GENERAC®

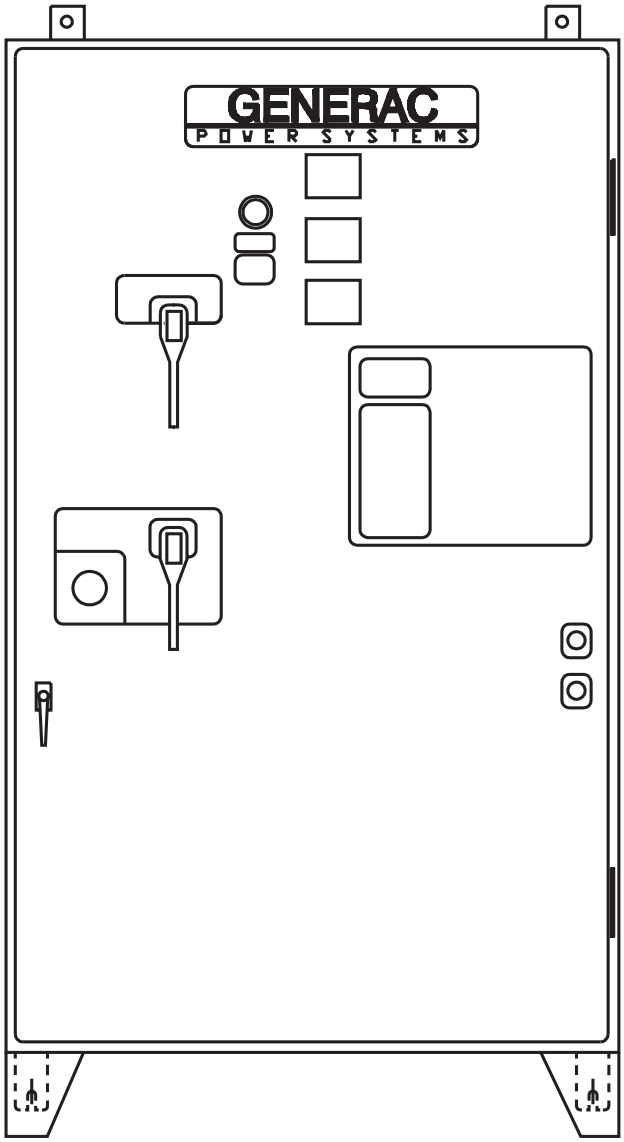
POWER SYSTEMS, INC.

Owner's Manual

GTS "B" Type

Bypass Isolation Automatic Transfer Switch

400 amp, 600 volts



Read the following information carefully before attempting to install, operate or service this equipment. Also read the instructions and information on tags, decals, and labels that may be affixed to the transfer switch. Replace any decal or label that is no longer legible.

DANGER! Connection of a generator to an electrical system normally supplied by an electric utility shall be by means of suitable transfer equipment so as to isolate the electric system from utility distribution system when the generator is operating (Article 701 Legally Required Standby Systems or Article 702 Optional Standby Systems, as applicable). Failure to isolate electric system by these means may result in damage to generator and may result in injury or death to utility workers due to backfeed of electrical energy.

Generac cannot possibly anticipate every possible cir cumstance that might involve a hazard. The warnings in this manual, and on tags and decals affixed to the unit are, therefore, not all-inclusive. If you use a procedure, work method or operating technique Generac does not specifically recommend, you must satisfy yourself that it is safe for you and others. You also must make sure the procedure, work method or operating technique that you choose does not render the transfer switch unsafe.

Throughout this publication, and on tags and decals affixed to the generator, DANGER, WARNING, CAUTION and NOTE blocks are used to alert you to special instruction about a particular operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully. Their definitions are as follows:

DANGER

After this heading, you can read instructions that, if not strictly complied with, will result in personal injury or property damage.

WARNING

After this heading, you can read instructions that, if not strictly complied with, may result in personal injury or property damage.

CAUTION

After this heading, you can read instructions that, if not strictly complied with, could result in damage to equipment and/or property.

NOTE:

After this heading, you can read explanatory statements that require special emphasis.

These safety warnings cannot eliminate the hazards that they indicate. Common sense and strict compliance with the special instructions while performing the service are essential to preventing accidents.

Four commonly used safety symbols accompany the DANGER, WARNING and CAUTION blocks. The type of information each indicates follows:

This symbol points out important safety information that, if not followed, could endanger personal safety and/or property of you and others.

This symbol points out potential explosion hazard.

This symbol points out potential fire hazard.

This symbol points out potential electrical shock hazard.

GENERAL HAZARDS

- Any AC generator that is used for backup power if a NORMAL (utility) power source failure occurs, must be isolated from the NORMAL (utility) power source by means of an approved transfer switch. Failure to properly isolate the NORMAL and STANDBY power sources from each other may result in injury or death to electric utility workers, due to backfeed of electrical energy.
- Improper or unauthorized installation, operation, service or repair of the equipment is extremely dangerous and may result in death, serious personal injury, or damage to equipment and/or personal property.
- Extremely high and dangerous power voltages are present inside an installed transfer switch. Any contact with high voltage terminals, contacts or wires will result in extremely hazardous, and possibly LETHAL, electric shock. DO NOT WORK ON THE TRANSFER SWITCH UNTIL ALL POWER VOLTAGE SUPPLIES TO THE SWITCH HAVE BEEN POSITIVELY TURNED OFF.
- Competent, qualified personnel should install, operate and service this equipment. Adhere strictly to local, state and national electrical and building codes. When using this equipment, comply with regulations the National Electrical Code (NEC), CSA Standard; C22.1 Canadian Electric Code and Occupational Safety and Health Administration (OSHA) have established.
- Never handle any kind of electrical device while standing in water, while barefoot, or while hands or feet are wet. DANGEROUS ELECTRICAL SHOCK MAY RESULT.

- Because jewelry conducts electricity, wearing it may cause dangerous electrical shock. Remove all jewelry (such as rings, watches, bracelets, etc.) before working on this equipment.
- If you must work on this equipment while standing on metal or concrete, place insulative mats over a dry wood platform. Work on this equipment only while standing on such insulative mats.
- Never work on this equipment while physically or mentally fatigued.
- Keep the transfer switch enclosure door closed and bolted at all times. Only qualified personnel should be permitted access to the switch interior.
- In case of an accident caused by electric shock, immediately shut down the source of electrical power. If this is not possible, attempt to free the victim from the live conductor but AVOID DIRECT CONTACT WITH THE VICTIM. Use a nonconducting implement, such as a rope or board, to free the victim from the live conductor. If the victim is unconscious, apply first aid and get immediate medical help.
- When an automatic transfer switch is installed for a standby generator set, the generator engine may crank and start at any time without warning. To avoid possible injury that might be caused by such sudden start-ups, the system's automatic start circuit must be disabled before working on or around the generator or transfer switch. For that purpose, a SAFETY DISCONNECT is provided inside the transfer switch. Always set that switch to its MANUAL position before working on the equipment. Then place a "DO NOT OPERATE" tag on the transfer switch and on the generator.

1.1 INTRODUCTION

This manual has been prepared especially for the purpose of familiarizing personnel with the design, application, installation, operation and servicing of the applicable equipment. Read the manual carefully and comply with all instructions. This will help to prevent accidents or damage to equipment that might otherwise be caused by carelessness, incorrect application, or improper procedures.

Every effort has been expended to make sure that the contents of this manual are both accurate and current. Generac, however, reserves the right to change, alter or otherwise improve the product at any time without prior notice.

1.2 EQUIPMENT DESCRIPTION

There are many critical emergency power systems where interruption of power is not permitted. For these types of system requirements, Generac Power Systems, Inc. offers a bypass isolation (BIS) automatic transfer switch. This type of switch is designed to meet the National Electric Code requirements for the inspection and/or maintenance of the automatic transfer switch without the need for power interruption.

The automatic transfer switch is used for transferring critical electrical loads from a NORMAL (utility) power source to a STANDBY (emergency generator) power source. Such a transfer of electrical loads occurs automatically when the NORMAL power source has failed or is substantially reduced and the STANDBY source voltage and frequency have reached an acceptable level. The transfer switch prevents electrical feedback between two different power sources (such as the NORMAL and STANDBY sources) and, for that reason, codes require it in all standby electric system installations.

The transfer switch consists of a solid state intelligence circuit, a transfer mechanism and a control panel.

1.3 TRANSFER SWITCH DATA PLATE

A DATA PLATE is permanently affixed to the enclosure subplate. Use this transfer switch only with the specific limits shown on the DATA PLATE and on other decals and labels that may be affixed to the switch. This will prevent damage to equipment and property.

When requesting information or ordering parts for this equipment, make sure to include all information from the DATA PLATE.

Record your Model and Serial numbers in the space provided below for future reference.

MODEL #

SERIAL #

1.4 TRANSFER SWITCH ENCLOSURE

The standard switch enclosure is a National Electrical Manufacturer's Association (NEMA) 12 type. NEMA 12 type enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids.

