

# Operator's Manual

# ASCO® Series 386 Electrically-Operated Non-Automatic Transfer Switches D-design 30 through 230 amps

**⚠ DANGER**

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

**⚠ WARNING**

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

**⚠ CAUTION**

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

**Note:** Refer to the outline and wiring drawings provided with your ASCO Series 386 Non-Automatic Transfer Switch for all installation and connection details and accessories.

An experienced licensed electrician must install the Non-Automatic Transfer Switch.

### Rating Label

Each Non-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.**

### Identification Label

The identification label on the Transfer Switch includes data for each specific ASCO Series 386. Use the switch only within the limits shown on identification label.



30–200 amp sizes

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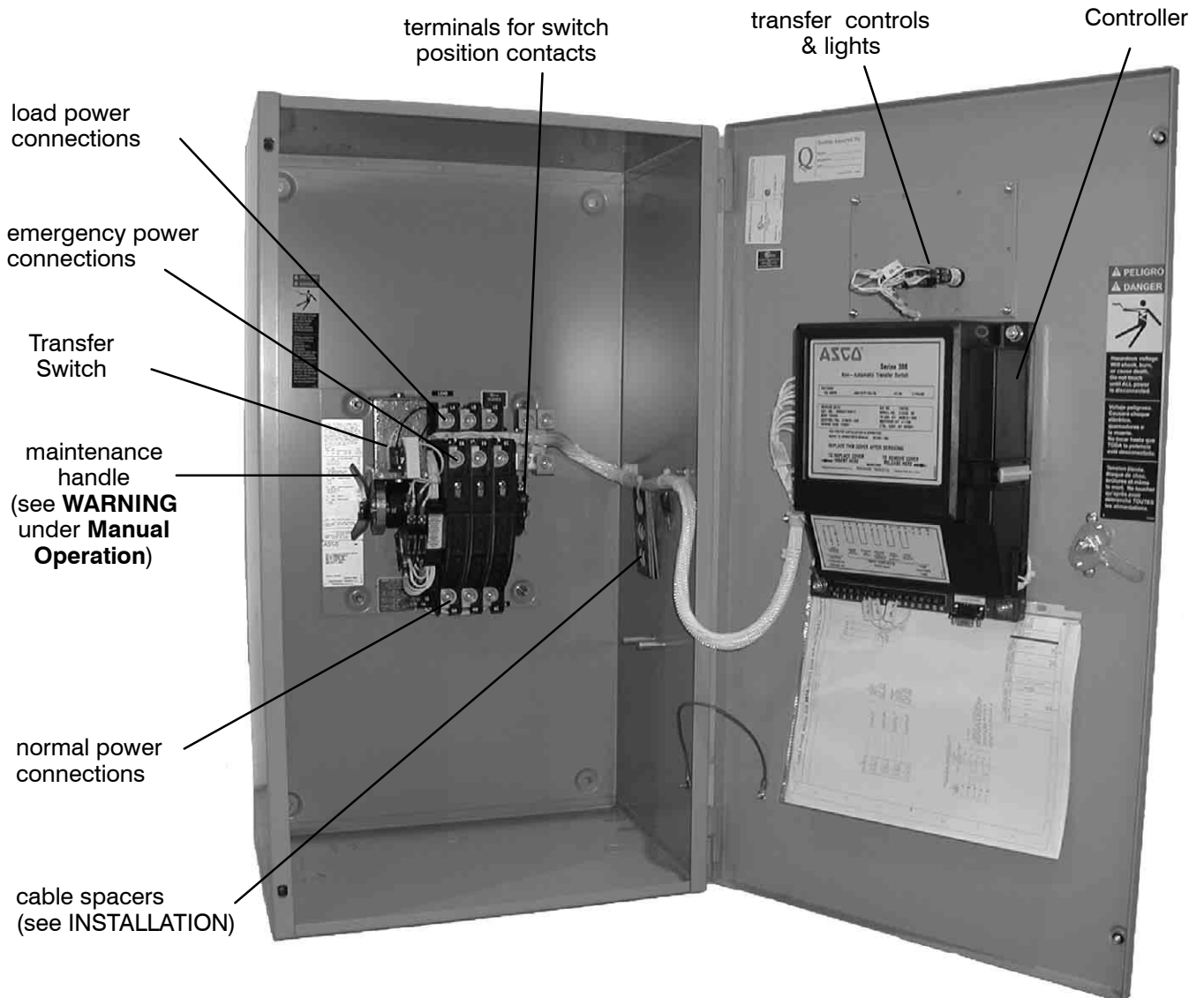
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## Catalog Number Identification

