

Operator's Manual

- Installation
- Testing
- Diagrams

ASCO® 940

Original Equipment

Automatic Transfer Switches

30–800 amps with Group 1 Control Panel

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ASCO 940s are Listed under Underwriter's Laboratories UL 1008 Standard for Safety for Automatic Transfer Switches. All control features are UL Component Recognized, which assures that ASCO automatic transfer switches meet OSHA Safety Requirements and will be acceptable to electrical inspectors.

ASCO 940 switches are suitable for emergency and standby system applications. They meet emergency system rating requirements as defined in National Electrical Code (NEC) Article 700 and UL 1008. Also, they are suitable for the requirements of NEC Article 517 – Health Care Facilities, NEC Article 701 – Legally Required Standby Systems, NEC Article 702 – Optional Standby Systems, NFPA 99 Health Care Facilities, and NFPA 110 Emergency and Standby Power Systems.

Rating Label

Each Automatic Transfer Switch contains a rating label to define the loads and fault circuit withstand/ closing ratings. Refer to the label on the Transfer Switch for specific values.

▲ WARNING: Do not exceed the values on rating label. Exceeding the rating can cause personal injury or serious equipment damage.

Nameplate

The Transfer Switch-nameplate includes data for each specific ASCO 940 switch. Use the switch only within the limits shown on this nameplate. A typical Catalog Number is also shown below with its elements explained:

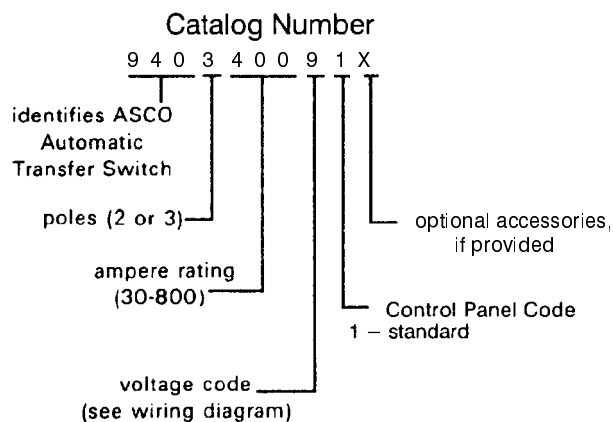


Only experienced licensed electricians should install the switch.

▲ DANGER: is used in this manual to warn of high voltages capable of causing shock, burns, or death.

▲ WARNING: is used in this manual to warn of possible personal injury.

▲ CAUTION: is used in this manual to warn of possible equipment damage.



SECTION 1 INSTALLATION

ASCO 940 automatic transfer switches are factory wired and tested. Field installation simply requires mounting and connection of service cables, engine start signal wires, and auxiliary control circuits (if required).

Mounting

Composite Outline and Mounting Diagram is furnished at the back of this manual. The diagram shows all mounting details and instructions.

⚠ WARNING: Protect the switch from construction grit and metal chips to prevent malfunction or shortened life for the switch.

Mount the automatic transfer switch vertically to a rigid supporting structure. Level all mounting points by using flat washers behind the holes to avoid forced distortion of the switch.

Transfer switches rated 225-400 amp are mounted on an insulator backing piece (installed behind the transfer switch). This insulator piece must be placed behind the transfer switch. See Figure 1-1.

⚠ WARNING: Be sure the insulator piece is behind 225, 260, and 400 amp transfer switches.

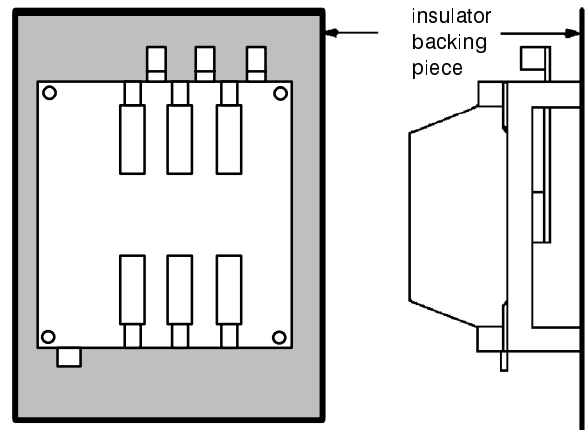


Figure 1-1. Insulator for 225, 260, 400 amp switches.

Line Connections

Composite Wiring Diagrams are furnished at the back of this manual. All wiring must be made in accordance with the National Electrical Code and local codes.

⚠ DANGER: De-energize the conductors before making any line or auxiliary circuitry connections. Be sure that Normal and Emergency line connections are in proper phase rotation. Place engine generator starting control in the OFF position. Make sure engine generator is not in operation.

Three cable spacers are included with 150–200 ampere transfer switches. When installing power cables, run the cables through the cable spacers as shown in Figure 1-2. Position cable spacers within 1½ inches from lugs.

Do not run cables behind the switch. Cables can be bundled on the right side of the switch. Maintain proper electrical clearance between the live metal parts and grounded metal: ½ inch minimum for 30-400 amps, 1 inch minimum over 400 amps.

It is not necessary to remove the barriers from 30–400 amp transfer switches. On 600–800 amp Transfer Switches, you must remove the barriers to install the cables. See Figure 1–3. Be sure to reinstall the barriers carefully.

⚠ CAUTION: The cable spacers must be located as shown for 150 & 200 amp switches.

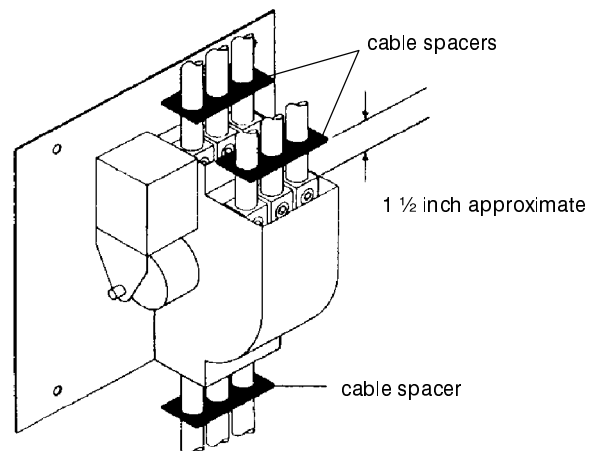


Figure 1-2. Cable spacer for 150 & 200 amp switches

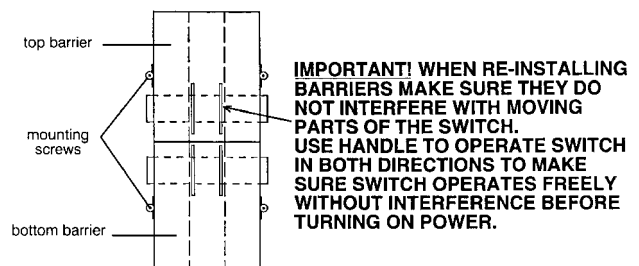


Figure 1-3. Barriers on 600 & 800 amp switches

INSTALLATION *(continued)*

Connect main source and load conductors to clearly marked switch terminal lugs. Be careful when stripping insulation from cables; avoid nicking or ringing the conductor. Remove surface oxides from cables by cleaning with a wire brush. Follow cable manufacturer's instructions when aluminum conductor is used. Apply joint compound to conductor, then carefully wipe away excess compound. Tighten the cable lugs to the torque specified on the rating label.

Auxiliary Circuits

Connect auxiliary circuit wires to appropriate terminals on the transfer switch. Note the control features that are furnished on this switch. Make the necessary auxiliary connections by referring to **Section 5, Control Features**.

Harnesses

The transfer switch is connected to the left side of the control panel by a plug-in harness (two plugs).

