Certification

Transfer Switch Equipment

Contactor Bypass/Isolation Transfer Switches

July 2014

STATEMENTS OF POLICY
EATON-ELECTRICAL SERVICES AND SYSTEMS TRAINING TEAM

The descriptions, diagrams, and photographs of this manual are given for training purposes only and are not meant to represent any particular set of installed equipment even though similar in appearance. The supplier of this training service, Eaton Corporation, is not responsible for any damage that might result from performing maintenance using the instructions given in these manuals. The equipment user is advised to consult the documents that were supplied with the original equipment order when performing maintenance.

Eaton Corporation has taken reasonable care in compiling and organizing the information in this training program so that it represents the methods of analyzing and maintaining power distribution systems that are generally accepted in the industry. However, training program attendees should be aware that instructors are employees or hired consultants of the corporation and have an interest in promoting the corporation's products and services.

It is the policy of the Eaton Electrical Services and Systems to protect the privacy of learners' records. For employees of Eaton Corporation, information concerning attendance and performance will be made available only to the employee or the employee's immediate supervisor.

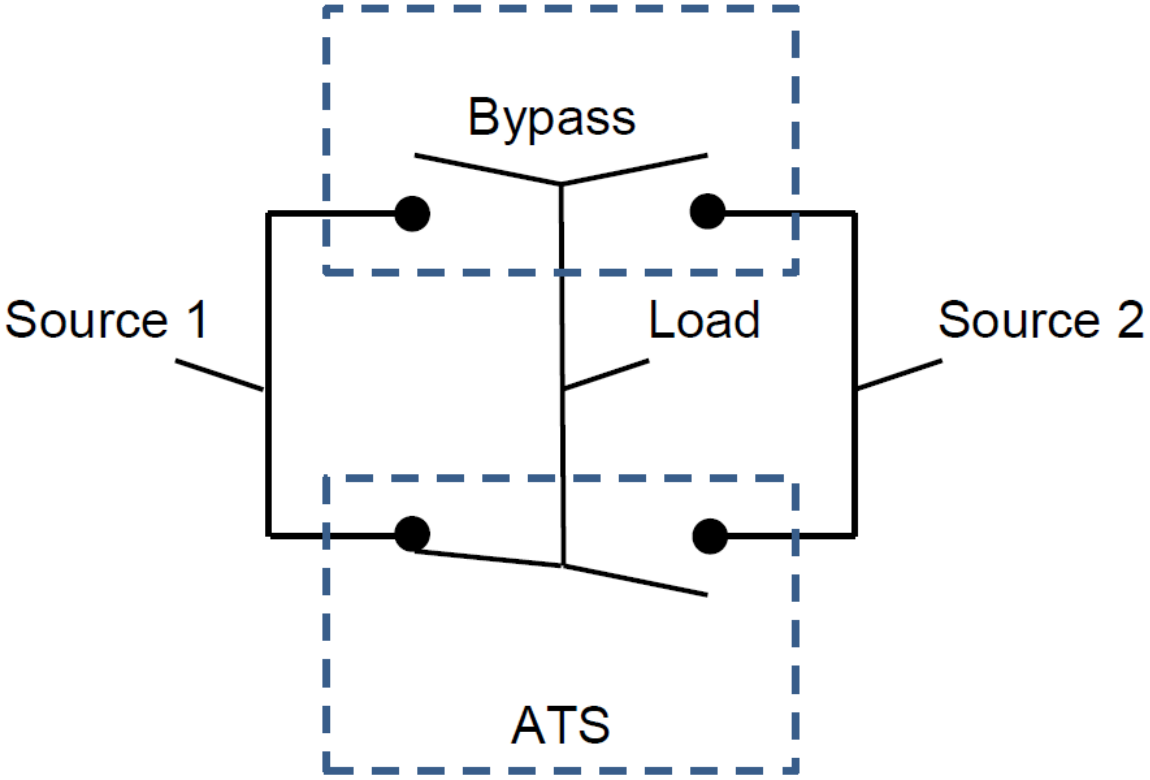
For learners who are not employees of Eaton Corporation, no information concerning registration, attendance or performance will be given to any party except the learner himself.

All learners' transcript information will be updated within thirty days of the successful completion of a training event.

Table of Contents

Eaton Contactor Bypass Isolation Transfer Switches

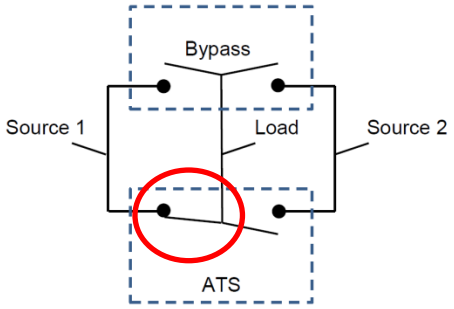
The Bypass / Isolation Transfer Switch is applied where there is a desire to maintain power to a load even when the ATS needs to be taken from service for maintenance. The schematic below indicates that the equipment is really two transfer switches connected in parallel with the ATS section typically in a drawout configuration so that it may be maintained.



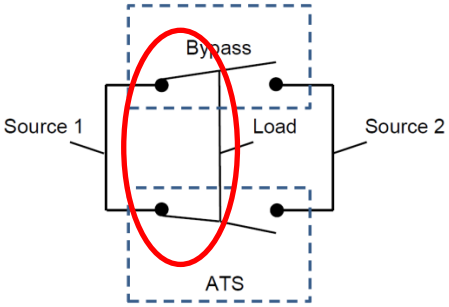
- Eaton has two versions of the Contactor Bypass/Isolation Transfer Switch
  - Based on the “C” Frame switching device rated 100-400 amps 480 volt, and 100 – 200 amps 600 volts.
  - Based on the “D” Frame switching device rated 100-1600 amps 600 volts.
- Eaton Bypass/Isolation Switches are available in two configurations.
  - Drawout ATS / Fixed Bypass
  - Drawout ATS/ Drawout Bypass
- Eaton Bypass/Isolation Switches are available with a controller selection
  - ATC-300
  - ATC-800
  - ATC-900

- Eaton Bypass/Isolation Switches are available in open or closed transition versions
    - Closed transition only available with ATC-800 or ATS-900 controllers
    - Closed transition requires utility approval, and may require special protective relay options.
- Eaton Bypass/Isolation Switches do a **Closed Transition Bypass**. Bypass transfer is between the same source on the ATS and BYPASS Contactors. **Closed Transition Transfer** is between two different sources.

Closed Transition BYPASS example:

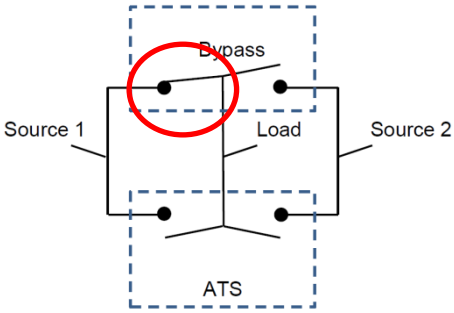


ATS Section Closed on Source 1



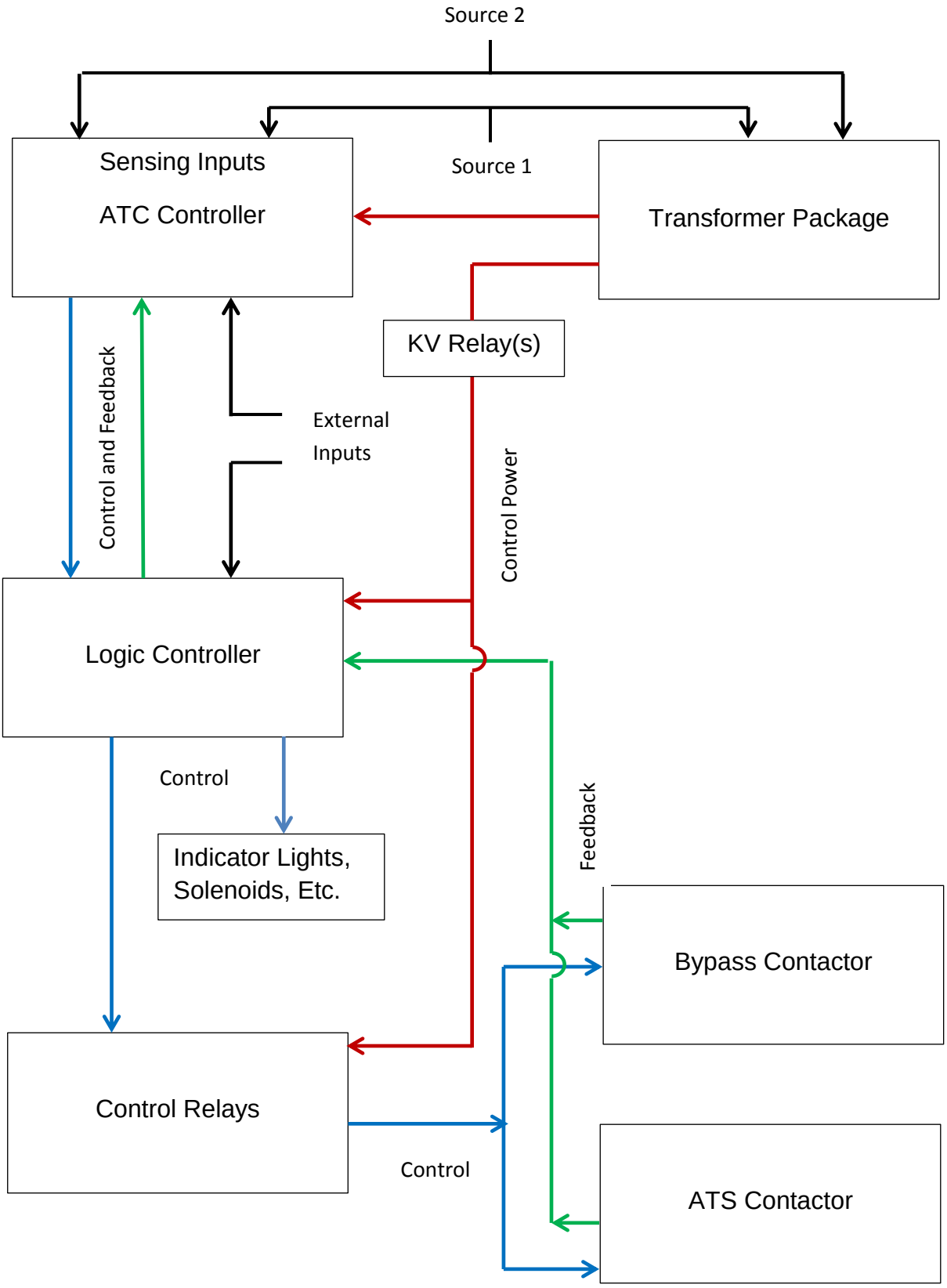
In Transition

ATS AND Bypass Section closed on Source 1 Overlap <100 msec.



Bypass Section Closed on Source 1

- Both frame sizes use the controller to operate the bypass section while bypassed, thus permitting full automatic operation even if the ATS section has been removed for maintenance.


Source 2
Sensing Inputs
ATC Controller
Source 1
Transformer Package
KV Relay(s)
Control and Feedback
External
Inputs
Control Power
Logic Controller
Control
Indicator Lights,
Solenoids, Etc.
Feedback
Bypass Contactor
Control Relays
Control
ATS Contactor

Eaton Contactor Bypass/Isolation Transfer Switch Components

Transformer Package

- Package is supplied for ordered system voltage
- Available Option is a multivoltage package with selector plug
- Supplies control voltages to the ATC Controller, Logic Controller, Control Relays, lights etc.

ATC Controller

- May be ATC-300, ATC-800 or ATC-900
- Controller decides what sources are good, handles transfer logic.
- Has certain External Inputs that it processes
- Some inputs come from Logic Controller

Logic Controller

- Process inputs from ATC Controller
- Send feedback to the ATC Controller
- Process certain External Inputs
- Outputs drive control relays to change Contactor status
- Determine which contactor is active
- Provide certain interlocking functions
- Drive indicator lights
- Uses a “buffer” to power ELC during outages not exceeding 30 seconds to prevent need to “reboot” and delay operation of the ATS.

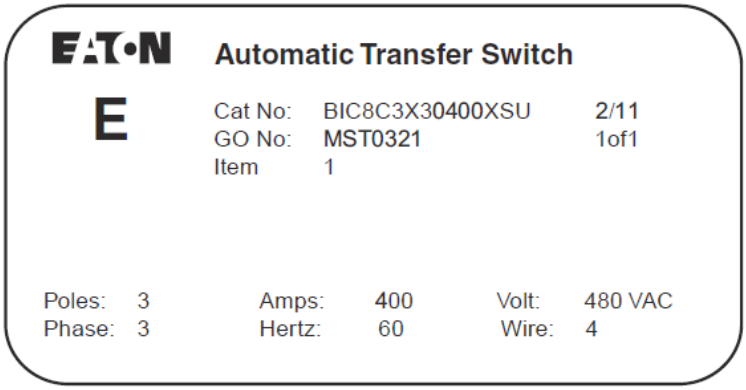
Contactors

- Handle the power switching based on control relay outputs
- Send feedback to the ATC Controller VIA the Logic Controller

Interlocks

- There are several Interlocks which may prevent normal operation of the unit.

The Contactor Bypass/Isolation ATS can be identified by information on the label.



Eaton Bypass/Isolation Contactor Type ATS Catalog System
Use ONLY to identify existing Switch! Do NOT build a Catalog Number from this table.