Typical ASCO 386 catalog no. for solid neutral, 3 pole, 150 amp, 480 V, N-ATS in Type 1 enclosure:

D 386	A	3	150	N	1	C
<b>Neutral</b>	<b>Phase Poles</b>	<b>Amperes</b>	<b>Voltage</b>		<b>Controller</b>	<b>Enclosure</b>
A – solid	2 – single Ø	30	A 115	K 415	1 – standard	C – type 1
B – switched	3 – three Ø	70	B 120	L 440	1X – if accessories ordered	F – type 3R
C – overlapping		100	C 208	M 460		G – type 4
blank – none		150	D 220	N 480		L – type 12
		200 *	E 230	P 550		blank – open type
			F 240	Q 575		
			H 380	R 600		
			J 400			

\* 200 amp. limited to 480 volts



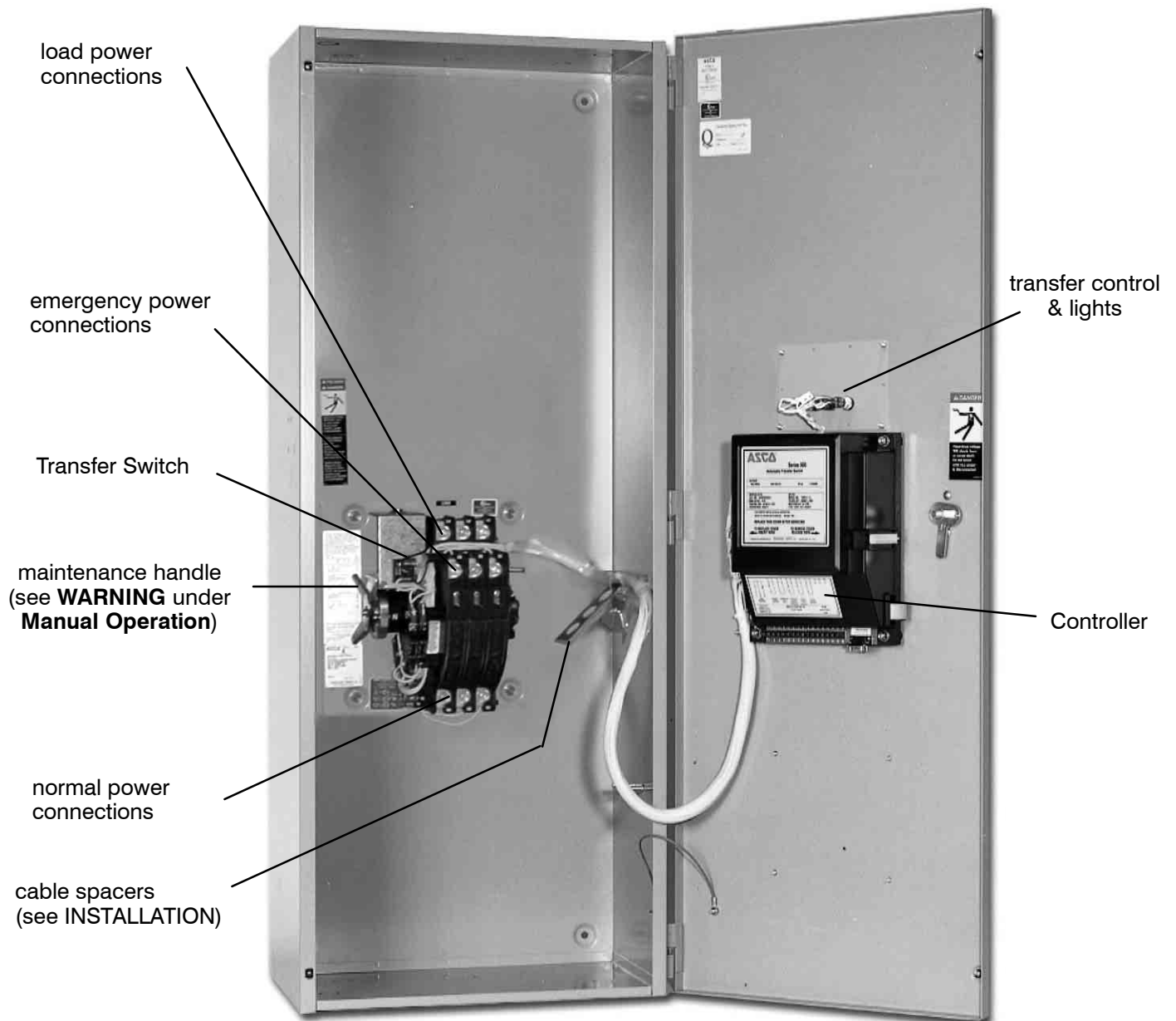
150 amp size in typical enclosure with location of customer connections