1.5 SAFE USE OF TRANSFER SWITCH

Before installing, operating or servicing this equipment, read the SAFETY RULES (inside front cover) carefully. Comply strictly with all SAFETY RULES to prevent accidents and/or damage to the equipment. Generac recommends you make a copy of the SAFETY RULES and post them near the transfer switch. Also, be sure to read all instructions and information you may find on tags, labels and decals affixed to the equipment.

Two publications that outline the safe use of transfer switches are the following:

- National Electrical Code
- UL 1008, STANDARD FOR SAFETY-AUTOMATIC TRANSFER SWITCHES

2.1 INTRODUCTION TO INSTALLATION

This equipment has been wired and tested at the factory. Installing the switch includes the following procedures:

- Mounting the enclosure.
- Connecting power source and load leads.
- Connecting the generator start circuit.
- Installing/connecting any options and accessories.
- Testing functions.

2.2 UNPACKING

Carefully unpack the transfer switch. Inspect closely for any damage that might have occurred during shipment. The purchaser must file with the carrier any claims for loss or damage incurred while in transit.

Check that all packing material is completely removed from the switch prior to installation.

Attach any lifting device to the transfer switch mounting holes or brackets only. DO NOT LIFT THE SWITCH AT ANY OTHER POINT.

2.3 MOUNTING

Enclosures are typically floor-mounted. Components are generally mounted in a standard NEMA 12-type enclosure. See Section 2.4.1, Mechanical Dimensions and Figure 2.1.

⚠ CAUTION ⚠

⚠ Handle transfer switches carefully when installing. Do not drop the switch. Protect the switch against impact at all times, and against construction grit and metal chips. Never install a transfer switch that has been damaged.

Install the transfer switch as close as possible to the electrical loads that are to be connected to it. To prevent switch distortion, level all mounting points. If necessary, use washers behind mounting holes to level the unit.

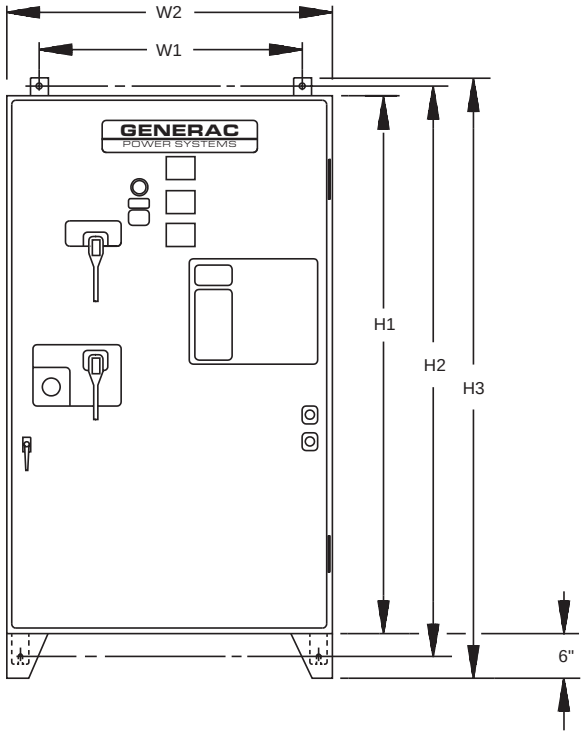
If the enclosure is not level the door mounted handles will not match the shafts on the BIS frame. Verify proper alignment. A slight amount of adjustment is built into the handle mounting. Loosen the (3) handle mounting nuts and align handles. Retighten mounting nuts.

◆ 2.4.1 MOUNTING DIMENSIONS

Mounting dimensions for Figure 2.1:

Current Rating	Height			Width		Depth	Weight (lbs.)
	H1	H2	H3	W1	W2		
400	69.4	71.4	77.4	32.0	38.0	20.5	650

Figure 2.1 — Mounting Dimensions



2.4 CONNECTING POWER SOURCE AND LOAD LINES

⚠ DANGER ⚠

⚠ Make sure to turn OFF both the normal (Utility) and standby (generator) power supplies before trying to connect power source and load lines to the transfer switch. Supply voltages are extremely high and dangerous. Contact with such high voltage power supply lines causes extremely hazardous, possibly lethal, electrical shock.

Wiring diagrams and electrical schematics are provided in this manual. Power source and load connections are made at a transfer mechanism, inside the switch enclosure.

◆ 2.4.1 3-POLE MECHANISM

This switch is used with a single or three phase system, when the single phase NEUTRAL line is to be switched during transfer; or with a 3-phase system, when NEUTRAL is not to be switched.

◆ 2.4.2 4-POLE MECHANISM

This switch is used with a 3-phase system, when the NEUTRAL line is to be switched during transfer action.

All power cables should enter the switch next to the transfer mechanism terminals. Standard terminal lugs on the transfer mechanism are solderless, screwtype.

Remove terminal covers to gain access to terminals. Connect power source and load conductors to clearly marked terminal lugs on transfer mechanism as follows:

- LOAD leads: Connect to terminals T1, T2, T3, & (T4).
- NORMAL (Utility) Source Leads: To terminals N1, N2, N3, & (N4).
- STANDBY (Emergency) Source Leads: Connect to transfer mechanism terminal lugs E1, E2, E3, & (E4).

NOTE:

Unless otherwise specified, a NEUTRAL block is not supplied with transfer switch on 3-phase, 4-pole units where the NEUTRAL line is to be switched during transfer.

Solderless, screw-type terminal lugs are standard. Conductor sizes must be adequate to handle the maximum current to which they will be subjected; based on the 75°C column of tables, charts, etc. used to size conductors. The installation must comply fully with all applicable codes, standards and regulations.

Before connecting wiring cables to terminals, remove any surface oxides from the cable ends with a wire brush. If ALUMINUM conductors are used, apply corrosion inhibitor to conductors. After tightening terminal lugs, carefully wipe away any excess corrosion inhibitor.

Tighten terminal lugs to the torque values as noted on the decal, inside the transfer switch door.

⚠ CAUTION ⚠

Use a torque wrench to tighten the conductors, being sure not to overtighten, or damage to the switch base could occur. If undertightened, a loose connection would result, causing excess heat which could damage the switch base.

Be sure to maintain proper electrical clearance between live metal parts and grounded metal. Allow at least 1/2 inch for 100-400 amp circuits; at least 1 inch for circuits over 400 amps.

⚠ DANGER ⚠

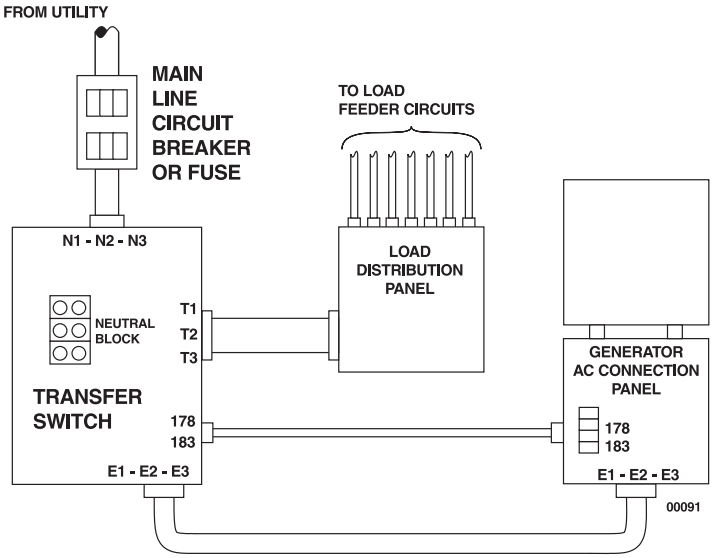
Reinstall the cover shields over the customer connection lugs for the normal, emergency and load terminals Failure to do so will allow exposure to the energized lugs. Touching these energized lugs will result in shock, burns or death.

2.5 CONNECTING START CIRCUIT WIRES

Connect suitable, approved wiring to transfer switch terminals 178 and 183 (see chart at the top of page 5). Route these wires through suitable, approved conduit and connect to identically numbered terminals in the AC connection (lower) panel of Generac power systems (engine-generator set). Do not route these wires in the same conduit as generator main AC output. See Figure 2.2.

Closure of Wire 178/183 circuit by switch circuit action must result in generator engine cranking and startup.

Figure 2.2 — Connection Diagram - 3-Phase With Neutral Shown (Typical)



Recommended wire gauge sizes for this wiring depends on the length of the wire, as recommended below:

MAXIMUM WIRE LENGTH	RECOMMENDED WIRE SIZE
460 feet (140m)	No. 18 AWG.
461 to 730 feet (223m)	No. 16 AWG.
731 to 1,160 feet (354m)	No. 14 AWG.
1,161 to 1,850 feet (565m)	No. 12 AWG.