Example: CB C 8 C3 X 3 0600 X S U
1 2 3 4 5 6 7 8 9 10

1	Basic Device	2	Switching Device	3	Control
BI	Open Transition Bypass / Isolation	C	Contactor	3	ATC300
CB	Closed Transition Bypass / Isolation			8	ATC800

4	Switch Type	5	Device Mounting	6	# Poles
C3	Three Position Contactor	X	Fixed Mount Bypass	2	Two (2)
C5	Three Position Contactor w/InPhase & TDN	E	Drawout Bypass	3	Three (3)
				4	Four (4)

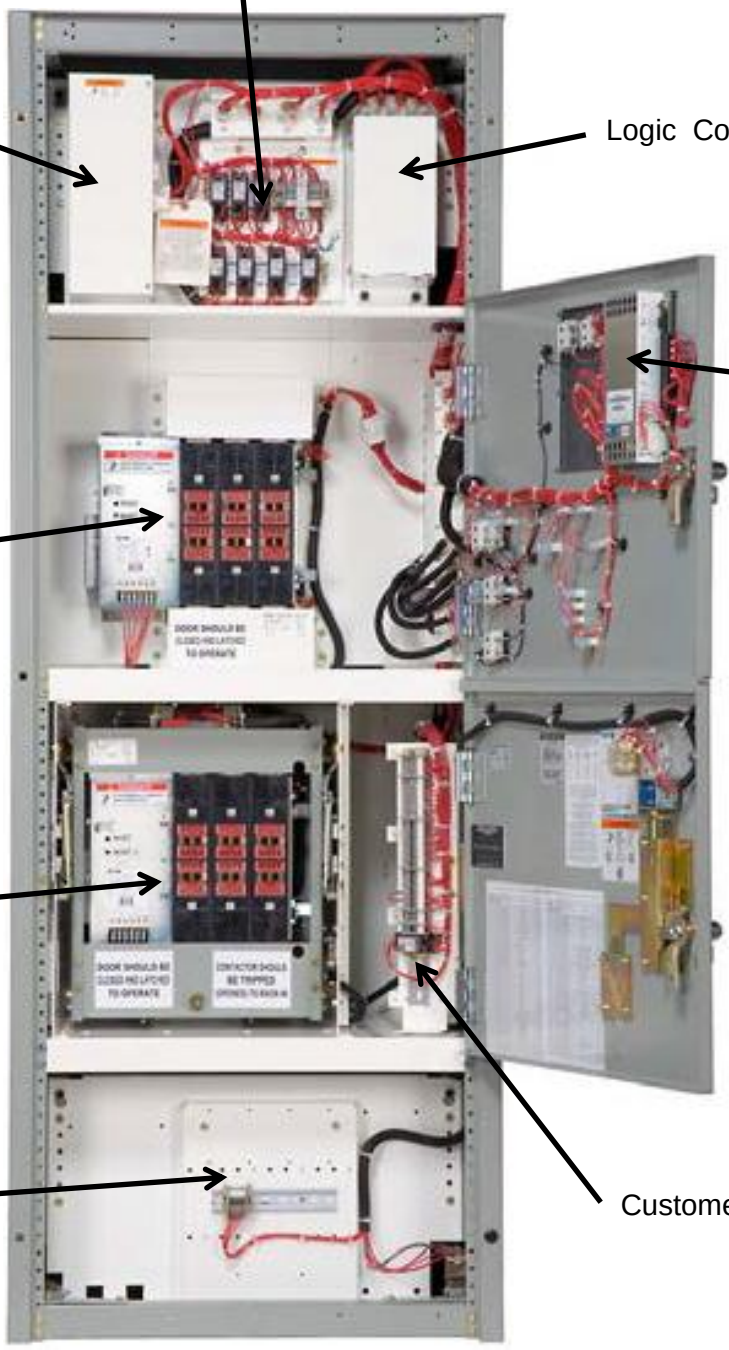
7	Amperes	8	Voltage	9	Enclosure
0040	40	A	120VAC/60Hz	S	Type 1
0080	80	B	208VAC/60Hz	J	Type 12
0100	100	E	600VAC/60Hz	R	Type 3R
0150	150	G	220VAC/50Hz		
0200	200	H	380VAC/50Hz		
0225	225	K	600VAC/50Hz	10	Listing
0260	260	M	230VAC/50Hz		
0400	400	N	401VAC/50Hz	U	UL/ULC
0600	600	O	415VAC/50Hz	X	No Listing
0800	800	W	240VAC/60Hz		
1000	1000	X	480VAC/60Hz		
1200	1200	Z	365VAC/50Hz		
1600	1600				

Decode the catalog number above by circling the correct selections.

Eaton C-Frame Contactor Bypass/Isolation Transfer Switch

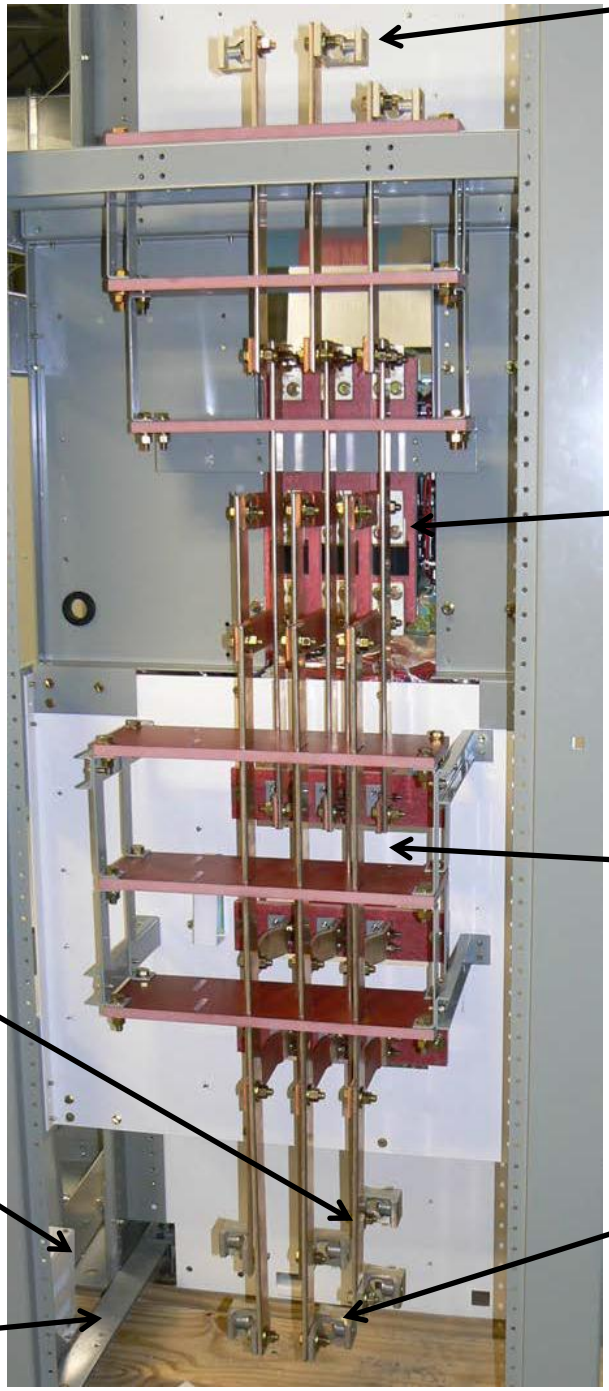
“C” Frame Ratings: 100-400 Amps 480 Volts Max.

“C” Frame Bypass/Isolation Transfer Switch Components



“C” Frame Contactor Bypass/Isolation Transfer Switch

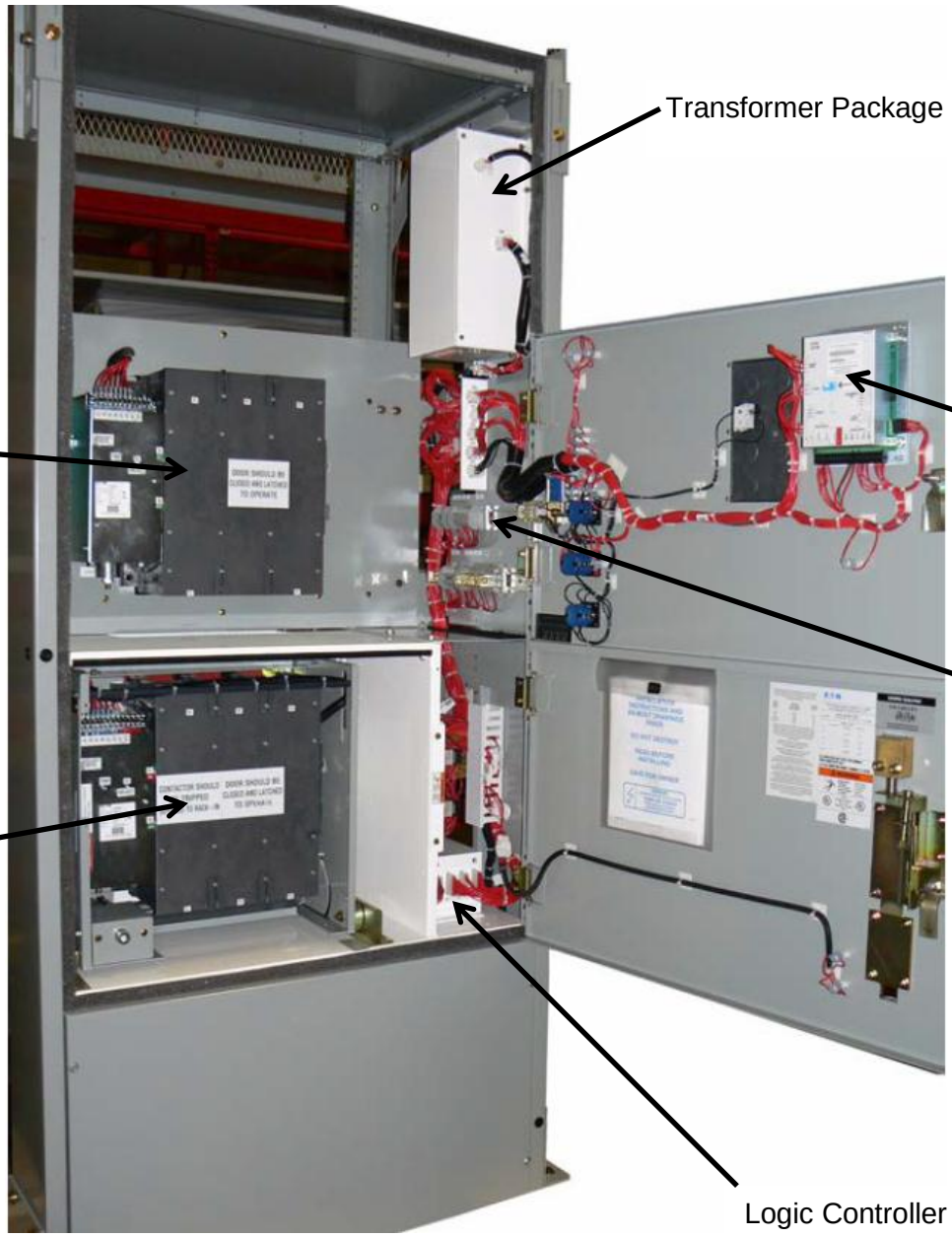
Rear View



Eaton D-Frame Contactor Bypass/Isolation Transfer Switch

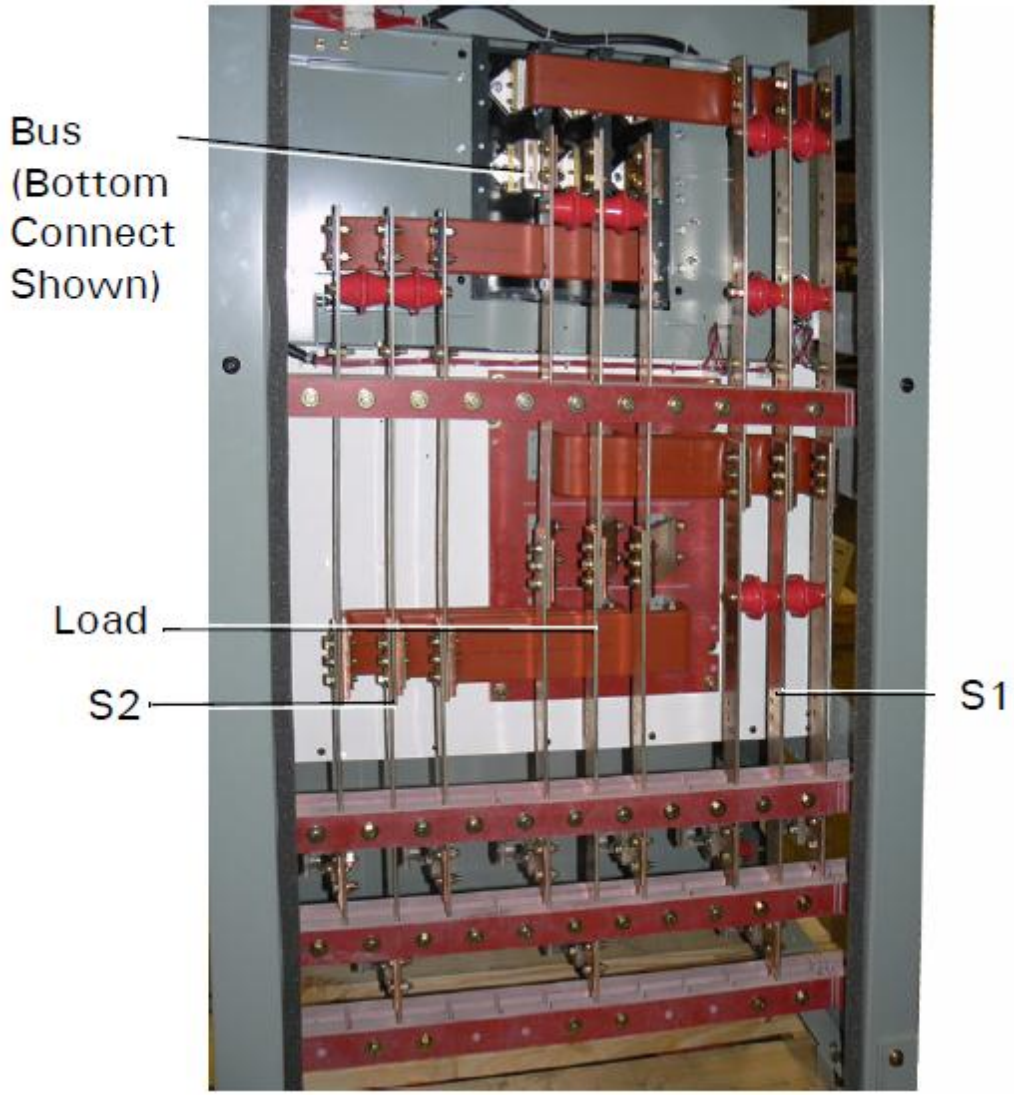
“D” Frame Ratings: 100-1600 Amps, 600 V Max.