Engine Starting Contacts

The engine control contact connections are located on the transfer switch. Connect signal wires to appropriate terminals as specified in Table 1-1 and shown in Figure 1-4 and Figure 1-5.

Table 1-1. Engine start connections.

When normal source fails	Terminals on transfer switch
contact closes	TB14 and TB15
contact opens	TB14 and TB16

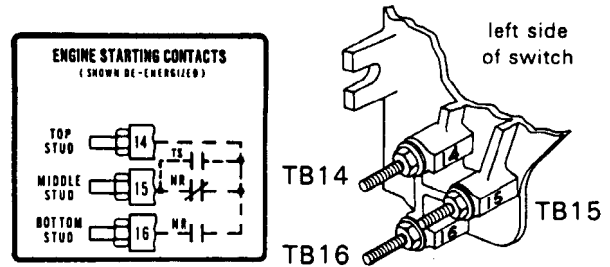


Figure 1-4. Engine starting contact label and location for 30 - 200 amp switches.

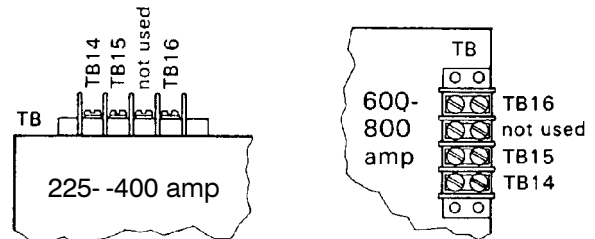


Figure 1-5. Engine starting contact label and location for 225-800 amp switches.



Load Disconnect Feature Connections (see Wiring Diagram & refer to page 5-1 for DIP switch settings)

For factory use only

Remote Control Features Connections (refer to the Wiring Diagram & page 5-1 for DIP switch settings) Each control contact must be suitable for a 5 V DC low energy circuit.

For factory use only

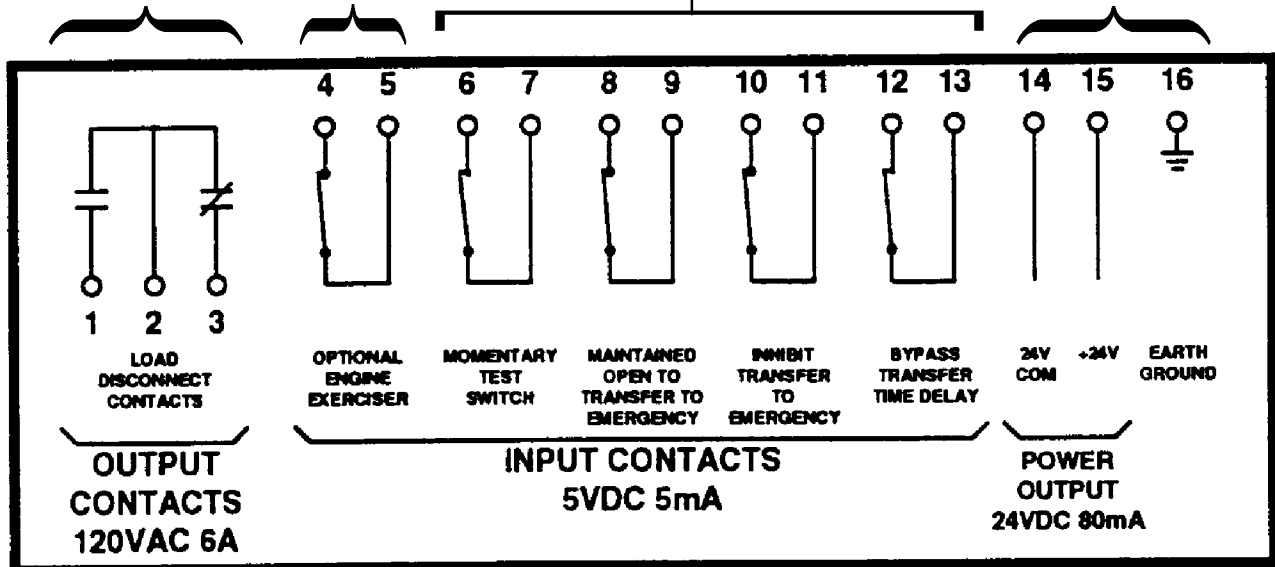


Figure 1-6. Input / Output label on the Control Panel.

INSTALLATION (continued)

Functional Test

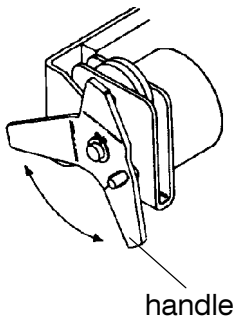


Figure 1-7.
30–200 A switches.

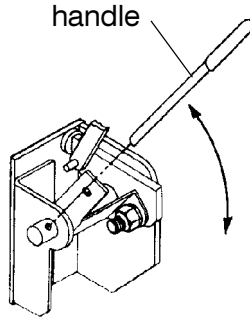


Figure 1-8.
225–400 A switches.

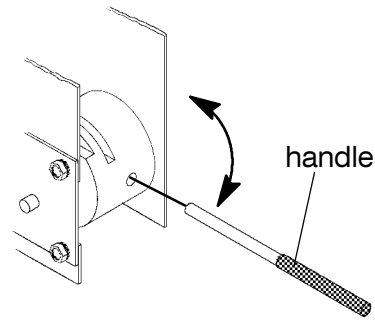


Figure 1-9
600 & 800 A switches.

The Functional Test consists of three checks: manual operation, voltage checks, and electrical operation.

▲ CAUTION: Do these checks in the order presented to avoid damaging the switch.

Read all instructions on the Composite Elementary Wiring Diagrams and labels affixed to the automatic transfer switch. Note the control features that are provided and review their operation before proceeding.

Manual Operation

A manual operator handle (detachable on 225 – 800 amp sizes) is provided on the Transfer Switch for maintenance purposes only. Manual operation of the switch must be checked before it is energized (operated electrically).

▲ WARNING: Do not manually operate the transfer switch until both power sources are disconnected: Open both circuit breakers.

1. Select the appropriate switch amperage size above and follow the directions for installing the handle:

30 through 200 ampere See Figure 1-7.

Grasp attached manual handle (left side of operator) and turn it with thumb and fingers.

225 through 400 ampere See Figure 1-8.

Insert the manual handle into the hole in the shaft, left side of the operator.

600 and 800 ampere See Figure 1-9.

Insert the manual handle into hole in the weight.

2. Move the handle as shown to manually operate the Transfer Switch. The switch should operate smoothly without binding. If it does not, check for shipping damage or construction debris.

3. Return the Transfer Switch to the *N* (normal) position. Remove manual operator handle (if detachable) and store it on the Transfer Switch in the place provided.

Voltage Checks

First check nameplate on the transfer switch for rated voltage. It should be the same as the normal and emergency line voltages.

▲ CAUTION: Verify that the feeders have been connected to the proper lugs.

▲ DANGER: Use extreme caution when using a meter to measure voltages in the following steps. Do not touch power terminals; shock, burns, or death could result.

1. Close the normal source circuit breaker.
2. Use an accurate voltmeter to check phase to phase and phase to neutral voltages present at the Transfer Switch normal source terminals.
3. Close the emergency source circuit breaker. (Start the generator, if necessary.)
4. Use an accurate voltmeter to check phase to phase and phase to neutral voltages present at the Transfer Switch emergency source terminals.

If necessary, adjust the voltage regulator on the generator according to the manufacturer's recommendations. The Automatic Transfer Switch will respond only to the rated voltage specified on the Transfer Switch nameplate.

5. Check phase rotation; it must be the same as the normal source.
6. Shut down the engine-driven generator. Then put the starting control selector switch (on the generator set) in the *automatic* position.
7. Close and secure the cabinet door.

