Instruction Leaflet

41-766.7

Effective: November 1999

New Information

Type SSV-T and SSC-T High Drop-out Relays

CAUTION

Before putting relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely. Inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

1.0 APPLICATION

The solid state types SSC-T current relay and SSV-T voltage relay are single phase non-directional units. They are adjustable over a wide range of current and voltage and have a calibrated scale plate which indicates the pick-up setting. The output unit is a telephone relay and an ICS (Indicating Contactor Switch) seal-in device.

2.0 CONSTRUCTION

The type SSC-T or SSV-T relay consists of a printed circuit board with a transformer, a scale plate, an output telephone relay, and several associated components. The relay is in the FT-11 Flexitest case which may be either semi-flush or projection mounted. The relay also includes one ICS (Indicating Contactor Switch) for indication and seal-in purposes. The relay chassis is draw-out construction for ease of test and maintenance.

The components are connected as shown in Figures 5, 6, and 7 (page 6 and page 7).

Input Transformer – The input transformer is a two winding type with a center tapped secondary winding. The secondary is connected to two full wave rectifiers.

Rectifiers and dc Power Supply – There are two full wave rectifiers. One with two zener diodes and a capacitor is used as an input signal and connected to a level detector (setting) circuit. The zener diodes are also used as surge protections. The other full wave rectifier is used as dc power supply. For type SSC-T overcurrent relay, a resistor-zener diode is needed in order to keep the current transformer's linearity.

Setting Circuit – The setting circuit is connected between zener-rectifier and sensing circuit.

It consists of two resistors and a potentiometer with a scale plate. The potentiometer has a locking feature to minimize accidental change of setting.

Sensing Circuit – The sensing circuit consists of a transistor, a zener diode, and several associated components. It is actually a level detector. If the input voltage from the rectifier is high enough to break down the zener diode, the output transistor will be turned on.

Output Circuit – The output circuit consists of a transistor driver and a telephone relay. The overcurrent relay (SSC-T) has a telephone relay equipped with two form A contacts. The over or under voltage relay (SSV-T) has a telephone relay equipped with one form A and form B contacts.

Indicating Contactor Switch (ICS) – The Indicating contactor switch is a small dc operated clapper type

device. A magnetic armature, to which leaf-spring mounted contacts are attached, is attracted to the magnetic core upon energization of the switch. When the switch closes, the moving contacts bridge two stationary contacts, completing the trip circuit. Also during this operation, two fingers on the armature deflect a spring located on the front of the switch which allows the operation indicator target to drop. The target is reset from the outside of the case by a push rod located at the bottom of the cover.

3.0 OPERATION

The block diagrams of the SSV-T and SSC-T are shown in Figures 1, 2 and 3 (page 4 and page 5) and the internal schematic are shown in Figures 4, 5, and 6 (page 5 and page 6). For overvoltage and overcurrent application, the transistor Q2 is normally not conducting and the telephone relay is de-energized. The transistor Q1 or current is applied to the primary of the transformer (T) a voltage is produced on the secondary side that tis proportional to the input. The potentiometer (R2) is for the pick-up setting. If the voltage from rectifier (Z1, Z2, and C2) is large enough to exceed the breakdown voltage of zener diode Z5, the zener diode conducts to turn on the transistor Q2 and operate the telephone relay.

For undervoltage application, the transistors Q1 and Q2 are normally conducting and the telephone relay is pulled in. As soon as the input voltage drops below the setting, the transistor Q2 is turned off and the telephone relay is released.

4.0 CHARACTERISTICS

4.1 OVERCURRENT RELAY SSC-T

Table 1: SSC-T Burden (60 Hertz)

Range (Amps)	Pickup Current Setting			
	Lowest Setting		Highest Setting	
	VA	P.F. Angle ø	VA	P.F. Angle ø
.05 - 2.0	0.5	8.5°	4.0	12.5°
2.0 - 8.0	0.5	8.5°	5.0	12.5°
4.0 - 8.0	0.5	8.5°	5.0	12.5°
10.0 - 40.0	0.8	10.0°	8.0	10.5°

Range	Continuous Rating	One Second Rating
0.5 - 2 amps	2 amps	28 amps
2.0 - 8 amps	8 amps	112 amps
4.0 - 16 amps	10 amps	280 amps
10 - 40 amps	10 amps	280 amps
Operating Frequency:	50/60 Hz	
Temperature Error:	2% between 20°C and 65°C	
Dropout Ratio:	90% to 98%	
Response Time: Pickup Time = 10 - 13 ms Dropout Time = 10 - 26 ms For 2 to 15 times pickup setting value (Figure 10)		
Transient Overreach:	5%	
Burden:	See Table 1 below	
Telephone Relay Contacts:	0.1 amps at 125 Vdc	

4.2 OVER/UNDERVOLTAGE RELAY SSV-T

Range:	60- 140 Volts 140 - 320 Volts 280 - 640 Volts
Continuous Rating:	Highest voltage of range setting
Operating Frequency:	50/60 Hz
Temperature Error:	2% between -20°C and +65°C
Dropout Ratio:	92% to 99% (Figure 13)
Response Time:	Pickup Time - 7– 10 ms Dropout Time – 14 - 40 ms (Figure 9)
Burden:	1 VA at 120 volts 60 Hz
Telephone Relay Contacts:	0.1 Amps at 125 Vdc

4.3 TRIP CIRCUIT

The main contacts will safely close 30 amperes at 250 volts dc and the seal in contacts of the indicating contactor switch (when supplied) will safely carry this current long enough to trip a circuit breaker.