“D” Frame Contactor Bypass/Isolation Transfer Switch Components



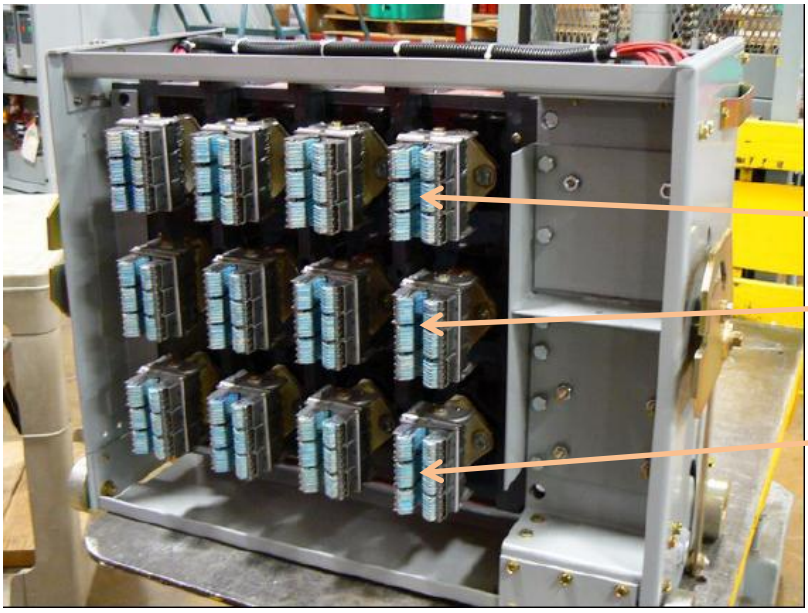
“D” Frame Contactor Bypass/Isolation Transfer Switch

Rear View



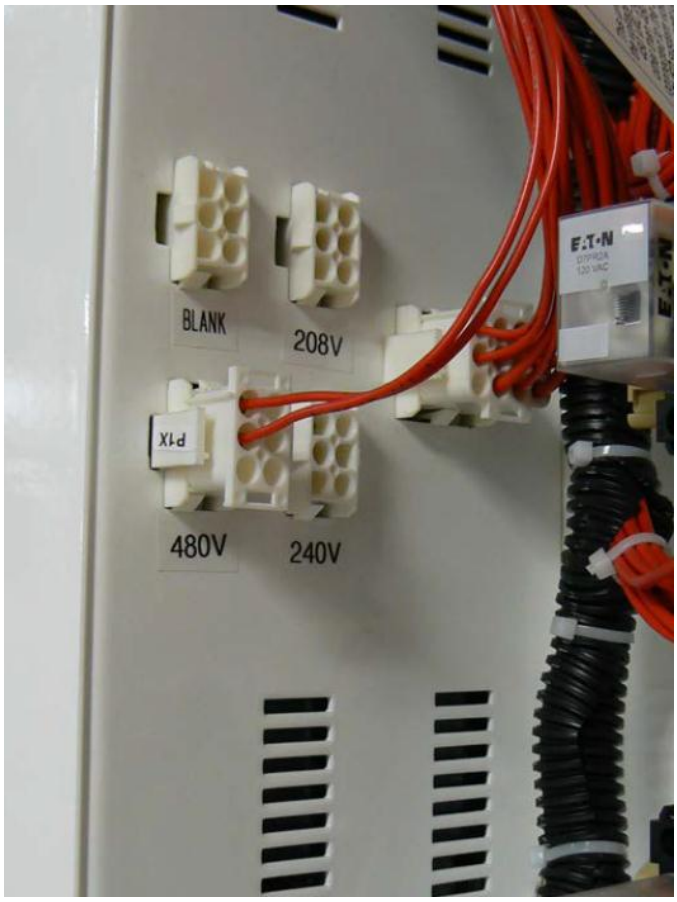
“D Frame” ATS Contactor shown drawn out

“D Frame” Drawout Contactor Rear View (1200A 4 pole)



Transformer Package

- Standard Single Voltage Panel
  - Supplied for ordered system voltage
  - Supplied when ATC-800 controller is supplied and Phase Reversal (Option 26H or 5H) is supplied
- Voltage Selection Panel
  - North American (208, 240 and 480 60Hz)
  - International (220, 230, 380, 415 50/60 Hz)



MAKE SURE THE VOLTAGE SELECTOR IS SET CORRECTLY BEFORE POWERING THE BYPASS / ISOLATION SWITCH!

- The transformer unit is easily removed by removing the two front screws and disconnecting the two plugs. The rear of the transformer enclosure has two flanges that are inserted into two slots.

ATC Controller

- Senses availability of the two sources
- K1,K2,K3,and K4 operate INPUTS to the Logic Controller
- “S1 Input”, “S2 Input” and “Monitor Mode” (Lockout on ATC-800) are driven by the Logic Controller.
- “Go To Source 2”, and “S2 Inhibit” would be initiated by customer provided contacts.
- “Engine Start” and “Alarm” contacts are for customer use.

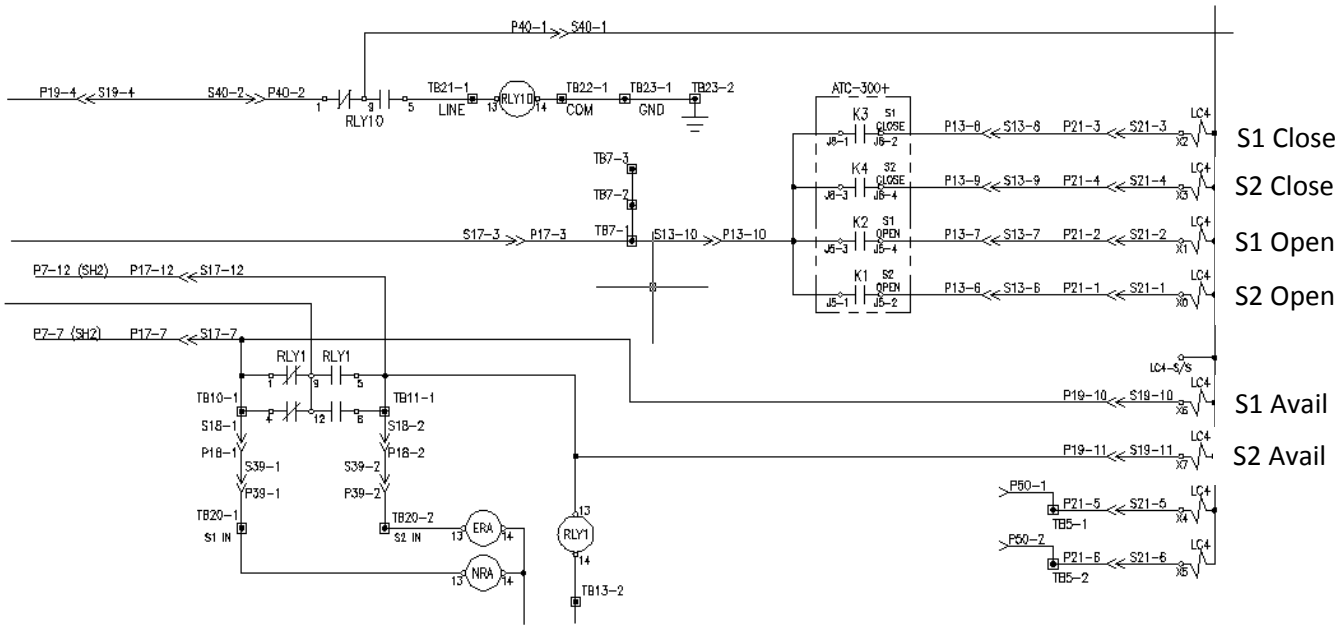
Logic Controller (General Information)

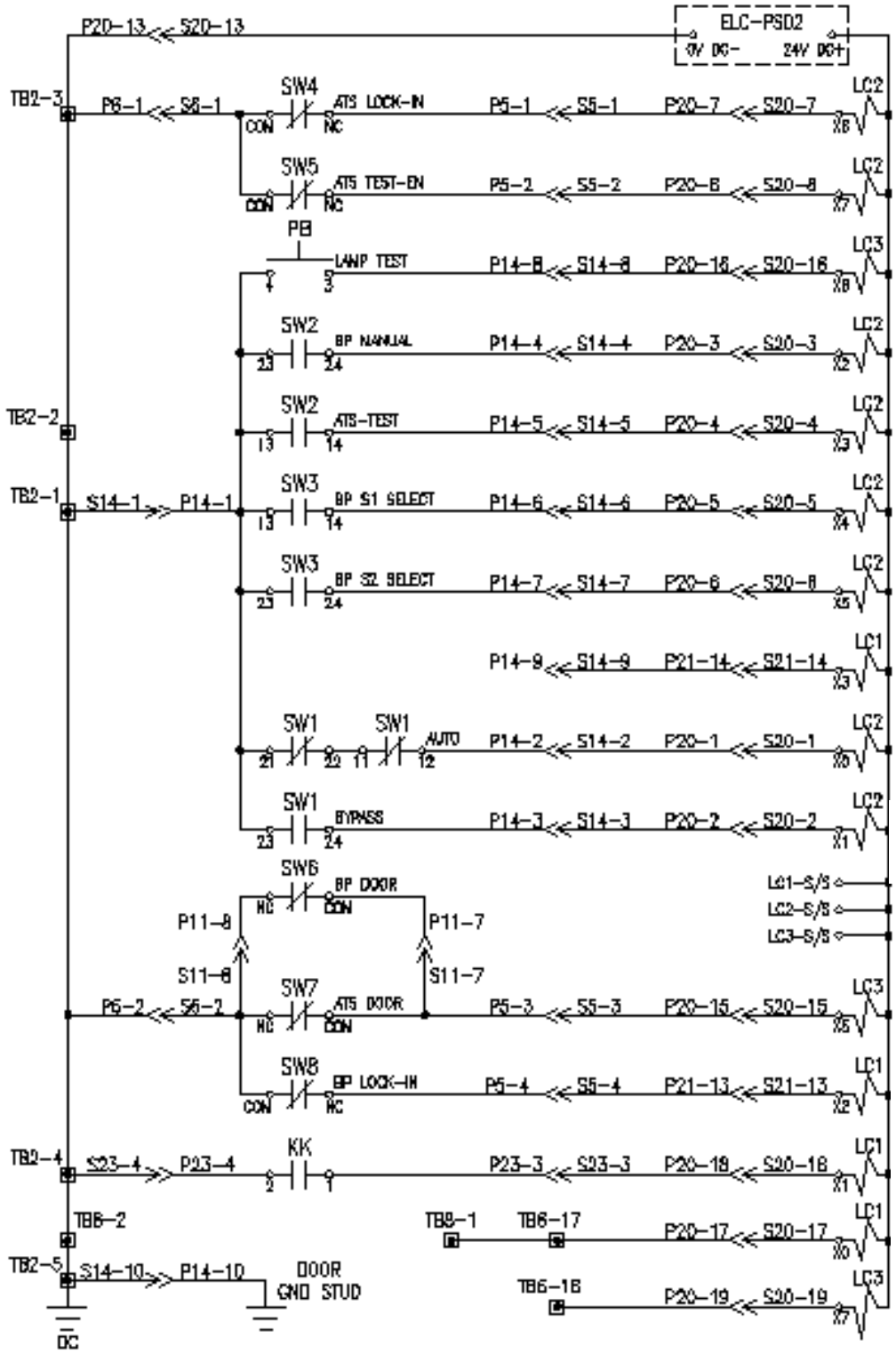
- Inserted between controller and contactor units to operate unit based on selections
- Unit is furnished now standard with a buffer which will support the ELC for about 30 seconds during a full power outage, to allow time for the generator to come up. Device is located in the bottom options compartment.
- There are two ELC’s in the field.
    - Up until May 2014 and ELC-PC was used
        - It had a non rechargeable battery good for up to 10 years.
        - If the battery was discharged ELC would lose the program. Replacing the battery would not “fix” it!
        - Very early models had no external indication of a bad battery
        - Later models shipped after November 15th 2013 had a battery failure indication by flashing two lights on the front panel.
    - In May 2014 ELC was changed to an ELC-PV
        - Battery is rechargeable, should hold the unit for one year.
        - Memory is in Flash Memory. Battery failure does not result in program loss. On power up program will be reloaded.
        - Battery failure indication is still in effect.
- Battery
    - The ELC has a battery which is used to maintain ELC memory. Battery life is estimated to be 5-10 years depending on ambient temperature. If unit is not powered up the battery will remain charged for about 1 year.
    - After Nov 15th 2013, the need to replace the battery is indicated by flashing indicators. (See below)

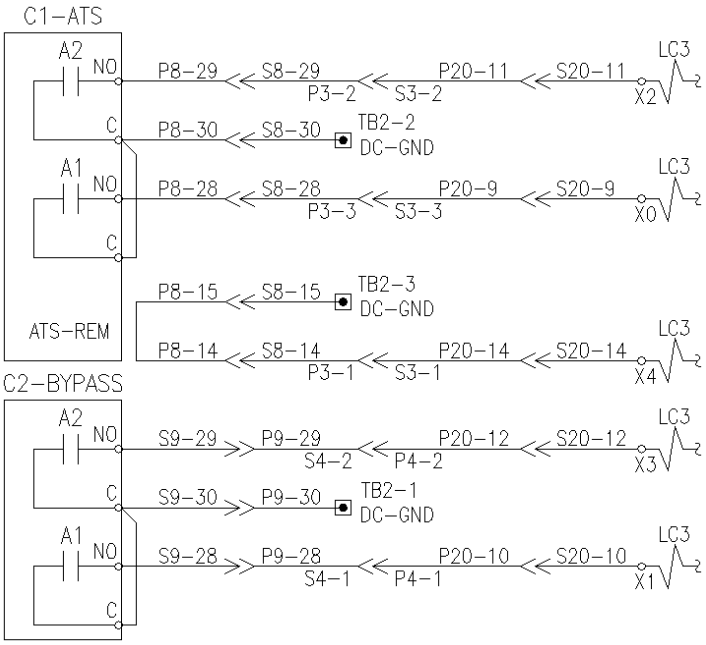
- Instructions for changing the ELC battery are covered in IL140004EN

ELC Logic Controller ("C" Frame)

Inputs




ELC-PSD2
0V DC-
24V DC+
P20-13
S20-13
TB2-3
P6-1
S6-1
SW4
ATS LOCK-IN
CON
NC
P5-1
S5-1
P20-7
S20-7
LC2
X6
ATS Locked In
SW5
ATS TEST-EN
P5-2
S5-2
P20-8
S20-8
X7
ATS Test Pos
PB
LAMP TEST
P14-8
S14-8
P20-16
S20-16
LC3
X6
Lamp Test Pushbutton
SW2
BP MANUAL
23
24
P14-4
S14-4
P20-3
S20-3
X2
Bypass Manual
TB2-2
ATS-TEST
13
14
P14-5
S14-5
P20-4
S20-4
X3
ATS Test
TB2-1
S14-1
P14-1
SW3
BP S1 SELECT
P14-6
S14-6
P20-5
S20-5
X4
S1 Select
BP S2 SELECT
P14-7
S14-7
P20-6
S20-6
X5
S2 Select
P14-9
S14-9
P21-14
S21-14
LC1
X3
SW1
AUTO
21
22
11
12
P14-2
S14-2
P20-1
S20-1
X0
Auto
BYPASS
P14-3
S14-3
P20-2
S20-2
X1
Bypass
SW6
BP DOOR
NC
P11-8
P11-7
S11-8
S11-7
LC1-S/S
LC2-S/S
LC3-S/S
P6-2
S6-2
SW7
ATS DOOR
P5-3
S5-3
P20-15
S20-15
X5
Doors Closed
SW8
BP LOCK-IN
P5-4
S5-4
P21-13
S21-13
X2
BP Locked In (Drawout Bypass Only)
TB2-4
S23-4
P23-4
KK
P23-3
S23-3
P20-18
S20-18
X1
Kirk Key Position
TB6-2
TB8-1
TB6-17
P20-17
S20-17
X0
Closed Transition enable
TB2-5
S14-10
P14-10
DOOR
GND STUD
DC
TB6-18
P20-19
S20-19
X7