INSTALLATION *(continued)*

NOTE

This is an original equipment manufacturer's unit which has been installed into another manufacturer's product. The descriptions of some of the operator controls and indications described in this manual may differ from the actual unit. Refer to the manufacturer's product information for exact descriptions of such features.

Electrical Operation

This procedure will check the electrical operation of the ASCO 940 Automatic Transfer Switch. Put the engine-generator starting control in the *automatic* position.

▲ WARNING: Close the cabinet door first.

Transfer Switch Test

NOTE: The normal source must be available and the emergency source generator must be capable of being started in this procedure.

1. Press and hold the door-mounted TRANSFER SWITCH TEST switch until the engine starts and runs. This should happen within 15 seconds.
2. The transfer switch will transfer to the Emergency position. If the *Transfer To Emergency Delay* is used, the transfer will occur after a time delay (up to 5 minutes). For immediate transfer press the BYPASS TIME DELAY switch (if provided).
3. The transfer switch will operate back to the Normal position after the *Retransfer To Normal Delay* (up to 30 minutes). For immediate retransfer press the BYPASS TIME DELAY switch (if provided).
4. The *Unloaded Running (Engine Cooldown) Delay* allows the engine to run unloaded for a 5 minute cool-down period.

This completes the Functional Test of the ASCO 940 Automatic Transfer Switch. Leave the engine-generator starting control in the *automatic* position.

NOTE: If Motor Load Transfer feature is activated, then transfer may not occur immediately after the respective time delays. Transfer will only occur when the phase relationship between sources is correct.

SECTION 2

SEQUENCE OF OPERATION

Control Panel Code 1

Refer to **Section 5, Control Features** for activation of standard additional control functions.

See Composite Elementary Wiring Diagram. Note Control Features furnished on this switch, and review operation.

NOTE

This is an original equipment manufacturer's unit which has been installed into another manufacturer's product. The descriptions of some of the operator controls and indications described in this manual may differ from the actual unit. Refer to the manufacturer's product information for exact descriptions of such features.

Transfer To Emergency

The sequence for load transfer to emergency source begins automatically when normal source voltage falls below the preset dropout point or when *TRANSFER SWITCH TEST* switch is pressed. An under voltage condition on any phase of the normal source is detected by the sensor.

When the normal source voltage fails or the *TRANSFER SWITCH TEST* switch is pressed, the SE relay de-energizes and relay NR begins its timing cycle (1 or 3 seconds, *Momentary Normal Source Outage Delay*). The NR relay is provided with a time delay on dropout to override momentary outages and prevent nuisance starting of the engine-driven generator. If the normal source voltage returns above the sensor dropout setting before the time delay expires, the NR relay timing cycle is reset to zero and relay SE energizes.

If the normal source voltage does not return above the sensor dropout setting before the time delay expires, the NR relay de-energizes and signals the engine-driven generator to start. At the same time, a voltage and frequency sensor begins monitoring the emergency source. The sensor will accept the emergency source only when both voltage and frequency reach preset pickup points. Usually about ten seconds elapse from dropout of the NR relay to acceptance by the sensor. This time span occurs because the engine-driven generator must crank, start, and run up to nominal pickup points. For this reason, if the *TRANSFER SWITCH TEST* switch is pressed it must be held for 15 seconds. If the emergency source is available immediately, the sensor may accept it as soon as NR relay drops out.

When the emergency source is accepted by the sensor, relay ER begins its timing cycle (*Transfer To Emergency Delay*). ER relay is provided with an adjustable (0 to 5 minutes) time delay on pickup to delay transfer of the load to the emergency source. For immediate transfer press *BYPASS TIME DELAY* switch.

ER relay energizes, the TS coil is energized, the transfer switch operates, and all switch contacts (mains, controls, auxiliaries) reverse position. The transfer switch is now supplying the load from the emergency source.

The transfer switch will remain in the Emergency position until the normal source is restored. If the *TRANSFER SWITCH TEST* switch is used, the transfer switch will remain on emergency until the *Retransfer To Normal Delay* times out.

Retransfer to Normal

The sequence for load retransfer to the normal source automatically begins when the voltage sensor detects restoration of the normal source. The voltage level must rise above the preset pickup point on all phases before the sensor will accept the normal source.

When the normal source is accepted by the sensor, relay SE begins its timing cycle (adjustable 1 sec. to 30 min., *Retransfer To Normal Delay*). For immediate retransfer press *BYPASS TIME DELAY* switch (if provided). SE relay is provided with a time delay on pickup to prevent immediate load retransfer to the normal source. The delay insures that the normal source has stabilized before reconnection of vital loads. If the normal source voltage falls below the present dropout point before the time delay expires, the timing cycle is reset to zero. If the emergency source fails for more than 4 seconds during the timing cycle, ER relay drops out and the load is immediately retransferred to the normal source, if that source is acceptable.

SE relay energizes and ER relay is dropped out. The TS coil is energized, the transfer switch operates, and all switch contacts (mains, controls, auxiliaries) reverse position. The transfer switch is now supplying the load from the normal source again.

Upon retransfer to the normal source, NR relay begins its timing cycle (*Unloaded Running [Engine Cooldown] Delay*). NR relay is provided with a 5 minute time delay on pickup to keep the engine running for a cool-down period.

NR relay energizes after the time delay and signals the engine-driven generator to shut down. All circuits are reset for any future normal source failure.

NOTE

Activation of standard control features shown in Section 5 will alter the sequence of operation and introduce additional time delays during transfer operations (as detailed above).

SECTION 3

TESTING & SERVICE

PREVENTIVE MAINTENANCE

Reasonable care in preventive maintenance will insure high reliability and long life for the automatic transfer switch.

Operate the switch at least once a month. Perform this four step Electrical Operation Test. This is a test with load transfer.

NOTE

This is an original equipment manufacturer's unit which has been installed into another manufacturer's product. The descriptions of some of the operator controls and indications described in this manual may differ from the actual unit. Refer to the manufacturer's product information for exact descriptions of such features.

Transfer Switch Test

1.	Press and hold the door-mounted <i>TRANSFER SWITCH TEST switch</i> until the engine starts and runs. This should happen within 15 seconds.
2.	The transfer switch will operate to the Emergency position. If the <i>Transfer To Emergency Delay</i> is used, the transfer will occur after a time delay (up to 5 minutes). For immediate transfer press <i>BYPASS TIME DELAY switch</i> (if provided).
3.	The Transfer Switch will operate back to the Normal position after the <i>Retransfer To Normal Delay</i> (up to 30 minutes). For immediate retransfer press <i>BYPASS TIME DELAY switch</i> (if provided).
4.	<i>Unloaded Running (Engine Cooldown) Delay</i> allows engine to run unloaded for 5 minutes.

Clean and inspect the switch once a year. De-energize all sources, then brush and vacuum away any excessive dust accumulation. Remove the transfer switch barriers and check contact condition. Replace contacts when pitted or worn excessively. Reinstall the barriers carefully.

Maintain transfer switch lubrication. The transfer switch has been properly lubricated, and under normal operating conditions no further lubricating is required. Renew factory lubrication if the switch is subjected to severe dust or abnormal operating conditions. Relubricate the operator if TS coil is replaced. Order *lubrication kit 75-100*.

Replacement parts. Refer to control panel nameplate for Service Data. Replacement parts are available in kit form. When ordering parts provide the Serial No. and Catalog No. from the transfer switch nameplate. Contact your local ASCO sales office.

DISCONNECTING THE CONTROL PANEL

The harness disconnect plugs are furnished for repair purposes only and should not have to be unplugged. If the control panel must be isolated, follow these steps carefully.

Disconnecting the Plugs

▲ WARNING: Do not unplug the control panel until step 1a. or 1b. below is completed.