4.4 INDICATING CONTACTOR SWITCH (ICS)

a. The indicating contactor switch has two taps that provide a pickup setting of 0.2 or 2 amperes. To change taps requires connecting the lead located in front of the tap block to the desired setting by means of a screw connection.

b. Trip Circuit Constants

0.2 amp tap - - - - - 6.5 ohms dc resistance
2.0 amp tap - - - - - 0.15 ohms dc resistance

5.0 SETTINGS

The relay must be set for the desired levels of voltage or current. The pickup of the relay is made by adjusting the potentiometer in the front of the relay. Setting in between the scale marking can be made by applying the desired voltage or current and adjusting the potentiometer until the telephone relay operates.

5.1 INDICATING CONTACTOR SWITCH (ICS)

The only setting required on the ICS unit is the selection of the 0.2 or 2.0 amperes tap setting. This selection is made by connecting the lead located in front of the tap block to the desired setting by means of the connecting screw.

The 0.2 amp tap is recommended for 125 or 250 volt dc circuits. The 2.0 amp tap should be used on 24 or 48 volt dc circuits.

6.0 INSTALLATION

The relays should be mounted on a switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the four mounting holes on the flange for the semi-flush type FT case. The mounting screws may be utilized for grounding the relay. External toothed washers are provided for use in the locations shown on the outline and drilling plan to facilitate making a good electrical connection between the relay case, its mounting screws and the relay panel. Ground Wires are affixed to the mounting screws as required for poorly grounded or insulating panels. Other electrical connections may be made directly to the terminals by means of screws for steel panel mounting.

For detail information on the FT case refer to Instruction Leaflet 41-076.

7.0 ADJUSTMENT AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory and *should not be disturbed after receipt by the customer.*

7.1 ACCEPTANCE TESTS

The following check is recommended to insure that the relay is in proper working order. Refer to the internal schematics and apply voltage or current to the proper terminals.

1. **Minimum Trip Current** – Check pickup at minimum and maximum settings. This is accomplished by applying the specified voltage or current and checking the pickup of the output telephone relay when the ac input is within ±5% of the settings.

2. **Dropout Ration** – After checking pickup, gradually reduce the input. The dropout should be greater than 92% and 90% of the pickup for SSV-T and SSC-T relays respectively.

7.2 INDICATING CONTACTOR SWITCH (ICS)

Close the main relay contacts and pass sufficient dc current through the trip circuit to close the contacts of the ICS. This value of current should be not greater than ICS's rated current. The operation indicator target should drop freely.

The contact wipe should be approximately 1/64" to 3/64". The bridging moving contact should touch both stationary contacts simultaneously.

8.0 ROUTINE MAINTENANCE

All relay's calibration should be checked and contacts should be cleaned at lease once every year. A contact burnisher Style # 182A836H01 is recommended for cleaning purpose. It is recommended to change the potentiometer R2 every ten years.

9.0 CALIBRATION

Use the following procedure for calibrating the relay if the relay adjustments have been disturbed. This procedure should not be used until it is apparent that the relay is not in proper working order. A new scale plate may be necessary when parts are changed.

Dial Calibration –

1. Connect an ohmmeter across the relay terminals which connect to the telephone relay contacts.

2. Apply the desired voltage or current to relay terminals 8 and 9.

3. Turn potentiometer on the front of the relay counter-clockwise from extreme clockwise position until the relay operates as indicated by the ohmmeter reading.

9.1 INDICATING CONTACTOR SWITCH (ICS)

Close the main relay contacts and pass sufficient dc current through the trip circuit to close the contacts of the ICS. This value of current should not be greater than the particular ICS tap setting being used. The operation indicator target should drop freely.

For proper contact adjustment, insert a .030” feeler gauge between the core pin and the armature. Hold the armature closed against the core pin and gauge and adjust the stationary contacts such that they just make with the moving contact. Both stationary contacts should make at approximately the same time. The contact follow will be approximately 1/64” to 3/64”.

