

Instructions for Combination Bypass Isolation and Transfer Switches 100 - 1000 Amps



APPLICATION

The Cutler-Hammer combination Bypass Isolation and Transfer Switches are listed under Underwriters' Laboratories UL 1008 and CSA C22.2 No. 178 Standard for Safety for Automatic Transfer Switches. The power contact assemblies utilized in the ATSBIs switches are also covered under UL489 and CSA C22.2 No. 5 Standard for Safety for Circuit breakers.



WARNING

SAFETY PRACTICES

THE CUTLER-HAMMER COMBINATION BYPASS ISOLATION AND TRANSFER SWITCH HAS BEEN DESIGNED AND MANUFACTURED WITH BUILT-IN INTERLOCKS AND SAFETY FEATURES INTENDED TO PROVIDE SAFE AND PROPER OPERATING SEQUENCES. TO PROTECT PERSONNEL ASSOCIATED WITH THE INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT THE FOLLOWING PRACTICES MUST BE FOLLOWED:

- Only qualified persons, as defined in the national Electrical Code, who are familiar with the installation and maintenance of low voltage circuits and equipment should perform any work associated with this equipment.
- COMPLETELY READ AND UNDERSTAND THESE INSTRUCTIONS before attempting any installation, operation, maintenance, or modification of this equipment.
- ALWAYS TURN OFF AND LOCK OUT THE POWER SOURCE(S) FEEDING THIS EQUIPMENT PRIOR TO PERFORMING ANY INSTALLATION, MAINTENANCE, OR MODIFICATION OF THIS EQUIPMENT. Failure to do so could result in electrical shock leading to death, personal injury, or property damage.

These instructions are not complete and may not contain all of the relevant information necessary to diagnose or solve a particular problem you face. If you have any question concerning the correct operation or maintenance procedures, please contact your local Cutler-Hammer representative.

There are no understandings, agreements, representations, or warranties expressed or implied including warranties of merchantability or fitness for a particular purpose other than those specifically set forth in any separate contract between the parties. Any such contract states the sole obligations of Cutler-Hammer and the contents of this document are not intended to and shall not become part of or in any way modify the terms set forth in such a contract. Information in this literature is intended to be comprehensive but not all inclusive. Should further information be required, please contact the nearest Cutler-Hammer sales office.

IDENTIFICATION

Each Cutler-Hammer ATSBI Switch is supplied with a permanently affixed nameplate which provides the user with data on that specific unit. The switch may only be applied within the limits identified on this nameplate without additional modification. The catalogue number appearing on the nameplate will provide the user with the following application information:

The nameplate will also list the shop order number/style number of the unit which should be referenced when contacting the factory for technical support.

A ratings nameplate will also be affixed to the switch identifying the withstand, interrupting, and closing ratings for which the unit is intended.



WARNING

DO NOT APPLY THIS PRODUCT AT RATINGS WHICH EXCEED THE VALUES NOTED ON THE RATINGS LABEL OF THIS UNIT. EXCEEDING THE NOTED RATINGS CAN CAUSE DEATH, SERIOUS PERSONAL INJURY OR PROPERTY DAMAGE.

DESCRIPTION

The Combination Bypass Isolation and Transfer Switch is a completely factory assembled and tested apparatus used in conjunction with standby power distribution equipment to provide alternate power availability to critical load circuits in the event or primary power interruption and or required maintenance activity.

It consists of three (3) basic elements. (See Fig. 1)

1. Automatic Transfer Switch (ATS)

The ATS performs the function of monitoring both normal and standby power sources and accomplishing an automatic transfer of critical load circuits between these sources as dictated by source availability. The normal source will be the preferred source and the ATS will remain connected to this source if available. The ATS consists of three basic elements:

Switch Type BIHI/5BIH3/5BIHI/4BIH3/4BIHI	Switch Frame	No. of Switched Poles	Ampere Rating 0400	Voltage	Enclosure Type	
				X	S	U
Combination Bypass Isolation and Transfer Switch	F = F Frame K = K Frame L = L Frame M = M Frame N = N Frame	2 = 2 Pole 3 = 3 Pole 4 = 4 Pole	0100 = 100A 0150 = 150A 0225 = 225A 0300 = 300A 0400 = 400A 0600 = 600A 0800 = 800A 1000 = 1000A	A = 120V B = 208V W = 240V X = 480V E = 600V G = 220V M = 230V Z = 365V H = 380V N = 401V O = 415V	S = Nema 1 U = UL C = CSA	

