	129A062G10
4	0	P . . . . . P P P	3501A86G06	129A062G10
4	0	P . . P . . P . . P	291B956G24	129A062G10
4	0	P . . P P P	291B956G25	129A062G10
4	0	P P . . . . . P P	129A538G01	129A062G10
4	0	P P P . . . . . P	498A022G01	129A062G10
4	0	P P P . . . . . T	9663A80G01	129A062G10
4	0	P P P P	9672A73G01	129A062G10
4	0	T . . . . . P P T	763A166G01	129A062G10
4	0	T . . . . . T T T	498A012G01	129A062G10
4	0	T . T . . . . T . T	862A584G01	129A062G10
4	0	T T T . . . . . T	1586C39G02	129A062G10
3	1	P P C . . . . . P	291B956G26	(1)
2	2	P . . . . . C-C P	129A507G01	129A062G01
2	2	P P . . . . . C-C .	291B956G18	129A062G01
2	2	P P C-C	291B956G30	(1)
2	2	T . . . . . C-C P	9671A05G01	129A062G01
2	2	T T . . . . . C-C .	9676A36G01	129A062G01
1	3	. . . C C C . . . P	291B956G28	(1)
0	4	. . . . . C-C C-C .	291B956G13	129A062G02
0	4	. C C C C	291B956G23	(1)
0	4	. C-C . . C-C . . .	763A109G01	(1)
0	4	. C-C C-C	498A027G01	129A062G09
0	4	C C C C	291B956G27	(1)
0	4	C-C C-C	291B956G29	(1)
0	4	C-C-C-C	837A087G01	(1)
5 Pole		**A B C D E F G H I J**		
5	0	P P . . . . . P P P	129A505G01	129A062G10
5	0	P P P P P	291B957G15	129A062G10
5	0	T T . . . . . T T T	9676A37G01	129A062G10
3	2	P C-C P . . . . . P	129A508G01	129A062G07
3	2	P P . . . . . C-C P	129A533G01	129A062G01
3	2	P P . . C-C . . . P	291B957G17	(1)
3	2	P P P C-C	291B957G16	(1)
3	2	T P . . . . . C-C T	291B957G09	129A062G01
1	4	. C C . C . C . P .	498A002G01	(1)
0	5	C . C . C . C . C .	129A555G01	(1)
6 Pole		**A B C D E F G H I J**		
6	0	. . . P P P P P P .	188A416G01	129A062G10
6	0	P P . . . . P P P P	837A889G01	129A062G10
6	0	P P . . P P . . P P	629A568G01	129A062G10
6	0	P P P . . . . P P P	129A504G01	129A062G10
6	0	P P P P . . . . P P	129A550G01	129A062G10
6	0	P P P P P P	291B958G25	129A062G10
6	0	P P T . . . . T T T	1586C40G01	129A062G10
6	0	T T T T . . . . T T	291B958G33	129A062G10
4	2	P . . . . P P C-C P	129A509G01	129A062G01
4	2	P P P P R-R	9667A02G01	(1)
4	2	T T . . . P P . C-C	9672A03G01	(1)

Table 3
FT-1 Switch Selection Guide (continued)

POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
3	3	P P . . . . C C C P	291B958G24	(1)
3	3	P P . . . . C C-C P	129A543G01	129A062G02
3	3	P P P . . . C C C .	9676A19G01	(1)
2	4	. . . C-C C-C P P .	291B958G30	129A062G12
2	4	P . . . . C-C C-C P	129A537G01	129A062G02
2	4	P . . . . P C-C C-C	291B958G31	(1)
2	4	P . . C C C C . . P	291B958G27	(1)
0	6	. . . . C-C C-C C-C	9672A72G01	(1)
0	6	. . . C C C C C C .	188A454G01	(1)
0	6	. . . C-A C-A C-A .	291B958G26	(1)
0	6	. . . C-A C-A C-C .	291B958G29	(1)
0	6	. . . C-B C-B C-B .	498A017G01	(1)
0	6	. . . C-C C-C C-C .	129A516G01	292B319G23
0	6	. . . R-R R-R R-R .	291B958G28	292B319G23
0	6	. . C C C C C C . .	129A523G01	(1)
0	6	. C-C . C-C . C-C .	498A014G01	(1)
0	6	C . C . C . . C C C	188A304G01	(1)
0	6	C-C C-C C-C	9660A97G01	(1)
7 Pole		**A B C D E F G H I J**		
7	0	. P P P P P P P . .	129A526G01	129A062G10
7	0	P . . P P P . P P P	129A503G01	129A062G10
7	0	P . . P P P P P . P	291B959G19	129A062G10
7	0	P P P . . . P P P P	129A547G01	129A062G10
7	0	P P P . . . P P P P	291B959G30	129A062G10
7	0	P P P P . . P P P .	498A013G01	129A062G10
7	0	P P P P P P . . . T	9663A79G01	129A062G10
7	0	P P P P P P P . . .	291B959G28	129A062G10
7	0	T . . P P P . P P T	763A168G01	129A062G10
7	0	T T P . . . P P P P	291B959G33	129A062G10
5	2	P C-C P . . . P P P	188A261G01	129A062G07
5	2	P P . . . C-C P P P	129A510G01	129A062G08
5	2	P P P P P . . . C-C	291B959G27	(1)
5	2	P P P P P . . C-C .	291B959G18	129A062G01
5	2	T P . . . P P C-C T	188A622G01	129A062G01
5	2	T T . . . R-R T T T	9667A17G01	129A062G08
4	3	P P C . C . C . P P	188A477G01	292B319G24
3	4	P C C . C . C . P P	188A618G01	(1)
3	4	P P . . . C-C C-C P	129A511G01	129A062G02
3	4	P P P . . C-C C-C .	498A008G01	129A062G02
3	4	T C-C T C-C T . . .	291B959G26	(1)

POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
3	4	T T T . . . C C C C	291B959G32	(1)
3	4	T T T . . C-C C-C .	291B959G20	129A062G02
1	6	. . . C-C C-C C-C T	498A003G01	292B319G23
1	6	C-C C-C C-C . . . T	9663A77G01	(1)
1	6	P C-C C-B C-B . . .	129A540G01	(1)
0	7	. . C C-C C-C C-C .	291B959G29	292B319G22
0	7	C-C C-C C-C C . . .	9676A24G01	(1)
8 Pole		**A B C D E F G H I J**		
8	0	. P P P P P P P P .	291B960G37	129A062G10
8	0	P . . P P P P P P P	129A549G01	129A062G10
8	0	P P P . . P P P P P	719B591G09	129A062G10
8	0	P P P . P P . P P P	291B960G39	129A062G10
8	0	P P P P . . P P P P	129A502G01	129A062G10
8	0	P P P P . . P P P T	129A536G01	129A062G10
8	0	P P P P P . . P P P	129A546G01	129A062G10
8	0	P P P P P . . P T T	719B591G14	129A062G10
8	0	P P P P P P P P . .	719B591G10	129A062G10
8	0	T T T T T . . T T T	719B591G12	129A062G10
6	2	P P P . . C-C P P P	291B960G26	129A062G08
6	2	P P P P P . . C-C P	188A632G01	129A062G01
6	2	P P P P P P . . C-C	291B960G36	(1)
6	2	T . . P P P P C-C T	763A167G01	129A062G01
4	4	. . P P P C-C C-C P	629A315G01	129A062G02
4	4	C-C C-C . . P P P P	719B591G13	(1)
4	4	C-C C-C . P P P P .	719B591G11	(1)
4	4	P C-C P . . P C-C P	129A512G01	129A062G06
4	4	P P . C C C C . P P	498A016G01	(1)
4	4	P P . C-C C-C . P P	129A530G01	129A062G12
4	4	P P P P . C-C C-C .	129A544G01	129A062G02
3	5	T P . . C C-C C-C T	291B960G27	292B319G23
2	6	. C C C C C C . P P	9667A21G01	(1)
2	6	. C-C C-C C-C . P P	129A521G01	129A062G09
2	6	. C-C C-C C-C P P .	129A525G01	129A062G09
2	6	C-B C-B C-B . . P P	291B960G38	(1)
2	6	T T . . C-C C-C C-C	9668A69G01	(1)
1	7	C . . C-B C-B C-B P	498A018G01	(1)
1	7	P . C C-C C-C C-C .	498A019G01	292B319G22
0	8	. C C C C C C C C .	498A004G01	(1)
0	8	. C-C C-C C-C C-C .	129A517G01	292B319G22
0	8	. C-C-C-B . C-C-C-B	498A029G01	(1)

Table 3
FT-1 Switch Selection Guide (continued)

POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
0	8	. C-C-C-B C-C-C-B .	291B960G20	(1)
0	8	. C-C-C-C C-C-C-C .	291B960G33	(1)
0	8	. R-R R-R R-R R-R .	9660A84G01	292B319G22
0	8	C C C C . . C C C C	188A229G01	(1)
0	8	C-C . . C-C C-C C-C	9672A10G01	(1)
0	8	C-C C-C C-C . . C-C	1586C41G01	(1)
0	8	C-C-C-A C-C-C-B . .	837A099G01	(1)
0	8	C-C-C-B . . C-C-C-B	498A025G01	(1)
0	8	C-C-C-C C-C-C-B . .	837A098G01	(1)
9 Pole		**A B C D E F G H I J**		
9	0	P P . P P P P P P P	129A548G01	129A062G10
9	0	P P P P . P P P P P	129A551G01	129A062G10
6	3	P P P C C C P P P .	291B961G23	(1)
6	3	P P P P P . C C C P	291B961G30	(1)
6	3	P P P P P . C C-C P	129A552G01	129A062G02
6	3	P P P P P . C-C C P	629A483G01	(1)
5	4	P P P P . C-C C-C P	188A633G01	129A062G02
5	4	P P P P P . C-C C-C	291B961G22	(1)
5	4	P P P P P C C C C .	291B961G28	(1)
5	4	P P P P P C-C C-C .	129A545G01	129A062G02
4	5	P P P P . C C-C-C-B	498A028G01	(1)
3	6	. T C-C T C-C T C-C	9663A34G01	(1)
3	6	P C-C P C-C P C-C .	861A551G01	(1)
3	6	P P . C-C C-C C-C P	129A515G01	292B319G23
3	6	P P P . C-C C-C-C-B	498A024G01	(1)
3	6	P P P C-C C-C . C C	291B961G27	(1)
3	6	P P P C-C C-C C-C .	291B961G29	292B319G23
3	6	T T . C-C C-C C-C T	9663A74G01	292B319G23
3	6	T T T C-C C-C C-C N	291B961G25	(1)
2	7	P P . C-B C-B C-B S	291B961G26	(1)
1	8	. C-C C-C C-C C-C T	498A009G01	292B319G22
1	8	T . C-C C-C C-C C-C	9668A70G01	(1)
0	9	. C C-B C C-B C C-B	498A023G01	(1)
0	9	C C-C C-C C-C C-C .	3501A86G05	(1)
0	9	C C-C C-C C-C C-C .	498A021G01	(1)
0	9	C-C C-C C-C C . C-C	9676A25G01	(1)
10 Pole		**A B C D E F G H I J**		
10	0	O O O O O O O O O O	9672A97G01	129A062G10

POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
10	0	P P P P P P P P P P	129A501G01	129A062G10
10	0	P P P P P P P P P P	3501A86G02	129A062G10
10	0	P P P P P P P P P T	774B430G19	129A062G10
10	0	P P P P P P P P T T	1586C42G23	129A062G10
10	0	P P P P P P P P Z Z	9671A94G01	129A062G10
10	0	P P P P P P P T T P	9672A77G01	129A062G10
10	0	P P P P P P P T T T	1586C42G25	129A062G10
10	0	P P P P P P T P P P	1586C42G29	129A062G10
10	0	P P P P P P T P P T	9676A08G01	129A062G10
10	0	P P P P P P T P T P	9672A75G01	129A062G10
10	0	P P P P P P T P T T	1586C42G30	129A062G10
10	0	P P P P P P T T T P	9672A98G01	129A062G10
10	0	P P P P P P T T T T	9672A71G01	129A062G10
10	0	P P P P P P Z Z Z Z	9671A95G01	129A062G10
10	0	P P P P P T T T T T	1586C42G24	129A062G10
10	0	P P P P P T T T T T	670B197G21	129A062G10
10	0	P P P P T P P T P P	9667A06G01	129A062G10
10	0	P P P P T P T T T T	1586C42G28	129A062G10
10	0	P P P P T T T P P P	9676A14G01	129A062G10
10	0	P P P P T T T T T T	670B197G26	129A062G10
10	0	P P P T T T T T T P	9672A74G01	129A062G10
10	0	P P T P T P P P P P	1586C42G15	129A062G10
10	0	P P T T T T T T T T	670B197G24	129A062G10
10	0	P T P P T P P T P P	9668A27G01	129A062G10
10	0	P T P P T T P P T P	9667A03G01	129A062G10
10	0	P T P T P P T P T P	9670A98G01	129A062G10
10	0	P T T P P P P P P P	9671A69G01	129A062G10
10	0	T P P P P P P P P P	1586C42G31	129A062G10
10	0	T P P P P P P P P T	670B197G36	129A062G10
10	0	T P P P P T P P P P	9667A93G01	129A062G10
10	0	T P P T P P P P P P	9670A35G01	129A062G10
10	0	T P P T P P T P P P	9670A34G01	129A062G10
10	0	T P P T P P T P P T	9670A97G01	129A062G10
10	0	T P T P P P P P P P	1586C42G06	129A062G10
10	0	T P T P P P P T P T	1586C42G46	129A062G10
10	0	T P T P T P T P T P	9668A54G01	129A062G10
10	0	T P T T T P T P T P	9676A34G01	129A062G10
10	0	T T P P P P P P P P	1586C42G45	129A062G10
10	0	T T P P P P P P P T	9667A78G01	129A062G10
10	0	T T P P P P P P T T	1586C42G41	129A062G10
10	0	T T P P P P T T P P	9660A92G01	129A062G10
10	0	T T P P P T T P P P	9671A68G01	129A062G10

