

Operator's Manual

ASCO® 7000 Series ACTS Automatic Closed-Transition Transfer Switches 150 through 4000 amps

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Note: Refer to the outline and wiring drawings provided with your 7000 Series ACTS for all installation and connection details and accessories.

Note: Refer to *Group 5 Controller User's Guide* 381333-126 for ATS status display messages, time delays, pickup & dropout settings, and adjustments.

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 the rating label. Exceeding the rating can cause personal injury or serious equipment damage.

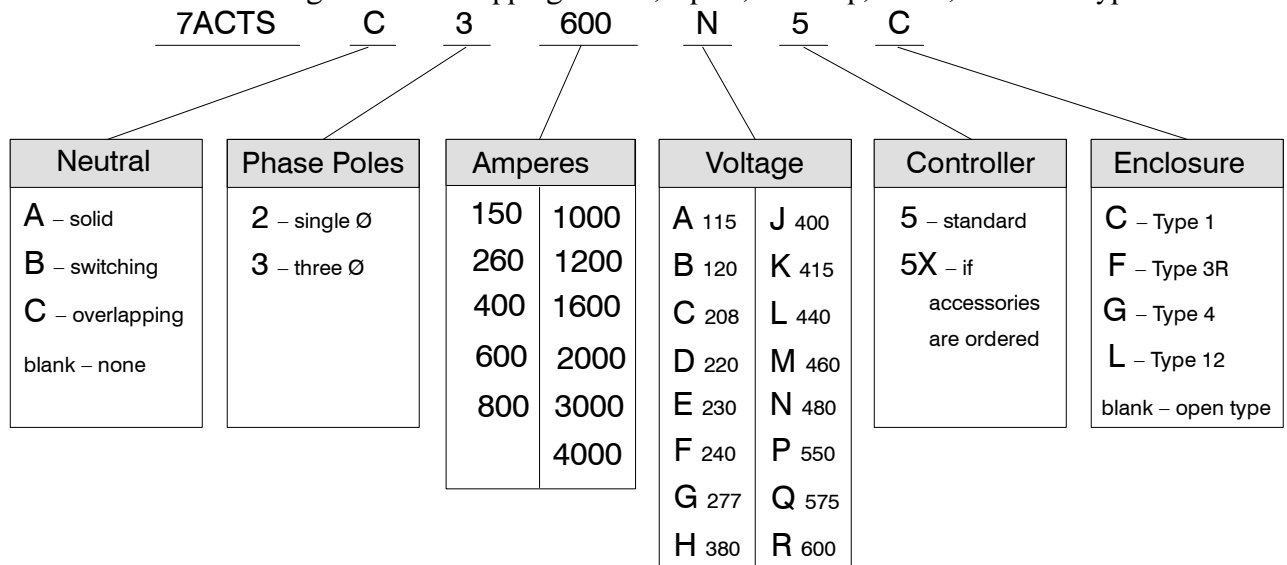
Nameplate

The Transfer Switch nameplate includes data for each specific 7000 Series ACTS. Use the switch only within the limits shown on this nameplate. A typical Catalog Number is shown below with its elements explained:

An experienced licensed electrician must install the ACTS.

Catalog Number Identification

Typical 7000 Series ACTS catalog no. for overlapping neutral, 3 pole, 600 amp, 480 V, ACTS in Type 1 enclosure:



SECTION 1 INSTALLATION

ASCO Series 7000 Automatic Closed-Transition Transfer Switches are factory wired and tested. Field installation simply requires mounting and connection of service cables and auxiliary control circuits (if required).

Remove the Shipping Skid

For large switches open the front door and remove the four lag screws (2 in front, 2 in rear) securing enclosure to the wood skid.

Supporting Foundation

For large switches the supporting foundation for the enclosure must level and straight. Refer to the applicable enclosure outline drawing included with the ACTS for all mounting details including door opening space.

If bottom cable entry is used, the foundation must be prepared so that the conduit stubs are located correctly. Refer to the enclosure outline drawing for specified area and location. Provide cable bending space and clearance to live metal parts. When a concrete floor is poured, use interlocking conduit spacer caps or a wood or metal template to maintain proper conduit alignment.