ATS S2 Connected

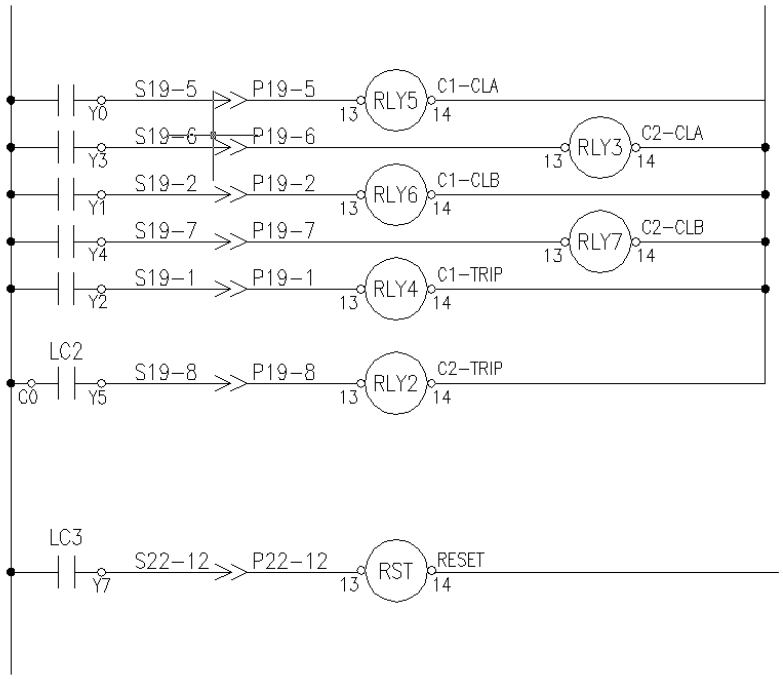
ATS S1 Connected

ATS Removed

BYPASS S2 Connected

BYPASS S1 Connected

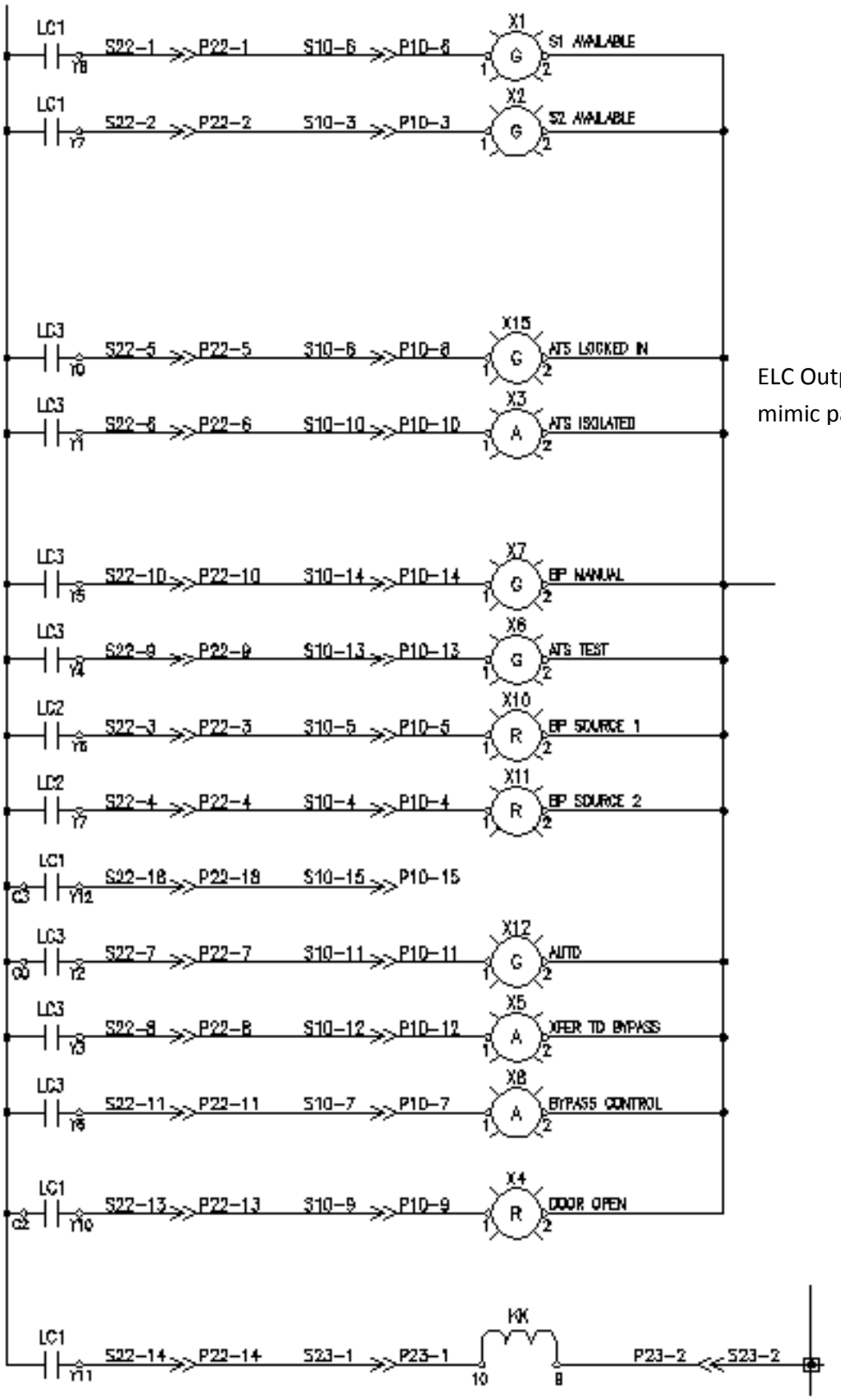
ELC Outputs



Relay Outputs RLY 2-7 and RST

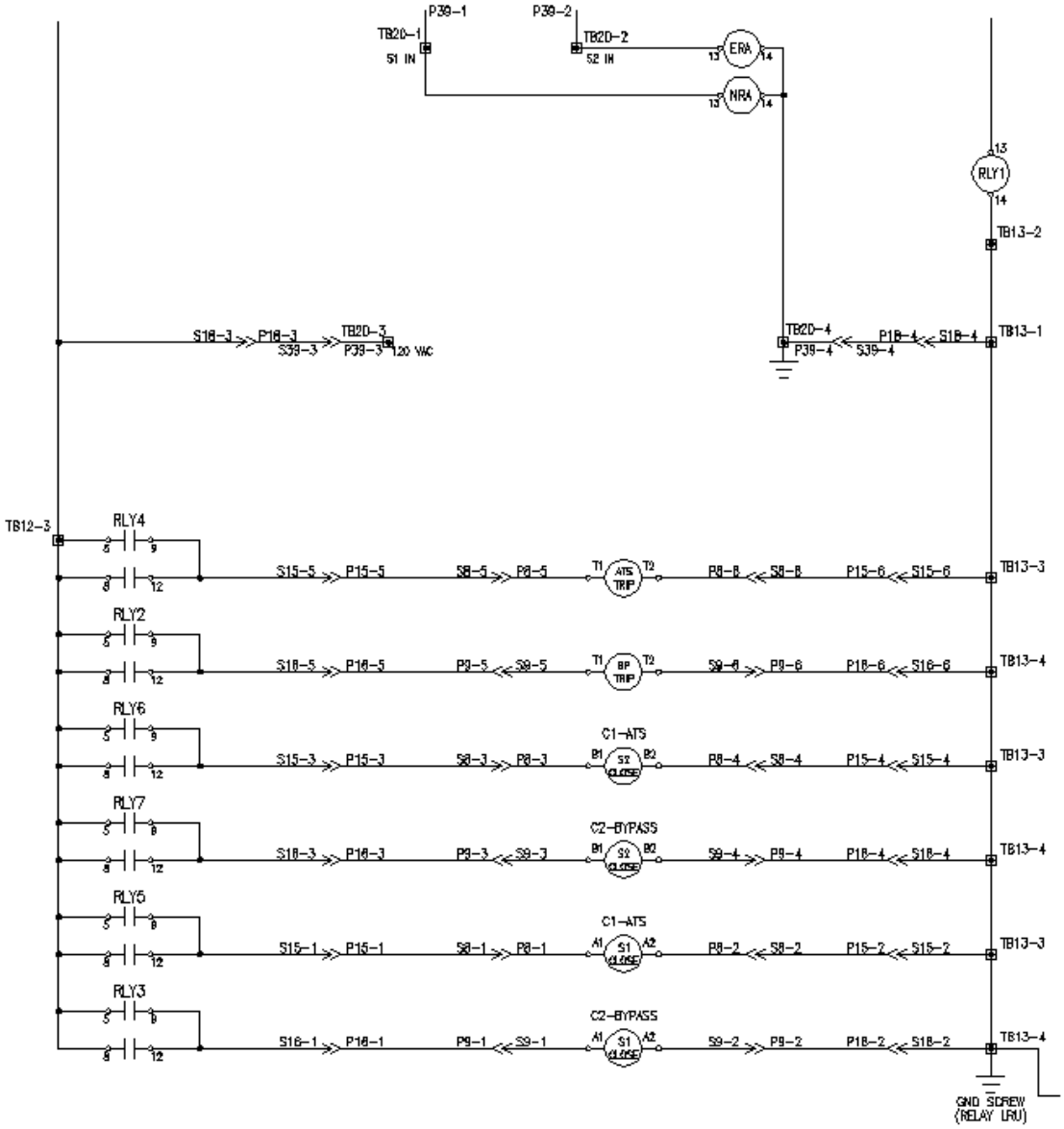
RLY 2-7 provide Contactor Control

RST is used to reset the ATC-Controller



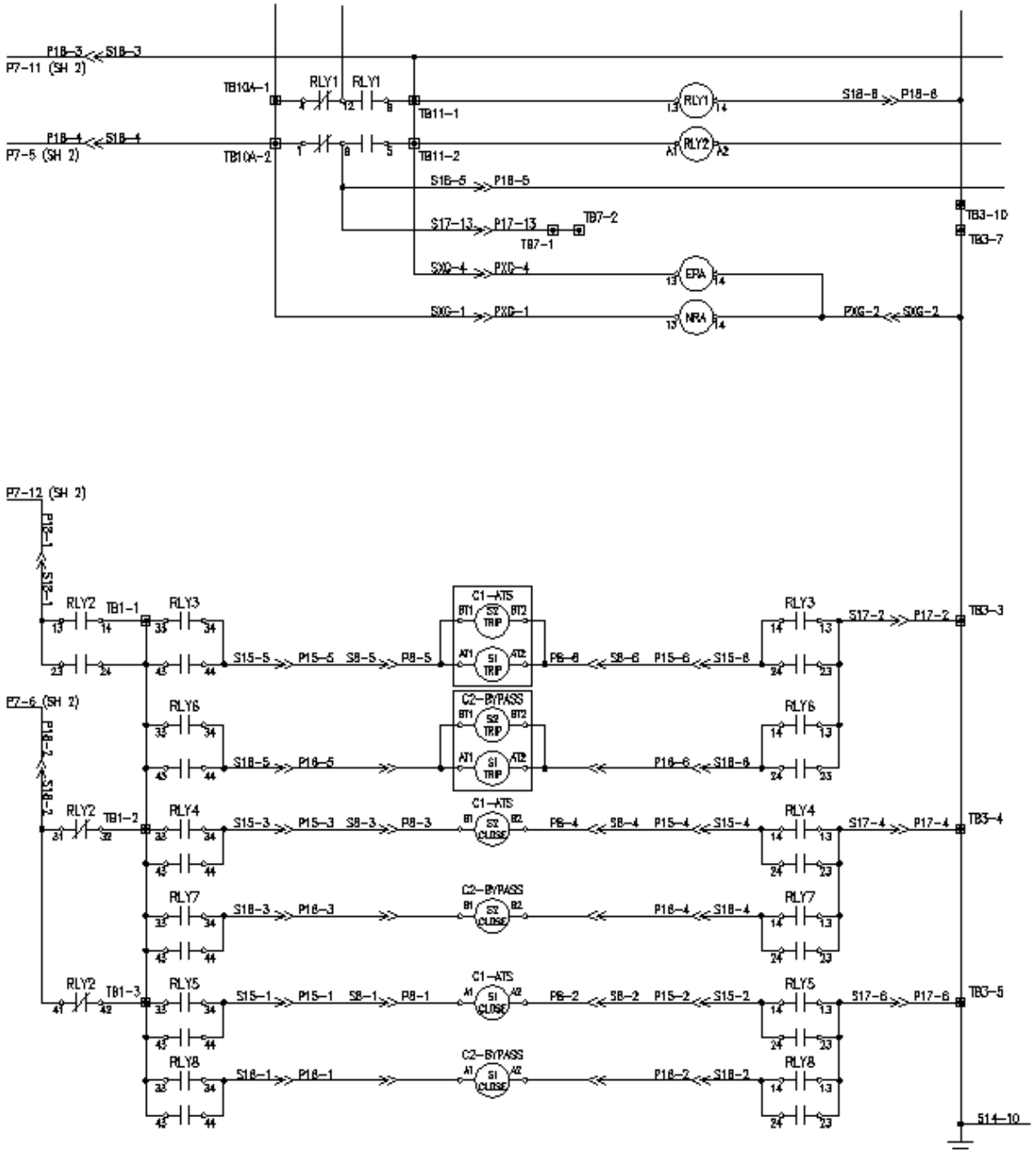
ELC Outputs drive the indicator lights on the mimic panel and the operator panel.

Control Relays (“C” Frame)



- RLY1 Control Power Voting Relay
- RLY2 BYPASS Trip to Neutral
- RLY3 BYPASS Close on S1
- RLY4 ATS Trip to Neutral
- RLY5 ATS Close on S1
- RLY6 ATS Close on S2
- RLY7 Bypass Close on S2
- RLY10 UPS Relay (Alternate ELC Control Power)
- ERA Emergency Source Available (Customer contacts)
- NRA Normal Source Available (Customer Contacts)

“D Frame Differences

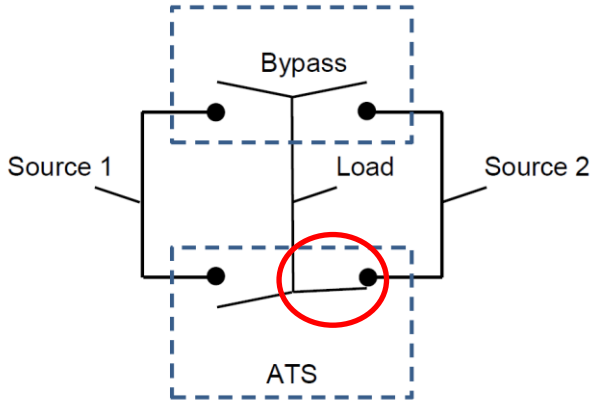


Uses RLY 2 as voting relay for 145VAC winding to operate larger solenoids

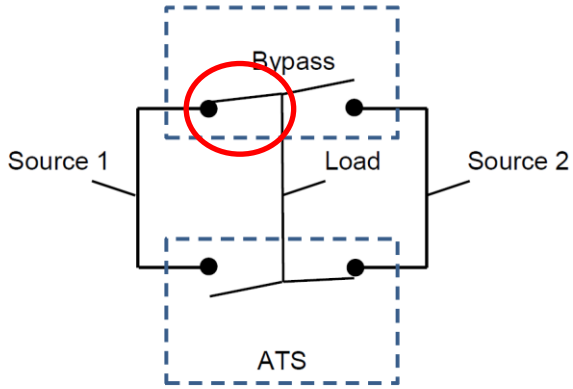
ATS and BYPASS Sections have TWO trip coils, one for each position.