## Catalog Number Identification

Typical ASCO 386 catalog no. for solid neutral, 3 pole, 230 amp, 480 V, N-ATS in Type 1 enclosure:

D 386	A	3	230	N	1	C
<b>Neutral</b>	<b>Phase Poles</b>	<b>Amperes</b>	<b>Voltage</b>		<b>Controller</b>	<b>Enclosure</b>
A – solid B – switched C – overlapping blank – none	2 – single Ø 3 – three Ø	230 **	A 115 B 120 C 208 D 220 E 230 F 240	H 380 J 400 K 415 L 440 M 460 N 480	1 – standard 1X – if accessories ordered	C – type 1 F – type 3R G – type 4 L – type 12 blank – open type

\*\* 230 amp. limited to 480 volts



230 amp. size in typical enclosure with location of customer connections

## SECTION 1 INSTALLATION

ASCO 386 Non–Automatic Transfer Switches are factory wired and tested. Installation requires skid removal then securing the enclosure to the supporting foundation.

### Mounting

Refer to the applicable enclosure outline drawing furnished with this switch and mount the Series 300 according to details and instructions shown on diagram.

### Line Connections

Refer to the Wiring Diagram provided with your ASCO 386 N–ATS. All wiring must be made in accordance with the National Electrical Code and local codes.

It is unnecessary to remove pole covers from the transfer switch. If you do remove them, reinstall them carefully.

#### **⚠ 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.**

#### **⚠ CAUTION**

**Protect the non–automatic transfer switch from construction grit and metal chips to prevent malfunction or shortened life of the N–ATS.**

### Connecting Power Conductors

After the power cables have been tested, connect them to the appropriate terminal lugs on the transfer switch as shown on the wiring diagram provided with this ASCO 386. Make sure the lugs provided are suitable for use with the cables being installed. Standard terminal lugs are solderless screw type and will accept the wire sizes listed on the drawings provided with the ASCO 386. Be careful when stripping insulation from the cables; avoid nicking or ringing the conductor. Remove surface oxides from cables by cleaning with a wire brush. When aluminum cable is used, apply joint compound to conductors. Tighten cable lugs to the torque specified on rating label.

Three cable spacers are included with 150, 200, and 230 ampere transfer switches. When installing power cables, run the cables through the cable spacers as shown in Figure 1–1. Position cable spacers within 1½ inches from lugs.