Table 3
FT-1 Switch Selection Guide (continued)

POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
10	0	T T P P T T P P T T	9667A86G01	129A062G10
10	0	T T T P P P P T T T	9663A25G01	129A062G10
10	0	T T T T P P P P P P	670B197G31	129A062G10
10	0	T T T T T P P P P P	9671A13G01	129A062G10
10	0	T T T T T T P P P P	716B562G10	129A062G10
10	0	T T T T T T T P P P	1586C42G44	129A062G10
10	0	T T T T T T T T T T	129A539G01	129A062G10
10	0	T T T T T T T T T T	3501A86G04	129A062G10
10	0	T T T T T T Z Z Z Z	9672A02G01	129A062G10
10	0	Z Z Y Y Y Y Y Y G W	9663A41G01	129A062G10
9	1	C P P P P P P P P P	498A011G01	(1)
9	1	C T T T T T T T T T	1586C42G39	(1)
8	2	C-A P P P P P P P P	714B325G31	(1)
8	2	C-C P P P P P P P P	837A665G01	(1)
8	2	C-C T T T T T T T T	1586C42G20	(1)
8	2	P C C P P P T P P P	1586C42G32	(1)
8	2	P P C-C P P P P P P	670B197G33	(1)
8	2	P P P C-C P P P P P	716B562G21	(1)
8	2	P P P P P P C-C P P	9663A60G01	(1)
8	2	P P P P P P P C-C P	129A542G01	129A062G01
8	2	P P P P P P P C-C T	1586C42G38	129A062G01
8	2	P P P P P P P P C-A	714B325G30	(1)
8	2	P P P P P P P P C-C	716B562G26	(1)
8	2	P P P P P P P R-R P	9676A15G01	129A062G01
8	2	P P P P T T P C-C P	716B562G35	129A062G01
8	2	T P P P P P P C-C P	9672A83G01	129A062G01
8	2	T P P P P P P C-C T	1586C42G26	129A062G01
8	2	T T C-C P G Y W Z O	9676A04G01	(1)
8	2	T T T T C-C T T T T	1586C42G33	(1)
8	2	T T T T T T T C-C T	1586C42G47	129A062G01
8	2	T T T T T T T R-R T	670B197G17	129A062G01
8	2	T T T T T T T T C-C	9672A89G01	(1)
7	3	P P P P P P C C-C P	129A553G01	(1)
6	4	C C P P P P P P C C	716B562G20	(1)
6	4	C-A C-A P P P P P P	714B325G27	(1)
6	4	C-C C-C P P P P P P	498A015G01	(1)
6	4	C-C C-C P P P P P T	1586C42G13	(1)
6	4	C-C C-C P P P P T T	9672A80G01	(1)
6	4	C-C C-C P P T T T T	9676A06G01	(1)
6	4	C-C C-C T T T T T T	9663A31G01	(1)
6	4	C-C P P C-C P P P P	716B562G17	(1)
6	4	C-C P P P P C-C P P	716B562G19	(1)

POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
6	4	C-C P P P P P P C-C	877A077G01	(1)
6	4	C-C-C-C P P P P P T	1586C42G11	(1)
6	4	C-C-C-C P P P P T T	1586C42G12	(1)
6	4	C-C-C-C T T T T T T	9672A99G01	(1)
6	4	C-C-C-E T T T T T T	9672A87G01	(1)
6	4	P C-C C-C P P P P P	716B562G36	(1)
6	4	P C-C P P P P C-C P	129A513G01	129A062G06
6	4	P C-C P P P P C-C T	629A735G01	129A062G06
6	4	P C-C P P P T C-C P	1586C42G22	129A062G06
6	4	P C-C P P T T C-C T	1586C42G27	129A062G06
6	4	P C-C-C-C P P P P P	836A867G01	(1)
6	4	P P C-A C-A P P P P	714B325G28	(1)
6	4	P P C-C P P C-C P P	716B562G15	(1)
6	4	P P P C-C P P C-C P	129A520G01	129A062G05
6	4	P P P P C-A C-A P P	714B325G29	(1)
6	4	P P P P C-C C-C P P	670B197G19	(1)
6	4	P P P P C-C P P C-C	670B197G34	(1)
6	4	P P P P P C-C C-C P	129A532G01	129A062G02
6	4	P P P P P P C-A C-A	714B325G16	(1)
6	4	P P P P P P C-C-C-A	714B325G18	(1)
6	4	P P P P P P C-C-C-C	670B197G28	(1)
6	4	P P T P P C-C C-C P	9676A09G01	129A062G02
6	4	P P T P T P C-C-C-C	1586C42G14	(1)
6	4	R-R R-R T T T T T T	670B197G25	(1)
6	4	T P C P C P C P C P	670B197G37	292B319G22
6	4	T P P C-C P P C-C P	9660A91G01	129A062G05
6	4	T P P C-C T P P C-C	9676A05G01	(1)
6	4	T P P P P C-C C-C T	849A307G01	(1)
6	4	T T T R-R T T R-R T	861A670G01	129A062G05
5	5	P P C C-C P C-C P P	670B197G20	(1)
4	6	C C C C C C P P P P	774B430G18	(1)
4	6	C C-C C-C C T T T T	1586C42G21	(1)
4	6	C-C C-C C-C P P P P	774B430G20	(1)
4	6	C-C C-C C-C P P P T	1586C42G36	(1)
4	6	C-C C-C C-C P P T T	9671A70G01	(1)
4	6	C-C C-C C-C T T T T	774B430G24	(1)
4	6	C-C P P C-C P P C-C	716B562G16	(1)
4	6	C-C T P C-C-C-C P T	1586C42G10	(1)
4	6	C-C-C-C C-C P P P P	774B430G09	(1)
4	6	L L L L C-E C-E C-E	9660A96G01	(1)
4	6	P C-C C-C C-C P P P	716B562G37	129A062G09
4	6	P C-C C-C C-C P P P	774B430G10	129A062G09

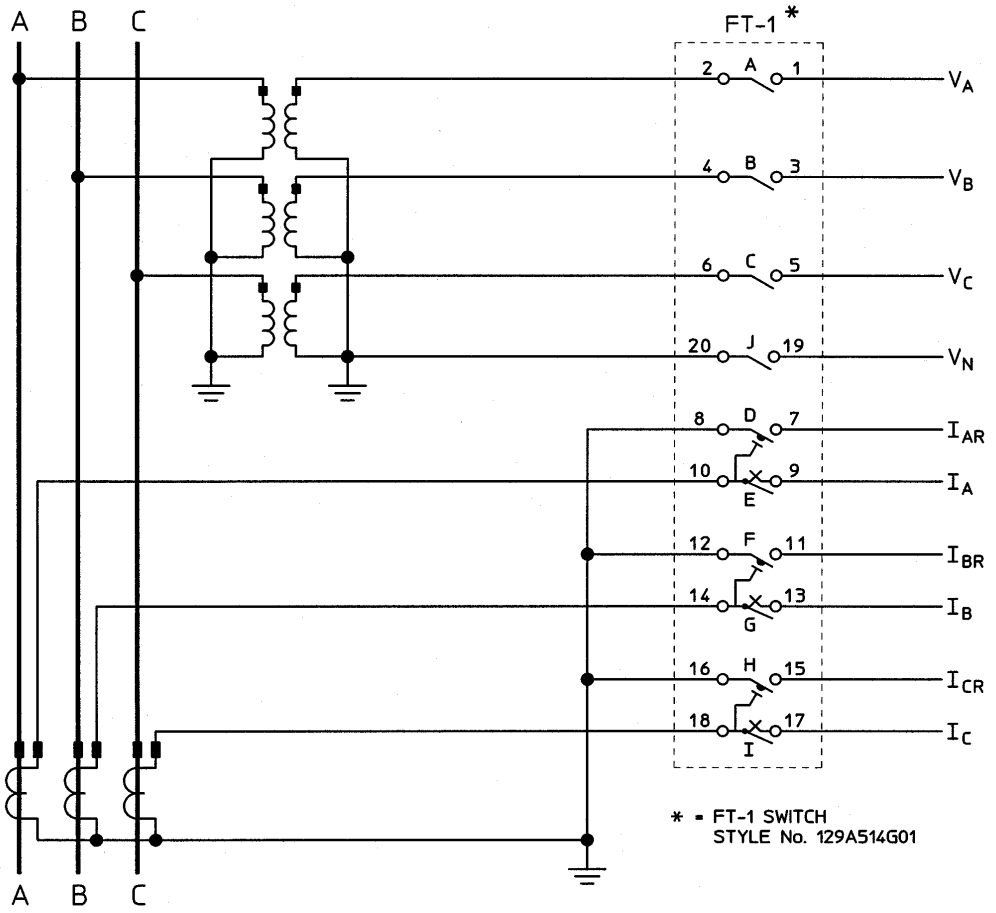
Table 3
FT-1 Switch Selection Guide (continued)