1. Observe the position of the transfer switch.
 - a. If the transfer switch is in the *Normal* position, place standby engine starting control in the *off* position. Then open the emergency source circuit breaker.
 - b. If the transfer switch is in the *Emergency* position, open the normal source circuit breaker. Place the engine starting control in the *test* or *run* position.
2. Separate the quick disconnect plugs by squeezing the latches. Do not pull on the harness wires.
3. Label, remove, and tape the signal wires connected to the engine start terminals on the transfer switch: TB14 and TB15, or TB14 and TB16.

Reconnecting the Plugs

▲ WARNING: Do not reconnect control panel until steps 1a. or 1b. and 2 below are completed.

1. Observe the position of the transfer switch.
 - a. If the transfer switch is in the *Normal* position, be sure that the standby engine starting control is still in the *off* position. The emergency source circuit breaker still should be open.
 - b. If the transfer switch is in the *Emergency* position, normal source circuit breaker still should be open.
2. Reconnect the signal wires connected to the appropriate engine start terminals on the transfer switch. See **Section 1, Engine Starting Contacts**.
3. The harness plugs and sockets are keyed. Carefully align the plugs with the sockets and press straight in until both latches click.
4. Restore the opposite source as follows:
 - a. If the transfer switch is in the *Normal* position, place the standby engine starting control in the *automatic* position. Then close the emergency source circuit breaker.
 - b. If the transfer switch is in the *Emergency* position, close the normal source circuit breaker. The load will be automatically retransferred to the normal source after the *Retransfer to Normal Delay*. For immediate retransfer, press *BYPASS TIME DELAY switch* (if provided). Place the engine starting control in the *automatic* position.

TESTING & SERVICE

(continued)

MANUAL LOAD TRANSFER

This procedure will manually transfer the load if the Control Panel is disconnected.

▲ WARNING: Do not manually operate transfer switch until both power sources are disconnected.

1. Open normal and emergency source circuit breakers.
2. Use manual handle to manually operate transfer switch to the opposite source. If detachable, remove the handle. See **Section 1, Manual Operation**.
3. If the transfer switch is in the Emergency position manually start the engine generator and then close the emergency source circuit breaker.

TROUBLE-SHOOTING

Note Control Features that are activated or furnished on the switch and review their operation. Refer to **Section 5**.

▲ WARNING: Proceed with care! The Automatic Transfer Switch is energized.

NOTE

This is an original equipment manufacturer's unit which has been installed into another manufacturer's product. The descriptions of some of the operator controls and indications described in this manual may differ from the actual unit. Refer to the manufacturer's product information for exact descriptions of such features.

Table 3-1. Trouble-Shooting Checks

PROBLEM	CHECK IN NUMERICAL SEQUENCE		
	1 OPERATION	2 GEN-SET	3 VOLTAGE
Gen-Set does not start when the <i>TRANSFER SWITCH TEST</i> switch is pressed and held for 15 seconds or when the normal source fails.	Hold the <i>TRANSFER SWITCH TEST</i> switch 15 sec. or the outage must be long enough to allow for the 1 or 3 sec. <i>Momentary Normal Source Outage Delay</i> plus engine cranking and starting time.	Starting control must be in automatic position. Batteries must be charged and connected. Check wiring to engine starting contacts.	-----
Transfer switch does not transfer the load to emergency source after the gen-set starts.	Wait for <i>Transfer to Emergency Delay</i> (0 to 5 min.) to time out. For immediate transfer, press the <i>BYPASS TIME DELAY</i> switch (if provided). If Motor Load Transfer is active, wait for in-phase condition (see below).	Generator output circuit breaker must be closed. Generator frequency must be at least 57 Hz.	Voltmeter should read at least 90% of nominal phase to phase voltage between transfer switch terminals EA and EC (or EL1 and EL2 for 2 pole switches). * * These are factory settings.
Transfer switch does not transfer the load to normal source when normal returns or when <i>TRANSFER SWITCH TEST</i> switch is released.	Wait for <i>Retransfer to Normal Delay</i> (1 sec. to 30 min.) to time out. For immediate retransfer, press <i>BYPASS TIME DELAY</i> switch (if provided). If Motor Load Transfer is active, wait for inphase condition (see below).	-----	Voltmeter should read at least 90% of nominal phase to phase voltage between transfer switch terminals NB and NC, NC and NA, and NA and NB (or NL1 and NL2 for 2 pole switches).
Gen-Set does not stop after load retransfer to the normal source.	Wait for the 5 minute <i>Unloaded Running Delay</i> to time out.	Starting control must be in automatic position.	-----

Trouble-Shooting the Motor Load Transfer Feature (refer to page 5-1)

▲ DANGER: Use extreme caution when using a meter to measure voltages in the following steps. Do not touch power terminals; shock, burns, or death could result.

1. Connect a voltmeter (set for twice system phase-to-phase voltage) between Transfer Switch terminals NA and EA.
2. Manually start generator. Voltmeter needle should sweep back and forth at a regular rate between 0 and about twice system voltage.
3. Press and hold *TRANSFER SWITCH TEST* switch. The load should transfer to emergency source when

meter needle is near 0 volts. If transfer does not occur, Motor Load Transfer feature is not operating.

4. Release *TRANSFER SWITCH TEST* switch. The load should retransfer back to the normal source after the *Retransfer to Normal Delay*, if used. The retransfer should occur when the needle is near 0 volts. If retransfer does not occur after the time delay, the Motor Load Transfer feature is not operating.
5. For immediate retransfer, press the *BYPASS TIME DELAY* switch (if provided). Then disconnect the voltmeter.

If the problem is isolated to circuits on the control panel or the transfer switch, call your local ASCO sales office. Furnish the Serial No. and Catalog No. from the transfer switch nameplate.

SECTION 4 ADJUSTMENTS

Time Delay Adjustment

Standard time delays are set to customer specifications (if none specified, standard factory settings are used).

To change a setting, follow procedure on page 4-2. Use Table 4-1 as a guide to time delay values and their corresponding adjustment DIP switch or potentiometer.

Table 4-1. Time Delay Settings. (Shaded DIP switch is standard factory setting).

DESCRIPTION	LABELS	FACTORY SETTING	ADJUSTMENT RANGE	S3 DIP SWITCH		ADJUSTMENT POTENTIOMETER
Override Momentary Normal Source Outages	TD ES	3 seconds	1 second	Actuator 1 on	<input type="checkbox"/> 1	--
			3 seconds	Actuator 1 off	<input checked="" type="checkbox"/> 1	
Transfer to Emergency	TIMER N/E	0 minutes (full ccw)	0 to 5 minutes	--	--	P2
Override Momentary Emergency S. Outages	--	4 seconds	non-adjustable	--	--	--
Retransfer to Normal	TIMER E/N	30 minutes (full cw)	1 second to 30 minutes	--	--	P1
Unloaded Running (Engine Cooldown)	--	5 minutes	non-adjustable	--	--	--

Sensor Adjustments

Voltage and frequency sensor pickup and dropout points are set to customer specifications (if none specified, standard factory settings are used). To change a setting, follow procedure on page 4-2. Use Tables 4-2 and 4-3 for settings and corresponding DIP switch actuators.

⚠ WARNING: Any change in these settings may affect the normal operation of the automatic transfer switch. This change could allow the load circuits to remain connected to a low voltage source. Low setting of S3 actuator 2 may also require TS coil change. Contact ASI.

Table 4-2. Voltage and Frequency Settings. (Shaded DIP switches are standard factory settings).