#### **⚠ CAUTION**

**The cable spacers must be located as shown for 150, 200, and 230 ampere transfer switches.**

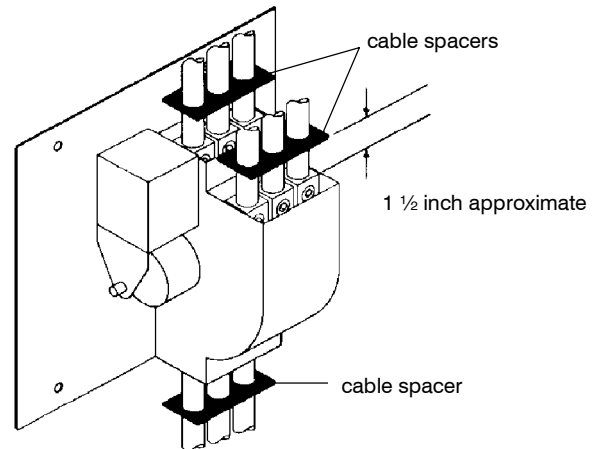


Figure 1–1. Cable spacers for 150, 200, & 230 amp. transfer switches.

### Controller Ground

A grounding wire must be connected to the controller's lower left mounting stud. Because the controller is mounted on the enclosure door, a conductive strap must be used between the enclosure and the door. This connection provides proper grounding which does not rely upon the door hinges.

### Harnesses

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

### Auxiliary Circuits

Connect auxiliary circuit wires to appropriate terminals on transfer switch as shown on the wiring diagram provided with this ASCO 386 Non–Automatic Transfer Switch.

## Functional Test

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 non-automatic transfer switch.**

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

### 1 – Manual Operation Test

A maintenance handle is provided on the Transfer Switch for maintenance purposes only. Manual operation of the transfer switch should 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. After deenergizing both power sources, open the enclosure door. Locate and the maintenance handle on the left side of the transfer switch frame. See Figure 1-2.
2. Grasp the attached maintenance handle and turn it with thumb and fingers as shown to manually operate it. The maintenance handle turns the opposite direction of the weight. Move it up or down as shown to manually operate the transfer switch. It should operate smoothly without any binding. If it does not, check for shipping damage or construction debris.
3. Return the transfer switch to the Normal position.

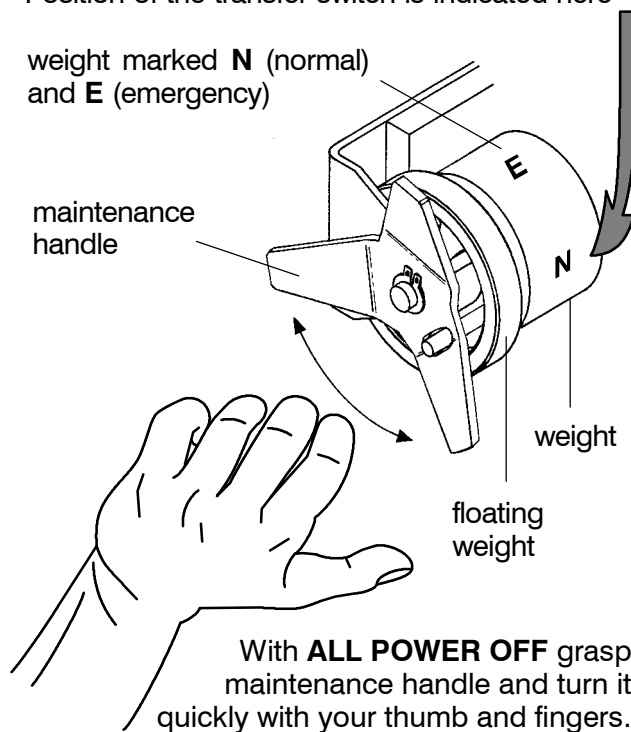
Note: If Normal and Emergency connections are reversed this operation is also reversed.