2.6 AUXILIARY CONTACTS

If desired, you have access to Auxiliary Contacts on the transfer switch to operate customer accessories, remote advisory lights, or remote annunciator devices.

The auxiliary contacts are mounted on the ATS mechanism. These switches are factory wired to a terminal strip for customer connection.

Contact operation is shown in the chart at the bottom of this page.

NOTE:

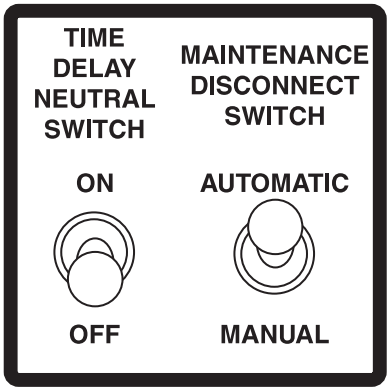
Auxiliary Contacts are rated 10 amps at 125 or 250 volts AC. DO NOT EXCEED THE RATED VOLTAGE AND CURRENT OF THE CONTACTS.

2.7 TIME DELAY NEUTRAL ON-OFF SWITCH

The Time Delay Neutral feature extends the time that the main contacts normally disconnect (Figure 2.2). By permitting the LOAD to remain disconnected from both power sources for a fixed time setting, residual voltages generated by heavy inductive loads will decay to a safe level before reconnecting. This provides some protection against nuisances such as blown fuses or circuit breakers that otherwise might occur during a rapid transfer of motor and other heavy inductive loads.

Units with the Time Delay Neutral feature are equipped with a Time Delay On/Off switch. To eliminate the time delay at neutral during a transfer action, set the switch to OFF.

Figure 2.2 — Time Delay Neutral Switch



2.8 OPTIONAL ACCESSORIES

Note any optional accessories that may be on the transfer switch must be properly wired into the standby electric system in conjunction with the transfer switch.

3.1 FUNCTIONAL TESTS AND ADJUSTMENTS

Following transfer switch installation and interconnection, inspect the entire installation carefully. A competent, qualified electrician should inspect it. The installation should comply strictly with all applicable codes, standards, and regulations. When absolutely certain the installation is proper and correct, complete a functional test of the system. Perform functional tests in the exact order presented in this manual, or you could damage the switch.

IMPORTANT: Before proceeding with functional tests, read and make sure you understand all instructions and information in this section. Also read the information and instructions of labels and decals affixed to the switch. Note any options or accessories that might be installed and review their operation.

Automatic Transfer Switch Auxiliary Contacts

CONTACTS	WIRE NO.	NORMAL	NEUTRAL	EMERGENCY
Utility, COM to N.O.	340 to 341	O	X	X
Utility, COM to N.C.	340 to 342	X	O	O
Standby, COM to N.O.	343 to 344	X	X	O
Standby, COM to N.C.	343 to 345	O	O	X
Utility, 2, N.O.	346	OV	* +20-24Vdc	* +20-24Vdc
Standby, 2, N.O.	347	* +20-24Vdc	* +20-24Vdc	OV

X = Closed O = Open
* This voltage is referenced to the #0 wire. The output is limited to 100 ma.

3.2 MANUAL OPERATION OF ATS MECHANISM

DANGER

Do NOT manually transfer under load. disconnect transfer switch from all power sources by approved means, such as a main circuit breaker(s).

A manual HANDLE is shipped with the transfer switch. Manual operation must be checked BEFORE the transfer switch is operated electrically. To check manual operation, proceed as follows (Figure 3.1):

1. In the transfer switch enclosure, set the Safety Disconnect switch to MANUAL. This prevents the generator from starting automatically as soon as you turn OFF the UTILITY power source.
2. If so equipped, turn the generator's Manual-Off-Auto switch to OFF.
3. Turn OFF both NORMAL and STANDBY power supplies to the transfer switch, with whatever means provided (such as the main line circuit breakers).
4. Note position of transfer mechanism main contacts by observing display windows in "A" and "B" in Figure 3.1 as follows:
   - Window "A" ON, Window "B" OFF - LOAD terminals (T1, T2, T3) are connected to NORMAL terminals (N1, N2, N3).
   - Window "A" OFF, Window "B" ON - LOAD terminals (T1, T2, T3) are connected to STANDBY terminals (E1, E2, E3).

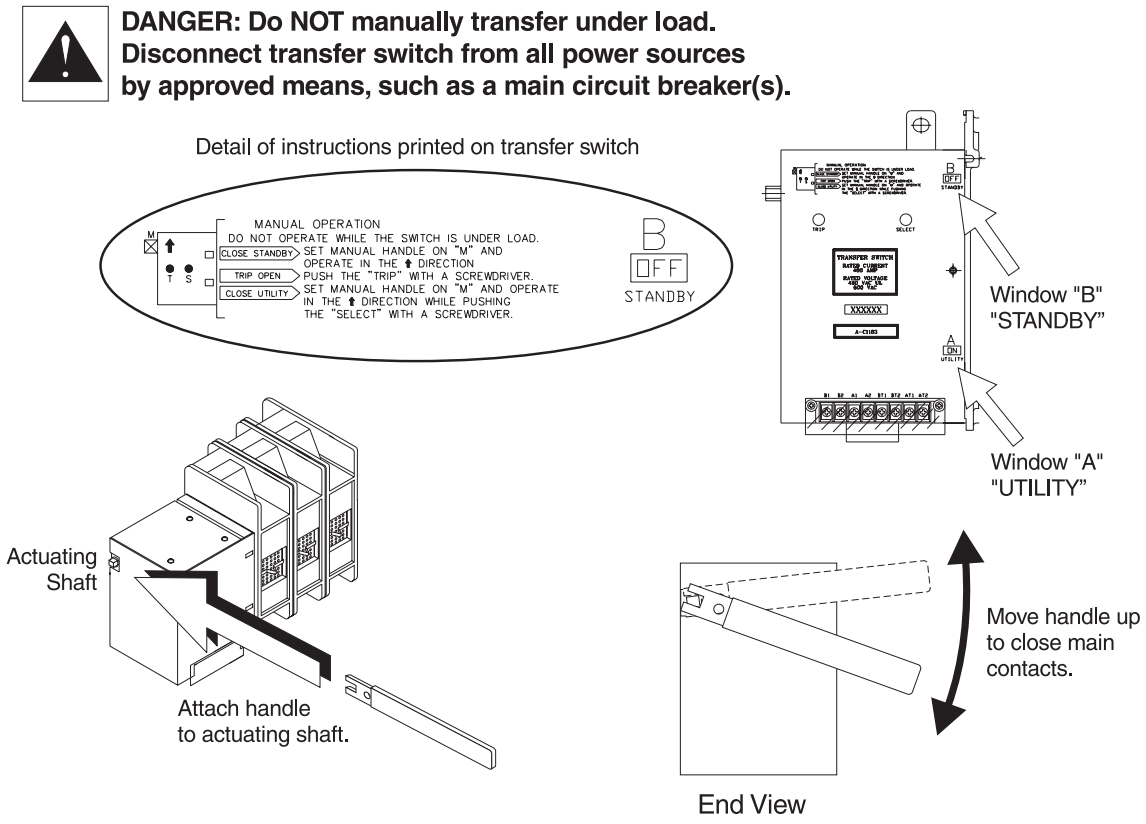
CAUTION

Do not use excessive force when operating the transfer switch manually or you could damage the manual handle.

◆ 3.2.1 TRIP TO NEUTRAL POSITION

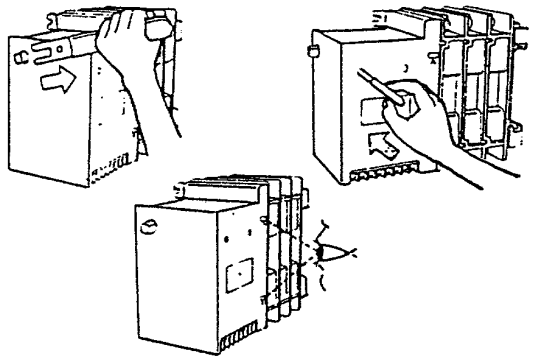
Remove handle from the square lug at the upper left corner of the switch. Insert a screwdriver into the "T" hole and push inward. The main contact should trip to the neutral position and the word OFF should appear in both windows "A" and "B". See Figure 3.2.

Figure 3.1 — Actuating Transfer Switch



NOTE: Return handle to storage location in enclosure when finished with manual transfer.

Figure 3.2 — Trip to Neutral



Disconnect manual handle from square shaft. Insert screwdriver into Hole "T" and push in. Confirm "trip" by word "OFF" in both windows "A" and "B".