DESCRIPTION	LABELS	SETTING	% of nominal		S1 DIP SWITCH	
			FACT. SET	ADJ. RANGE		
Normal Source Voltage	PU / N	Pickup	90 %	95 % *	Actuator 3 off	<input type="checkbox"/> 3
				90 %	Actuator 3 on	<input checked="" type="checkbox"/> 3
	DO / N	Dropout	85 %	90 % *	Actuator 1 off Actuator 2 off	<input type="checkbox"/> 1 <input type="checkbox"/> 2
				85 %	Actuator 1 on Actuator 2 off	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
				80 %	Actuator 1 off Actuator 2 on	<input type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
				70 %	Actuator 1 on Actuator 2 on	<input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2
Emergency Source Voltage	--	Pickup	90 %	non-adjustable	--	
	--	Dropout	75 %	non-adjustable		
Emergency Source Frequency	--	Pickup	95 %	non-adjustable	--	
	--	Dropout	85 %	non-adjustable		
	60 / 50 Hz	60 / 50 Hz	60 Hz	60 Hz		
50 Hz				Actuator 4 on	<input type="checkbox"/> 4	
Voltage Phases	3 Ø, 1 Ø	3 Ø / 1 Ø	3 Ø	3 phase	Actuator 6 off	<input checked="" type="checkbox"/> 6
				1 phase	Actuator 6 on	<input type="checkbox"/> 6

* If dropout voltage is set to 90%, the pickup voltage must be set to 95%.

Table 4-3. Transformer Voltage Adjust. (Low setting shifts all voltage settings down 4.2%)

DESCRIPTION	LABELS	FACTORY SETTING	ADJUSTMENT	S3 DIP SWITCH	
Voltage Adjust (4.2%)	LOW / HI	HI	LOW	Actuator 2 off	<input type="checkbox"/> 2
			HI	Actuator 2 on	<input checked="" type="checkbox"/> 2

ADJUSTMENTS (continued)

⚠ WARNING: Do not make any setting changes while the control panel is energized.

How to Change a Setting

1. Prevent the transfer switch from operating by disconnecting one source first, then the other, as follows:
 - a. If the transfer switch is in the Normal position, open the emergency source circuit breaker. Turn the engine starting control to *off*. Then open the normal source circuit breaker.
 - b. If the transfer switch is in the Emergency position, open the normal source circuit breaker. Turn engine starting control to *test* or *run*. Then open the emergency source circuit breaker.
2. Disconnect both harness plugs from control panel by squeezing the latches. Do not pull on the wires.
3. Remove cover from the control panel by releasing latch on right side with your thumb. See Figure 4-1.
4. Locate the appropriate adjustment potentiometer or DIP switch for the setting that you want to change. Refer to Table 4-1 and Table 4-2 on page 4-1 and Figure 4-2, Figure 4-3, Figure 4-4 on page 4-2.
5. Use a small screwdriver to turn the potentiometer clockwise to increase the time delay or counterclockwise to decrease it. See Figure 4-3.
6. Use a ball-point pen (or similar pointed tool) to slide the switch actuators left or right so they match the illustration next to the setting (left = off, right = on). Recheck the setting. See Figure 4-4.
7. Install the cover on the control panel by hooking it on the left side and latching the right side.
8. Reconnect both harness plugs to the control panel by aligning and pressing straight in until latches click.
9. Close the enclosure door, then restore both sources:
 - a. If the transfer switch is in the Normal position first close the normal source circuit breaker, then close the emergency source circuit breaker.
 - b. If the transfer switch is in the Emergency position, close the normal source circuit breaker. The load will be automatically retransferred to the normal source. Then close the emergency source circuit breaker.
10. Turn the engine starting control to *automatic*.

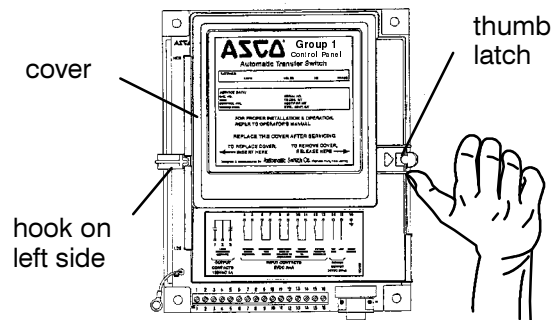


Figure 4-1. Control Panel cover latch.

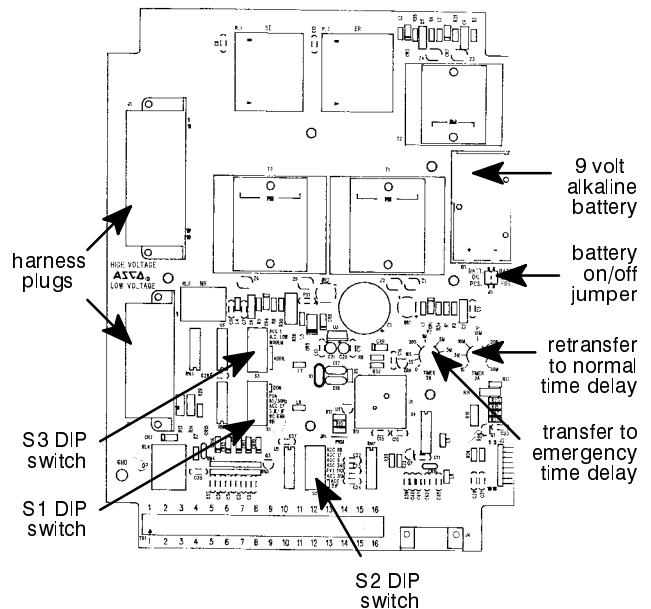


Figure 4-2. Location of potentiometers.

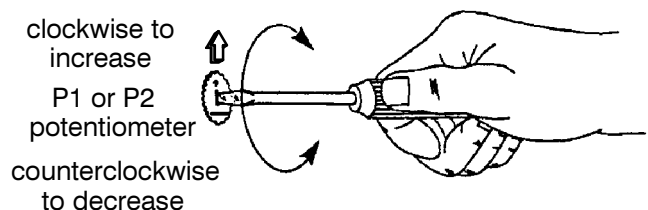


Figure 4-3. Changing time delay potentiometers.

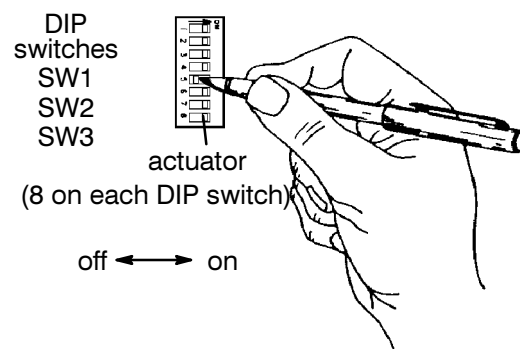


Figure 4-4. Setting DIP switch actuators.

SECTION 5 CONTROL FEATURES

MOTOR LOAD TRANSFER

Inphase monitoring logic controls transfer and retransfer of motor loads, so that inrush currents do not exceed normal starting currents. It avoids nuisance tripping of circuit breakers and mechanical damage to motor couplings.

The Motor Load Transfer feature is built into the control panel. DIP switch S1 (actuator 5) activates this feature: right = ON, left = OFF.

FUNCTION	S1 DIP SWITCH	
enable	Actuator 5 on	
disable	Actuator 5 off	

Shaded DIP switches are standard factory settings.

Note

If the Motor Load Transfer feature is enabled, it will be activated following the Load Disconnect Feature Delay Before Transfer delay.

LOAD DISCONNECT FEATURE

Connect external circuits to the terminals indicated on the Wiring Diagram in the back of this manual.

The double throw (Form C) contact is rated for 28 VDC or 120 VAC (6 amps resistive). The contact operates prior to a selectable 0, 3, 10, or 20 second delay before transfer of the Automatic Transfer Switch. The contact resets either immediately following transfer or after the same delay as set for pre-signal before transfer.