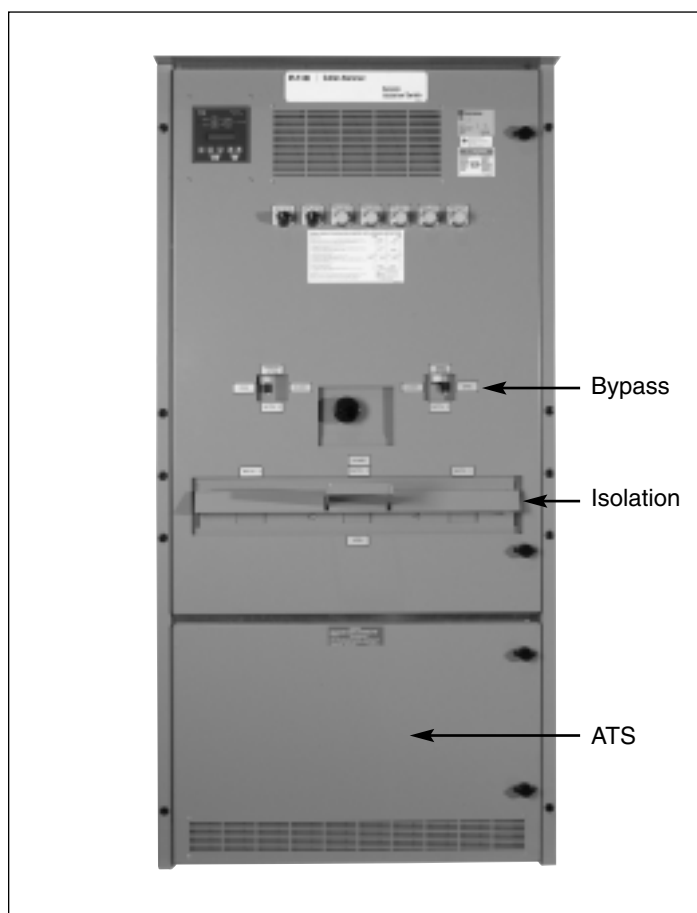


Fig. 1

- A. Power switching contacts which close or open to connect or disconnect the load circuits to the respective power sources.
- B. Transfer mechanism which functions to drive the power switching contacts to the appropriate positions.
- C. Intelligence circuitry which monitors the condition of the power sources and makes transfer operation decisions.

A separate instruction manual is always provided for the ATS Controller of this equipment only. The user/installer should read and thoroughly understand this separate document in conjunction with this manual before proceeding with installation and operation of the ATSBI equipment.

2. Isolation Switch and Operating Mechanism

The isolation contacts are load break switches which when actuated by means of the isolation

mechanism operating handle, disconnect all power to the ATS power switching contacts. This allows the isolated ATS to be inspected or maintained with all power disconnected.

3. Bypass Switched

The bypass switch permits power continuity to critical load circuits while the ATS is isolated. Normal and emergency bypass switches are provided to permit bypass to either power source, but both bypass switches are interlocked with the isolation switch to positively prevent inadvertent paralleling of sources.

INSTALLATION

Cutler-Hammer ATSBI Switches are factory wired and tested. Installation simply requires mounting and connecting of power cables (or bus), engine start signal wires, and auxiliary control circuits (if required).

MOUNTING

Remove all packing materials from the unit including any internal shipping braces.

Inspect the unit thoroughly for obvious shipping damage or deformation. Protect the unit from construction grit and metal chips during the installation process.

Lifting eyes are provided with the unit to facilitate handling. If not already in place, assemble lifting eyes to top of enclosure using hardware provided with eyes. DO NOT attempt to lift unit by any means other than lifting eyes. Lifting by other means can result in damage to equipment. All metal subpanels must remain in place prior to lifting equipment into place via lifting eyes.

The floor mounted unit must be mounted straight and square on a flat and level floor surface.

If bottom cable entry is required, conduit stubs must be appropriately positioned in prepared mounting pad prior to installation of unit.

CABLE CONNECTIONS

Test all power cables prior to connection to the unit to ensure that conductors or cable insulation has not been damaged while being pulled into position. Power cables are to be connected to solderless screw type lugs located at the top of the bypass switch. Refer to wiring diagrams supplied with unit for power termination identification. Verify that the lugs supplied will accommodate the power cables being used. ATSB units will accommodate the wire sizes as noted in Table 1.