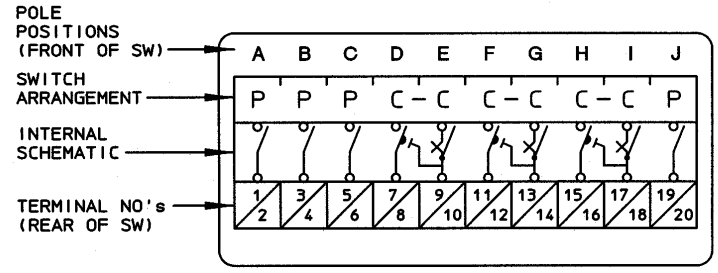
POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
4	6	P C-C P C-C P C-C P	129A528G01	(1)
4	6	P P C C C C C C P P	774B430G21	(1)
4	6	P P C C-C C-C C P P	714B325G19	(1)
4	6	P P C-C P P C-C C-C	716B562G18	(1)
4	6	P P P C C C C C C P	9670A05G01	(1)
4	6	P P P C-A P C-C-C-A	714B325G17	(1)
4	6	P P P C-C C-C C-C P	129A514G01	292B319G23
4	6	P P P C-C C-C C-C T	670B197G32	292B319G23
4	6	P P P C-C C-C C-C Z	9671A93G01	292B319G23
4	6	P P P C-C C-R C-R T	1586C42G34	292B319G23
4	6	P P P C-C P C-C-C-C	670B197G27	(1)
4	6	P P P P C-A C-A C-A	714B325G24	(1)
4	6	P P P P C-C C-C C-C	1586C42G05	(1)
4	6	P P P P C-C C-C C-C	670B197G18	(1)
4	6	P P P P C-C-C C-C-C	1586C42G37	(1)
4	6	P P P P P P C-C C-C	670B197G23	(1)
4	6	P P P P R-R R-R R-R	9660A85G01	(1)
4	6	P P P R-R R-R R-R P	1586C42G03	292B319G23
4	6	P P T C-C C-C C-C T	1586C42G48	292B319G23
4	6	P R-R P R-R P R-R P	9676A17G01	(1)
4	6	R-B R-B R-B T T T T	714B325G20	(1)
4	6	T C-C T C-C T C-C T	188A523G01	(1)
4	6	T P C-C C-C C-C P P	1586C42G18	(1)
4	6	T T C-C C-C C-C T T	9667A22G01	(1)
4	6	T T P C-C C-C C-C T	9667A80G01	292B319G23
4	6	T T P P C-C C-C C-C	9672A90G01	(1)
4	6	T T T C-C C-C C-C P	9667A69G01	292B319G23
4	6	T T T C-C C-C C-C T	714B325G32	292B319G23
4	6	T T T C-C C-C C-C W	9676A35G01	292B319G23
4	6	T T T R-R R-R R-R T	774B430G13	292B319G23
4	6	T T T T C-C C-C C-C	498A010G01	(1)
4	6	T T T T C-C C-C-C-C	9676A10G01	(1)
4	6	Z Z Z C-C C-C C-C Z	9672A01G01	292B319G23
3	3	P P P U C U C U C U	1485B70G09	(1)
3	6	L L L U C-E C-E C-E	1485B70G10	(1)
3	6	P P P C-B C-B C-B S	716B562G30	(1)
3	6	P P P S C-C C-C C-C	774B430G16	(1)
3	6	T T T C-C C-C C-C U	1485B70G11	(1)
3	7	C-C C-C C-C C P P P	1586C42G43	(1)
3	7	C-C P C-C P C-C P C	714B325G22	(1)
3	7	P P C C-C C C-C C P	716B562G12	(1)
3	7	P P C C-C C-C C-C P	129A535G01	292B319G22
3	7	P P C C-C C-C C-C P	3501A86G01	292B319G22
3	7	P P C C-C C-C C-C T	9672A86G01	292B319G22
3	7	P P P C C C C C C C	1586C42G17	(1)
3	7	P P P C C-C C-C C-C	9671A26G01	(1)
3	7	P P P C-C C-C C-C C	1586C42G19	(1)
3	7	P P P C-C C-C C-C C	714B325G11	(1)
3	7	P P P C-C C-C C-C C	714B325G25	(1)
3	7	P T C C-C C-C C-C T	670B197G22	292B319G22
3	7	T T C C-C C-C C-C T	670B197G35	292B319G22
3	7	T T T C-C C-C C-C C	9663A59G01	(1)
2	8	C-A P P C C-C C C-C	714B325G21	(1)
2	8	C-C C-C C-C C-C P P	837A407G01	(1)
2	8	C-C C-C C-C C-C P T	9672A95G01	(1)
2	8	C-C C-C C-C C-C T P	9676A11G01	(1)
2	8	C-C C-C C-C C-C T T	774B430G22	(1)
2	8	C-C C-C P C C C C P	837A664G01	(1)
2	8	C-C P P C C-C C C-C	716B562G24	(1)
2	8	C-C T C-C C-C C-C T	9667A68G01	(1)
2	8	C-C-C-B C-C-C-B P P	498A031G01	(1)
2	8	C-C-C-C C C C-C P P	716B562G38	(1)
2	8	C-C-C-C C-C C-C P P	714B325G15	(1)
2	8	C-C-C-C C-C-C-B P P	837A101G01	(1)
2	8	C-C-C-C C-C-C-B T T	1586C42G42	(1)
2	8	C-C-C-C C-C-C-C P P	774B430G11	(1)
2	8	C-C-C-C C-C-C-C P T	1586C42G09	(1)
2	8	C-C-C-C C-C-C-C T P	9671A22G01	(1)
2	8	C-C-C-C P C-C-C-C P	9672A94G01	(1)
2	8	C-C-C-C T C-C-C-C T	9676A01G01	(1)
2	8	C-C-C-D C-C-C-B P P	498A032G01	(1)
2	8	C-C-C-D C-C-C-D P P	714B325G13	(1)
2	8	C-C-C-D C-C-C-D P P	774B430G12	(1)
2	8	C-C-C-E C-C-C-E T T	9672A23G01	(1)
2	8	C-C-C-E T C-C-C-E T	9672A88G01	(1)
2	8	C-C-E C C-C C-C P P	716B562G39	(1)
2	8	P C C C C C C C C P	129A519G01	(1)
2	8	P C C C C P C C C C	716B562G27	(1)
2	8	P C-C C-C C-C C-C P	129A518G01	292B319G22
2	8	P C-C C-C C-C C-C P	3501A86G03	292B319G22
2	8	P C-C C-C C-C C-C T	1586C42G08	292B319G22
2	8	P C-C C-C C-C C-C T	837A616G01	292B319G22
2	8	P P C-C C-C C-C C-C	716B562G25	(1)
2	8	R-B R-B R-B R-B T T	714B325G12	(1)