Time delay between the load disconnect control signal and initiation of transfer is set on the control panel with DIP switch S2 (actuators 6, 7, 8) as shown below:

Delay Before Transfer

LD TDBT	S2 DIP SWITCH	
0 (disable)	Actuator 7 on Actuator 8 on	
3 seconds	Actuator 7 on Actuator 8 off	
10 seconds	Actuator 7 off Actuator 8 on	
20 seconds	Actuator 7 off Actuator 8 off	

Shaded DIP switches are standard factory settings.

Delay After Transfer*

LD TDAT	S2 DIP SWITCH	
enable	Actuator 6 on	
disable	Actuator 6 off	

*Enabling the Delay After Transfer will cause the control signal to reset after the same delay as set for the Delay Before Transfer.

REMOTE CONTROL FEATURES

These remote control features require a customer-supplied normally closed contact suitable for a 5 V dc low energy circuit. Refer to the Wiring Diagrams at the back of this manual. Activate appropriate DIP switch S2 actuators below.

Remote Test (terminals CP6–7)

RTSW	S2 DIP SWITCH	
disable	Actuator 3 on	
enable	Actuator 3 off	

Remote Transfer to Emergency (CP8–9)

RT /E	S2 DIP SWITCH	
disable	Actuator 2 on	
enable	Actuator 2 off	

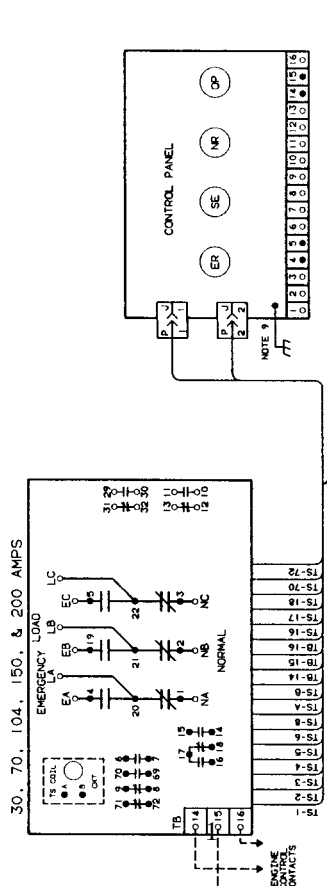
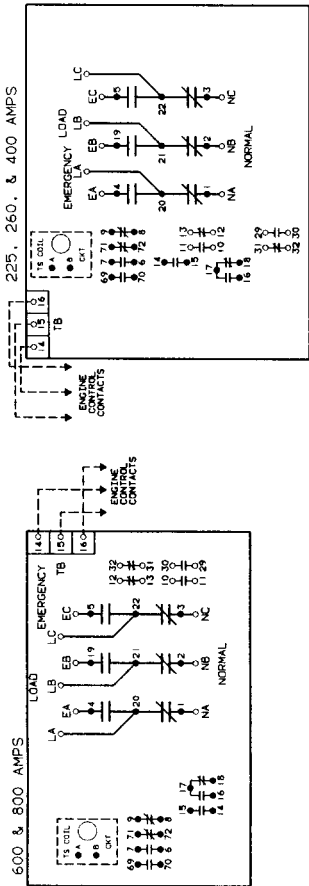
Bypass Transfer Time Delay (CP12–13)

TD E/N BYP.	S2 DIP SWITCH	
disable	Actuator 1 on	
enable	Actuator 1 off	

Inhibit Transfer to Emergency (CP10–11)

N/E INHIB.	S2 DIP SWITCH	
disable	Actuator 4 on	
enable	Actuator 4 off	

PHYSICAL DIAGRAM



CONTROL FEATURES

- VOLTAGE AND FREQUENCY SENSING**
- A. DEFERRING CONTACTS SELECTABLE AT 90% TO 100% OF NOMINAL SOURCE VOLTAGE. PICKUP SETTING IS ADJUSTABLE TO 90% OR 100% FACTOR. AT 90% PICKUP TO THE OPERATOR'S MANUAL FINISHED PANEL. AT 100% PICKUP TO THE OPERATOR'S MANUAL FINISHED SWITCH REGARDING CONTROL PANEL SETTINGS.
 - B. NON-ADJUSTABLE PICKUP SETTING OF 90% OF NOMINAL VOLTAGE. PICKUP SETTING IS ADJUSTABLE TO 90% OR 100% FACTOR. AT 90% PICKUP TO THE OPERATOR'S MANUAL FINISHED PANEL. AT 100% PICKUP TO THE OPERATOR'S MANUAL FINISHED SWITCH REGARDING CONTROL PANEL SETTINGS.
 - C. DEFERRING CONTACTS SELECTABLE AT 90% OF NOMINAL VOLTAGE. PICKUP SETTING IS ADJUSTABLE TO 90% OR 100% FACTOR. AT 90% PICKUP TO THE OPERATOR'S MANUAL FINISHED PANEL. AT 100% PICKUP TO THE OPERATOR'S MANUAL FINISHED SWITCH REGARDING CONTROL PANEL SETTINGS.
- TIME DELAYS**
- A. HONDIARY NORMAL SOURCE OUTAGE DELAY - ACTIVATED WHEN DELAY ON TRANSFER AND ENGINE STARTING STOWALS FACTORY SET AT 30 SECONDS. PICKUP SETTING IS ADJUSTABLE TO 30 SECONDS. EACH TRANSFER SWITCH REGARDING CONTROL PANEL SETTINGS.
 - B. HONDIARY NORMAL SOURCE OUTAGE DELAY - ACTIVATED AFTER THE HONDIARY NORMAL SOURCE IS DEACTIVATED. PICKUP SETTING IS ADJUSTABLE TO 30 SECONDS. PICKUP SETTING IS ADJUSTABLE TO 30 SECONDS. EACH TRANSFER SWITCH REGARDING CONTROL PANEL SETTINGS.
 - C. RETRANSMIT TO NORMAL DELAY - ACTIVATED WHEN THE NORMAL SOURCE IS ACCEPTABLE. PICKUP SETTING IS ADJUSTABLE TO 30 SECONDS. PICKUP SETTING IS ADJUSTABLE TO 30 SECONDS. EACH TRANSFER SWITCH REGARDING CONTROL PANEL SETTINGS.
 - D. UNLOADED RUNNING (ENGINE COOLDOWN) DELAY - ACTIVATED ON EXPIRATION OF THE NORMAL SOURCE OUTAGE DELAY WITHOUT A COMMIT TO TRANSFER TO EMERGENCY. NON-ADJUSTABLE DELAY OF 9 MINUTES.

- ENGINE CONTROL CONTACTS**
- ONE SET OF FORM C CONTACTS (11, 10, 8, 1, 1 NC) THAT CHANGE POSITION ON TRIPPING OF DISTRIBUTION CIRCUIT BREAKERS AND POSSIBLE DAMAGE TO EQUIPMENT. CONTACTS 11, 10, 8, 1, 1 NC ARE CONNECTED TO NORMAL. CONTACTS 11, 10, 8, 1, 1 NC ARE CONNECTED TO EMERGENCY.
- EMERGENCY TRANSFER TO EMERGENCY FEATURE** - REQUIRES A CUSTOMER SUPPLIED REMOTE NORMALLY CLOSED CONTACT OPENING OF THE CONTACT SUPPLIES EMERGENCY SOURCE WHILE CONNECTED TO THE NORMAL SOURCE.
- EMERGENCY TRANSFER TO NORMAL DELAY IF ACTIVE** - REQUIRES A CUSTOMER SUPPLIED REMOTE NORMALLY CLOSED CONTACT OPENING OF THE CONTACT SUPPLIES EMERGENCY SOURCE WHILE CONNECTED TO THE NORMAL SOURCE.
- LOAD DISCONNECT FEATURE**
- ONE SET OF FORM C CONTACTS (11, 10, 8, 1, 1 NC) THAT CHANGE POSITION ON TRIPPING OF DISTRIBUTION CIRCUIT BREAKERS AND POSSIBLE DAMAGE TO EQUIPMENT. CONTACTS 11, 10, 8, 1, 1 NC ARE CONNECTED TO NORMAL. CONTACTS 11, 10, 8, 1, 1 NC ARE CONNECTED TO EMERGENCY.
- MOTOR LOAD TRANSFER FEATURE**
- EMERGENCY TRANSFER CONTROL LOGIC TO INITIATE AN EMERGENCY TRANSFER OF MOTOR LOADS TO EMERGENCY SOURCE. CONTACTS 11, 10, 8, 1, 1 NC ARE CONNECTED TO NORMAL. CONTACTS 11, 10, 8, 1, 1 NC ARE CONNECTED TO EMERGENCY.