Mounting

Refer to the outline and mounting diagram provided with the ACTS; it shows all mounting details and instructions.

CAUTION

Protect the switch from construction grit and metal chips to prevent malfunction or shortened life of the automatic switch switch.

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

The controller is mounted on the cabinet door. An add-on DIN rail is provided for some optional accessories and is mounted below the controller on the door.

Auxiliary Cable Boxes

For 1000 & 1200 amp sizes, auxiliary cable boxes are required for all (normal, emergency, & load) bottom or top entry. Order ASCO part no. 609027 if required.

CAUTION

On 1000 & 1200 amp be sure to install auxiliary cable boxes if both service and load cables are entering through the top or bottom of enclosure.

Line Connections

A *Wiring Diagram* is furnished with the ASCO Series 7000 ACTS (separate from this manual). Refer to this drawing. 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.

Do not run cables in front of or 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 150-400 amps, 1 inch minimum over 400 amps.

It is not necessary to remove the barriers from the transfer switches to install the cables. If you do remove them, however, be sure to reinstall the barriers carefully.

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.

INSTALLATION (continued)

Bus Connections

For large switches use grade 5 hardware to connect bus to appropriate terminal plates. Wipe off the bus surfaces before they are joined. If the bus is very dirty, gently clean the surfaces with a non-flammable solvent. Avoid touching the cleaned surfaces.

Tighten bolted joints to the torque specified in Table 1-1.

 CAUTION
<p>The reliability of the connection depends on how clean and how tight the joint is.</p>

Table 1-1. Tightening torque values for bolted joints (Grade 5 hardware)

Bolt Diameter in inches	Tightening Torque in foot pounds
1/4	7
5/16	12
3/8	20
1/2	50
5/8	95
3/4	155

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 the Wiring Diagram.

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 (if used) are located on the transfer switch. Connect signal wires to appropriate terminals as specified in Table 1-2 and shown in Figure 1-1 or Figure 1-2.

Table 1-2. Engine start connections

When normal source fails	Terminals on transfer switch
contact closes	TB1 and TB2
contact opens	TB1 and TB3

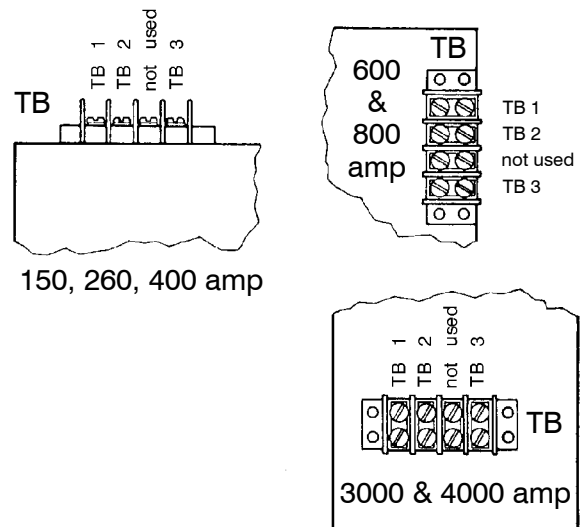


Figure 1-1. Engine starting contact label and location for 150–800 & 3000–4000 amp switches.

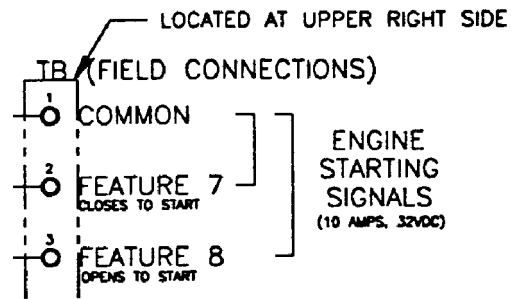


Figure 1-2. Engine starting contact connections and location for 1000–2000 amp switches.