Closed Transition Bypass Contactor.

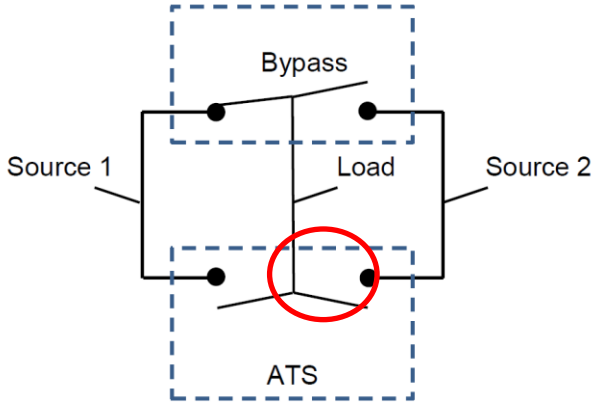
- **CLOSED TRANSITION TRANSFER** is done using BOTH the ATS and Bypass Contactors
- Both contactors must be “racked in” and available.
- Closed Transition can be done in both the ATS and BYPASS positions provided BOTH contactors are connected.
- Sequence transferring from Source 2 to Source 1.
- The complete transfer takes FIVE steps



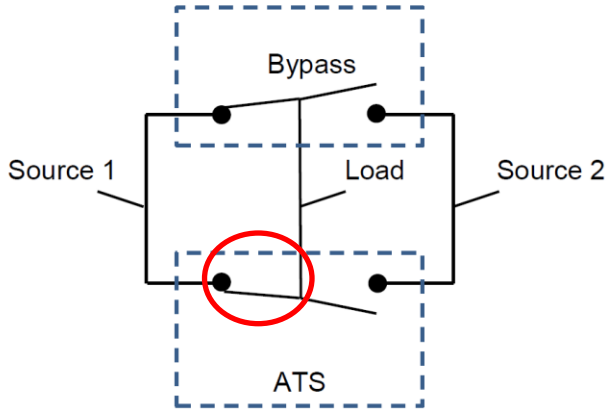
- ATS is Connected to Source 2
- Source 1 becomes available.



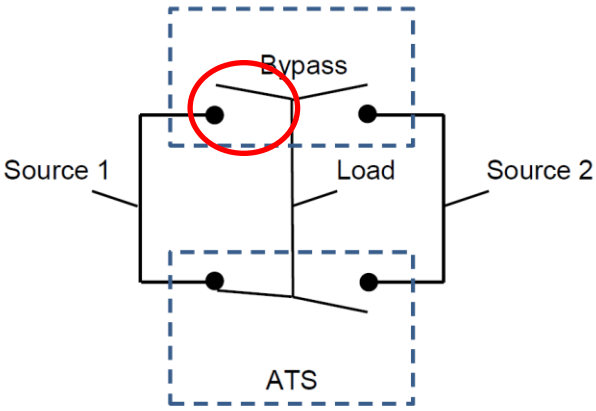
- Frequency/Voltage Checks completed.
- Sync Check
- Bypass Closes on Source 1
- *ATS still closed on S2*



- In <100 msec ATS S2 Opens



- ATS Closes on S1
- No sync check!



- Bypass S1 Opens

Operation of the Bypass Isolation Transfer Switch

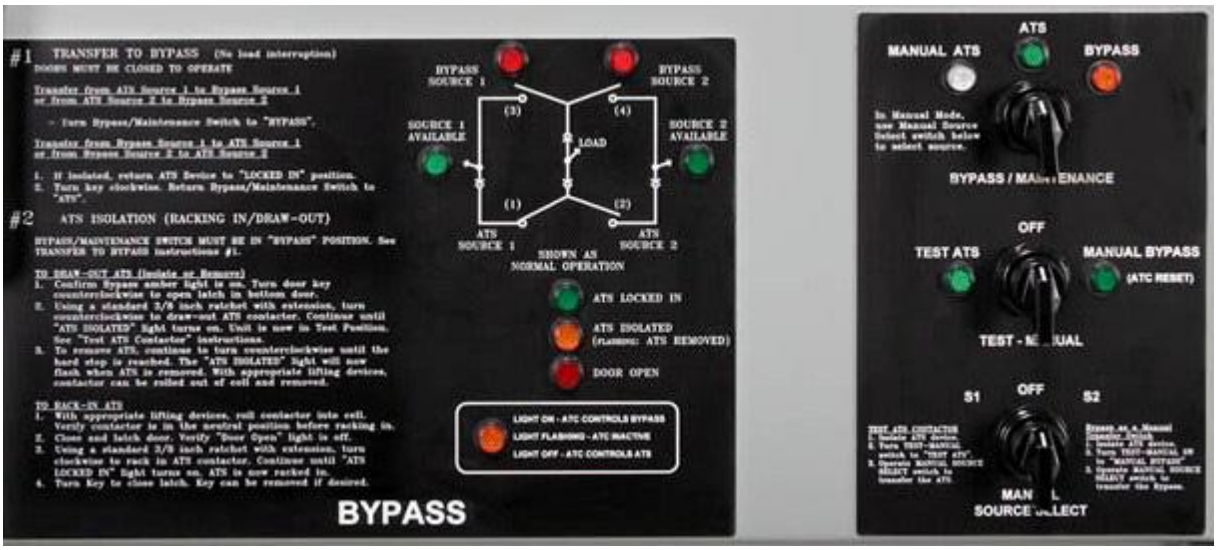
Warning

NEVER OPERATE THE TRANSFER SWITCH MANUALLY VIA THE OPERATING HANDLE WITH POWER ON S1 AND/OR S2. FAILURE TO HEED THIS WARNING COULD RESULT IN DEATH OR SEVERE INJURY. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT ON THE EQUIPMENT PRIOR TO OPERATING MANUALLY. WHILE ENERGIZED, AN ARC FLASH AND SHOCK HAZARD EXISTS. CONSULT NFPA 70E AND OSHA GUIDELINES FOR OPERATOR SAFETY PRIOR TO SERVICING, INSPECTING OR OPERATING EQUIPMENT.

Bypass/Contactor Operations Center

The top access door contains the operations center which consists of the controller, an accessory device panel, a mimic panel, and a control panel.

Operator Panel



- The mimic panel contains the indicators, and abbreviated instructions.
- The indicators are lit when the switch is in the bypass position only.
- All lamps will be off when the Bypass/Maintenance Switch is in the "ATS" position.
- Indicators:
  - Source 1 Power Available
  - Source 2 Power Available
  - Bypass Source 1 Connected
  - Bypass Source 2 Connected
  - ATS Drawout “Locked In”
  - ATS withdrawn Test Mode (secondaries still connected), when the light is flashing the ATS is disconnected from the secondaries.
  - Door Open (either BYPASS Section or ATS Section)
  - Controller Status
  - Two lights for the BYPASS/MAINTENANCE Function (Three if Option 29G) is supplied
  - Two lights for the TEST/MANUAL function.

Operator Panel

Two position BYPASS/MAINTENANCE Switch for switching between ATS and BYPASS. Three position w/Option 29G shown.

Three position TEST/MANUAL Switch. Provides ATS Test (with ATS withdrawn to "Test" or Manual Bypass Operation. In manual BYPASS operation the controller does NOT operate the BYPASS section automatically.

Manual Source Selector Switch. Used to manually test ATS, or operate BYPASS section manually.

Transfer to Bypass

- All doors must be closed and latched. The Door Open light should not be flashing.
- Turn ***Bypass/Maintenance*** Switch to **Bypass**.
    - The BYPASS operation may be done while ATS is connected to either source.
    - The ***BYPASS*** amber light will illuminate when the Bypass contactor is closed on S1 or S2 and the ATS contactor is tripped.
    - The appropriate Source Available and Connected indicators will light.
    - The ***CONTROLLER STATUS*** will light indicating the ATC controller is now actively controlling the Bypass part of the switch.
    - The ***ATS Locked In*** Green lamp will light when the ATS is sufficiently racked in. This lamp is important because the contactor must be racked in all the way to a locked position or the unit will not operate
- If access is needed to the ATS compartment, turn the Kirk-Key clockwise within 1 minute of switching to Bypass. If not done within 1 minute, simply switch back to **ATS,** pause and then back to **BYPASS.** This opens the drawout mechanism access door, so that that the ATS contactor may be withdrawn with the door closed.

Transfer to ATS

- The ATS must be racked in.

- The ***ATS Locked In*** Green lamp will light when the ATS is sufficiently racked in. This lamp is important because the contactor must be racked in all the way to a locked position or the unit will not operate

- Doors must be closed and latched
- The Kirk-Key must be turned counterclockwise
- Turn the Bypass/Maintenance Switch to **ATS.**
- The Auto light will illuminate when the ATS contactor is closed on the appropriate source and the Bypass contactor is tripped. The "ATS Locked In" and the "AUTO" lights will remain illuminated for a short time after switching back to Auto mode.
  Note: If most of the lamps start flashing, that is a signal that the ATS is not racked in to the locked position or the Kirk-Key is not turned CCW and the drawout access latch door is not closed.

TEST/MANUAL Switch Operation

After Drawn out to the TEST position, the ATS contactor can be tested using the ***Test-Manual*** Switch.

The ***Test-Manual*** Switch can also function as a manual (electrical) switch to close the Bypass contactor to S1 or S2.

This switch will also reset the ATC controller by moving the switch to **Manual Bypass** and back to the **OFF** position.

Testing the ATS

With the unit in Bypass mode and with the ATS drawn-out to the TEST position,

1. Operate the ***Test-Manual*** Switch to the **TEST ATS position.**
2. Using the ***Manual Source Select*** operate the switch to the **S1**, **OFF**, and **S2** as desired. Pause slightly at each step to allow the contactor to “catch up”..

Electrical Manual Mode for the BYPASS

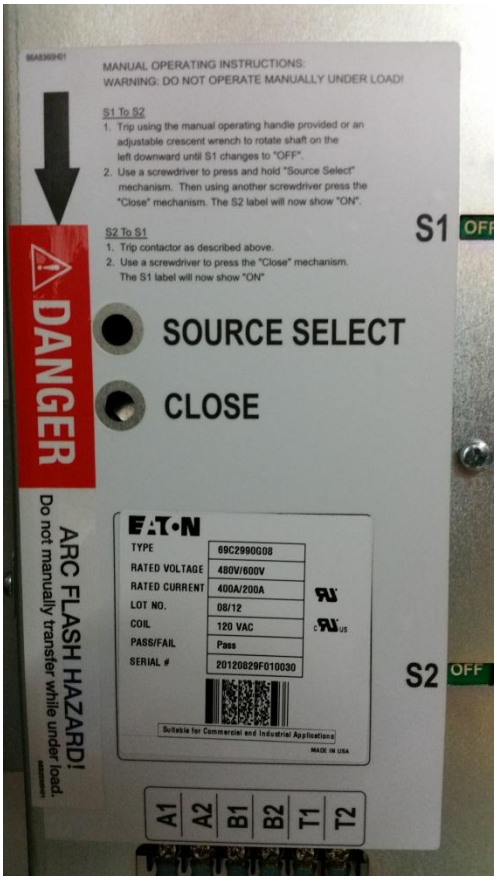
1. The ***BYPASS/MAINTENANCE*** Switch must be in **BYPASS**
2. To switch the Bypass manually the ATS contactor MUST be isolated or racked-out and removed.
   a. ***ATS ISOLATED*** Indicator flashing.

3. The doors must be closed and latched.
4. **Caution: Manual operation of the Bypass could remove power from the Load because of the possible neutral position.**
5. Selecting manual operation of the Bypass unit will disallow automatic operation of the BYPASS section stop.
    a. The ATC-800 controller will show "Lockout".
    b. the ATC-300+ controller will show "Monitor Mode".
    c. Both controllers will still follow the actions on the MIMIC bus LEDs. The ***CONTROLLER STATUS*** indicator will now be flashing to indicate the controller is inactive.
6. Using the ***MANUAL SOURCE SELECT*** switch select the source to which the Bypass is currently connected as indicated by the Bypass Connected Indicators .
7. Using the MANUAL SOURCE SELECT switch you may select S1, OFF or S2.
    a. The manual operation will work with only one source available but only to that source and to trip. If a source is not available, the unit will not manually switch to that position.
8. To return the BYPASS section to automatic operation, turn the ***TEST-MANUAL*** Switch to **OFF**.

MANUAL OPERATION

MANUAL operation of either the ATS contactor or the BYPASS contact MUST NEVER be attempted with power on the device! Failure to need may cause severe personal injury, or property damage!

- If manually operating the ATS section (or a drawout BYPASS) the contactor must be isolated from both the primary and secondary stabs.
- The FIXED Bypass will require power be removed from the unit from BOTH sources.



TO TRIP: Locate the manual lever on the left side of the contactor. Attach the handle to the manual ever and rotate down. This will trip the contactor, notice that both indicators will be green or "Off".

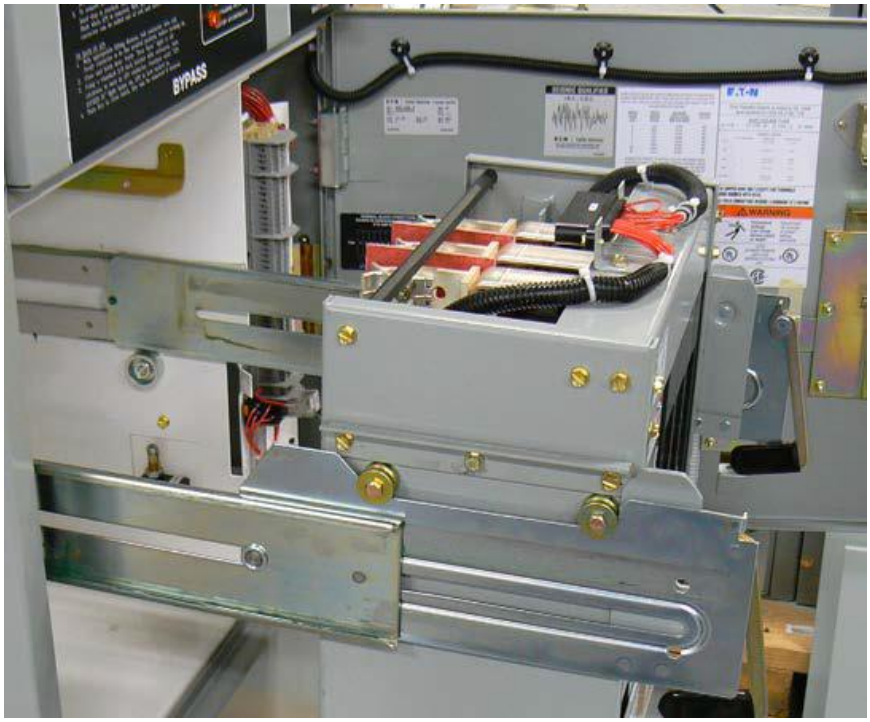
TO CLOSE ON S1: Depress the ***Close*** button located on the operating mechanism of the contactor to bring the contactor to the S1 close position. Notice the top indicator is now red and "on".