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

Position of the transfer switch is indicated here

weight marked **N** (normal) and **E** (emergency)

maintenance handle



With **ALL POWER OFF** grasp maintenance handle and turn it quickly with your thumb and fingers.

Figure 1-2. Maintenance handle and positions.

## INSTALLATION (continued)

### Functional Test (continued)

#### 2 – Voltage Checks

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

#### **⚠ 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. The *Load Connected To Normal* lamp 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 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 ASCO 386 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 engine-driven generator, if applicable.
7. Close the cabinet door and tighten the screws.

#### 3 – Electrical Operation

This procedure will check the electrical operation of the Non-Automatic Transfer Switch. See Figure 1–3.

#### **⚠ WARNING**

**Close the transfer switch enclosure door and tighten the screws before you test electrical operation.**

#### **Transfer Test**

Both normal and emergency sources must be available and above 90% of nominal voltage specified on nameplate.

1. Turn the door-mounted **Transfer Control** switch clockwise to *Transfer To Emergency*.
2. The transfer switch will operate to the Emergency position. The *Load Connected To Emergency* light should come on and the *Load Connected To Normal* light should go off.
3. Turn the door-mounted **Transfer Control** switch counterclockwise to *Transfer To Normal*.
4. The transfer switch will operate back to the Normal position. The *Load Connected To Normal* light should come on and the *Load Connected To Emergency* light should go off.

This completes the Functional Test of the ASCO 386 non-automatic transfer switch.



Figure 1–3. Operating Controls.

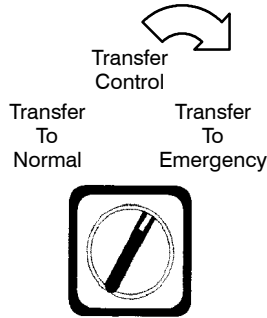
## SECTION 2

# SEQUENCE OF OPERATION

### Controller Code 1

Refer to **Section 5, Optional Accessories** for additional control functions.

Refer to **Wiring Diagram** furnished with the ASCO 386. Note Control Features furnished on this switch, and review operation.



### Transfer To Emergency

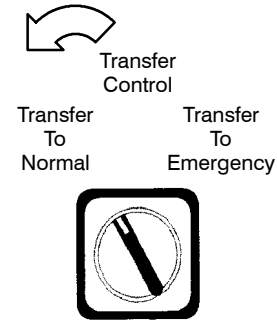
The sequence for load transfer to the emergency source begins when you turn the door-mounted **Transfer Control** switch clockwise to the *Transfer To Emergency* position.

When the **Transfer Control** switch is operated to *Transfer To Emergency*, the 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. If the emergency source is available immediately, the sensor may accept it as soon as the **Transfer Control** switch is operated.

When the emergency source is accepted by the sensor, relay ER picks up to transfer the load to the emergency source.

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 **Transfer Control** switch is operated to the *Transfer To Normal* position.



### Retransfer to Normal

The sequence for load retransfer to the normal source begins when you turn the door-mounted **Transfer Control** switch counterclockwise to the *Transfer To Normal* position.

When the **Transfer Control** switch is operated to *Transfer To Normal*, the voltage sensor begins monitoring the normal source.

The SE relay energizes when the sensor accepts the normal source voltage.

SE 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 normal source again.

The SE relay de-energizes when the **Transfer Control** switch is released.

The transfer switch will remain in the Normal position until the **Transfer Control** switch is operated to the *Transfer To Emergency* position.

#### Note

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



## SECTION 3

### TESTING & SERVICE

#### PREVENTIVE MAINTENANCE

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

ASCO Services, Inc. (ASI) is ASCO Power Technologies's national service organization. ASI can be contacted at 1-800-800-2726 for information on preventive maintenance agreements. In Canada call 1-888-234-ASCO (2726).

#### TESTING

Operate the switch at least once a month by following this four-step **Electrical Operation Test**.