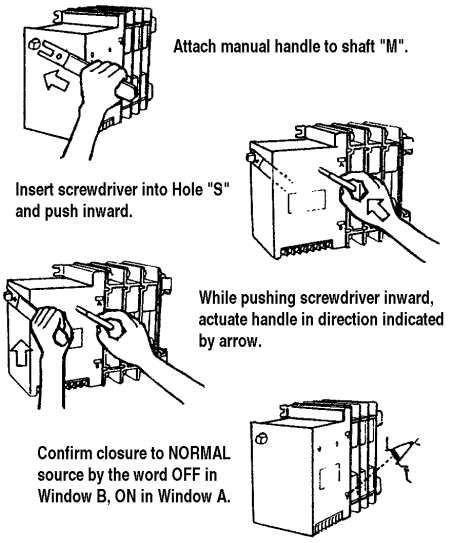
◆ 3.2.2 CLOSE TO NORMAL SOURCE SIDE

Before proceeding, verify the position of the switch by observing window "A" and window "B". If window "A" displays ON the ATS is closed in the UTILITY position, with the LOAD connected to the NORMAL source. It is not necessary to manually close in the UTILITY position. See Figure 3.3 on page 7.

If window "A" reads OFF and window "B" reads ON it will be necessary to trip the ATS to the neutral position. See section 3.2.1.

With handle attached to the actuating shaft. Insert screwdriver into hole marked "S". While pushing inward on screwdriver, move manual handle upward as indicated by arrow in illustration until it stops. DO NOT FORCE. Confirm main contacts close to UTILITY source when window "A" is ON and window "B" is OFF. Remove handle from switch.

Figure 3.3 — Closure to Normal Source Side



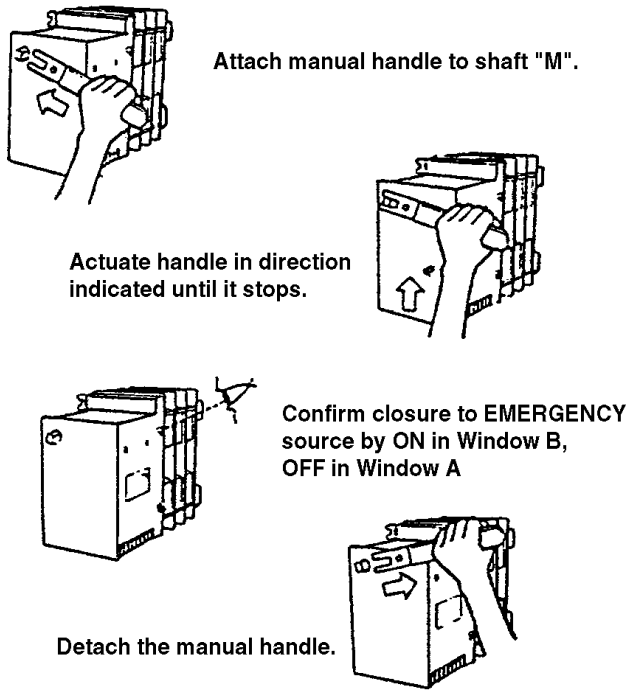
◆ 3.2.3 CLOSE TO EMERGENCY SOURCE SIDE

Before proceeding, verify the position of the switch by observing window "A" and window "B". If window "B" reads ON the ATS is closed in the STANDBY position, with the LOAD connected to the STANDBY source. It is not necessary to manually close in the STANDBY position. See Figure 3.4.

If window "B" reads OFF and window "A" reads ON it will be necessary to trip the ATS to the neutral position. See section 3.2.1.

With handle attached to the actuating shaft. Move manual handle upward as indicated by arrow in illustration until it stops. DO NOT FORCE. Confirm main contacts close to STANDBY source when window "B" is ON and window "A" is OFF. Remove handle from switch.

Figure 3.4 — Closure to Emergency Source Side



3.3 MANUAL OPERATION OF RACKING MECHANISM

CAUTION

The Racking mechanism is internally interlocked to prevent disconnecting the ATS mechanism unless the Load is connected to one of the sources through the Bypass mechanism. Verify the position of the ATS mechanism. Move the Bypass Handle to close the Bypass mechanism in the same position as the ATS is closed in. These operations need to be done with the enclosure door closed. The manual handles mounted on the door will not engage to the mechanism properly unless the enclosure door is completely closed and securely latched.

Manual operation of the Racking mechanism will require using 2 handles; the Racking Handle and the Racking Enable Handle.

◆ 3.3.1 ATS FROM NORMAL TO TEST POSITION (STEP A)

Move Racking Enable handle to Enable. This is done by rotating it counterclockwise. See Figure 3.5.

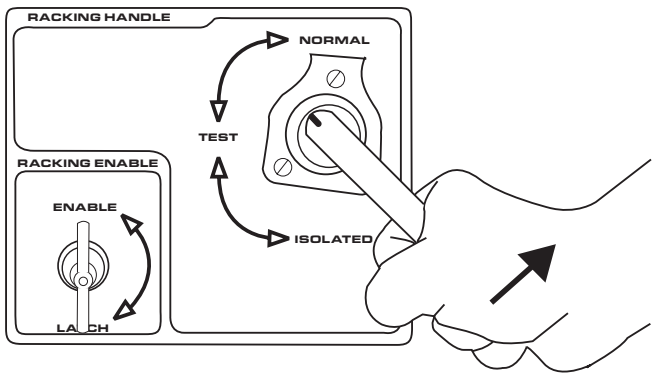
Rotate Racking Handle to TEST position. This is done by rotating the handle in the counterclockwise direction until it stops. The pointer on the Racking Handle should be aligned with the word TEST. Verify the Racking Enable handle has returned to the Latch position.

When the racking mechanism is in the TEST position the LOAD terminals of the ATS are disconnected. The operation of the automatic mechanism can be electrically tested using the SYSTEM TEST switch.

NOTE:

This will not affect the customer load.

Figure 3.5 — From Normal to Test Position



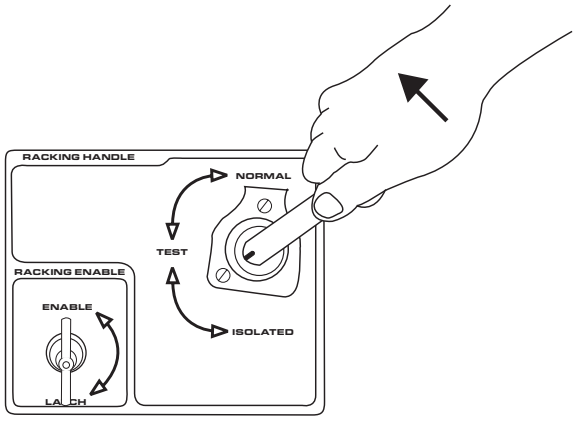
◆ 3.3.2 ATS FROM TEST POSITION TO ISOLATED POSITION (STEP B)

Move Racking Enable handle to Enable. This is done by rotating the handle counterclockwise. See Figure 3.6.

Rotate Racking Handle to ISOLATED position. This is done by rotating the handle in the counterclockwise direction until it stops. The pointer on the Racking Handle should be aligned with the word ISOLATED. Verify the Racking Enable handle returned to the Latch position.

The Racking Handle can be locked in this position to prevent unauthorized movement of the Racking Handle. The locking function is done by using a customer supplied padlock.

Figure 3.6 — From Test Position to Isolated Position



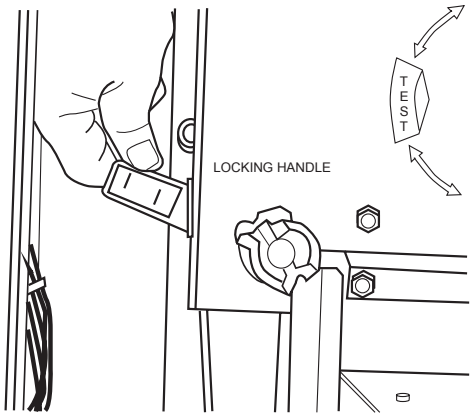
DANGER

The next step will require opening the the enclosure door. If the BIS switch is energized, potentially lethal voltages exist and extreme caution must be used.

◆ 3.3.3 MOVING ATS CARRIAGE TO REMOVAL POSITION (STEP C)

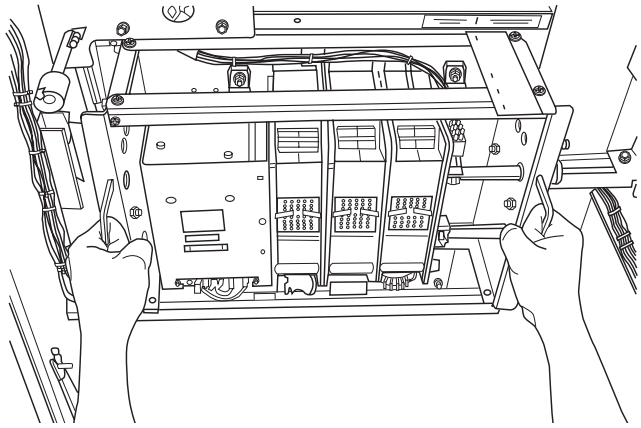
Open the enclosure door. Locate the Racking Enable handle on the left side of the BIS frame. Push down the handle to unlatch the ATS sliding carriage. See Figure 3.7 on page 9.