10.0 RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

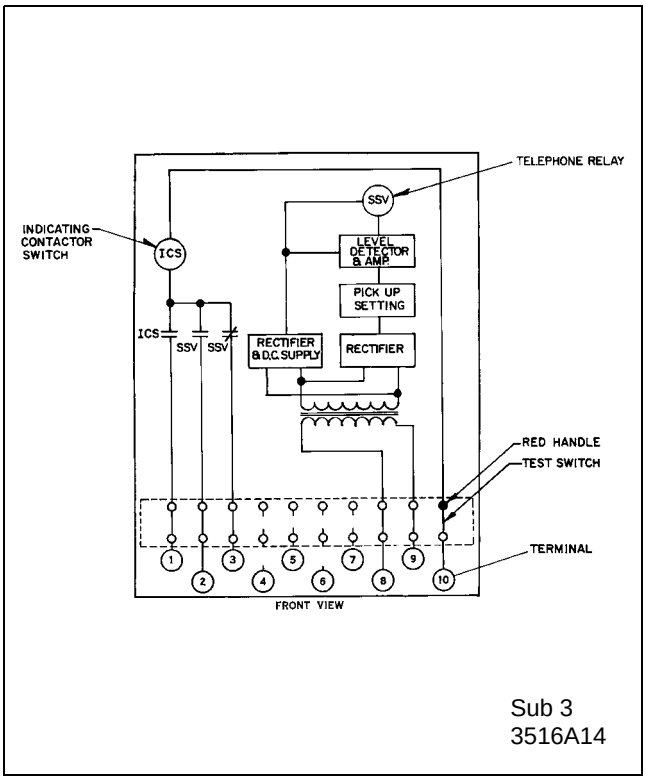


Figure 1: Block Diagram of the Type SSV-T Relay in the Type FT-11 Case

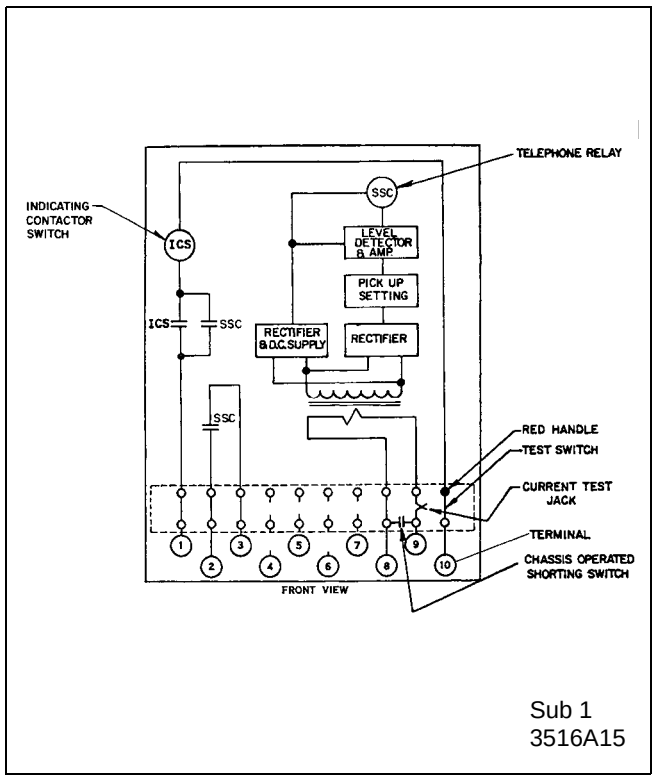


Figure 2: Block Diagram of the Type SSC-T Relay in the Type FT-11 Case

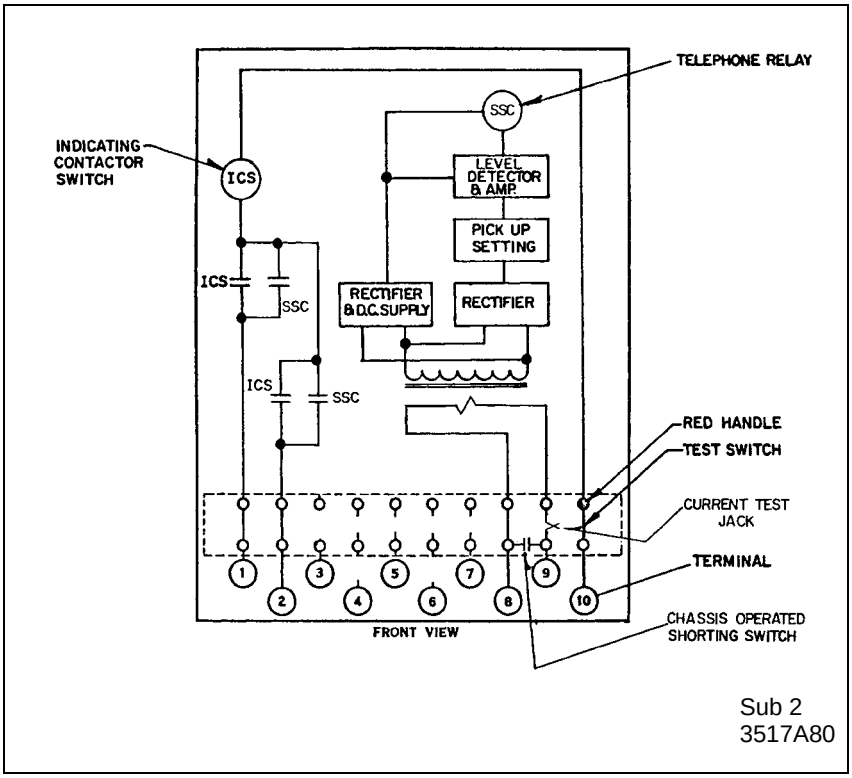
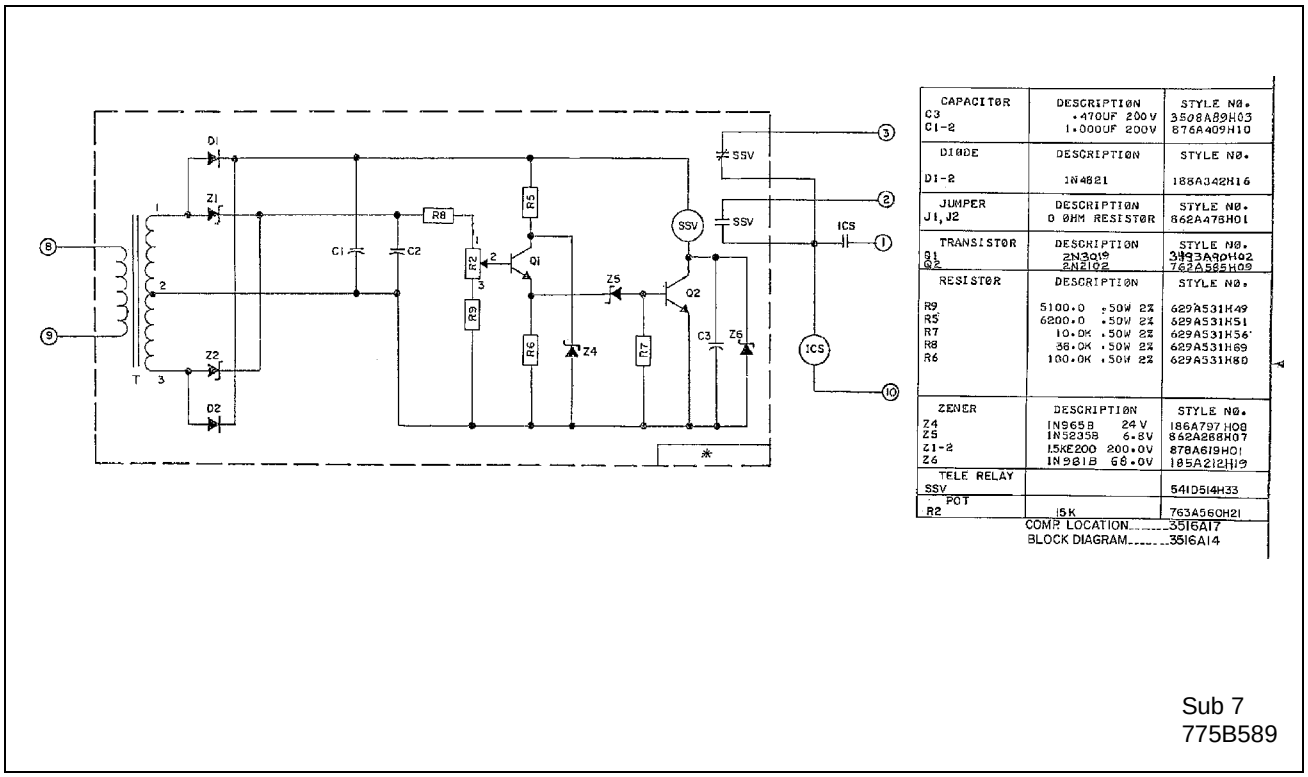