WIRE SIZE FOR EXTERNAL POWER CABLE CONNECTIONS PER PHASE CONNECTION. CU/AL WIRE

RATING	200A - 400A	600A
NORMAL	(1) 3/0 – 750MCM – OR (2) 3/0 – 250MCM	(2) 400 – 500MCM
EMERGENCY	(1) 3/0 – 750MCM – OR (2) 3/0 – 250MCM	(2) 400 – 500MCM
LOAD	(1) 3/0 – 750MCM – OR (2) 3/0 – 250MCM	(2) 400 – 500MCM
NEUTRAL**	(3) 3/0 – 750MCM	(6) No. 4 – 500MCM
GROUND	(1) No. 14 – 1/0 (1) No. 6 – 2/0	(1) No. 14 – 1/0 (1) No. 6 – 2/0
RATING	240V 100 - 200A 480 - 600V 100 - 150A	800 - 1000A
NORMAL	(1) No. 6 – 300MCM	(4) 4/0 – 500MCM
EMERGENCY	(1) No. 6 – 300MCM	(4) 4/0 – 500MCM
LOAD	(1) No. 6 – 300MCM	(4) 4/0 – 500MCM
NEUTRAL	(1) No. 6 – 300MCM	(12) 4/0 – 500MCM
GROUND	(1) No. 14 – 1/0 (1) No. 6 – 2/0	(1) No. 14 – 1/0 (1) No. 6 – 2/0

Table 1



WARNING

DE-ENERGIZE ALL POWER CABLE OR CONTROL WIRING INTENDED FOR CONNECTION TO THE UNIT. CONTACT WITH LIVE POWER CONNECTORS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

Carefully strip insulation from the power cables avoiding nicking or ringing of the conductor strands. Prepare stripped conductor termination end by cleaning with a wire brush. If aluminum conductors are used, apply an appropriate joint compound to the clean conductor surface area. Tighten cable lugs to the torque values identified on the label affixed to the unit immediately adjacent to the lugs.



WARNING

IMPROPER POWER CABLE CONNECTIONS CAN CAUSE EXCESSIVE HEAT GENERATION AND SUBSEQUENT EQUIPMENT FAILURE.

BUS CONNECTIONS

All interconnecting bus between the ATSB1 Switches have been assembled at the factory and require no additional attention during the installation process. In connecting power supply bus, use grade 5 hardware for the bolted connection to the bypass switch terminal plates located at the rear of the unit. Insure that the bus surfaces to be joined are clean and free from dirt or other foreign substances. A nonflammable solvent may be desirable for cleaning the bus if required. Tighten connecting hardware per table 2.

Bolt Diametre 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



WARNING

IMPROPER POWER BUS CONNECTIONS CAN CAUSE EXCESSIVE HEAT GENERATION AND SUBSEQUENT EQUIPMENT FAILURE

HARNESSES

The ATS Power Panel, ATS Logic Panel, and B/I Panel are interconnected via a number of preassembled wiring harnesses. These harnesses are terminated in keyed plug/socket connectors. All plug/sockets are engaged at the factory prior to

Energizing the equipment. The plug/sockets are keyed to only permit proper insertion alignment by pushing the plug into the socket until the latches click.

ENGINE START CONNECTION

The engine control contact connections are located on the ATS Switch. NOTE: Prior to making the engine start connection to the ATSB1 equipment, set engine generator controls selector switch in the Off position to prevent an unwanted engine start condition. Connect the engine start wires to the RED terminal blocks marked 51A and 52A. A contact closes between these terminal blocks when an engine start signal is provided by either the ATS or Bypass logic. See wiring diagram supplied with the equipment for additional start connection information.