Figure 3.7 — Unlatch Sliding Carriage



Locate the handles on the front of the ATS carriage. Slowly pull the ATS carriage out until it stops. See Figure 3.8.

Figure 3.8 — Moving Carriage to Removal Position



CAUTION

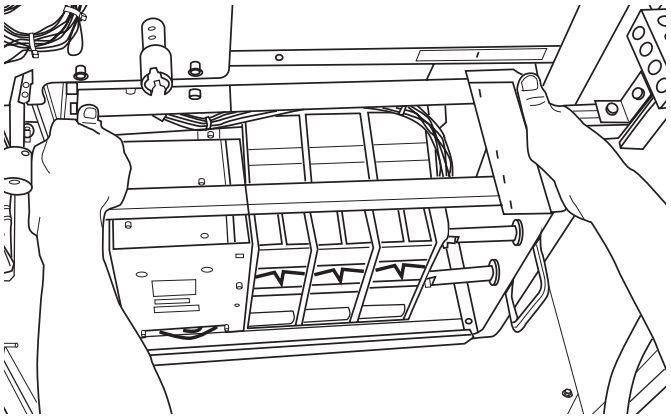
The ATS sliding mechanism weighs at least 50 lbs.. The operator must be capable of lifting this amount of weight or you may risk personal injury.

◆ 3.3.4 REMOVAL OF ATS CARRIAGE FROM BIS FRAME (STEP D)

Locate the cutouts at the top of the ATS sliding carriage. These will be used to lift the ATS carriage from the BIS frame. See Figure 3.9.

Push down the Locking Handle to unlatch the ATS sliding carriage. Lift and pull the ATS sliding mechanism from the BIS frame.

Figure 3.9 — Removal from BIS Frame



CAUTION

The BIS is interlocked to prevent the ATS from being installed when the ATS is in a different position than the Bypass mechanism. Verify the ATS mechanism is in the same position as the Bypass mechanism. If not, it will be necessary to manually move the ATS to the same position as the Bypass mechanism.

3.3.5 RETURNING ATS CARRIAGE INTO BIS FRAME

Push down the Racking Enable handle to unlatch the ATS sliding carriage. Using the lifting handles on the ATS carriage, lift the ATS carriage and place it into the BIS frame. Be sure to align the sliding rails and push in until it latches. Push down the Racking Enable handle to unlatch the ATS sliding carriage and push the ATS carriage in until it latches.

The ATS carriage is now set up to reverse the rack-out procedure and return the ATS mechanism to the NORMAL position.

To return the ATS sliding carriage to the Normal position it will be necessary to repeat steps D to A. Starting with step D, then C, and so on.

NOTE:

Be sure to return the Bypass Handle to the AUTO position. Failure to do so will not allow the ATS to operate automatically.

3.4 VOLTAGE CHECKS

DANGER

Disconnect all loads from the transfer switch until all voltage checks and phase rotation checks have been completed to prevent possible injury to personnel and, or damage to equipment.

For safety, set the safety disconnect switch (inside transfer switch enclosure) to its manual position before proceeding with voltage checks.

Before proceeding, check the transfer switch data PLATE for switch rated voltage. Make sure the data plate voltage is compatible with NORMAL and STANDBY power source voltages.

Proceed with caution. Do not touch electrically hot terminals, wires, etc. During the voltage checks, the transfer switch is electrically energized.

Perform voltage checks as follows:

1. Inside the transfer switch enclosure, set the Maintenance Disconnect switch to MANUAL.
2. If generator is so equipped, set the Manual-Off-Auto switch to OFF.
3. On the switch enclosure door, set SYSTEM TEST switch to AUTOMATIC MODE position.
4. Check that the word "ON" is visible in Window "A", the word "OFF" in Window "B". See Section 3.2 on page 5, MANUAL OPERATION OF ATS MECHANISM for location of "A" and "B" windows.
5. Check that the bypass handle is in the AUTO position. If not, manually move handle to the AUTO position.
6. Check that the Racking Handle is in the NORMAL position. If not manually move to the NORMAL position.
7. Check that the Racking Enable Handle is in the LATCH position. If not, manually move to the LATCH position.

CAUTION

Before proceeding to voltage checks, manually connect the load to NORMAL power supply. window "A" must indicate ON, Window "B" must indicate OFF before proceeding.

8. Turn ON the NORMAL (Utility) power supply to the transfer switch, with whatever means provided (such as the main line circuit breaker).

IMPORTANT: DO NOT PROCEED UNTIL STEPS 1-8 HAVE BEEN COMPLETED.

DANGER

The transfer switch is now electrically hot. Proceed with caution.

9. With UTILITY voltage available to the transfer switch, check that the Automatic Transfer Switch (Closed to Normal) LED on the enclosure door is ON. If the Automatic Transfer Switch (Closed to Normal) LED is OFF, turn off the utility power supply to the transfer switch by whatever means provided (such as the main line circuit breaker), then proceed back to Step 1 of "VOLTAGE CHECKS".
10. Inside the transfer switch enclosure door, locate the Utility Voltage Sensor Circuit Board. The UTILITY ON light (LED) should be ON.
11. With an accurate AC voltmeter, check the phase-to-phase (line-to-line) and phase-to-neutral (line-to-neutral) voltages present at transfer mechanism terminals N1, N2, N3 and neutral. SUPPLIED VOLTAGES MUST BE FULLY COMPATIBLE WITH TRANSFER SWITCH RATED VOLTAGE.

DANGER

Ensure that the phase rotation of NORMAL (Utility) power lines and transfer switch load power lines are compatible.

12. Refer to the standby generator instruction manual. Make sure the generator engine has been properly serviced and prepared for use, as outlined in that manual. Then start the generator engine manually. Let the engine stabilize and warm up for a few minutes.
13. Turn ON the EMERGENCY (GENERATOR) power supply to the transfer switch by whatever means provided (such as the main line circuit breaker).
14. With the generator running, check that the EMERGENCY source available LED light on the switch enclosure door is ON.
15. With an accurate AC voltmeter, check phase-to phase (line-to-line) and phase-to neutral (line-to neutral) voltages present at transfer mechanism terminals E1, E2 and E3. Also check AC frequency at those terminals. If frequency is incorrect, the engine governor may require adjustment. Generator AC output voltage and frequency must be compatible with transfer switch rated voltage and frequency.

DANGER

Ensure that the phase rotation of EMERGENCY (GENERATOR) power lines and transfer switch NORMAL (UTILITY) and load power lines are compatible.

16. If supplied voltage or frequency is incorrect, refer to standby generator Owner's Manual. If AC frequency is incorrect, adjust engine governed speed. If voltage is incorrect, adjust generator's voltage regulator or correct the problem.

17. When supplied voltage and frequency is correct, shut down the engine manually.

⚠ DANGER ⚠

Supplied voltages from both NORMAL (Utility) and EMERGENCY (Generator) power sources must be compatible with transfer switch rated voltage before proceeding.

18. Connect the transfer switch load to the transfer switch when "voltage checks" section has been completed. Connect the load to the transfer switch by whatever means provided [such as circuit breaker(s)], then proceed with the "ELECTRICAL OPERATION" section.

NOTE:

After manual operation checks, mechanisms should be in the following positions.

- **Bypass Handle in AUTO.**
- **Racking Handle in NORMAL.**
- **Racking Enable in LATCH.**
- **ATS in UTILITY.**

3.5 ELECTRICAL OPERATION

Test transfer system electrical operation as follows:

1. On the Utility Voltage Sensor circuit board, check that the UTILITY ON lamp (LED) is ON.
2. In the switch enclosure, set the Maintenance Disconnect switch to AUTOMATIC.
3. On the enclosure door, check that the following lamps are ON:
   - Normal source available - ON
   - Automatic Transfer Switch (Closed to Normal) - ON
   - ATS Racking System - NORMAL
   - All other lamps should be OFF.

⚠ CAUTION ⚠

The UTILITY ON lamp (on circuit board) and the SWITCH POSITION-UTILITY lamp (on enclosure door) must both be ON before proceeding to Step 3.

4. Refer to the appropriate owner's manual. Be sure the standby generator is prepared for automatic operation.
5. In the switch enclosure, set the Maintenance Disconnect switch to AUTOMATIC.
6. Set the System Test switch to its NORMAL TEST MODE position. Generator startup and transfer to the STANDBY power source should occur. Refer to the SEQUENCE OF OPERATION, Section 3.13.

NOTE:

All systems are equipped with the Inphase Monitor Control board, and advisory lights on the circuit board will light up to indicate operation of the various solid state timers that control automatic operation. By observing these lights (LED's), the operator can check the automatic operating sequences and times. See SENSOR AND TIMER ADJUSTMENTS, Section 3.25. For a detailed description of the automatic operating sequences, see SEQUENCE OF OPERATION, Section 3.13.