- REMOTE CONTROL FEATURES**
- THE FOLLOWING CONTACTS ARE USED TO INITIATE AN EMERGENCY TRANSFER OF MOTOR LOADS TO EMERGENCY SOURCE. CONTACTS 11, 10, 8, 1, 1 NC ARE CONNECTED TO NORMAL. CONTACTS 11, 10, 8, 1, 1 NC ARE CONNECTED TO EMERGENCY.
- A. **REMOTE TEST FEATURE** - REQUIRES A CUSTOMER SUPPLIED REMOTE NORMALLY CLOSED CONTACT OPENING OF THE CONTACT SUPPLIES EMERGENCY SOURCE WHILE CONNECTED TO THE NORMAL SOURCE.
 - B. **EMERGENCY TRANSFER TO EMERGENCY FEATURE** - REQUIRES A CUSTOMER SUPPLIED REMOTE NORMALLY CLOSED CONTACT OPENING OF THE CONTACT SUPPLIES EMERGENCY SOURCE WHILE CONNECTED TO THE NORMAL SOURCE.
 - C. **EMERGENCY TRANSFER TO NORMAL DELAY IF ACTIVE** - REQUIRES A CUSTOMER SUPPLIED REMOTE NORMALLY CLOSED CONTACT OPENING OF THE CONTACT SUPPLIES EMERGENCY SOURCE WHILE CONNECTED TO THE NORMAL SOURCE.
 - D. **EMERGENCY TRANSFER TO NORMAL DELAY IF ACTIVE** - REQUIRES A CUSTOMER SUPPLIED REMOTE NORMALLY CLOSED CONTACT OPENING OF THE CONTACT SUPPLIES EMERGENCY SOURCE WHILE CONNECTED TO THE NORMAL SOURCE.

- INCLUDED ACCESSORIES**
- ACC WA - OPERATOR MEMBRANE NOT INCLUDED
 (1) CLOSE WHEN AT IS CONNECTED TO NORMAL
 (2) CLOSE WHEN AT IS CONNECTED TO EMERGENCY
- WIRING DIAGRAM AS60-940**
 AUTOMATIC TRANSFER SWITCHES
 WITH GROUP 1 CONTROLS
- Automatic Switch Co.**
 10000 W. 10th St., St. Louis, Mo. 63141

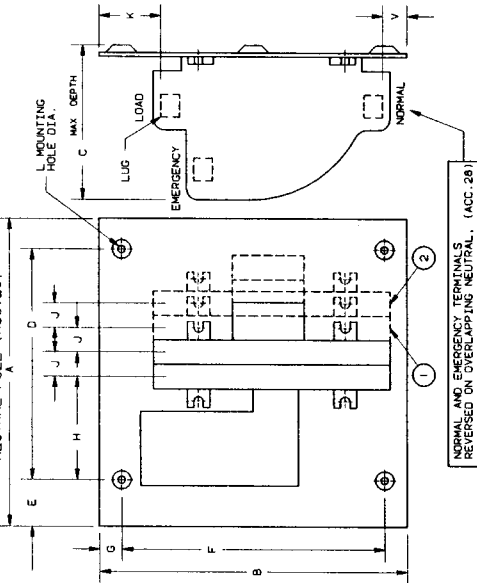
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30 THRU 200 AMPS.
2 & 3 POLE
WITH & WITHOUT OVERLAPPING
NEUTRAL POLE (ACC. 28)

AMP SIZE	DIMENSIONS											
	A	B	C	D	E	F	G	H	J	K	L	V
3000	150.25	150.25	136.50	136.50	166.75	41.62	282.75					
1000	100.25	100.25	96.75	96.75	116.50	31.12	190.50					
150	260.4	260.4	260.4	260.4	260.4	163.4	875.5					
3070	0.75	3.48	0.75	2.09	0.31	0.79						
100	19.75	88.4	18.2	35.30	87.5	80.5						
150	19.7	113.3	24.4	32.9	87.9	117.5						

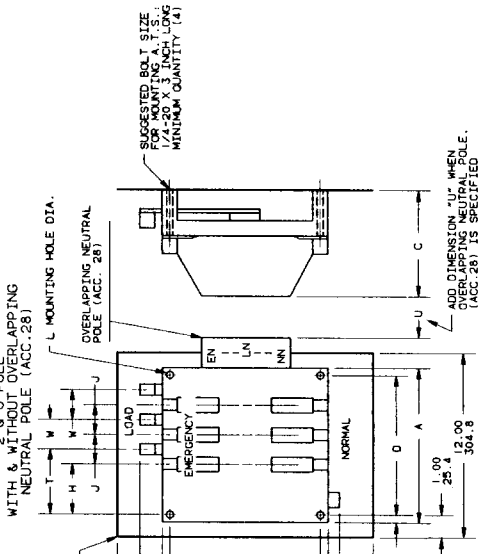
SUGGESTED BOLT SIZE FOR MOUNTING A.T.S.: (4)
1/4-20 X 1 INCH LONG MINIMUM QUANTITY (4)

- ① LOCATION OF THIRD POLE IF 3 POLES WITH & WITHOUT OVERLAPPING NEUTRAL LOCATION IF SPECIFIED WITH 2 POLES (ACC. 28)
- ② LOCATION OF OVERLAPPING NEUTRAL POLE (ACC. 28) IF SPECIFIED WITH 3 POLES



225 THRU 400 AMPS.
2 & 3 POLE
WITH & WITHOUT OVERLAPPING
NEUTRAL POLE (ACC. 28)

WARNING
SUPPLIED BACKING
PIECE MUST BE
INSTALLED AS
SHOWN.



NOTE: CENTER POLE IS OMITTED ON 2 POLE SWITCHES.

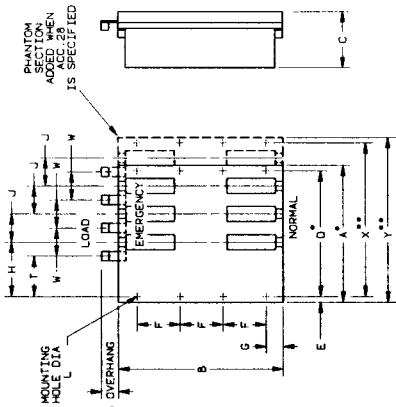
DIMENSIONS												
A	B	C	D	E	F	G	H	J	K	L	T	X
11.00	104.9	174.5	254.0	12.50	279.4	12.50	38.3	53.8	53.8	87.9	4.93	51.70
279.4	104.9	174.5	254.0	12.50	279.4	12.50	38.3	53.8	53.8	87.9	4.93	51.70

AMP SIZE	DIMENSIONS											
	A	B	C	D	E	F	G	H	J	K	L	
600	19.25	25.00	11.00	16.37	0.43	7.50	1.25					
800	489.0	635.0	279.4	466.6	10.9	190.5	31.8					
600	6.87	3.50	1.75	0.50	5.12	3.50						
800	74.5	88.9	44.5	27.7	30.6	88.9						
OVERLAPPING NEUTRAL ** RELATED DIMENSIONS												
AMP SIZE	X	Y	Z	W								
600	31.87	23.75										
800	555.5	1577.8										

SUGGESTED BOLT SIZE FOR MOUNTING A.T.S.: (1)
3/8-16 X 1-1/2 INCH LONG (8)

- * WITHOUT OVERLAPPING NEUTRAL POLE (ACC. 28).
- ** WITH OVERLAPPING NEUTRAL POLE (ACC. 28).