AUXILIARY CIRCUIT CONNECTIONS

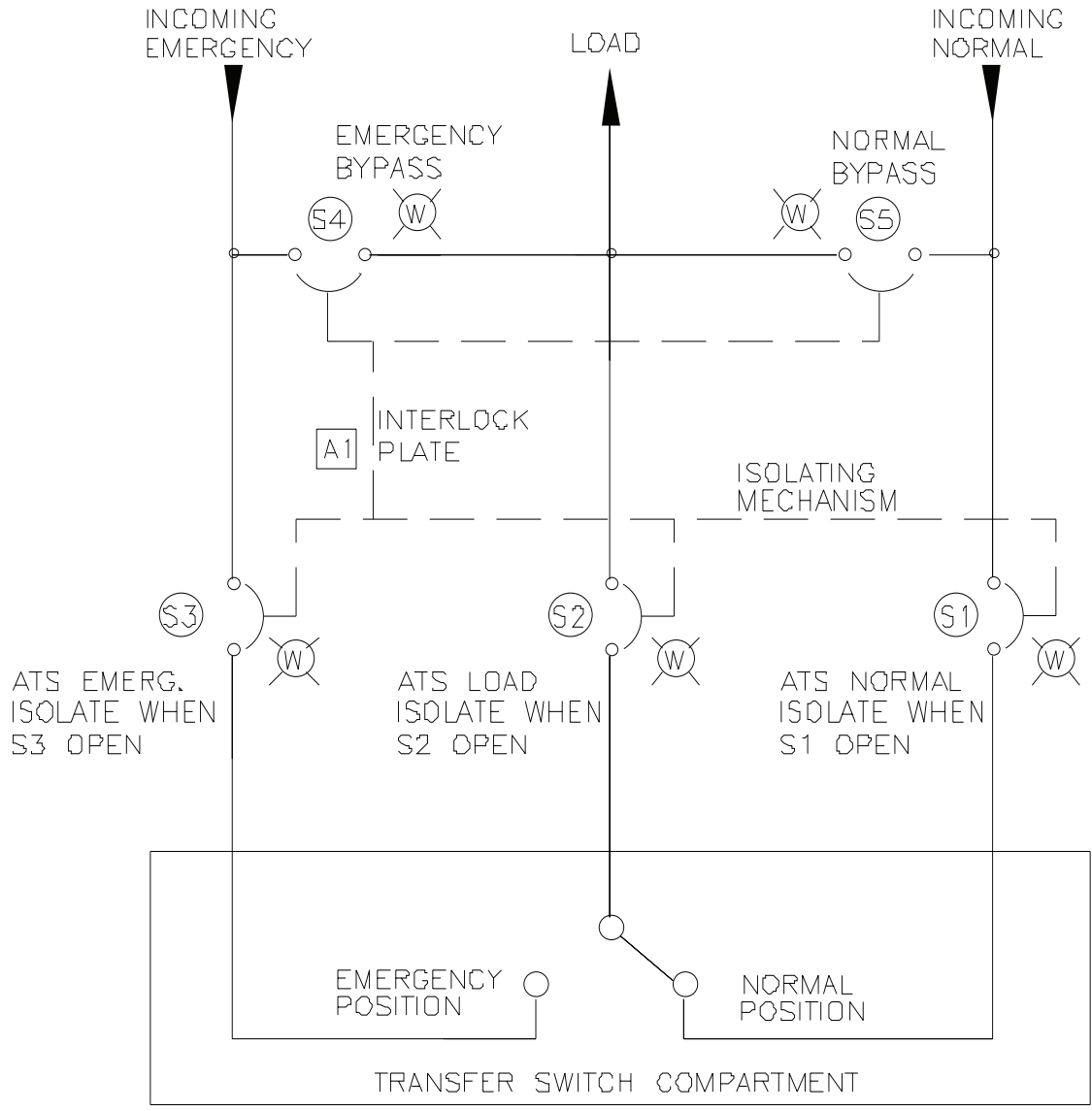
Additional auxiliary control circuit connections may be required on the ATSB1 equipment in specific applications. Such connections could include: Standard position indication contacts, optional accessories 14,24,33 and 35, and other special connections specifically supplied for your application. Refer to wiring diagrams supplied with the equipment for connections identification.

PRELIMINARY CHECKS

After the ATSB1 enclosure is installed and power cables are connected to the equipment, make a thorough inspection of the unit to insure no tools are left inside and that the cabinet is free of debris. If necessary use a vacuum cleaner to remove any and all construction or installation debris from the equipment.

Read and understand all labels affixed to the equipment. Give specific attention to the operation instruction label and schematic diagram affixed to the enclosure front cover. See Fig. 3. Review and understand the composite wiring diagrams supplied with the equipment. Note any optional accessories that may have been furnished with this unit and review their operation. Make all necessary ATS logic and accessory adjustments as indicated in the controller manual.