Table 3
FT-1 Switch Selection Guide (continued)

POTENTIAL	CURRENT	A B C D E F G H I J	STANDARD STYLE	IN-SERVICE TEST PLUG
2	8	R-C R-C R-C R-C T T	716B562G11	(1)
2	8	T C C C C C C C C P	9671A04G01	(1)
2	8	T C C C C C C C C T	9671A12G01	(1)
2	8	T C C C-C C-C C-C T	876A157G01	(1)
2	8	T C-C C-C C-C C-C P	670B197G38	292B319G22
2	8	T C-C C-C C-C C-C T	849A513G01	292B319G22
2	8	T R-R R-R R-R R-R T	716B562G28	292B319G22
2	8	T T C-C C-C C-C C-C	1586C42G16	(1)
2	8	T T C-C C-C C-C C-C	774B430G28	(1)
1	9	C C C C C C C C C P	129A541G01	(1)
1	9	C C C C C C C C C T	188A286G01	(1)
1	9	C C C C-C C-C C-C P	670B197G16	(1)
1	9	C-C C-C C-C C C-C P	1586C42G40	(1)
1	9	C-C C-C C-C C C-C T	1586C42G35	(1)
1	9	P C-C C C-C C C-C C	714B325G23	(1)
1	9	P C-C-C-B C C-C-C-B	498A030G01	(1)
0	10	C C C C C C C C C C	129A529G01	(1)
0	10	C C C C C C C C C C	774B430G17	(1)
0	10	C C C C-C C-C C-C C	9676A18G01	(1)
0	10	C C-B C C-B C C-B C	716B562G14	(1)
0	10	C C-C C-C C-C C-C C	716B562G13	(1)
0	10	C-C C-C C C C-C C-C	714B325G26	(1)
0	10	C-C C-C C-C C-C C C	774B430G15	(1)
0	10	C-C C-C C-C C-C C-C	498A020G01	(1)
0	10	C-C C-C C-C C-C R R	9676A23G01	(1)
0	10	C-C C-C C-C C-C-C-C	9676A20G01	(1)
0	10	C-C-C-A C-C C-C C-A	774B430G14	(1)
0	10	C-C-C-A C-C-C-A C-C	1586C42G02	(1)
0	10	C-C-C-B C-C C-C-C-B	498A001G01	(1)
0	10	C-C-C-C C-C C-C C-C	714B325G14	(1)
0	10	C-C-C-C C-C-C-C C-C	774B430G23	(1)
0	10	C-D C-D C-D C-D C-D	9676A07G01	(1)
0	10	C-E C-E C-E C-E C-E	714B325G09	(1)
0	10	J J J J J J J J J J	291B962G31	(1)
0	10	R-B R-B R-B R-B R-B	714B325G10	(1)
0	10	R-C R-C R-C R-C R-C	716B562G09	(1)
0	10	R-R R-R R-R R-R R-R	9663A33G01	(1)

(1) When a multi-position In-Service Test Plug is not available, then the individual current circuit test plug can be used.