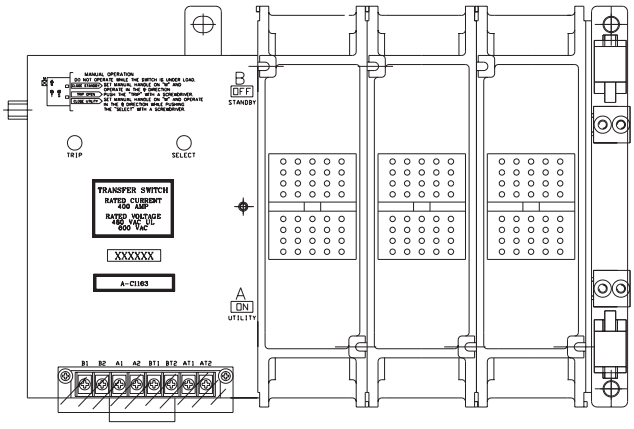
7. When the test is complete, return the System Test Switch to its AUTOMATIC MODE position. Retransfer back to the UTILITY (normal) power source. The generator should shut down according to circuit board timers.

3.6 TRANSFER MECHANISM

The transfer mechanism houses the main, current carrying contacts, along with other mechanical and electrical components required for operating the switch (Figure 3.10). Main contacts are actuated by a single solenoid, are electrically operated and mechanically held. A separate solenoid coil is used to trip open the main contacts. A third solenoid coil is used to set up the internal linkage for closing the main contacts. Power for that coil's operation is taken from the side to which the LOAD is being transferred. Thus, transfer to any power source cannot occur unless that power source is available to the switch.

LOAD or "T" contacts, bolted to an insulated plastic pole piece are stationary. The NORMAL (utility) and STANDBY (emergency) contacts are moveable. The contacts are actuated by means of a closing coil and mechanical linkage. The pole assemblies which retain the stationary moveable main contacts are sandwiched together and retained by thru-bolts. Either 3 or 4-pole assemblies may be used to form a 3 or 4-pole mechanism.

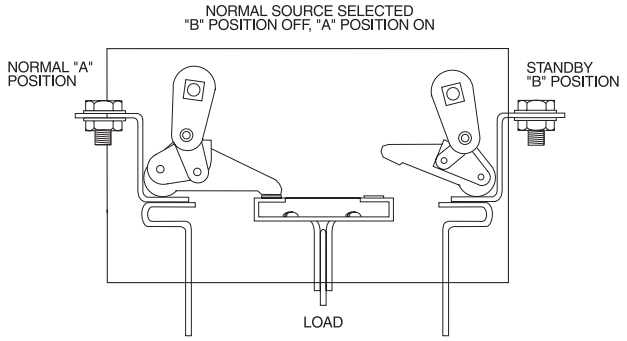
Figure 3.10 — The Transfer Mechanism



3.7 MAIN CONTACTS AT NORMAL (UTILITY)

The illustration (Figure 3.11) shows the LOAD terminals connected to the NORMAL (utility) terminals. Window "A" will display the word "ON"; Window "B" the word "OFF".

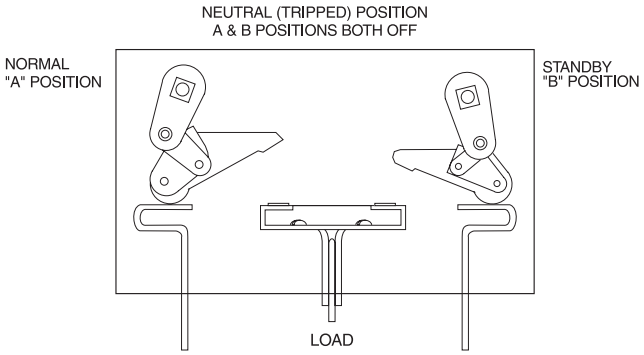
Figure 3.11 — Main Contact at Normal (Utility)



3.8 MAIN CONTACTS AT NEUTRAL

LOAD terminals are disconnected from both power supply terminals. The word "OFF" will be displayed in both Windows "A" and "B" (Figure 3.12).

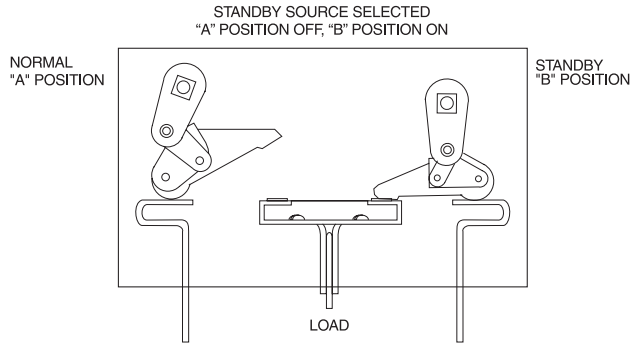
Figure 3.12 — Main Contacts at Neutral



3.9 MAIN CONTACTS AT STANDBY (EMERGENCY)

LOAD terminals are connected to the standby (emergency) power supply. Window "B" will display the word "ON"; Window "A" the word "OFF" (Figure 3.13).

Figure 3.13 — Main Contacts at Standby (Emergency)



3.10 SWITCHES AND ADVISORY LAMPS

This section will familiarize the reader with switches and advisory lights on the transfer switch enclosure door, as well as with the Safety Disconnect Switch inside the switch enclosure.

Circuit board inside the switch door may also mount several switches. Operation of these switches will be covered in the section entitled SENSOR AND TIMER ADJUSTMENTS, Section 3.25 on page 20.

3.11 SYSTEM TEST

This switch permits operator selection of AUTOMATIC, NORMAL TEST or FAST TEST mode as follows (Figure 3.14 on page 13):

◆ 3.11.1 AUTOMATIC MODE

Use this switch position for all normal automatic operations. With AUTOMATIC MODE selected, any NORMAL source voltage that dropped below a preset value will result in the automatic sequence of events listed in the chart in Section 3.14 on page 15.

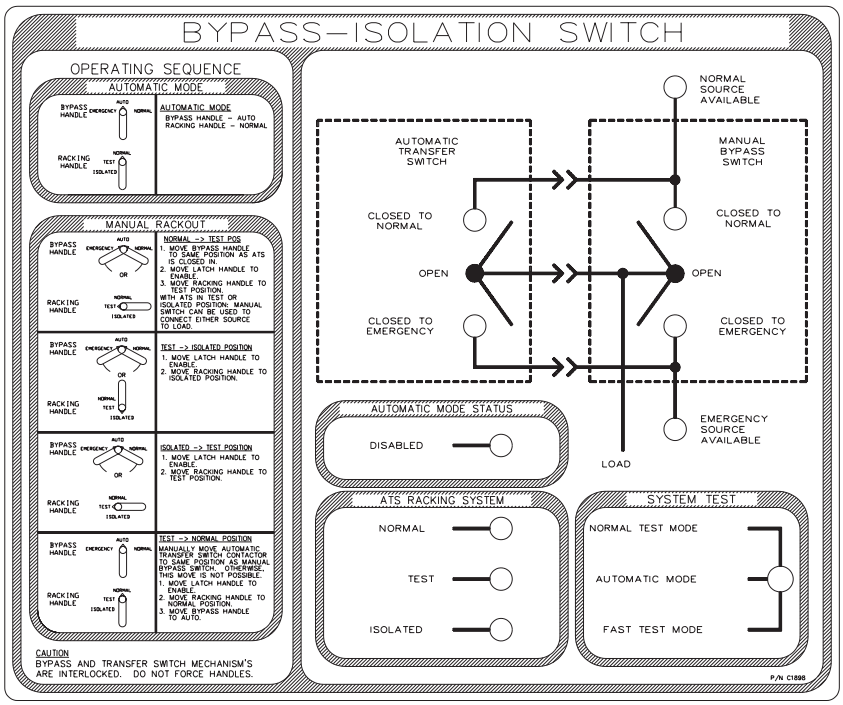
◆ 3.11.2 NORMAL TEST MODE

Permits the operator to test automatic operations, just as though an actual drop in NORMAL source voltage had occurred. See the chart in Section 3.14 on page 15. During the test, observe the lights (LED's) on the transfer switch circuit board to monitor automatic operating sequences.

◆ 3.11.3 FAST TEST MODE

Permits the operator to test system operation with all circuit board timers accelerated to less than five seconds. Switch is spring-loaded back to AUTOMATIC MODE, so continuously press the control to FAST TEST. Following the generator startup, loads are transferred to the EMERGENCY (standby) power source as soon as EMERGENCY source voltage and frequency have reached the settings of STANDBY VOLTAGE and STANDBY FREQUENCY sensors on the SYSTEM CONTROL board.