SINGLE LINE AND OPERATION

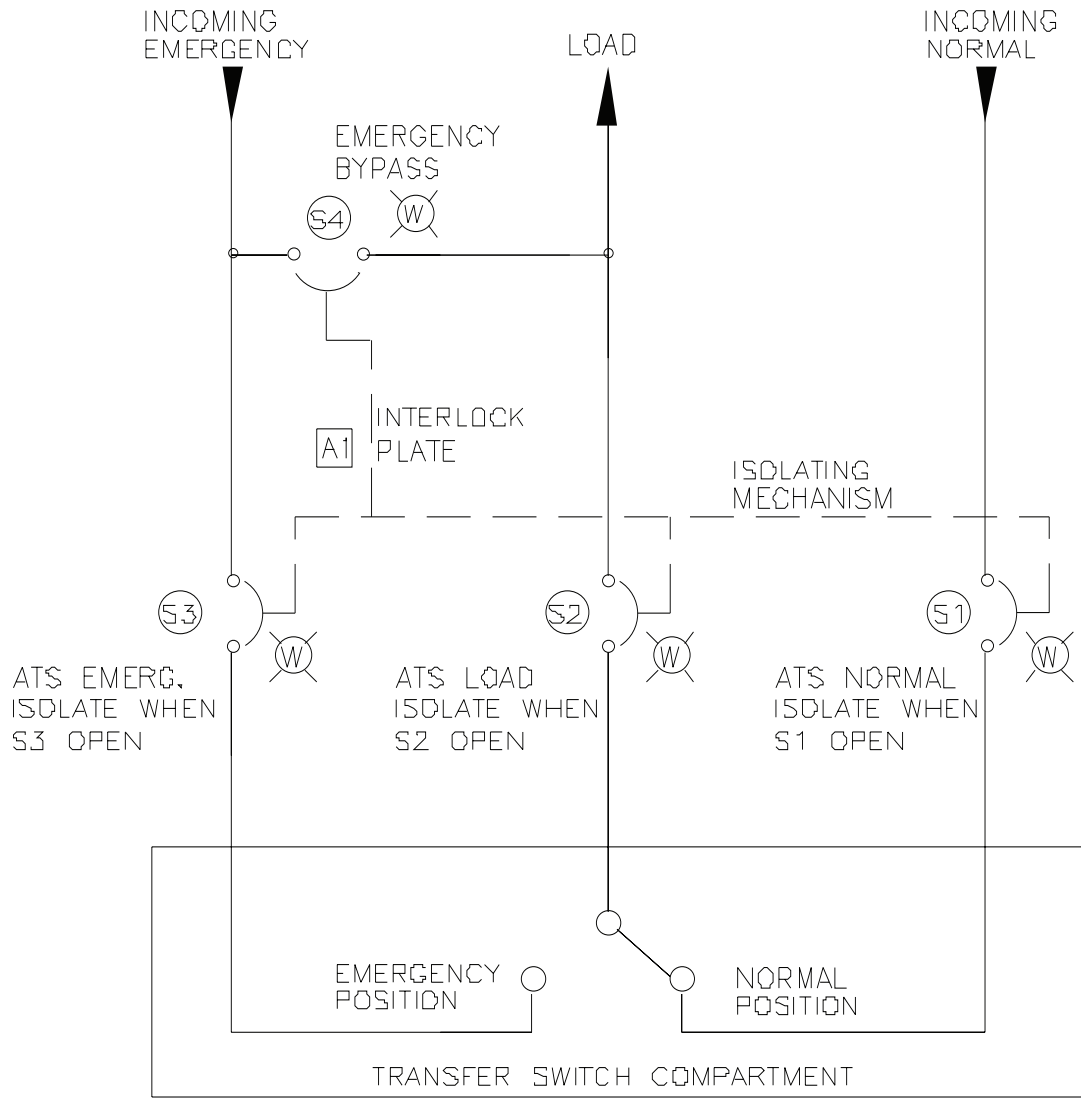


SWITCH	S1	S2	S3	S4	S5
NORMAL BYPASS					X
EMERG. BYPASS				X	
NORMAL POSITION	X	X	X		

X = SWITCH IS CLOSED

Fig. 3

SINGLE LINE AND OPERATION



SWITCH	S1	S2	S3	S4
EMERG. BYPASS				X
NORMAL POSITION	X	X	X	

X = SWITCH IS CLOSED

Fig. 3

Verify the phase to phase line voltages of both the normal and emergency power sources are the same and that they match rated voltage as indicated on the ATSB I equipment ratings label.



CAUTION

SEVERE EQUIPMENT DAMAGE CAN RESULT IF UNIT IS NOT APPLIED TO PROPER VOLTAGE.

DO NOT ENERGIZE EQUIPMENT IS SUPPLY VOLTAGES DO NOT MATCH EQUIPMENT RATINGS LABEL. CONTACT THE FACTORY FOR FIELD VOLTAGE RATING MODIFICATION INSTRUCTIONS.

FUNCTIONAL TESTING

Following the operational instructions label on the enclosure front, proceed to place the equipment in the Normal Bypass mode. Set the enclosure mounted auto/test switch to the auto position.



DANGER

YOU ARE READY TO ENERGIZE EQUIPMENT. VOLTAGES WILL EXIST WITHIN THE ENCLOSURE CAPABLE OF CAUSING SEVERE PERSONAL INJURY OR DEATH.

USE EXTREME CAUTION TO AVOID CONTACT WITH ENERGIZED EQUIPMENT.

ENERGIZING NORMAL SOURCE

With the main switch in the Normal Bypass position, apply normal source power to the equipment by closing the normal upstream breaker or switch supplying the ATSB I switch on the normal side.

NOTE: The load terminals of the unit will now be energized. If it is undesirable to energize connected load equipment during the functional tests, measures should be taken to isolate such loads by opening an appropriate downstream breakers.

The ATS power panel may cycle to close to the normal position if not already in normal. This DOES

NOT indicate a presence of voltage on the ATS power panel since the ATS logic panel senses on the line side of the Bypass switch. Utilizing a voltmeter measure phase-to-phase-to-neutral voltages across the normal bypass line terminals to ensure normal voltage is correct.