TO CLOSE S2: Depress the ***Source Select*** and ***Close*** button (at the same time) located on the operating mechanism of the contactor to bring the contactor to the S2 close position. Notice the bottom indicator is now red and "on".

Once the manual operation is complete and automatic operation is desired, trip the contactor, close and latch doors, and rack-in. Also return the Test-Manual Switch to the off position.

Draw-out, Racking-in, and Removal of the ATS Contactor

The Fixed Bypass Isolation Switch is equipped with one draw-out contactor switching device. The bottom contactor (ATS) is interlocked and removable. The Bypass contactor is identical to the ATS contactor if it is a dual drawout system Instead of a fixed type. To remove the Bypass contactor, all power must be removed.



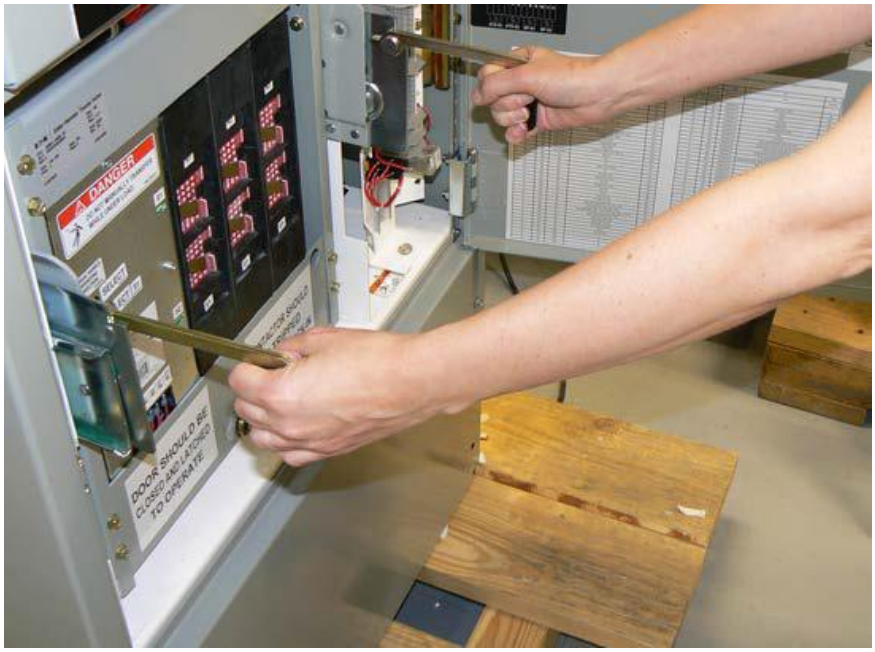
ATS Drawout Contactor in the Drawn Out Position

Installing a Drawout Switching Device

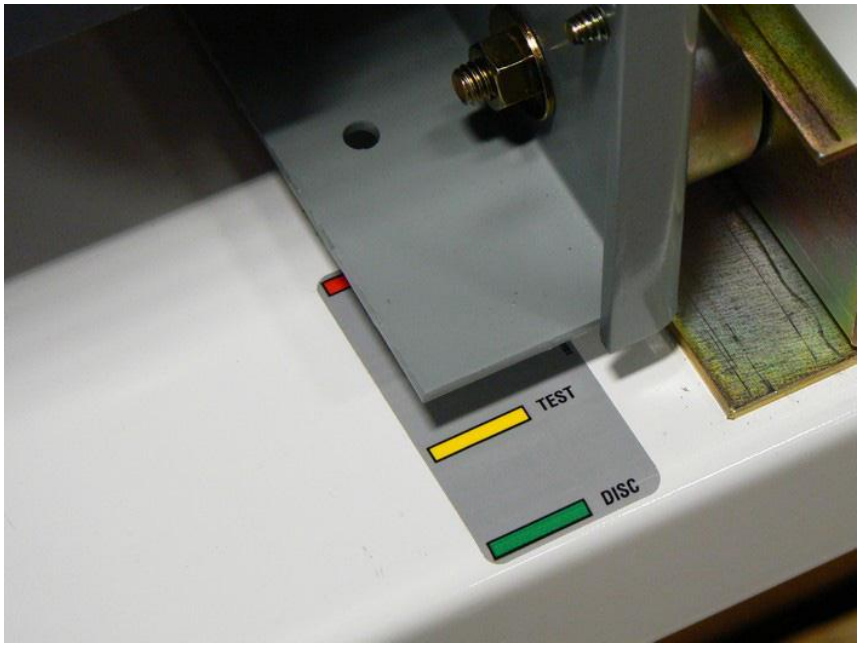
To install the contactor:

1. Check the Contactor to be sure that it is tripped. Electrical interlocks are used to make sure the contactor is tripped before it meets the rear stabs, but they would work only if there is power on the unit!
2. The top door of the switch should be closed.
3. If power is on the switch, before installing the ATS contactor the switch must be in the Bypass mode (Transfer to Bypass amber light on) with the power through the Bypass contactor.
4. With appropriate lifting devices or two person lifting, carefully insert the contactor rollers on top of the slides as shown below.

5. Push in the slides as shown into the stop and now it is ready to rack into the cassette as shown below.
6. Make sure the contactor is pushed back firmly to seat it on the crank mechanism.



7. Using a 3/8 inch ratchet with a 12” extension, rack the contactor in to the TEST position.



Racking in the Drawout Contactor

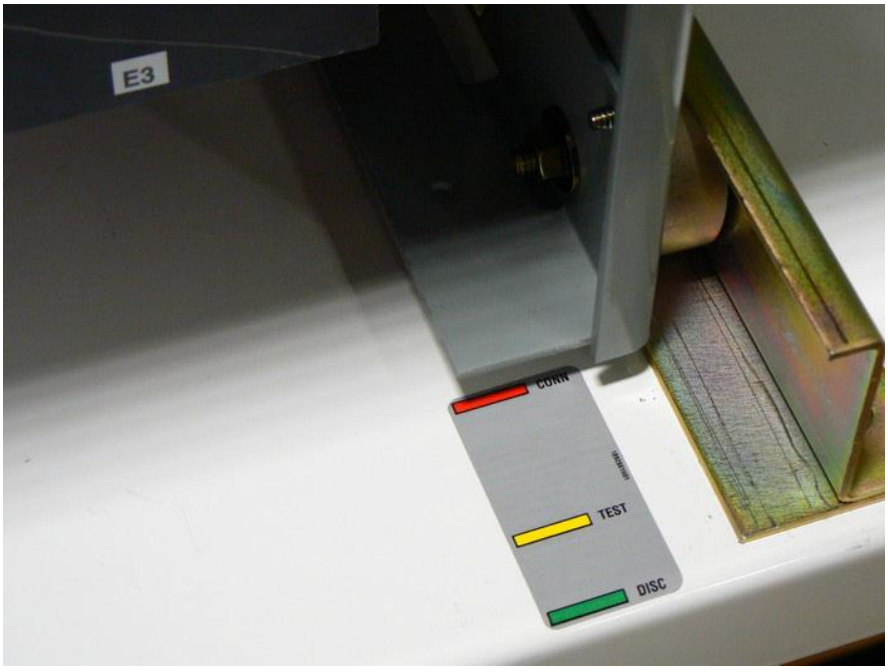
1. Close and latch the bottom ATS door.
2. Using a 3/8-inch square drive ratchet with a 12 inch extension, insert into the crank and ratchet the drawout in to the **TEST** position. (***ATS ISOLATED*** indicator lit but NOT flashing).
3. Close the ATS compartment door. The Drawout latch access door should be open.
4. Insert the ratchet through the door and continue to rack in the drawout.

5. The "ATS Isolated" light will go off .
6. Continue until the "ATS Locked" light comes on.
7. Unit is now fully racked in on the stabs. Do not exceed 15 ft lb of torque or the levering mechanism may be damaged.
8. The Kirk-Key must be turned counterclockwise to close the draw-out opening or the unit will not go back to the Auto mode. (If one forgets this step and tries to switch back to the ATS mode using the "Bypass/Maintenance" switch, most of the lights will start flashing. Simply turn the Kirk-Key until it locks.)
9. The ***ATS/BYPASS*** switch can now be put in the **ATS** position if desired, (see Section 5 "Operation of the Bypass Isolation Switch").

Draw-Out ATS Contactor

TO DRAW-OUT, THE CONTACTOR DEVICE MUST BE IN THE TRIPPED (OPEN) POSITION, THE UNIT MUST BE IN THE BYPASS MODE WITH THE POWER THROUGH THE BYPASS CONTACTOR, AND ALL DOORS CLOSED AND LATCHED.

1. Place the ***ATS/BYPASS*** switch in **BYPASS**.
2. Confirm that the ***BYPASS*** Indicator is on, then turn the ***Kirk Key*** to open the latch.
    a. When the unit is switched to Bypass mode, the ***Kirk Key*** may be turned within one (1) minute. If the key is not turned within one (1) minute, turn the ***ATS/BYPASS*** switch back to **AUTO**, pause and then back to the **BYPASS**.
3. Using a 3/8-in. square drive and ratchet with 12 inch extension, insert the extension into latch hole through door and turn counterclockwise.
4. Stop when the ***ATS ISOLATED*** indicator lights.
5. If removal of the contactor is desired, open the compartment access door, insert the ratchet and continue levering the contactor into its “Removed” position using a counterclockwise ratcheting motion
6. There is a label on the bottom of the enclosure for reference, showing the drawout position.



Removing the Contactors with power off.

1. Open the ATS Section door by inserting a tool such as a screwdriver into the mechanical latch release and lifting.

2. The BYPASS Section door may then be opened.
3. If both contactors are drawout type, removal is accomplished using a 3/8 inch ratchet and extension.
    a. Trip the contactor to the OFF position.
4. If the Bypass is Fixed, access to buswork in rear will be necessary.

Contact Inspection

Method is different on the “C” Frame and the “D” Frame.

Make sure power is OFF!

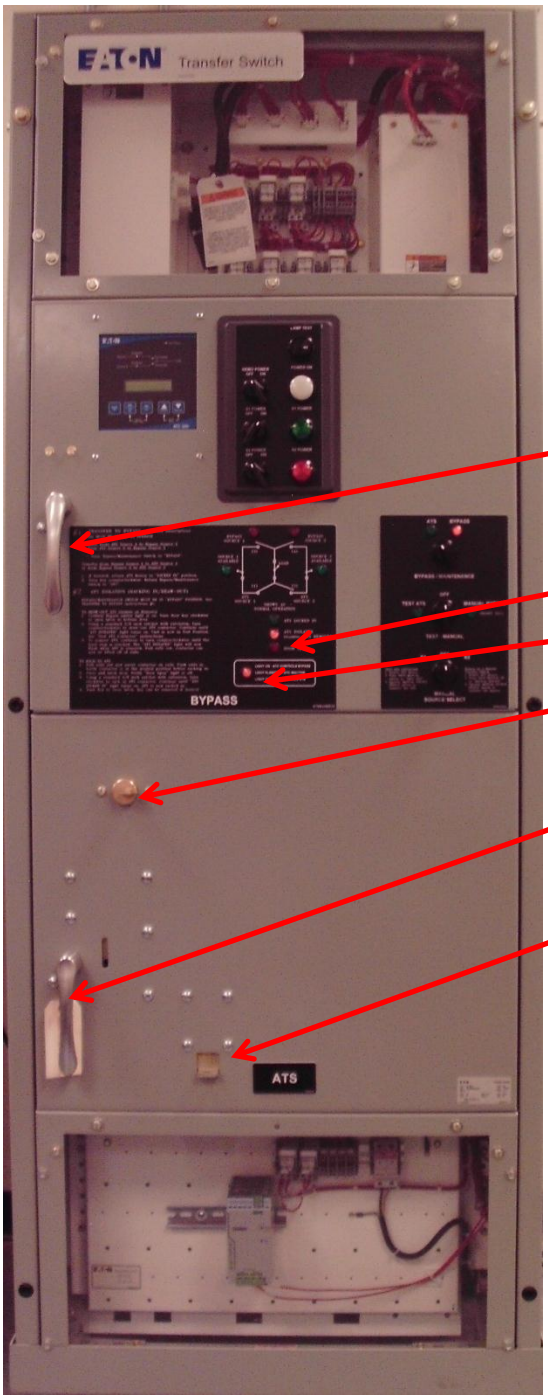
“C” Frame

Using a pair of pliers, grasp the spring clip on one side of the “V”, and twist slightly to release the clip and remove. The Arc Chute can then be removed and the contacts inspected. To reinstall the clip grasp the spring clip, insert the opposite end into the slot, twist to reinstall.

“D” Frame

Remove the screws on the cover of the contactor assembly to expose the arc chutes and contacts.

Contactor Bypass/Isolation ATS Demo Introduction



For the ATS to operate and transfer between sources:

- the doors must be closed
- the Kirk Key must be fully counterclockwise with the drawout access latch closed
- the ***Door Open*** Indicator must NOT be flashing.

Bypass Section Access Door

Door Open Indicator

Controller Status Indicator

Kirk Key

ATS Section Access Door

Drawout Access Latch

You will now proceed through the sequence of operation from ATS to BYPASS and back.

Secondly, you will open the equipment to gain access and investigate the internal devices of the switch.