##### Transfer Switch Test

- A. Turn the door-mounted **Transfer Control** switch clockwise to *Transfer to Emergency*.
- B. The transfer switch will operate to the Emergency position. The *Load Connected To Emergency* light should come on and the *Load Connected to Normal* light should go off.
- C. Turn the door-mounted **Transfer Control** switch counterclockwise to *Transfer to Normal*.
- D. The transfer switch will operate to the Normal position. The *Load Connected to Normal* light should come on and the *Load Connected to Emergency* light should go off.

#### 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 switch enclosure.** Brush and vacuum away any excessive dust accumulation. Remove any moisture with a clean cloth.
- Check the Switch Contacts.** Remove transfer switch barriers and check the condition of the contacts. Replace contacts when pitted or worn excessively. Reinstall 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. Don't use oil; order **lubrication 625550-001** (Castrol *EndurexR* 4000 lubricant).
- Check all cable connections and 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. Contact your local ASCO Power Technologies sales office or ASI. In the United States call 1-800-800-ASCO (2726), or in Canada call 1-888-234-ASCO (2726).

#### DISCONNECTING THE CONTROLLER

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

##### Disconnecting the Plugs

##### **WARNING**

**Do not unplug the controller 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.

##### Reconnecting the Plugs

##### **WARNING**

**Do not reconnect controller until steps 1 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 transfer switch is in the *Emergency* position, normal source circuit breaker still should be open.
2. The 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 Controller is disconnected.

### WARNING

**Do not manually operate the 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 the Control Features that are activated or furnished on the switch and review their operation. Refer to **Section 5, Optional Features**.

### WARNING

**Proceed with care! The ASCO 386 is energized.**

Table 3-1. Trouble-Shooting Checks.

PROBLEM	CHECK IN NUMERICAL SEQUENCE	
	1 OPERATION	2 VOLTAGE
Transfer switch does not transfer the load to the emergency source.	Turn <i>Transfer Control</i> switch clockwise to <i>Transfer to Emergency</i> position.	Generator output circuit breaker must be closed. 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). * Generator frequency must be at least 57 Hz. * * These are factory settings.
Transfer switch does not transfer the load to the normal source.	Turn <i>Transfer Control</i> switch counterclockwise to <i>Transfer to Normal</i> position.	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).

## Trouble-Shooting Motor Load Transfer (Optional Feature 27) (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. Turn the TRANSFER TO EMERGENCY control switch clockwise. The load should transfer to emergency source when meter needle is near 0 volts. If transfer does not occur, the Motor Load Transfer accessory is not operating.
4. Turn the TRANSFER TO NORMAL control switch counterclockwise. The load should retransfer back to the normal source when the needle is near 0 volts. If retransfer does not occur after the time delay, the Motor Load Transfer accessory is not operating.
5. Disconnect the voltmeter.

If the problem is isolated to circuits on the controller or the transfer switch, call your local ASCO Power Technologies sales office or ASI. In the United States, call 1-800-800-2726. In Canada, call 1-888-234-2726. Furnish the Serial No., Bill of Material (BOM) No., & Catalog No. from transfer switch nameplate.

## SECTION 4 ADJUSTMENTS

### Sensor Adjustments

Voltage and frequency sensor pickup and dropout points are factory set as specified on the Wiring Diagram. The frequency setting can be set for 50 or 60 Hz.. To change this setting, follow the procedure below. Use Table 4-1 for the setting and corresponding DIP switch actuator.

**⚠ WARNING**

**Do not change any other factory settings. Any change in these settings may affect the normal operation of the ASCO 386. This change could allow the load circuits to remain connected to a low voltage source.**

Table 4-1. Frequency Settings. (■ Shaded DIP switch is standard factory setting).