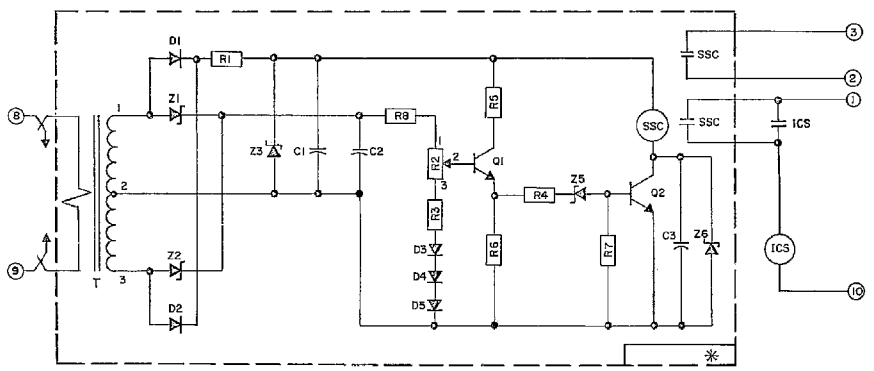
Figure 3: Block Diagram of the Type SSC-T Relay (Double Trip)



CAPACITOR	DESCRIPTION	STYLE NO.
C3	.470UF 200V	3508A89H03
C1-2	1.0000UF 200V	876A409H10
DIODE	**DESCRIPTION**	**STYLE NO.**
D1-2	1N4821	188A342H16
JUMPER	**DESCRIPTION**	**STYLE NO.**
J1, J2	0 OHM RESISTOR	862A478H01
TRANSISTOR	**DESCRIPTION**	**STYLE NO.**
Q1	2N3019	3993A80H02
Q2	2N2102	762A585H09
RESISTOR	**DESCRIPTION**	**STYLE NO.**
R9	5100.0 .50W 2%	629A531H49
R5	6200.0 .50W 2%	629A531H51
R7	10.0K .50W 2%	629A531H56
R8	36.0K .50W 2%	629A531H69
R6	100.0K .50W 2%	629A531H80
ZENER	**DESCRIPTION**	**STYLE NO.**
Z4	IN5655 24 V	186A797H08
Z5	IN5235B 6.8V	862A868H07
Z1-2	15KE200 200.0V	878A619H01
Z6	IN981B 68.0V	185A212H19
TELE RELAY		
SSV		541D514H33
POT		
R2	5K	763A560H21

COMP LOCATION 3516A17
BLOCK DIAGRAM 3516A14

Figure 4: Internal Schematic of the Type SSV-T Relay

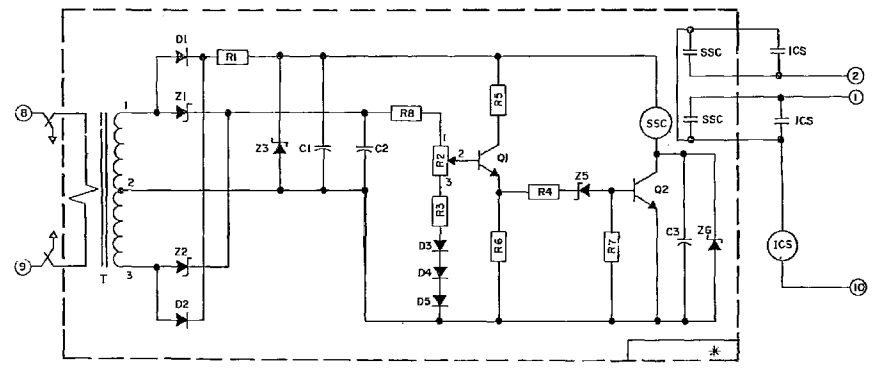


CAPACITOR	DESCRIPTION	STYLE NO.
C3	.470UF 50V	762A680H04
C1-2	1.000UF 200V	876A409H10
DIODE	DESCRIPTION	STYLE NO.
D3-4-5	IN914	836A928H01
D1-2	IN4821	188A342H16
POT		
R2	10K	763A560H20
	DESCRIPTION	STYLE NO.
Q1-2	2N3019	3493A90H02
RESISTOR	DESCRIPTION	STYLE NO.
R3	3000.0 .50W 2%	629A531H43
R5	6200.0 .50W 2%	629A531H51
R7	10.0K .50W 2%	629A531H56
R8	43.0K .50W 2%	629A531H71
R6	100.0K .50W 2%	629A531H80
R4	470.0 .50W 2%	829A531H24
R1	620.0 5.00W 1%	837A233H03
ZENER	DESCRIPTION	STYLE NO.
Z3	IN2986B 24 V	629A798H03
Z5	IN5235B 6.8V	862A288H07
Z1-2	1.5KE200 200.0V	878A619H01
Z6	IN3036A 47.0V	184A449H05
TELE. RELAY		
SSC		541D514H24