FT-1 STYLE No. 129A514G01
(SWITCH LAYOUT)

9666A11 SUB 2

Figure 11. Typical FT-1 Switch Connection Schematic

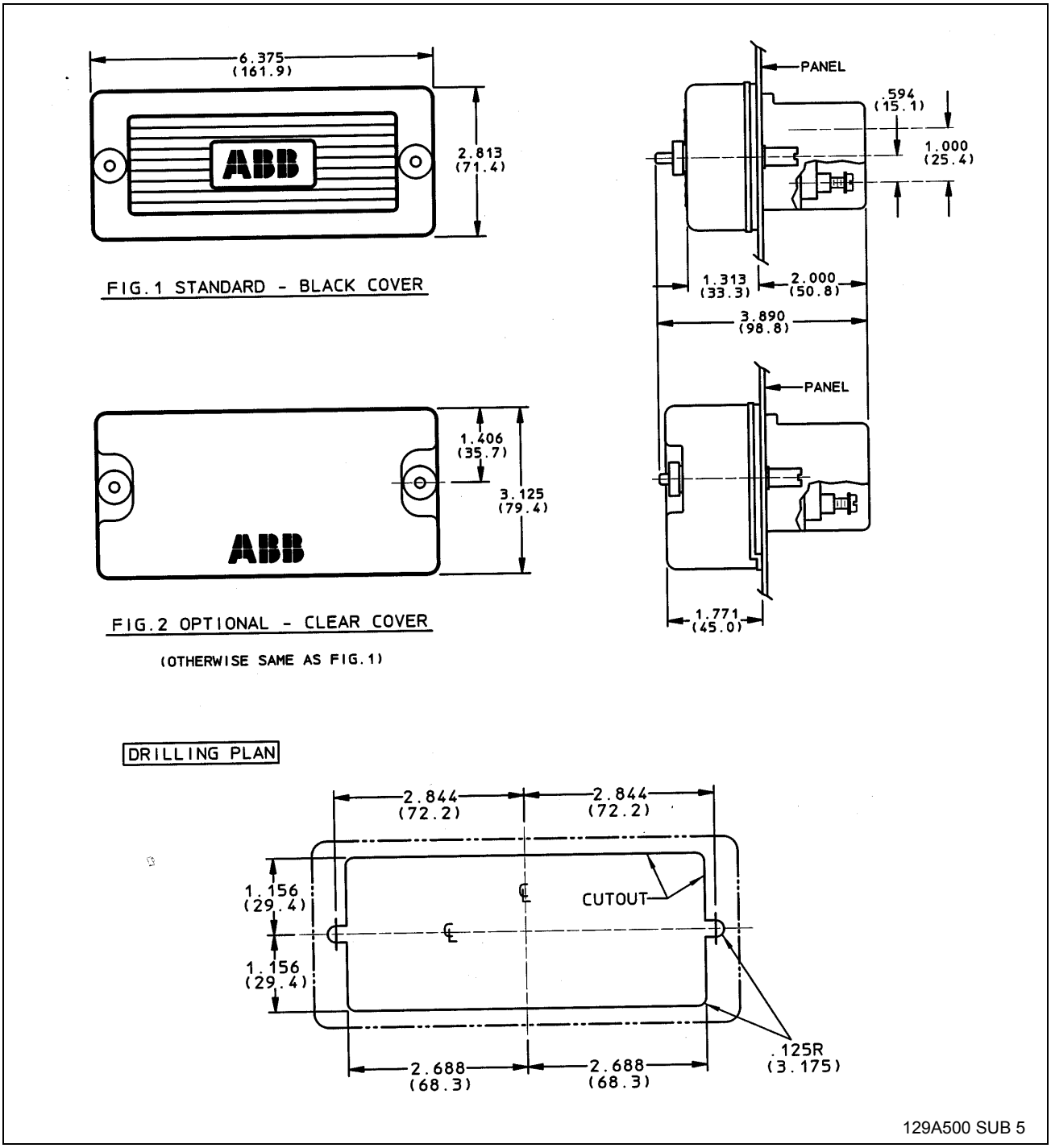


Figure 12. FT-1 Switch, Outline and Drilling Plan, with Standard Black Cover or Optional Clear Cover

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