DANGER

CONTACT WITH ENERGIZED COMPONENTS CAN CAUSE ELECTRICAL SHOCK CAPABLE OF PRODUCING SEVERE PERSONAL INJURY OR DEATH. USE EXTREME CAUTION TO AVOID CONTACT WITH ENERGIZED COMPONENTS WHEN USING A METER FOR VOLTAGE CHECKS.

The following status indicator lights mounted on device panels of both the Bypass (upper) enclosure panel and the ATS (lower) enclosure door should be lit.

1. Normal Bypass Energized
2. Transfer Switch Isolated
3. Normal Source Available
4. Load Energized
5. Normal Position Energized

Refer to status indicator lights section for a complete operational description of all supplied pilot lights.

ENERGIZING EMERGENCY SOURCE

Following the operational instructions label on the enclosure front, proceed to place the equipment in the Emergency Bypass Mode by opening the Normal Bypass Switch and closing the Emergency Bypass Switch.

With the switch in the Emergency Bypass position, manually start the engine generator (if applicable) at the set utilizing the generator selector switch. Apply Emergency source power to the equipment by closing the generator breaker ahead of the ATSB I Switch on the Emergency side.

NOTE: The ATS Power Panel should remain connected (closed) on the Normal Source.

Utilizing a voltmeter, measure phase-to-phase and phase-to-neutral voltages across the Emergency Bypass Line Terminal to insure Emergency voltage is correct. If necessary, make adjustments to the voltage regulator on the generator according to the manufacturer's recommendations to correct any observed voltage deviations.

The following enclosure mounted status indicator lights should be lit.

1. Emergency Bypass Energized
2. Transfer Switch Isolated
3. Normal Source Available
4. Emergency Source Available
5. Load Energized
6. Normal Position Energized

ATS FUNCTIONAL TEST WITHOUT LOAD TRANSFER

While the ATSBI Switch is in either Bypass position, the ATS is isolated from the power circuits of both sources. The ATS Logic Panel is, however, still connected, via a test cable harness, to control power enabling complete electrical and mechanical testing of the ATS.

ENERGIZING ATS

Following the operational instruction label on the enclosure front, proceed to energize the ATS by opening the appropriate closed Bypass Switch and placing the isolation Switch in the "ON" position. Load circuits will now be connected to the ATS power contacts.

The following enclosure mounted indicator lights will be lit assuming availability of both sources.

1. Normal Source Available
2. Emergency Source Available
3. Load Energized
4. Normal Position Energized

Once the ATS has been energized, the ATSBI equipment is ready for standby service. Position the Generator control selector switch to the auto start position.

Additional functional load transfer tests may be desirable including automatic engine start operation.

See ATS Controller Manual for additional testing and troubleshooting information.

TRANSFER SWITCH REMOVAL

Cutler-Hammer Automatic Transfer Switches typically do not require periodic maintenance or inspection necessitating the removal of the ATS from service. If removal is necessary, the following procedure explains how to remove the Automatic Transfer Switch from service.

1. Bypass and Isolate the Automatic Transfer Switch by carefully following operational instructions on previous pages. Verify that the "Transfer Switch Isolated" is lit.



DANGER

THE BYPASS-ISOLATION SWITCH IS STILL ENERGIZED. CONTACT WITH ENERGIZED COMPONENTS CAN CAUSE SEVERE PERSONAL INJURY AND DEATH.

USE EXTREME CAUTION TO AVOID CONTACT WITH THE BYPASS ISOLATION SWITCH.

2. Open enclosure doors(s) all the way and using a voltmeter verify ABSENCE of voltage on all line input terminals of both the Normal and Emergency ATS Switches.
3. Disconnect plugs interconnecting the ATS power panel with the logic panel.
4. Disconnect interconnecting bus bars terminating on the Normal and Emergency switches line input points (N1, N2, N3, E1, E2, E3 and N if supplied).
5. Disconnect wiring to terminals which isolate pilot circuits wired to the logic panel.
6. Remove bolts which hold the power panel to the enclosure internal support brackets and lift the power panel carefully forward through the enclosure doors.

TRIP RESET

The Cutler-Hammer ATSBI Switch is supplied with high interrupting molded case switches which function as the power contacts for the Transfer Switch, Isolation Switch, and Bypass Switches. These Moulded Case Switches are equipped with instantaneous releases which act to open the switch only under high fault short circuit conditions. This automatic opening (trip) function is a self protecting feature that guarantees maximum contact life and significantly reduces the need for contact inspection, maintenance, or replacement as well as offering maximum safety.

The instantaneous release have been specifically designed and calibrated with a very high current release point permit selective short circuit current isolation by overcurrent protective devices closest to the fault. This means that a short circuit fault occurring downstream of the ATSBI equipment would normally be cleared by a downstream breaker or fuse and would not cause an automatic opening of any of the Moulded Case Switches within the unit.