COMP. LOCATION____3516A18
BLOCK DIAGRAM____3516A15

Sub 4
775B590

Figure 5: Internal Schematic of the Type SSC-T Relay



CAPACITOR	DESCRIPTION	STYLE NO.
C3	.470UF 50V	762A680H04
C1-2	1.000UF 200V	876A409H10
DIODE	DESCRIPTION	STYLE NO.
D3-4-5	IN914	836A928H01
D1-2	IN4821	188A342H16
POT		
R2	10K	763A560H20
	DESCRIPTION	STYLE NO.
Q1-2	2N3019	3493A90H02
RESISTOR	DESCRIPTION	STYLE NO.
R3	3000.0 .50W 2%	629A531H43
R5	6200.0 .50W 2%	629A531H51
R7	10.0K .50W 2%	629A531H56
R8	43.0K .50W 2%	629A531H71
R6	100.0K .50W 2%	629A531H80
R4	470.0 .50W 2%	829A531H24
R1	620.0 5.00W 1%	837A233H03
ZENER	DESCRIPTION	STYLE NO.
Z3	IN2986B 24V	629A798H03
Z5	IN5235B 6.8V	862A288H07
Z1-2	1.5KE200 200.0V	878A619H01
Z6	IN3036A 47.0V	184A449H05
TELE. RELAY		
SSC		541D514H24

COMP. LOCATION____3516A18
BLOCK DIAGRAM____3517A80

Sub 3
775B758

Figure 6: Internal Schematic of the Type SSC-T Relay (Double Trip)