Demo Panel

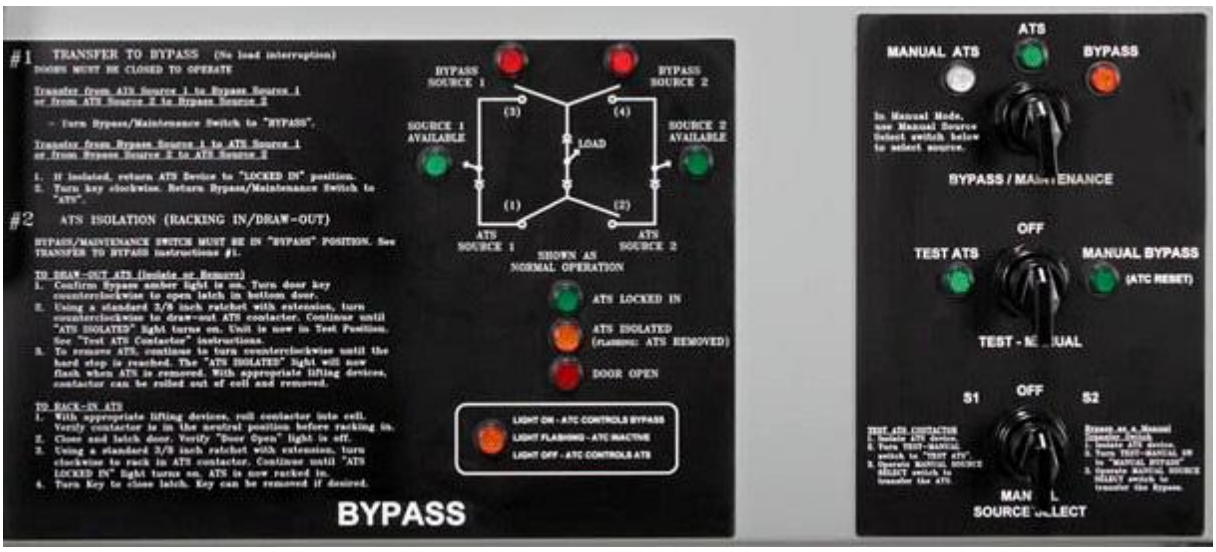
LAMP TEST is part of every Bypass/Isolation ATS

DEMO POWER turns power on to demo

S1 POWER turns on Source 1

S2 POWER turns on Source 2

BYPASS MIMIC Panel and Control Panel (Standard on ALL Switches)



Contactor Bypass Lab 1: Operation and Opening unit for Inspection

In an actual field application EATON policy requires appropriate PPE to operate the equipment.

The demo switches are powered from a wall outlet, therefore the arc flash hazard is minimal.

Be aware there is a minimal shock hazard from control power. The bus is not energized.

Part 1: Basic ATS Operation

1. Check visually to verify that both access doors are closed
2. Verify the drawout access latch is closed.
3. All switches on the demo panel should be “OFF”
4. Turn on the ***DEMO POWER*** switch. White indicator should light.
5. Put the ***BYPASS/MAINTENANCE*** switch in **ATS.**
6. Turn on ***S1 POWER*** switch. Green indicator should light and controller is powered up with LED’s and display lit. If not already connected, the ATS should connect to S1 and the ***S1 AVAILABLE*** and ***S1 CONNECTED*** LED’s on the ATC-300 controller should be lit.
7. Press the ***LAMP TEST*** pushbutton on the DEMO PANEL. All lamps on the BYPASS MIMIC PANEL and the CONTROL PANEL should light. Did all the indicators light? _____
8. What LED’s are lit on the ATC-300 controller? Unit Status _____

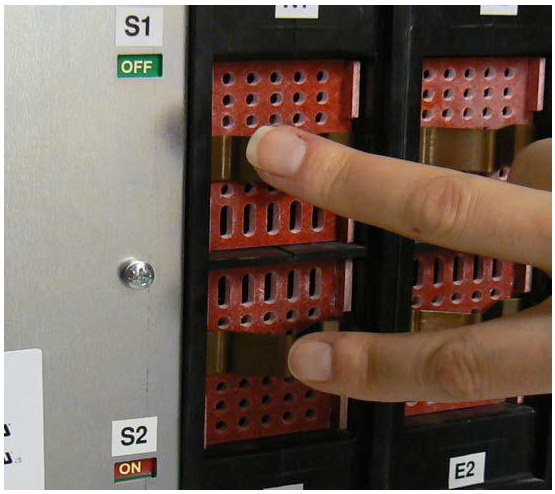
   S1 Available___ S2 Available ___ S1 Connected ___ S2 Connected ___

9. Turn ***S1 POWER*** Off. Wait about 5-6 seconds
10. Turn ***S2 POWER*** On.
11. Did ATS transfer to S2? ____. How do you know? _____
12. Turn ***S1 POWER*** On. After Time Delays, ATS should transfer back to S1.
13. After ATS retransfers to S1, turn ***S2 POWER*** off.

Part 2: Operation to Bypass, Operate, and Draw Out ATS section

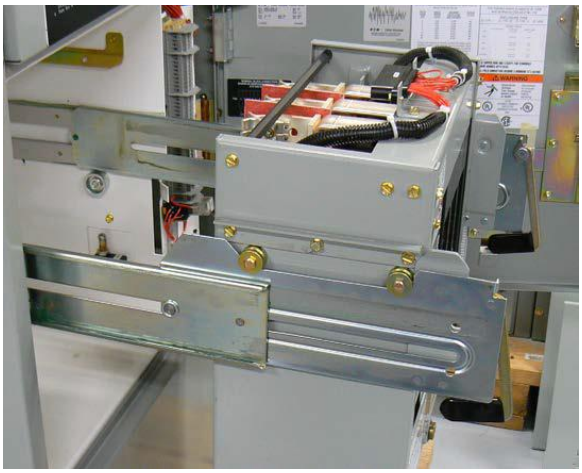
1. Turn the ***ATS/BYPASS*** switch on the control panel to BYPASS.
2. Did the ATS indicator on the control panel go out, and the BYPASS indicator light? _____
3. Turn the Kirk Key CLOCKWISE. The Drawout Access Latch should open.
    a. Note: After ONE minute, you will NOT be able to turn the key!
    b. If the one minute timer expires, momentarily return the ***BYPASS/MAINTENANCE*** switch to **ATS** and back to **BYPASS**.
4. What indicators are lit on the BYPASS MIMIC PANEL?
    a. ***SOURCE 1 AVAILABLE*** _____
    b. ***SOURCE 2 AVAILABLE*** _____
    c. ***BYPASS SOURCE 1 (Connected)*** _____
    d. ***BYPASS SOURCE 2 (Connected)*** _____
    e. ***ATS LOCKED IN*** _____
    f. ***ATS ISOLATED*** _____
    g. ***DOOR OPEN*** _____
    h. In what state is the ATC Controller Status Indicator? OFF _____ ON_____ FLASHING_____
    i. What does this mean? _____
5. What LED's are lit on the ATC-300 controller?
    a. S1 Available___ S2 Available ___ S1 Connected ___ S2 Connected ___
6. Turn ***S1 POWER*** Off. Wait about 5-6 seconds.
7. Turn ***S2 POWER*** On.
8. Did BYPASS transfer to S2? ____. How do you know? _____
9. What indicators are lit on the BYPASS MIMIC PANEL?
    a. ***SOURCE 1 AVAILABLE*** _____
    b. ***SOURCE 2 AVAILABLE*** _____
    c. ***BYPASS SOURCE 1 (Connected)*** _____
    d. ***BYPASS SOURCE 2 (Connected)*** _____
    e. ***ATS LOCKED IN*** _____
    f. ***ATS ISOLATED*** _____
    g. ***DOOR OPEN*** _____
    h. In what state is the ATC Controller Status Indicator? OFF _____ ON_____ FLASHING_____
10. What does this mean? _____
11. Turn ***S1 POWER*** On. After Time Delays, BYPASS should transfer back to S1.
12. After BYPASS retransfers to S1, turn ***S2 POWER*** off.
13. Using a 3/8" ratchet with a 12" extension, insert the extension into the Drawout Access and once seated crank the ratchet CCW until the ***ATS ISOLATED*** indicator is lit. (ISOLATED is the same as TEST position)
14. Remove the ratchet and open the ATS Compartment Door.

15. Place the ***TEST-MANUAL*** switch in the **TEST ATS** position.
16. Looking at the ATS Contactor you should see that both position indicators show **OFF (Green)**



17. In the TEST position (Isolated) we can electrically operate the ATS Contactor to verify the solenoids and mechanical operation.
18. Using the ***MANUAL SOURCE SELECT*** switch on the control panel, move the switch to S1, then back to OFF, then to S2. Do this a few times and observe the operation. Is the contactor changing state correctly? _____.
19. Note the Auxiliary Switch Operation on the righthand side of the contactor during operation.
20. Insert the ratchet and extension into the drawout crank, ratchet CCW to rack out the contactor to the DISCONNECT Position (ATS REMOVED). What is the status of the ***ATS ISOLATED*** Indicator? _____. What does the flashing indicator represent? _____.
21. Using the assist handles, pull the drawout contactor fully out on the rails.

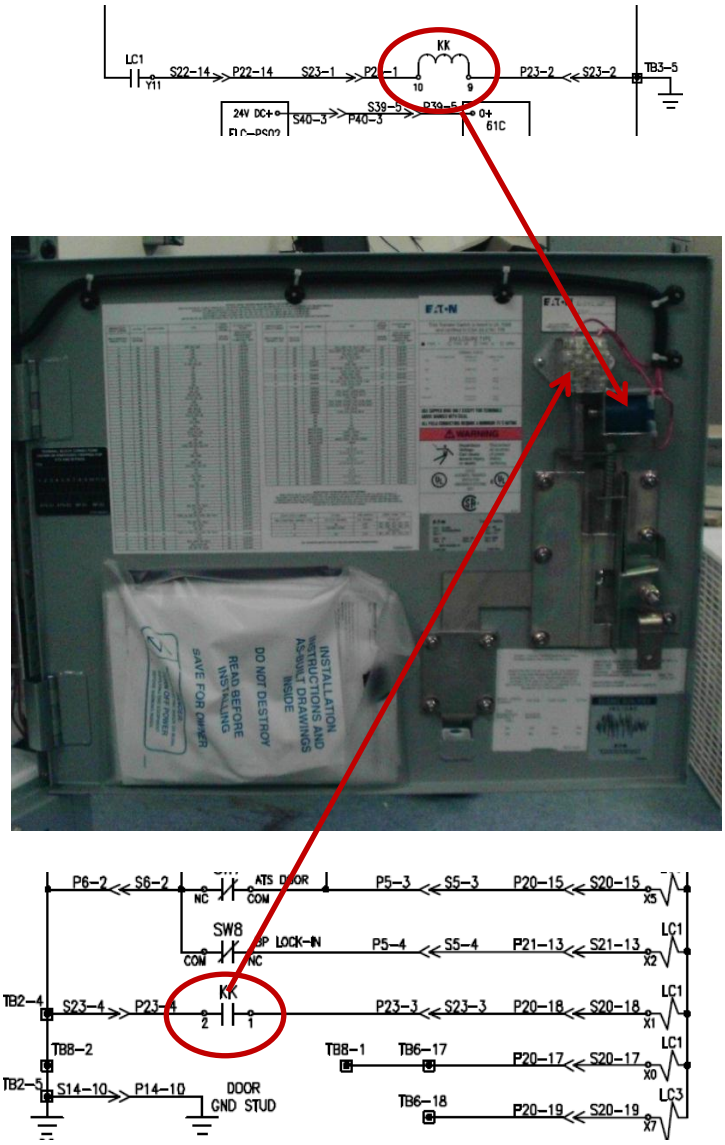
NOTE: ON INSTALLED EQUIPMENT, THE BUS STABS IN THE REAR OF THE COMPARTMENT WILL BE ENERGIZED IF THE EQUIPMENT IS ENERGIZED. USE CAUTION !



22. Unlatch and open the Bypass Section Door. What Source is powering the load? _____.
23. NOTE: Work done on the BYPASS Contactor in this scenario (Fixed Bypass) should not be attempted with power on the equipment. There is a warning label on the BYPASS contactor that operation should not be attempted with the section door open. Should a power failure occur the BYPASS Contactor can operate even with the door open.
24. Close everything up on the Bypass/Isolation Transfer Switch, restore operation to the ATS Section, and test the unit to insure it is working properly.

Contactor Bypass Lab 2: Interlocks, Location and Operation

Kirk Key Operation



When the ***BYPASS/MAINTENANCE*** switch is moved to the **BYPASS** position the KK solenoid is energized for ONE minute. The Kirk Key lock may then be operated.

When the Kirk Key is rotated clockwise the mechanism opens the drawout access door and the **KK** contact opens. At this point the ATS compartment door may be opened.

If the KK contact is open, then return to the ATS section is prohibited by the logic.

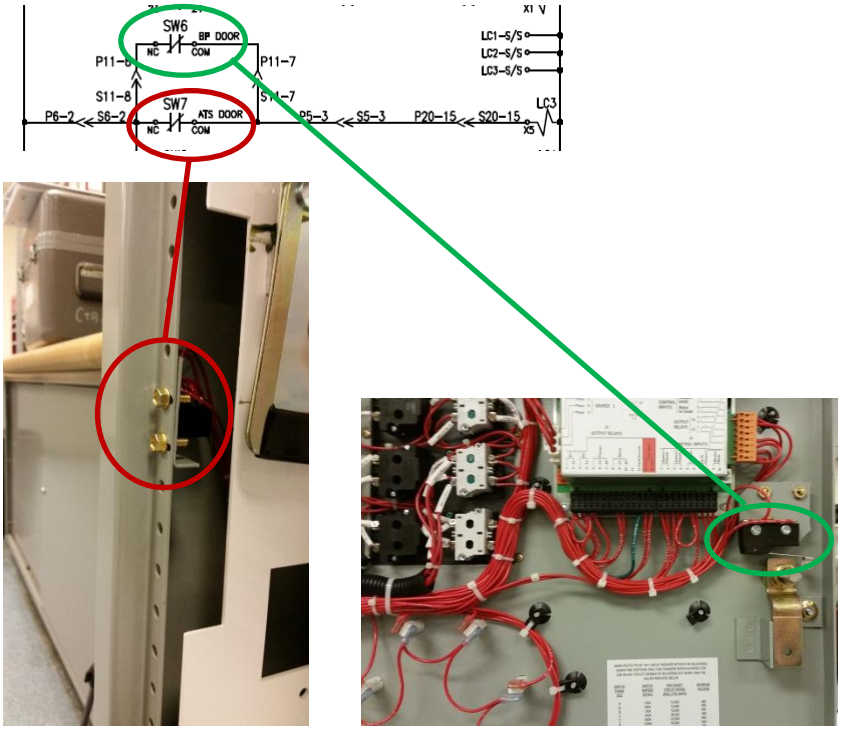
If the ***BYPASS/MAINTENANCE*** switch is turned to **ATS**, several lights on the BYPASS panel and the BYPASS OPERATION PANEL will flash. The unit will NOT return to ATS operation. You will also get a “Source x Device” message on the controller display.

You MUST place the Kirk Key fully CCW and reset the controller alarm to operate using the ATS section.

1. Turn the ***DEMO POWER SWITCH*** to **ON.**
2. Turn the **S1 POWER SWITCH** to **ON.**
3. Allow the TDEC timer to expire.
4. Turn the ***BYPASS/MAINTENANCE*** switch to **BYPASS.**

5. Rotate the Kirk Key CLOCKWISE.
6. Open the ATS Compartment Door.
7. Examine the mechanical interlocking for the door handle and drawout latch. You may operate the door handle to see the mechanism work. If the solenoid should time out you can manually depress the solenoid to release the mechanism so that you can close the door.
8. Close the door and make sure the handle is closed completely.
9. Place the ***BYPASS/MAINTENANCE*** Switch to **ATS**.
10. What happened? _____
11. Turn the Kirk Key CCW. Did the unit return to ATS Operation? _____
12. Reset the Alarm Message on the controller.