INSTALLATION (continued)

Functional Test

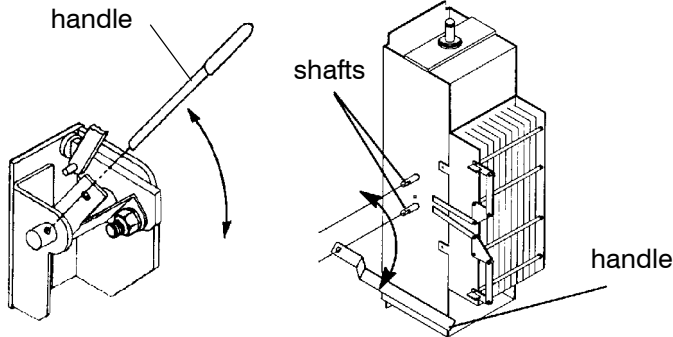
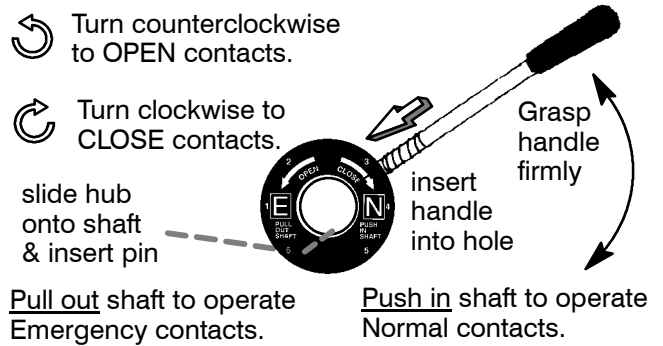


Figure 1-3.
150 – 400 A
transfer switches
(1 operator shown)

Figure 1-4.
600 & 800 A
transfer switches
(dual operator shown)



Turn counterclockwise to OPEN contacts.

Turn clockwise to CLOSE contacts.

slide hub onto shaft & insert pin

Pull out shaft to operate Emergency contacts.

Grasp handle firmly

insert handle into hole

Push in shaft to operate Normal contacts.

Figure 1-5
1000 – 2000 A
transfer 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 ACTS.

Read all instructions on the *Wiring Diagrams* and labels affixed to the ACTS. Note the control features that are provided and review their operation before proceeding.

1 – Manual Operation

A detachable manual operator handle is provided on the Transfer Switches **for maintenance purposes only**. Manual operation of both CN and CE transfer switches must be checked before they are operated electrically.

WARNING

Do not manually operate the transfer switches 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:

150 through 400 ampere See Figure 1-3.

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

600 and 800 ampere See Figure 1-4.

Attach the manual handle onto the pivot shaft extension, left side of the operator.

1000 through 2000 ampere See Figure 1-5.

Install the hub (with pin) onto the shaft and insert the handle firmly into the side hole in the hub. Push hub in or pull it out to engage opposite source contacts.

3000 and 4000 ampere See Figure 1-6.
Insert the manual handle into the hole in the weight.

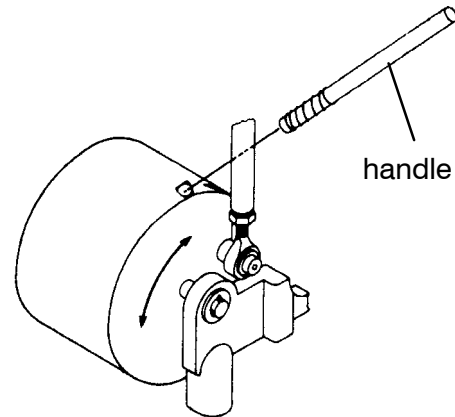


Figure 1-6. 3000 & 4000 amp transfer switches (one operator shown).

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. Repeat the manual operation check on the other Transfer Switch.
3. Return the CN Transfer Switch to the C (closed) position. Return the CE Transfer Switch to the O (open) position. Remove manual operator handle and store it on the Transfer Switch in the place provided.

WARNING

Verify that the maintenance handle has been removed and stored properly before proceeding!

Now continue to **2 – Voltage Checks** on next page.