In some instances a downstream short circuit could cause an automatic opening within the ATSBI equipment. The following instructions describe the procedure for resetting an automatically opened switch.

TRANSFER SWITCH RESET

The Automatic Transfer Switch is equipped with an automatic switch reset feature. Should an ATS Moulded Case Switch automatically open as a result of a downstream short circuit condition, the ATS logic will engage the Transfer Mechanism to electrically reset the automatically opened switch.

If optional overcurrent protection (option 16,17, or 37) is provided, the automatic switch reset provision is omitted. If one of these options is supplied, the ATS will lockout electrical operation until the tripped switch is reset by placing it in the off position utilizing the manual operating handle located on the transfer mechanism.

ISOLATION SWITCH RESET

An automatic opening of the Isolation Switch will be visually indicated by a lit amber light on the Bypass Isolation (upper) panel of the enclosure.

**CAUTION**

A TRIP CONDITION IS A RESULT OF A FAULTED POWER CIRCUIT CONNECTED TO THE EQUIPMENT. FAILURE TO CORRECT SUCH FAULTED CONDITIONS CAN CAUSE SEVERE EQUIPMENT OR CABLE DAMAGE, PRESENT A POTENTIAL FIRE HAZARD, AND RESULT IN DEATH OR PERSONAL INJURY.

IDENTIFY AND CORRECT THE FAULTED CIRCUIT BEFORE ATTEMPTING TO RESET AUTOMATICALLY OPENED SWITCHES WITHIN THE ATSBI EQUIPMENT.

To Reset Isolation Switch:**100 - 1000 Amp Units**

1. Move Isolation handle down to "RESET" position. This position is beyond the "OFF" position and may require more downward force than is used to open the switch only.
2. The lit "Isolated Mechanism Tripped" amber light should turn off.
3. Move Isolation handle up to the "ON" position.
4. Verify that the white "Load Energized" light is lit.

BYPASS SWITCH RESET

An automatic opening of the Normal or Emergency Bypass Switch will be visually indicated by a lit amber light located on the Bypass Isolation (upper) panel of the enclosure labeled "Bypass Tripped".



CAUTION

A TRIPPED CONDITION IS A RESULT OF A FAULTED POWER CIRCUIT CONNECTED TO THE EQUIPMENT. FAILURE TO CORRECT SUCH FAULTED CONDITIONS CAN CAUSE SEVERE EQUIPMENT OR CABLE DAMAGE, PRESENT A POTENTIAL FIRE HAZARD AND RESULT IN DEATH OR PERSONAL INJURY.

IDENTIFY AND CORRECT FAULTED CIRCUIT BEFORE ATTEMPTING TO RESET TRIPPED SWITCHES WITHIN THE ATSBİ EQUIPMENT.

TO RESET BYPASS SWITCH

1. Move appropriate Bypass Switch operating handle down to full "OFF" position. This reset action may require more downward force than used to open the switch only. A correctly reset switch will allow the operating handle to remain in the full "OFF" position. If the operating handle remains in a "Midway" position after initial reset attempt, the switch is not reset. Try again.
2. The lit "Bypass Tripped" amber light should turn off.
3. Move appropriate Bypass Switch operating handle up to the "ON" position.
4. Verify that the appropriate "Bypass Energized" red light is lit.

NOTE: An Automatic opening of any Moulded case Switch used in the ATSBİ equipment will only occur if that specific switch is closed in the power circuit on which a fault occurs. Therefore, it is only necessary to reset affected switches as indicated by the lit pilot lights.

OPTIONAL OVERCURRENT PROTECTION AND SERVICE EQUIPMENT (OPTION 16 AND 17) (OPTION 37)

The Cutler-Hammer ATSBİ equipment can be optionally (16 and 17) equipped with integral overcurrent (overload and short circuit) protection. If selected the standard Moulded Case Switches with instantaneous short circuit releases are replaced with conventional circuit breakers equipped with thermal elements in addition to magnetic releases to provide overload and short circuit protection to connected equipment and cables. These circuit breakers will replace the standard Moulded Case Switches in the ATS and Bypass Switches only. The Isolation Switch will only employ Moulded Case Switches.

Units optionally supplied as service equipment rated (Option 37) will include this integral overcurrent protection as standard. The service equipment rated unit will also have provisions for service disconnect as required by the NEC. A service disconnect position is a built in feature of the service equipment rated Cutler-Hammer ATSBİ Switch.

STORAGE

If the ATSBİ is to be stored prior to installation it should be ordered with packaging/crating suitable for the storage environment both mechanically and environmentally. The equipment is not designed or packaged for outdoor storage and warranty will be withdrawn upon evidence of extended outdoor exposure. It is strongly suggested that this equipment be stored in a climate controlled environment with temperature ranges between -20° C to 85° C with a relative humidity of 80% condensation or less.