600 AND 800 AMPS.
2 & 3 POLE
WITH & WITHOUT OVERLAPPING
NEUTRAL POLE (ACC. 28)



NOTE: SECOND POLE FROM RIGHT IS OMITTED ON 2 POLE SWITCHES.
LEFT POLE IS NEUTRAL WHEN ACC. 28 IS SPECIFIED.

APPROXIMATE SHIPPING WEIGHT, LBS (KG)
(WEIGHT INCLUDES STANDARD TRANSFER SWITCH & CONTROLS)
2 & 3 POLES WITH & WITHOUT OVERLAPPING NEUTRAL POLE (ACC. 28)

AMP SIZE	POLES	WEIGHT
30	2	15 (7)
104	3	18 (8)
150	2	17 (8)
200	3	20 (9)
225, 260	2	37 (17)
400	3	45 (21)
600	2	130 (62)
800	3	143 (67)
	3	450 (207)

SWITCH RATING (AMPS)	RANGE OF AL-CU WIRE SIZE
30-104	ONE #14 TO 2/0 AWG
150	ONE #8 TO 3/0 AWG
200	ONE #8 TO 3/0 AWG COPPER ONLY
225-260-400	TWO #1/0 AWG TO 250 MCM OR ONE #4 AWG TO 600 MCM
600-800	THREE #2 AWG TO 600 MCM

CATALOG NO. TO ASCO @ S. C. BY
DATE



COMPOSITE OUTLINE AND MOUNTING DIMENSIONS FOR OPEN TYPE 2 & 3 POLE WITH & WITHOUT OVERLAPPING NEUTRAL POLE ACC. 28 30 THROUGH 1200 AMPERE ASCO #940 AUTOMATIC TRANSFER SWITCHES WITH GROUP 1 MICROPROCESSOR CONTROLS

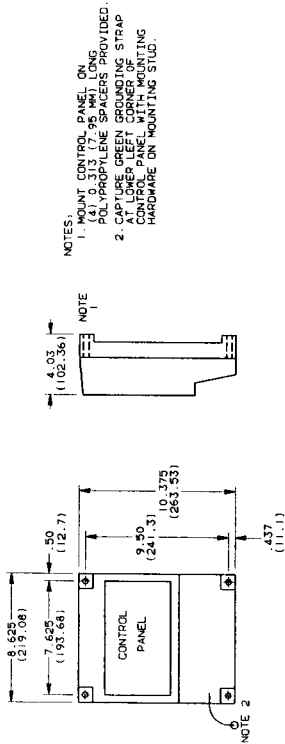
Tomatic Switch Co.
FLORENCE, S. C. 29502

BY DATE	PROBABILITY OF AUTOMATIC SWITCHING
10/1/79	USE PERMITTED FOR OUR WORK ONLY
10/1/79	ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED
10/1/79	AS - 2
10/1/79	AS - 3
10/1/79	AS - 4
10/1/79	AS - 5
10/1/79	AS - 6
10/1/79	AS - 7
10/1/79	AS - 8
10/1/79	AS - 9
10/1/79	AS - 10

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Sheet 2 of 2

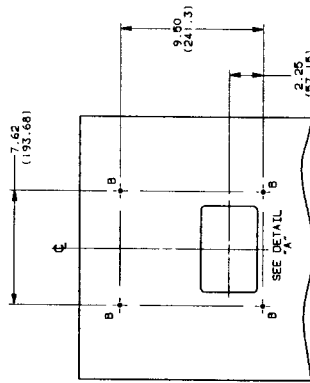
CONTROL DATA MOUNTING DATA



NOTES:

1. MOUNT CONTROL PANEL ON (4) 0.313 (7.95 MM) LONG COPPER BRASS SCREWS PROVIDED. CAPTURE SCREWS PROVIDED AT LOWER LEFT CORNER OF CONTROL PANEL WITH MOUNTING HARDWARE ON MOUNTING STUD.

CONTROL PANEL & CONTROLS MOUNTING

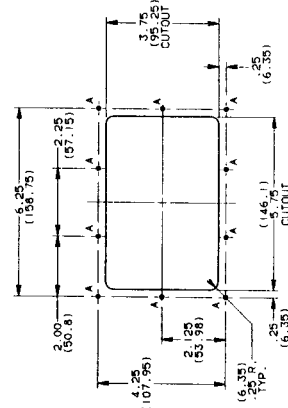


SUGGESTED MOUNTING

- HOLE B - 0.249 FOR
0.252

0.250-20 X 2.00 LONG
PENN. ENGINEERING &
MFG. CO. SEE DRAWING
CAPTIVE STUD NO.
FH-0420-32-Z1

CONTROLS (MEMBRANE) DETAIL "A"
(NOT PROVIDED W/ACC. 96A)



SUGGESTED MOUNTING

- HOLE 'A' - 0.137 DIA. FOR
0.140 DIA. FOR
0.138-32 X 0.5 LONG
PENN. ENGINEERING &
MFG. CO. SEE DRAWING
CAPTIVE STUD NO.
FH-632-8-Z1

NOTE:

- 1- USE GASKET PROVIDED WHEN MOUNTING CONTROL (MEMBRANE).

GENERAL NOTES

1. WHEN INSTALLING, CONNECT NORMAL, EMERGENCY, AND LOAD CONDUCTORS TO SIMILARLY MARKED TERMINALS.
2. ALL INTERNAL CONNECTIONS ARE MADE AT THE FACTORY.
3. MAINTAIN ELECTRICAL CLEARANCE OF 0.50, 12.7 MM, MINIMUM BETWEEN LIVE METAL PARTS AND GROUNDED METAL.
4. WHEN OPEN TYPE ATS'S ARE INTENDED FOR ENCLOSURE TYPE MOUNTING BY OTHERS, MOUNT THE TRANSFER SWITCH UNIT ON THE INSIDE BACK SURFACE AND THE CONTROL PANEL(S) ON THE INSIDE DOOR SURFACE.
5. THE CONTROL PANEL IS CONNECTED TO THE TRANSFER SWITCH PANEL BY WIRE HARNESS WITH TMD (2) QUICK DISCONNECT PLUGS. HARNESS LENGTH IS - 30.00" 762.0 MM. FOR 30-200 AMP SWITCHES, 40.00" 1016.0 MM. FOR 225-400 AMP SWITCHES AND 88.00" 2235.2 MM. FOR 1000 & 1200 AMP SWITCHES.
6. AN OPERATOR'S MANUAL IS FURNISHED WITH EACH AUTOMATIC TRANSFER SWITCH. REFER TO THIS PUBLICATION PRIOR TO INSTALLATION AND OPERATION OF THE SWITCH.

COMPOSITE OUTLINE AND MOUNTING DIMENSIONS FOR OPEN TYPE 2 & 3 POLE WITH & WITHOUT OVERLAPPING NEUTRAL POLE ACC. 28 30 THROUGH 1200 AMPERE ASG-940 AUTOMATIC TRANSFER SWITCHES WITH GROUP 1 MICROPROCESSOR CONTROLS

Automated Switch Co. ©
FLORHAM PARK, N. J. U. S. A.

REVISIONS TO THIS DRAWING SHALL BE INDICATED BY NUMBER AND DATE. THE NUMBER OF REVISIONS IS LIMITED BY NUMBER.

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