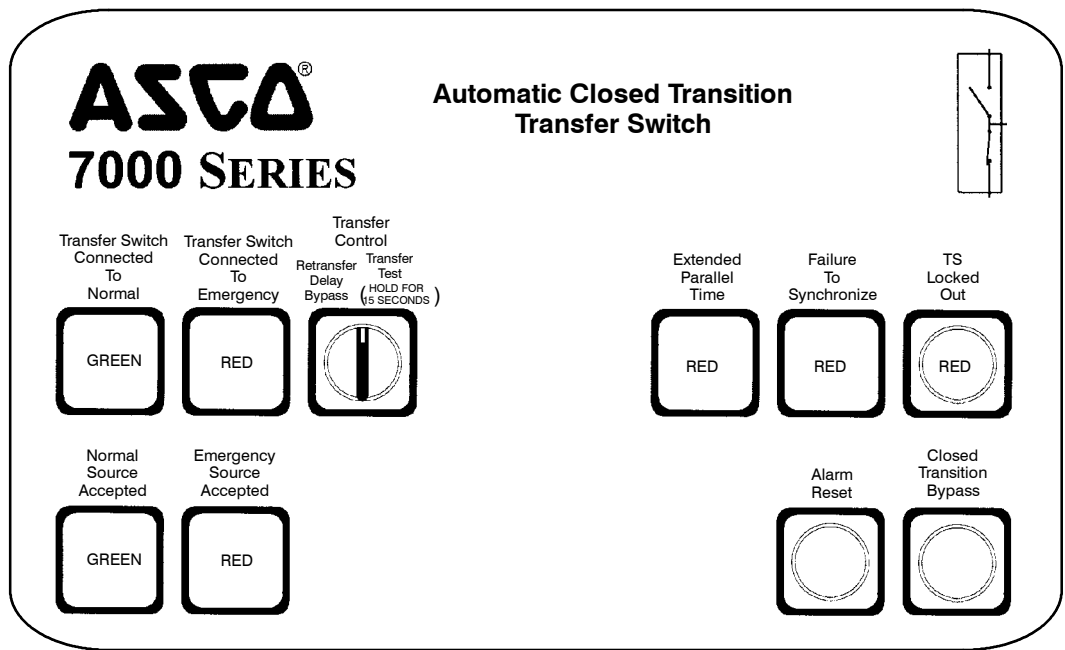


Figure 1-7. Standard controls and indicators.

2 – Voltage Checks

First check nameplate on transfer switch; rated voltage must be the same as 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. Do not touch power terminals; shock, burns, or death could result!

Perform steps 1 through 6 at the rights. Observe the status lights. See Figure 1-7.

- Black square means light is on.
- White square means light is off.

* If necessary, adjust 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.

Now continue to 3 – Electrical Operation on next page.

1	Close the normal source circuit breaker. The <i>Transfer Switch Connected To Normal</i> and the <i>Normal Source Accepted</i> lights should come on.	
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 generator, if necessary.) The <i>Transfer Switch Connected To Normal & Emergency Source Accepted</i> lights should come on.	
4	Use an accurate voltmeter to check phase to phase and phase to neutral voltages present at the transfer switch emergency source terminals.*	
5	Use a phase rotation meter to check phase rotation of emergency source; it must be the <u>same</u> as the normal source.	
6	Shut down the engine-generator, if applicable. The <i>Emergency Source Accepted</i> light should go off. Then put the starting control selector switch (on the generator set) in the <i>automatic</i> position. Close enclosure door.	

INSTALLATION (continued)