DESCRIPTION	LABEL	FACTORY SETTING	ADJUSTMENT RANGE	S1 DIP SWITCH
Frequency	60 / 50 Hz	60 Hz	60 Hz	Actuator 4 off <span style="display: inline-block; width: 15px; height: 10px; background-color: #cccccc; border: 1px solid black; margin-left: 5px;"></span> 4
			50 Hz	Actuator 4 on <span style="display: inline-block; width: 15px; height: 10px; background-color: black; border: 1px solid black; margin-left: 5px;"></span> 4

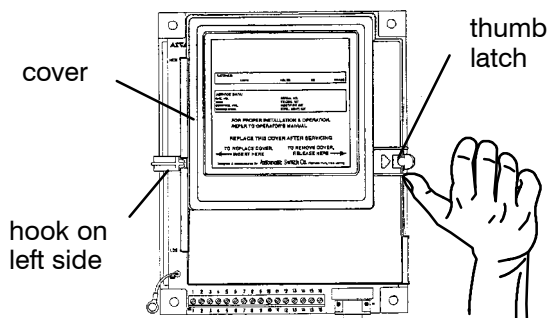


Figure 4-1. Controller cover latch.

### How to Change a Setting

**⚠ WARNING**

**Do not make any setting changes while the controller is energized.**

1. Deenergize all power, then open the enclosure door.
2. Disconnect both harness plugs from controller by squeezing the latches. Do not pull on the wires.
3. Remove cover from the controller by releasing latch on right side with your thumb. See Figure 4-1.
4. Locate the appropriate adjustment DIP switch for the setting that you want to change. Refer to Table 4-1 above and Figure 4-2 and Figure 4-3.
5. 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 4-3.
6. Install the cover on the controller by hooking it on the left side and latching the right side.
7. Reconnect both harness plugs to the controller by aligning and pressing straight in until latches click.
8. Close the enclosure door, then restore both sources.

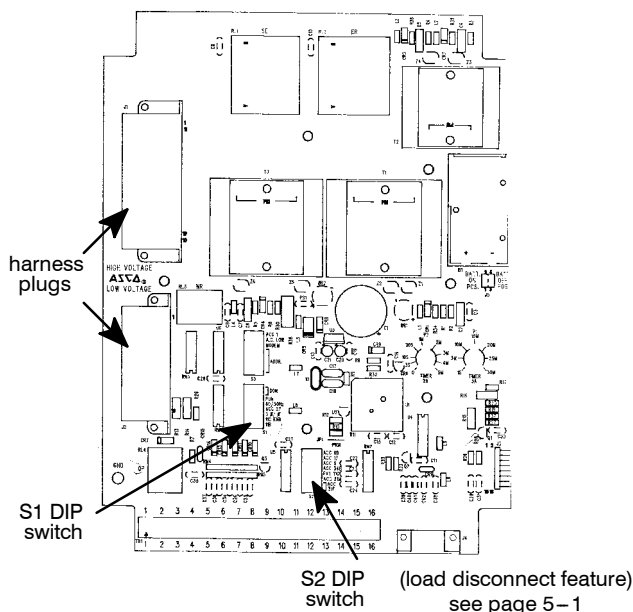


Figure 4-2. Location of DIP switch.

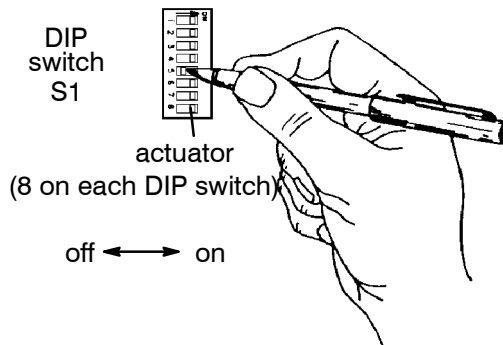




Figure 4-3. Setting DIP switch actuator.


## SECTION 5 OPTIONAL 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 controller. 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. Also, the transfer switch may not operate immediately after the transfer control switch is operated, even if both sources are available. This delay is intentional introduced if the two power sources are not inphase. Depending on the frequency difference, it may take a few seconds for the sources to reach synchronism.





### 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 Non-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 controller 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.

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HELP

800–800–2726 (ASCO)

customercare@asco.com

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