MAINTENANCE

The ATSBİ is maintenance free under normal usage. Local conditions, however, may make it necessary to clean the equipment once a year. De-energize all sources of power and vacuum away any dust, dirt, or debris that may have accumulated within the enclosure or on logic components.

Follow recommendations of the Generator manufacturer as to testing procedures and frequency of the associated standby set.

Good maintenance practices call for periodic inspection of all electrical apparatus. Terminal lugs and bus connections should be periodically checked for tightness of the connections to avoid excessive heating and premature failure. The Moulded Case Switches employed in the equipment have self wiping contacts built in to the design of the switch. Periodical operation of switches under load conditions will remove any high resistance film that might develop on power contact surfaces.

FACTORY MAINTENANCE

Cutler-Hammer offers extended maintenance agreements for our ATSBi product. In most instances such maintenance agreements also extends warranty periods. Contact your local Cutler-Hammer Representative for more information on factory supplied maintenance.

REPLACEMENT PARTS

Many of the logic components of the ATSBi equipment are individually replaceable with field installable kits. Cutler-Hammer maintains an in-house inventory of replacement parts for all components used in this equipment. Parts are typically available on a sameday shipment basis. Contact your local Cutler-Hammer Representative for replacement parts identification and availability.

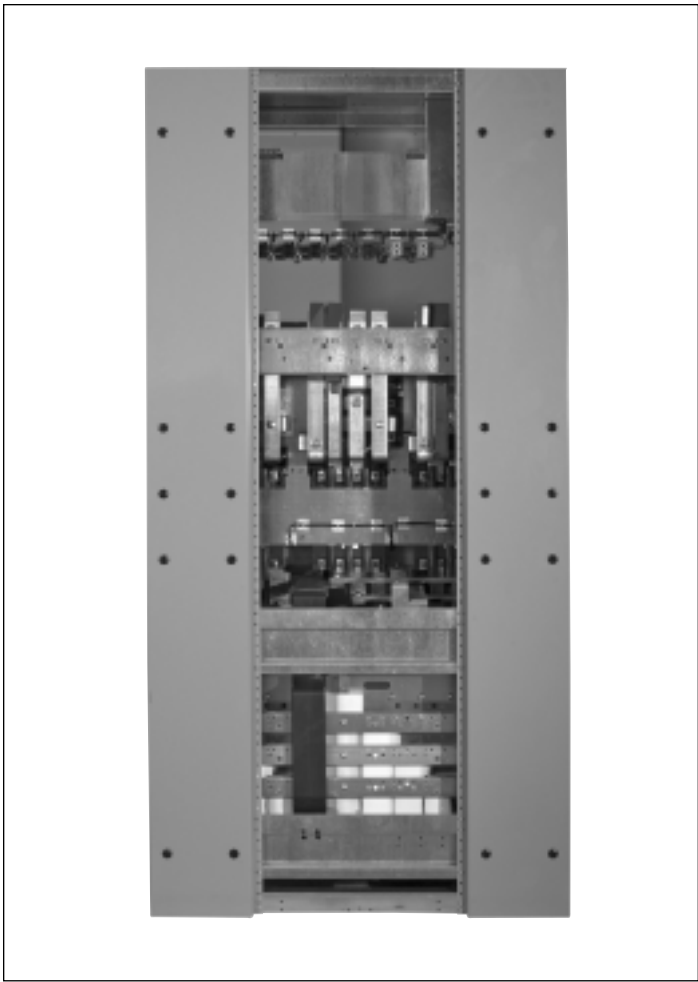


Fig. 5 Bussing arrange of Bypass Isolation ATS

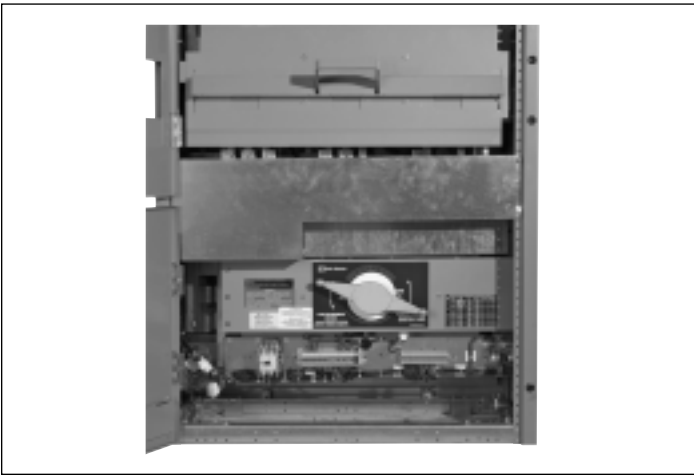


Fig. 4 ATS Portion of Bypass Isolation ATS