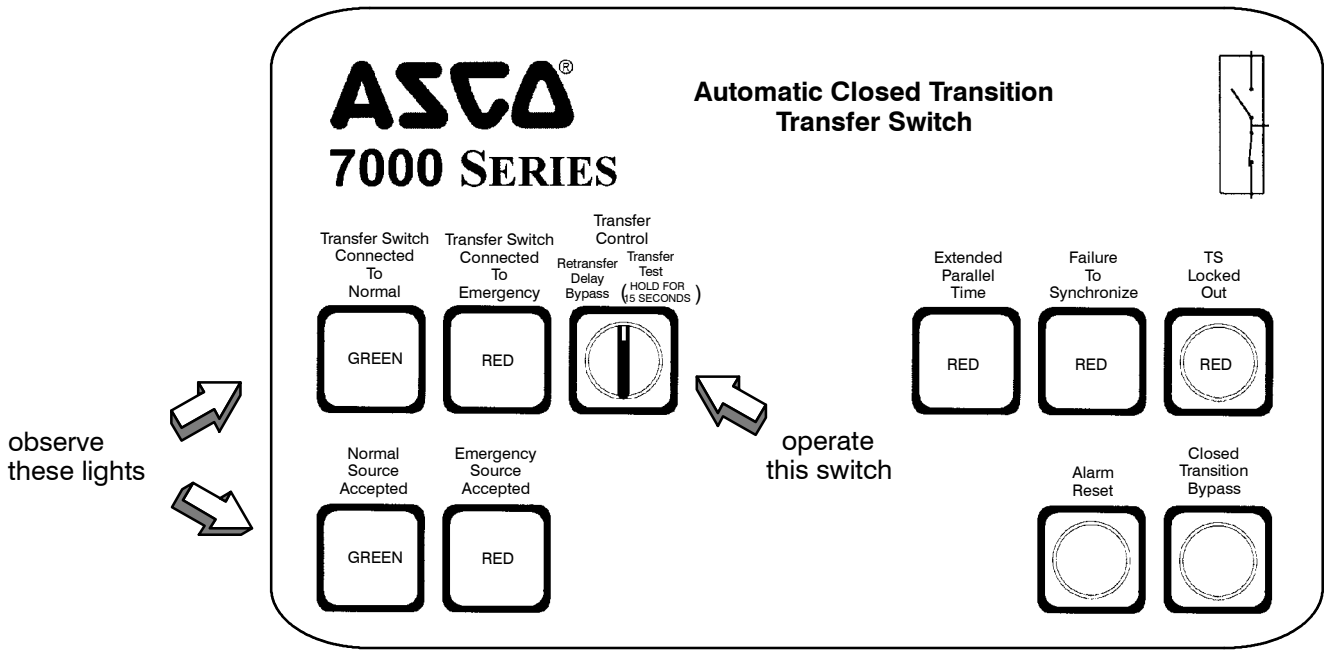


Figure 1-8. Standard controls and indicators.

3 – Electrical Operation

This procedure will check the electrical operation of the Automatic Closed-Transition Transfer Switch. See Figure 1-8.

WARNING

Close the enclosure door first.

Transfer Test

Both normal and emergency sources must be available and the emergency source generator (if used) must be capable of being started in this procedure.

Perform steps 1 through 4 at the rights. Observe the status lights.

- Black square means light is on.
- White square means light is off.

1	Turn and <u>hold</u> Transfer Control switch clockwise to <i>Transfer Test</i> until the engine starts and runs (within 15 sec.). <i>Emergency Source Accepted</i> light should come on.	
2	Transfer switch CE closes and then Transfer Switch CN opens (closed-transition overlap). The <i>Transfer Switch Connected To Emergency</i> light should come on and the <i>Transfer Switch Connected to Normal</i> light goes off (you might see and hear the brief overlap transfer).	
3	Transfer switch will operate back to Normal position after Feature 3A time delay. For immediate retransfer turn Transfer Control counterclockwise to <i>Retransfer Delay Bypass</i> . The <i>Transfer Switch Connected To Normal</i> light should come on; <i>Transfer Switch Connected to Emergency</i> light should go off.	
4	The engine-generator will stop after the Feature 2E time delay (unloaded running engine cool-down). The <i>Emergency Source Accepted</i> light should go off.	

This completes the Functional Test of the ACTS.

SECTION 2 TESTING & SERVICE

TRANSFER TEST

Operate the 7000 Series ACTS at least once a month by following the five-step **Electrical Operation Transfer Test** procedure on page 1-4.

PREVENTIVE MAINTENANCE

Reasonable care in preventive maintenance will insure high reliability and long life for the 7000 Series ACTS. An annual preventive maintenance program is recommended.

ASCO Services, Inc. (ASI) is ASCO Power Technologies' national service organization. ASI can be contacted at 1-800-800-2726 for information on preventive maintenance agreements.

Checklist for Yearly Inspection

DANGER

Hazardous voltage capable of causing shock, burns, or death is used in this switch. Deenergize both Normal – Emergency power sources before performing inspections!