Figure 3.14 — System Test Switch, Standby Operating Light, and Switch Position Light



3.12 LED DESCRIPTIONS

◆ 3.12.1 NORMAL SOURCE AVAILABLE

This LED will go ON to tell the operator that the Normal (Utility) source is available to the Manual Bypass Switch and the Automatic Transfer Switch.

◆ 3.12.2 EMERGENCY SOURCE AVAILABLE

This LED will go ON to tell the operator that the Standby generator is running and that the Emergency (Standby) source is available to the Manual Bypass Switch and the Automatic Transfer Switch.

◆ 3.12.3 MANUAL BYPASS SWITCH — CLOSED TO EMERGENCY

This LED will go ON to tell the operator that the Manual Bypass Switch contacts are closed in the Emergency (Standby) position. The Customer Load is connected to the Emergency (Standby) source through the Manual Bypass Switch.

◆ 3.12.4 AUTOMATIC TRANSFER SWITCH — CLOSED TO NORMAL

This LED will go ON to tell the operator that the Automatic Transfer Switch contacts are closed in the Normal (Utility) position. This Customer Load is connected to the Normal (Utility) source through the Automatic Transfer Switch.

◆ 3.12.5 AUTOMATIC TRANSFER SWITCH — CLOSED TO EMERGENCY

This LED will go ON to tell the operator that the Automatic Transfer Switch contacts are closed in the Emergency (Standby) position. The Customer Load is connected to the Emergency (Standby) source through the Automatic Transfer Switch.

◆ 3.12.6 AUTOMATIC MODE STATUS — DISABLED

This LED will flash ON and OFF to tell the operator that the Automatic Transfer Switch System is not ready for automatic operation. This LED will flash when any of the following conditions are met:

1. The Maintenance Disconnect switch (inside the box, in the upper left side of subplate) is in the Manual position.
2. The Manual Bypass Switch is closed in either the Normal or the Emergency position.
3. The Automatic Transfer Switch racking position is in any position other than the Normal position.

◆ 3.12.7 ATS RACKING SYSTEM — NORMAL

This LED will go ON to tell the operator that the Automatic Transfer Switch Racking Mechanism is in the Normal position. The Normal position of the racking mechanism is when the ATS sliding contacts are fully engaged to the stationary contacts.

◆ 3.12.8 ATS RACKING SYSTEM — TEST

This LED will go ON to tell the operator that the Automatic Transfer Switch Racking Mechanism is in the Test Position. The Test position of the racking mechanism is when the ATS sliding contacts are not fully inserted into the stationary contacts. The Load busbars are not connected, only the Normal and Emergency source busbars are engaged to the stationary contacts.

◆ 3.12.9 ATS RACKING SYSTEM — ISOLATED

This LED will go ON to tell the operator that the Automatic Transfer Switch Racking Mechanism is in the Isolated position. The Isolated position of the racking mechanism in when none of the ATS sliding contacts are inserted into the stationary contacts.

NOTE:

The above mentioned source available LED's are powered from their respective sources.

The above mentioned switch position and status LED's are powered from the Load side of the switch. The LED's will only provide an accurate indication when there is voltage present on the Load terminals.

3.13 SEQUENCE OF OPERATION

When acceptable NORMAL source voltage is available, you can observe the following:

- Utility voltage Sensor circuit board monitor's NORMAL source voltage and UTILITY ON lamp is ON.
- Switch Position - UTILITY lamp is ON.
- Transformer reduced LOAD (T) terminal voltage is delivered to the 7-day exerciser board to operate the 7-day exercise timer.

If you want, you can monitor which automatic timers and sensors on the Inphase Monitor Control circuit board are active by observing light emitting diodes (LED's) next to the sensor/timer adjustments.

◆ 3.13.1 SEQUENCE 1 - VOLTAGE DROPOUT

- UTILITY source voltage drops below 75-95% of the Voltage Pickup Setting (factory set to about 80%). The UTILITY ON lamp goes OFF.
- Voltage Dropout sensor is factory set to about 80% of "pickup" voltage.
- Voltage dropout below this sensor's setting triggers Sequence 2.

◆ 3.13.2 SEQUENCE 2 - LINE INTERRUPT DELAY

- UTILITY voltage dropout below setting of Voltage Dropout sensor turns on a Line Interrupt Delay Timer.
- Line Interrupt Delay may be set for 0.1 to 10 seconds; has been factory set to about 5 seconds.
- If voltage dropout lasts longer than Line Interrupt Delay setting, circuit board action closes the automatic start circuit (Wires 178 and 183). When that circuit closes, engine cranks and starts as controlled by a circuit board in the generator's control panel.
- Once the standby generator starts, circuit board is turned ON (go to Sequence 3).

◆ 3.13.3 SEQUENCE 3 - ENGINE MINIMUM RUN AND WARMUP TIMERS

- This timer establishes the minimum length of time for the generator to run before you can shut it down. Timer prevents shutdown of a cold engine.
- Timer is adjustable from 5 to 30 minutes; factory setting is about 20 minutes.
- An engine warmup timer is also turned ON. This timer permits engine to stabilize and warm up before loads are transferred to STANDBY. Timer is adjustable from 5 seconds to 3 minutes; factory setting is about 1 minute.

NOTE:

Actual time between re-transfer back to UTILITY and engine shutdown is whichever is longer of the Engine Cool Down timer setting or any time remaining on Engine Minimum run timer.

◆ 3.13.4 SEQUENCE 4 - STANDBY VOLTAGE AND FREQUENCY SENSORS

- If generator AC output voltage and frequency is above the setting of these sensors, loads transfer to the STANDBY power source.
- Adjust Standby Voltage Sensor between 85% and 95% of nominal supply voltage; factory setting is about 90%.
- Adjust Standby Frequency Sensor between 80% and 90% of nominal supply frequency; factory setting is about 90%.

NOTE:

You can bypass the engine warmup timers by setting the Engine Warmup Timer Bypass switch to ON. Loads are transferred to STANDBY as soon as generator AC voltage and frequency have reached the settings of the Voltage and Frequency sensors without having to wait for the engine to warm up.

◆ 3.13.5 SEQUENCE 5 - VOLTAGE PICKUP

- If the UTILITY source voltage is restored above the setting of the Voltage Pickup sensor, Sequence 5 begins.
- Adjust Voltage Pickup between 85% to 95% of the normal supply voltage from the UTILITY source; factory setting is about 90%.

◆ 3.13.6 SEQUENCE 6 - RETURN TO UTILITY TIMER

- This timer prevents re-transfer that a Utility Source voltage surge or transient might cause.
- Adjust timer between 1 to 30 minutes; factory setting is about 5 minutes.
- If UTILITY voltage remains above the setting of the Voltage Pickup Sensor for the time interval of the Return to Utility Timer setting, loads are re-transferred back to the UTILITY source.

◆ 3.13.7 SEQUENCE 7 - ENGINE COOL DOWN TIMER

- After the switch re-transfers loads back to UTILITY, this timer starts. When the interval has "timed out", the automatic start circuit (Wires 178/183) is opened, and the engine shuts down.
- Timer permits engine to run at no-load for a fixed time, so the engine internal temperature can stabilize before shutting down.
- Set the timer for 1-30 minutes; factory setting is about 10 minutes.

NOTE:

Actual time between re-transfer back to UTILITY and engine shutdown is whichever is longer of the Engine Cool Down timer setting or any time remaining on Engine Minimum run timer.

After the switch automatically re-transferred loads back to the UTILITY power source and generator has shut down, the system is "armed" for Sequence 1 again.

3.15 BYPASSING PROCEDURE

This procedure explains how to bypass the closed Automatic Transfer Switch contacts. This must be done before the ATS can be moved to the TEST or ISOLATED position.