Door Interlocks.



When either access door (ATS or BYPASS) is open, the appropriate interlock microswitch is closed completing the circuit to the LC3 input of the ELC and this will cause:

- "Door Open" Indicator on the mimic panel to flash
- Operation to BYPASS is inhibited
- Operation of ATS is inhibited
- If in BYPASS, the Bypass section will operate automatically even with either door open.

1. Turn the ***DEMO POWER SWITCH*** to **ON.**
2. Turn the ***S1 POWER SWITCH*** to **ON.**
3. Allow the TDEC timer to expire.

4. Turn the ***BYPASS/MAINTENANCE*** switch to **BYPASS.**
5. Rotate the ***Kirk Key*** CLOCKWISE.
6. Open the ATS Compartment Door.
7. Open the BYPASS Compartment Door.
8. Is the **"Door Open"** Indicator flashing? _____
9. Find the microswitch interlocks for both doors and operate the switches using your fingers or an insulated tool individually, and then together. Did you have to operate both switches to get the "Door Open" Indicator to extinguish? _____
10. Close both doors.
11. Make sure the **"Door Open"** indicator is OFF.
12. Rotate one of the door handles just enough to cause the **"Door Open"** light to flash.
13. Turn ***S1 POWER*** to **OFF**, wait a couple seconds.
14. Turn ***S2 POWER*** to **ON**.
15. Did the BYPASS Contactor operate to Source 2? _____
16. Is this what you expected? _____
17. Turn the ***BYPASS/MAINTENANCE*** switch to **ATS**.
18. What Happened? _____
19. What THREE things must be done to restore operation?
    a. _____
    b. _____
    c. _____
20. Restore normal operation with the ATS section connected to Source 1.
21. Turn the ***DEMO POWER*** **OFF**.

Contactor Bypass Lab 2: Lessons Learned

1. Interlocks may inhibit operation of the Equipment.
2. Make sure both doors are closed.
3. ATS section will NOT operate if any door is open.
4. BYPASS section WILL operate with any door open.
5. For operation of the ATS, the Kirk Key must be COUNTERCLOCKWISE!
6. All lights flashing on the MIMIC Bus indicates a interlock issue. Check doors and Kirk Key.
7. You may need to reset an error message on the controller.
8. The BYPASS section CAN operate even with doors open. CAUTION!

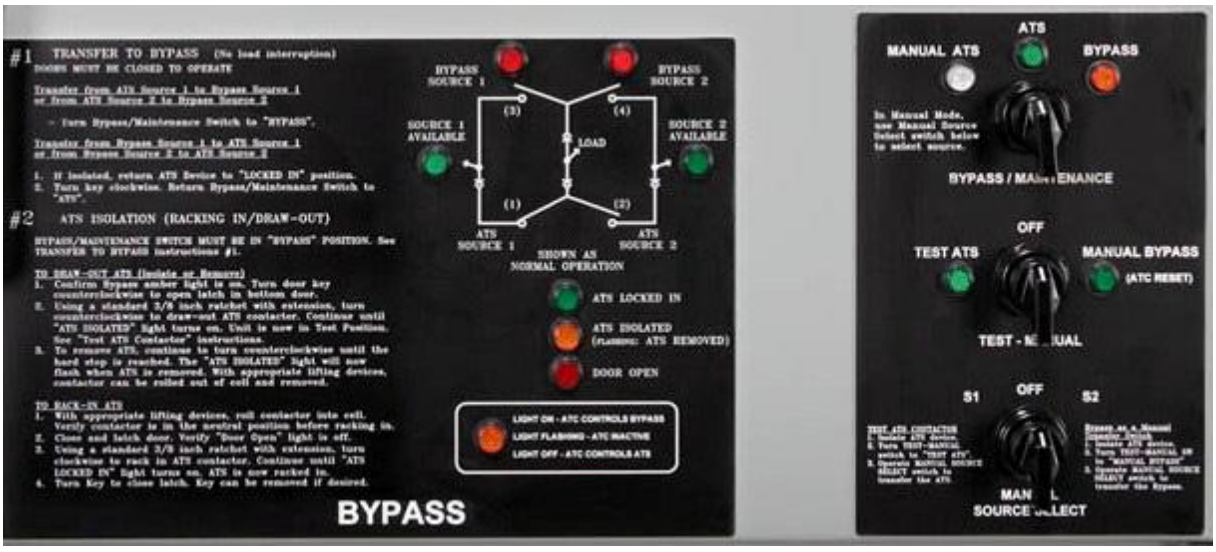
Contactor Bypass Lab 3: Control Relays and Their Operation

There are 7 control relays used in the Contactor Bypass Isolation Transfer Switch. This lab will investigate the operation of the relays, and possible failure modes. You will be using the drawings for the typical 400 amp BIC3C3E30400XSU included in Appendix x of your workbook.

You are going to investigate to scenarios in each of two relays

Part 1: RLY2

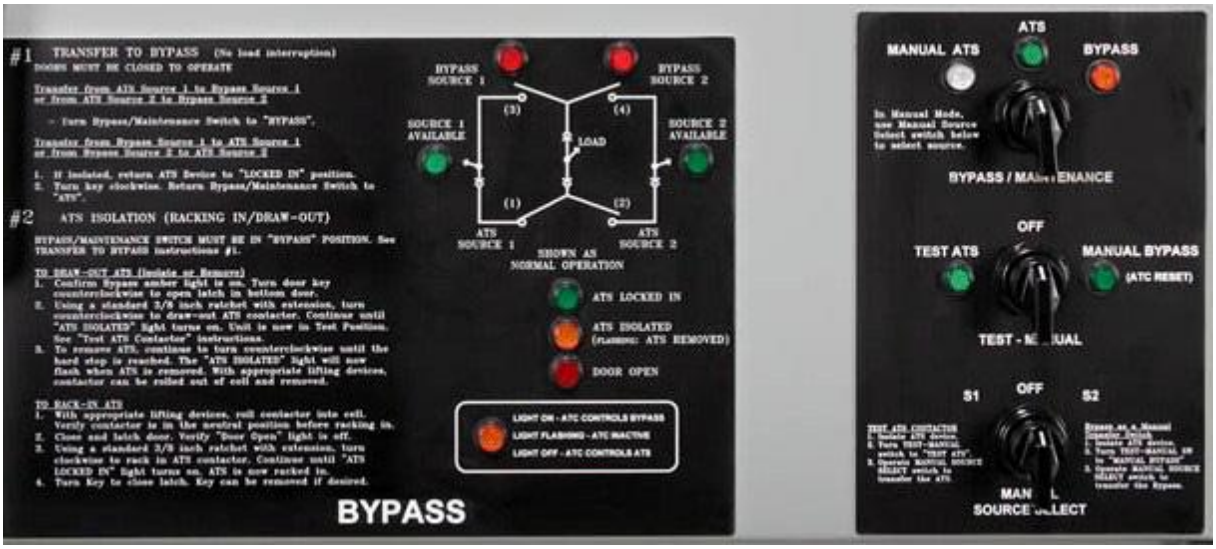
1. Turn the ***DEMO POWER*** to **ON.**
2. Turn the ***S1 POWER*** to **ON.**
3. Allow the TDEC timer to expire.
4. What function does RLY2 perform? _____
5. Turn the ***BYPASS/MAINTENANCE*** Switch to **BYPASS**
6. Unplug RLY2
7. Turn ***S1 POWER*** to **OFF**
8. Wait a few seconds and turn the ***S2 POWER*** to **ON**
9. Circle the lights on the mimic panel that are lit. If flashing draw an “F” on the circle.



10. What LED’s are lit on the controller? _____, _____
11. What message is on the controller display? _____
12. What do you think this message means? _____
13. What other components could cause this type of failure?

    _____, _____, _____

14. Turn the ***DEMO POWER*** to **OFF** and plug relay RLY2 back in.
15. Turn the ***DEMO POWER*** to **ON**.
16. Turn ***S1 POWER*** to **ON**, Wait for BYPASS to transfer to S1.
17. Turn ***S2 POWER*** to **OFF**
18. Turn the ***BYPASS/MAINTENANCE*** Switch to **ATS**
19. Wait for the equipment to “stabilize” on ATS and S1.
20. Unplug RLY2
21. Turn the ***BYPASS/MAINTENANCE*** Switch to **BYPASS.**
22. Wait a few seconds to and turn the ***BYPASS/MAINTENANCE*** Switch to **ATS**.
23. Did you hear only ONE “bang”??
24. Circle the lights on the mimic panel that are lit. If flashing draw an “F” on the circle.



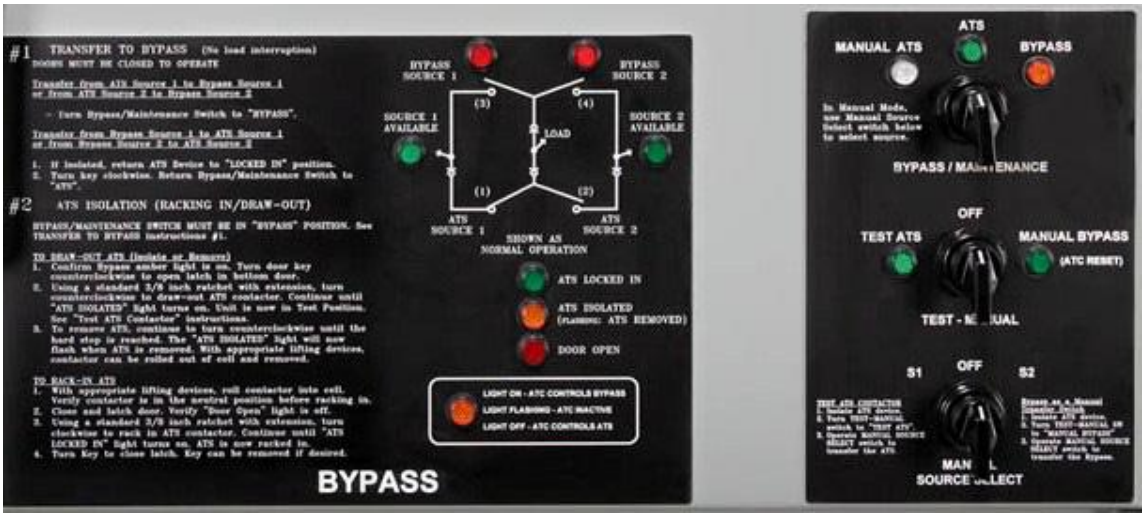
25. What is going on? _____
26. With the BYPASS/MAINTENANCE Switch in ATS is the ATS indicator lit? _____
27. Using a screwdriver, open the mechanical latch release on the ATS Access door, open the door, and then open the BYPASS access door.
28. What do you notice about the ATS and BYPASS Contactors?
    _____
29. Close the doors.
30. Place the ***BYPASS/MAINTENANCE*** Switch in **BYPASS**.
31. After Equipment stabilizes, turn the ***DEMO POWER*** Switch **OFF.** Replace RLY2.
32. Turn ***DEMO POWER*** to **ON**.
33. Place the ***BYPASS/MAINTENANCE*** Switch in **ATS**.
34. Turn the ***DEMO POWER*** Switch **OFF**.

Part 2: RLY5

1. What function does RLY5 perform? _____
2. Unplug RLY5.
3. Turn ***DEMO POWER*** **ON.**
4. Turn ***S1 POWER*** **ON.** Place the ***BYPASS/MAINTENANCE*** Switch in **ATS**
5. Wait a few seconds, and Turn ***S1 POWER*** **OFF.**
6. Wait a few seconds and turn ***S2 POWER*** **ON.**
7. ATS Contactor should close in S2.
8. Turn ***S1 POWER*** **ON.**
9. Wait for all timers to time.
10. What two things does the controller indicate?
    a. Source Connected?_____
    b. Error Message?_____
11. What does the error message tell you? _____

Note: If unable to connect to the preferred source, the controller will return to the backup source and if it is a generator keep the generator running.

12. Replace RLY5.
13. Clear the error message on the controller.
14. ATS should retransfer to S1.
15. Remove RLY5 again.
16. Turn the MAINTENANCE/BYPASS Switch to BYPASS, wait a few seconds.
17. Turn the MAINTENANCE/BYPASS Switch to ATS.
18. Did you only hear a “bang” _____
19. What lights are lit on the mimic panel?



20. Is there a message on the controller display? _____
21. Open the doors by using the mechanical latch release.
22. What contactor is closed on which source? _____ _____.
23. Is there a problem? _____
24. What other components could you check if it was found the relay was not problematic? _____ _____
25. What terminals could you check on the relay to determine it is working and what voltages would you be looking for?
    a. Coil Voltage _____
    b. Input Terminals _____
    c. Output Terminals _____
26. Turn ***Demo Power*** **OFF,** Replace RLY5.

Contactor Bypass Lab 3: Lessons Learned

1. A control relay failure or a failure in the relay circuit will cause some interesting symptoms.
2. Look at the mimic bus and the controller for “clues”

Startup (BYPASS/ISOLATION TRANSFER SWITCH)

The instructions that follow are minimal. Suggested testing is included so that proper commissioning and certification is done. Other testing requested by the customer may be required. (Meggering, thermal scan, etc.)

Before Energizing

1. Generator Engine Start Controls should be “OFF” Generator breaker should be open and locked out.
2. Make sure the voltage selection plug on the optional transformer package is set correctly. On a fixed unit voltage make sure the nameplate rated voltage is the same as the system voltage.
3. Check that all loads on the system are ready to be energized.
4. Connect the Engine Start Terminals (TB6, 1-2) to the generator controller.
5. Set the ***ATS/BYPASS*** switch to **ATS.**
6. Make sure all doors are closed on the equipment, and the Kirk Key is fully counterclockwise with the drawout access door closed.

Connecting power

1. Turn on S1 Power to the Equipment.
2. Check there are no lights lit on the Mimic Panel or the Operator Panel. If lights are lit, investigate cause and resolve before proceeding.
3. Using the Lamp Test button on the device panel, check that ALL lights on the Mimic Panel light. Failure to light could indicate a problem with the ELC controller.
4. Check voltage and phase rotation of the sources.
5. Controller should be powered up. Do any setpoint programming needed. Programming information MUST be supplied by the engineer or customer, possibly with the exception of Nominal Voltage and Frequency.
6. Equipment should now be operating with the ATS section on Source 1.
7. Enable the generator, and make sure the generator breaker is closed.
8. Run load test using the engine test button on the controller set properly.
9. Run a power failure test by turning off power from S1.
10. Using the ***ATS/BYPASS*** switch change to **BYPASS**.
11. Check that controller is running the BYPASS section.
12. Run the load test using the engine test button on the controller.
13. Run a power failure test by turning off power from S1.
14. Return the ATS/BYPASS switch to ATS.
15. All options should be verified in operation.

Schematics and Drawings

A drawing set comes with each Bypass/Isolation Transfer Switch. Included are Outline, schematic, wiring and layout diagrams.

You have a set of diagrams for both a typical 400 amp and a 1200 amp Bypass Switch in the back of the workbook section.