- Clean the ACTS enclosure.** Brush and vacuum away any excessive dust accumulation. Remove any moisture with a clean cloth.
- Check the transfer switch contacts.** Remove transfer switch barriers and check the condition of the contacts. Replace contacts when pitted or worn excessively. Reinstall the barriers carefully.
- Maintain transfer switch lubrication.** If switch is subjected to severe dust or abnormal operating conditions, renew factory lubrication on all movements and linkages. Relubricate solenoid operator if TS coil is replaced. Do not use oil; order *lubrication kit 75-100*.
- Check all cable connections & retighten them.**

REPLACEMENT PARTS

Replacement parts are available in kit form. When ordering parts provide the Serial No., Bill of Material No. (BOM), and Catalog No. from the transfer switch nameplate. For service call ASCO Services at 1-800-800-2726; you will be put in contact with your local ASI 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:

Disconnecting the Plugs

WARNING

Do not unplug the control panel until steps 1a or 1b 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 two quick disconnect plugs by squeezing the latches. Do not pull on the harness wires.

Reconnecting the Plugs

WARNING

Do not reconnect the control panel until steps 1 and 2 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. The two harness plugs and sockets are keyed. Carefully align the plugs with the sockets and press straight in until both latches click.
3. 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.

TESTING & SERVICE

(continued)

MANUAL LOAD TRANSFER

This procedure will manually transfer the load if the control panel is disconnected.

WARNING

Do not manually operate the transfer switch until both power sources are disconnected (all conductors deenergized).

1. Deenergize both the normal and emergency source conductors (remove fuses or open circuit breakers).
2. Use manual handle to manually operate transfer switch to the opposite source. First open the closed transfer switch, then close the other transfer switch. Do not leave both closed. Then remove the handle. See *Manual Operation* on page 1–3.
3. If the transfer switch is in the Emergency position manually start the engine generator and then install emergency source fuse or close the circuit breaker.

TROUBLE-SHOOTING

Note any optional accessories that may be furnished on the ACTS and review their operation. Refer to any separate drawings and/or instructions that may be packed with the ACTS.

DANGER

Hazardous voltage capable of causing shock, burns, or death is used in this switch. Do not touch the power or load terminals of the transfer switch!

Table 2-1. Trouble-Shooting Checks.

PROBLEM	CHECK IN NUMERICAL SEQUENCE		
	1 OPERATION	2 GEN-SET	3 VOLTAGE
Engine-generator set does not start when the Transfer Control switch is turned and held in <i>Transfer Test</i> position or when normal source fails.	Hold <i>Transfer Test</i> switch 15 seconds or the outage must be long enough to allow for Feature 1C time delay plus engine cranking and starting.	Starting control must be in the automatic position. Batteries must be charged and connected. Check wiring to engine starting contacts.	–
Transfer switch does not transfer the load to the emergency source after the engine-generator set starts.	Wait for Feature 2B time delay to time out.	Generator output circuit breaker must be closed. Generator frequency must be at least 95% of nominal (57 Hz for a 60 Hz system.) *	Voltmeter should read at least 90% of nominal phase to phase voltage between terminals EA and EC (or EL1 and EL2 for 2 pole switches)*
Transfer switch does not transfer the load to normal source when normal returns or when the Transfer Control switch is released.	Wait for Feature 3A time delay to time out.	–	Voltmeter should read at least 90% of nominal phase to phase voltage between terminals NB and NC, NC and NA, and NA and NB (or NL1 and NL2 for 2 pole switches).
Gen. does not stop after load retransfer to normal source.	Wait for Feature 2E time delay to time out.	Starting control must be in the automatic position.	–
<i>Failure to Synchronize</i> light comes on.	Conditions of Normal or Emergency Sources not suitable for closed transition transfer. Recheck voltage and frequency of both sources. Press Alarm Reset pushbutton.		
<i>Extended Parallel Time</i> light comes on.	CN and CE contacts are closed longer than setting in the Controller. Open the disconnected source circuit breaker, then call 1–800–800–2726 for service.		
<i>TS Locked Out</i> light comes on.	Transfer lockout operation has occurred; transfer switch is disabled from automatic operation. Open the disconnected source circuit breaker, then call 1–800–800–2726 for service.		

* These are factory settings. Refer to **Controller User's Guide**.

If the problem is isolated to circuits on the controller or the transfer switch, call 1–800–800–2726 (ASCO Services); you will be put in contact with your local ASI office. Furnish the Serial No., Bill of Material No. (BOM), and Catalog No. from the transfer switch nameplate.

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