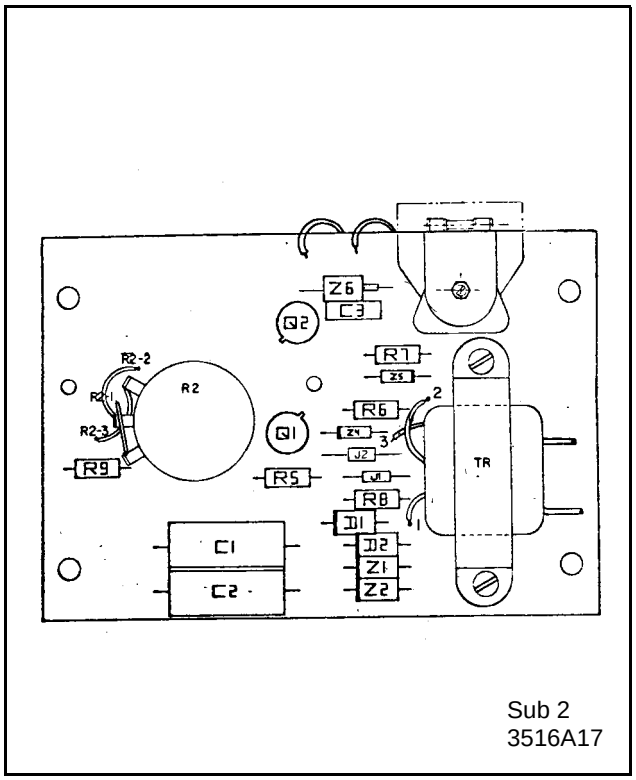


Figure 7: Component Location on SSV-T Module

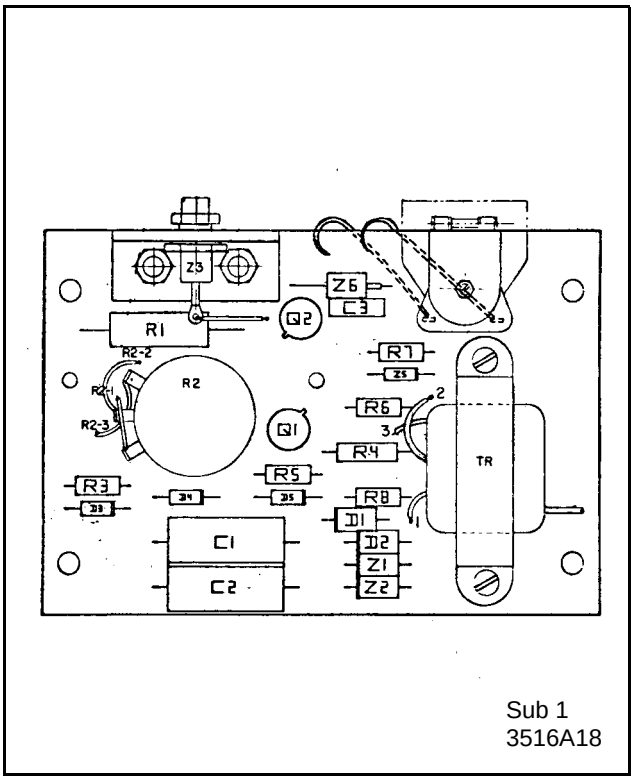


Figure 8: Component Location on SSC-T Module

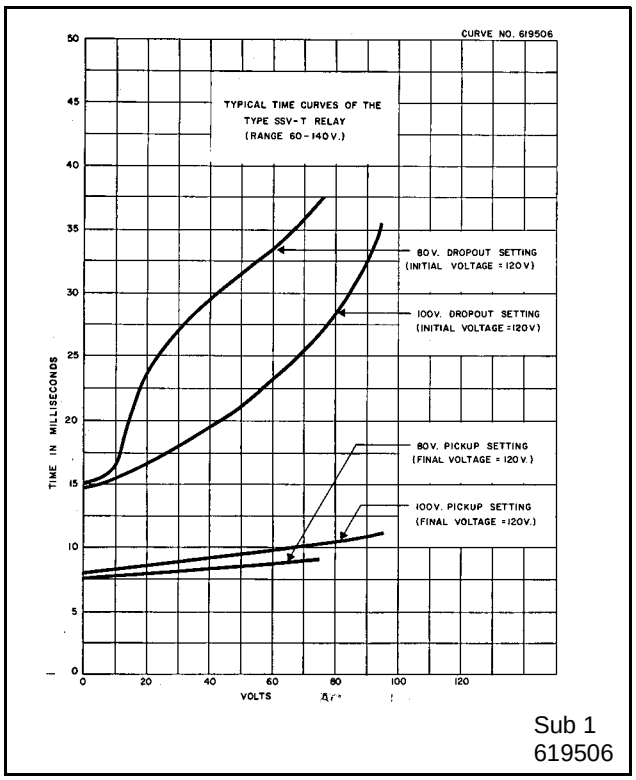


Figure 9: Typical Operating and Reset Time Curves of the Type SSV-T Relay

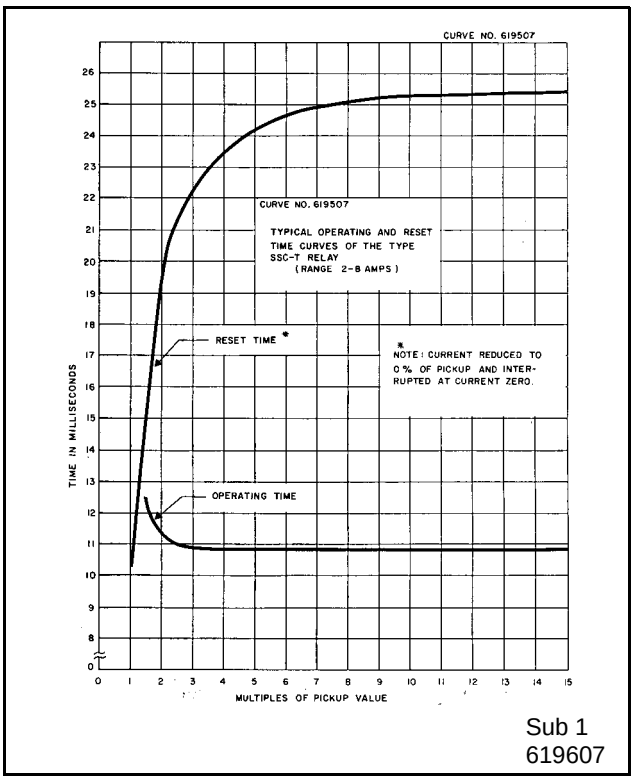


Figure 10: Typical Operating and Reset Time Curves of the Type SSC-T Relay

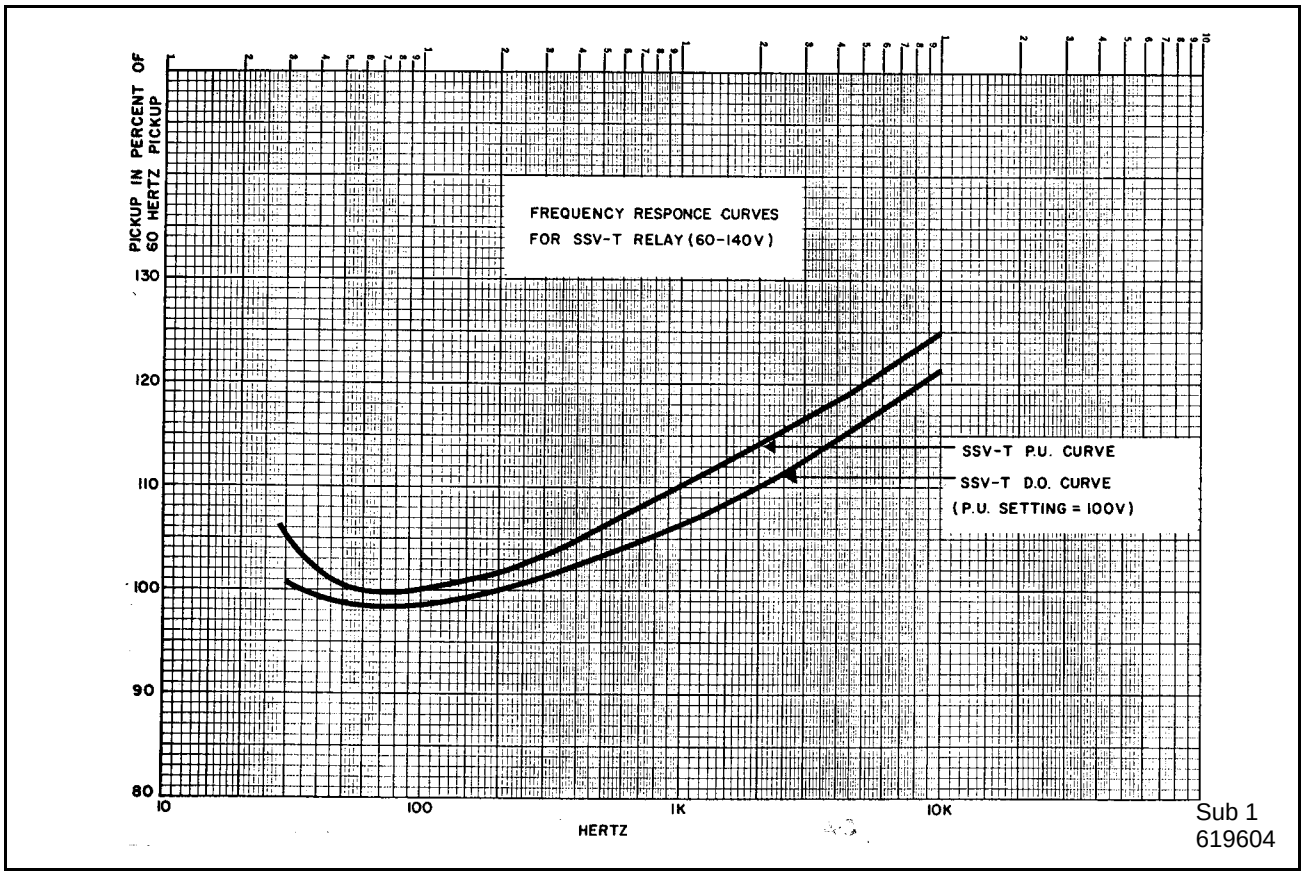


Figure 11: Typical Frequency Response Curve of the Type SSV-T Relay

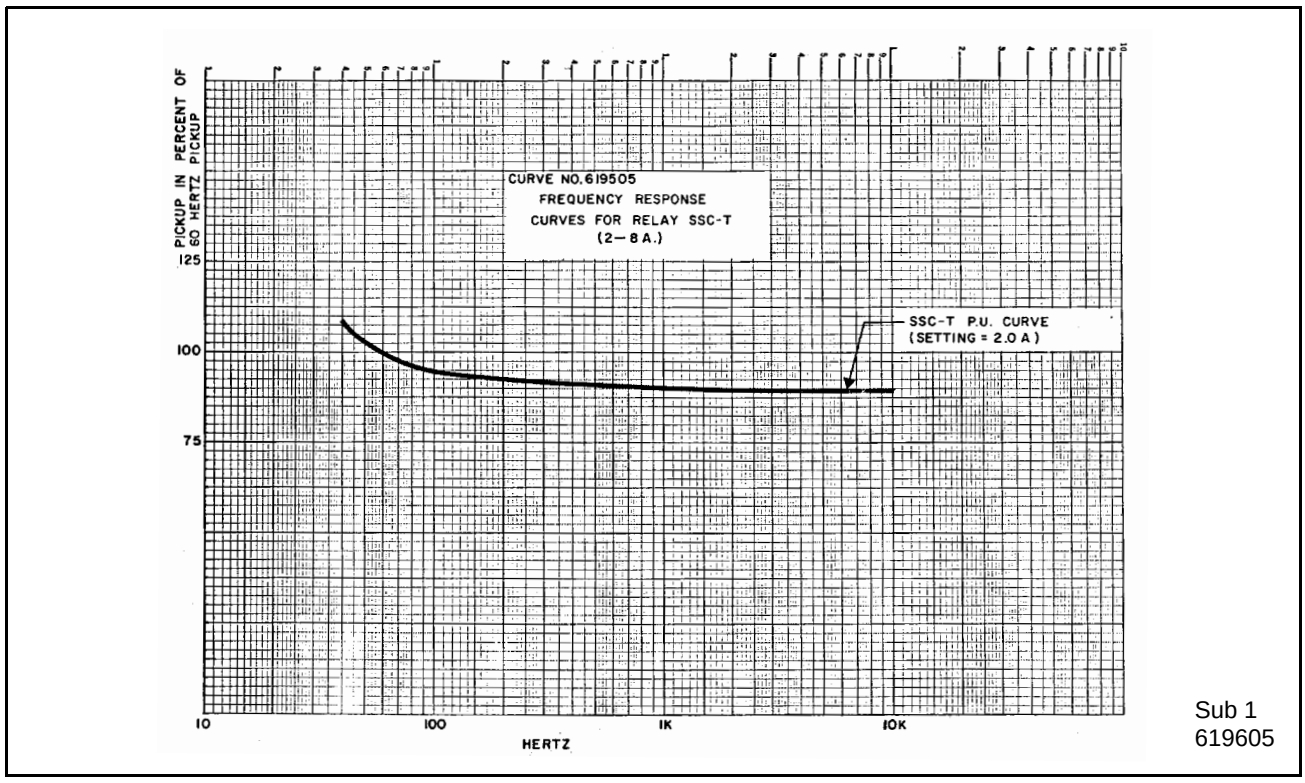


Figure 12: Typical Frequency Response Curve of the Type SSC-T Relay

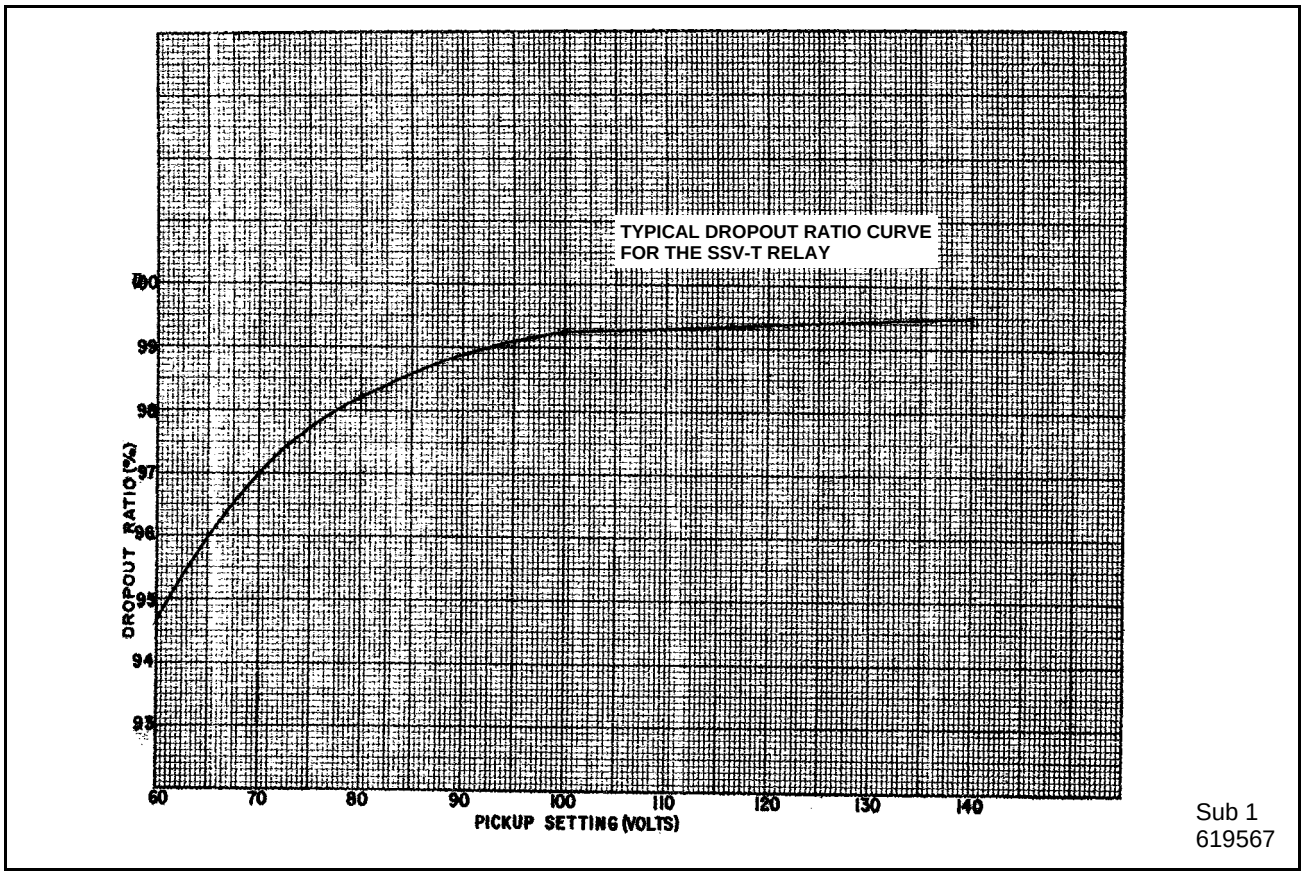


Figure 13: Typical Dropout Ratio Curve for the SSV-T Relay

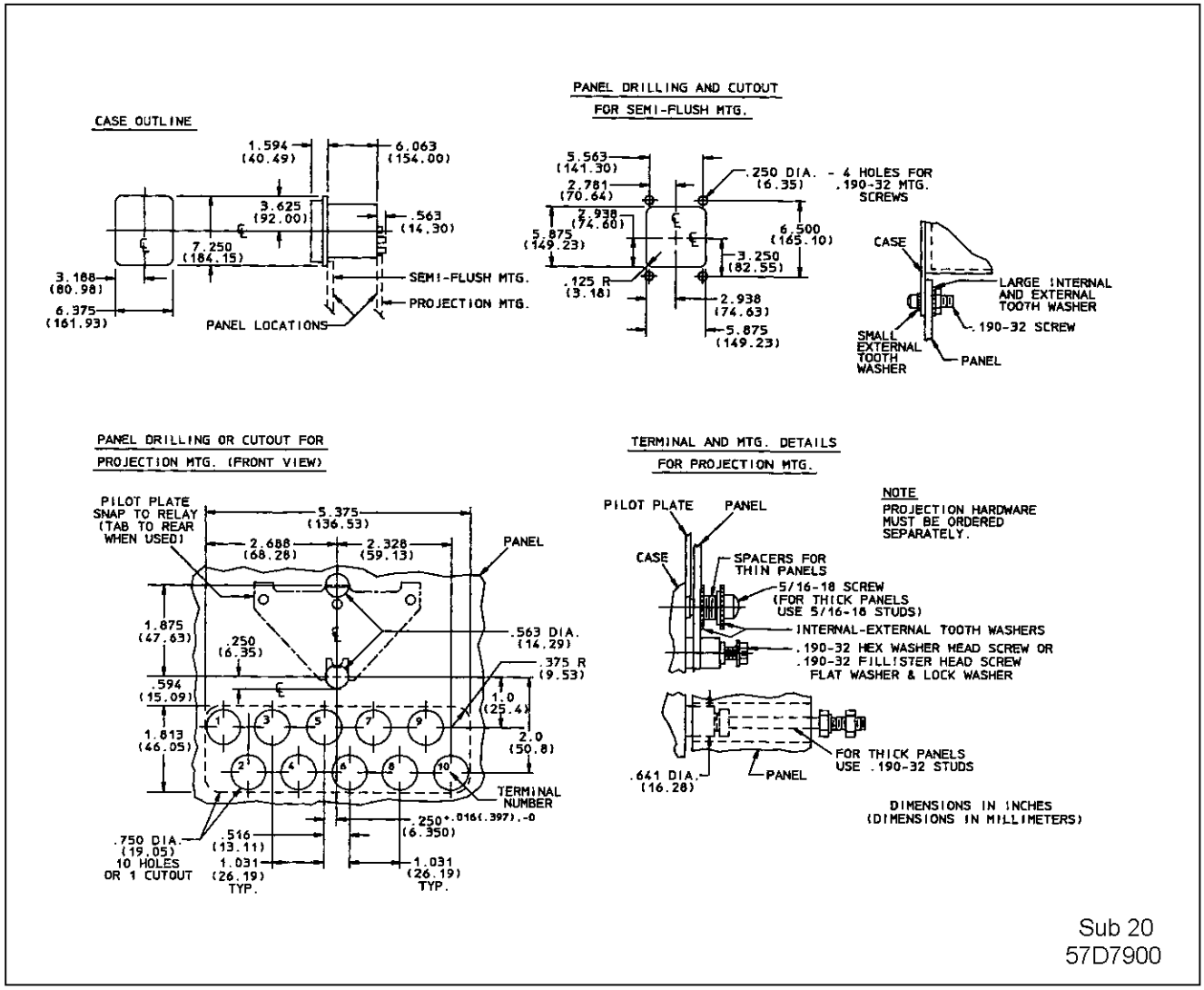


Figure 14. Outline and Drilling Plan for SSV-T and SSC-T Relays in FT-11 Case

THIS SPACE RESERVED FOR NOTES

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