3.14 SEQUENCE OF OPERATION SETTINGS

Units with Inphase Monitor Control Circuit Board

SEQUENCE	ACTION	TIMER/SENSOR	ADJUST RANGE	FACTORY SETTING
—*	UTILITY volts available - no action	Voltage Dropout Sensor	75 - 95%	80%
A*	UTILITY voltage drops out	Voltage Dropout Sensor	75 - 95%	80%
B	Line Interrupt Delay Timer Starts	Line Interrupt Delay Timer	0.1 - 10 seconds	5 seconds
C	Line Interrupt Delay Timer Stops	Line Interrupt Delay Timer	.01 - 10 seconds	5 seconds
—	Engine cranks and starts			
D	Engine Minimum Run Timer starts	Engine Minimum Run Timer	5 to 30 minutes	20 minutes
E**	Engine Warmup Timer Starts	Engine Warmup Timer	5 sec. - 3 min.	1 minute
F	EMERGENCY source available LED ON			
G**	Engine Warmup Timer stops	Engine Warmup Timer	5 sec. - 3 min.	1 minute
H	Is STANDBY voltage good?	Standby Voltage Sensor	85 - 95%	90%
J	Is STANDBY frequency good?	Standby Frequency Sensor	80 - 90%	90%
K	Time Delay at NEUTRAL	Time Delay Neutral Timer	0.1 - 10 seconds	5 seconds
L	Inphase Transfer	Inphase Transfer Select	None	
—	Transfer to STANDBY			
M	ATS - Closed to Normal LED ON			
—	STANDBY source powers LOAD			
N	UTILITY voltage restored	Voltage Pickup Sensor	85 - 95%	90%
—	Normal source available LED ON			
O	Return to UTILITY Timer ON	Return to Utility Timer	1 - 30 minutes	5 minutes
P	Timed Delay at NEUTRAL	Time Delay Neutral Timer	0.1 - 10 seconds	5 seconds
R	Inphase Transfer	Inphase Transfer Select	none	0.1 - 30 seconds
S****	Signal Before Transfer LED lights	Signal Before Transfer Timer	1 - 30 seconds	10 seconds
—	Re-transfer to UTILITY source			
—	ATS - Closed to Normal LED			
T***	Engine Cooldown Timer starts	Engine Cooldown Timer	1 - 30 minutes	10 minutes
U***	Engine Cooldown Timer stops	Engine Cooldown Timer	1 - 30 minutes	10 minutes
—	Engine shuts down			
—	UTILITY volts available - no action			

* 75 - 95% of the Voltage Pickup Sensor setting
** Engine Warmup Timer can be bypassed. See SENSOR AND TIMER ADJUSTMENTS
*** Following re-transfer to UTILITY source, engine shutdown will not occur until both Engine Minimum run and Engine Cooldown timers have timed out.
**** Only active if option is provided and selected.

CAUTION

The bypass mechanism can only be closed in the same position that the ATS mechanism is closed in. Trying to close the bypass mechanism in a position other than the ATS is closed in, will result in damage to the interlocking mechanism.

Refer to Manual Operation of ATS Mechanism, Section 3.2 for details of operation.

3.16 TEST

This procedure explains how to move the ATS from the NORMAL to TEST position.

1. Bypass the closed ATS set of contacts. See Bypassing procedure section above.
2. To move the ATS to the TEST position refer to Manual Operation of Racking Mechanism, Section 3.3.1, page 8.

The normal electrical operation of the ATS can be verified at this time. The NORMAL and EMERGENCY sources are connected and the LOAD is disconnected from the ATS. The customer load is being supplied through the Bypass Switch contacts.

It is possible to check the electrical operation of the ATS at this time without interrupting the Customer Load. Use the door mounted System Test switch. The Fast Test Mode will test all functions without the time delays. See description of Fast Test Mode in Section 3.11.3, page 12. The Normal Test Mode will test all functions with the preset time delays.

3. To move the ATS to the ISOLATED position. Refer to Manual Operation of Racking Mechanism, Section 3.3.2, page 8.

3.17 ATS SWITCH REMOVAL

This procedure explains how to remove the ATS mechanism carriage from the BIS frame.

Refer to Removal of ATS Carriage from BIS Frame in Sections 3.3.3 and 3.3.4 for detailed instructions.

3.18 ATS SWITCH REINSTALLATION

This procedure explains how to reinstall the ATS mechanism carriage into the BIS frame.

Refer to Manual Operation of Racking Mechanism section 3.3.5 for detailed instructions.

3.19 RETURN TO SERVICE

This procedure explains how to return the BIS and ATS switch mechanisms to normal, automatic service after the servicing the ATS mechanism.

Refer to Manual Operation of Racking Mechanism section 3.3.5 for detailed instructions.

3.20 TRANSFER SWITCH OPTIONS

The transfer switch may be equipped with one or more of the following options:

- Signal Before Transfer
- Remote Auto Control
- Preferred Source Selector
- Manual 3-Position Selector Switch (Normal, Auto, Standby)
- Manual bypass for return to Normal

◆ 3.20.1 OPTIONAL INSTRUMENT PACKAGE

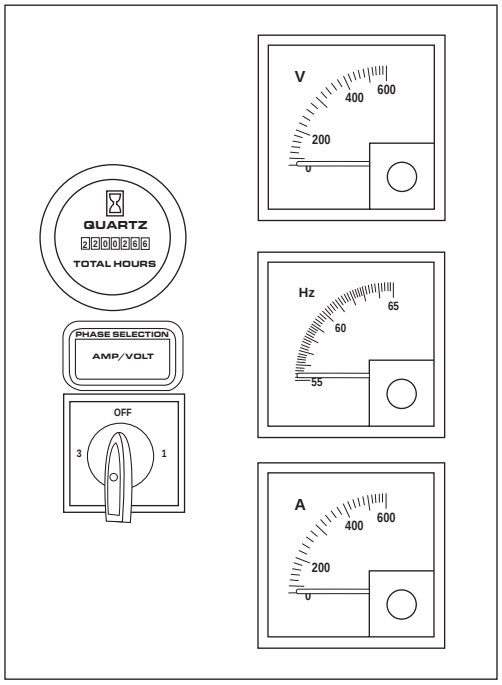
The optional instrument package includes (a) an AC voltmeter, (b) an AC ammeter, (c) an AC frequency meter, (d) an hourmeter, and (e) a phase selector switch (Figure 3.15). Several current transformers are required to operate the instrument package, i.e., two for single phase systems, three for 3-phase systems. Use the phase selector switch to select the 1-phase voltage and current being read as follows:

SWITCH OPERATION	CURRENT READING	VOLTAGE READING
1	Line 1	Line 1 to Neutral
2	Line 2	Line 2 to Neutral
3	No reading	Line 1 to Line 2
OFF	No reading	No reading

For 3-phase systems use the switch as follows:

SWITCH OPERATION	CURRENT READING	VOLTAGE READING
1	Phase A	Phase A to Phase B
2	Phase B	Phase B to Phase C
3	Phase C	Phase C to Phase A
OFF	No reading	No reading

Figure 3.15 — Instrument Package



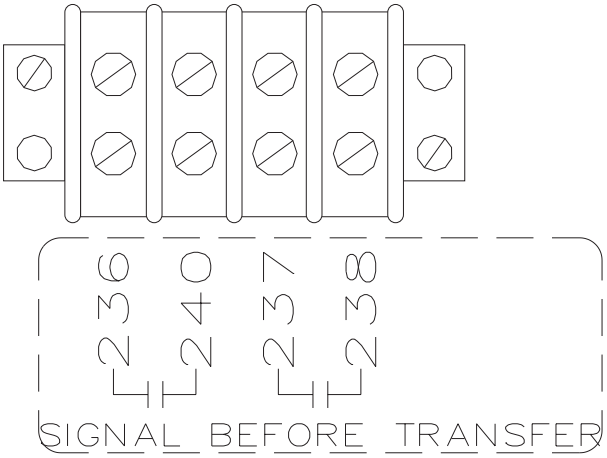
◆ 3.20.2 SIGNAL BEFORE TRANSFER

The signal before transfer option includes a signal relay, customer connection terminal strip and the associated wiring. See Figure 3.16.

The logic for this option is a part of the Inphase Monitor Control PCB. The option is active when the Signal Before Transfer switch is ON. The delay time is adjustable from 1 to 30 seconds.

The basic operation of the option is to delay (for the period of time set on timer knob) the transfer of the ATS mechanism while a signal relay (SR) is energized. When the relay is energized, 2 sets of the dry contacts (wire nos. 236-240 and 237-238) are closed. These dry contacts can be connected to, via a terminal strip located on the bottom of the subplate. Reference the wiring diagram no. C1907 for further details. The customer connections are made on terminal strip TS4.

Figure 3.16 — Signal Before Transfer



NOTE:

This delay is not active on a Normal source failure. Transfer during Normal source failure is immediate.

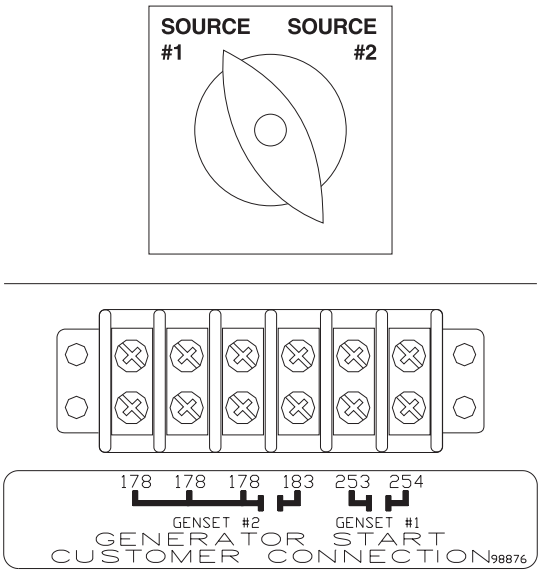
3.21 REMOTE AUTO CONTROL

The Remote Auto Control option includes a customer connection terminal strip and the associated wiring (Figure 3.17).

This option allows for remote starting of the generator and transfer of the ATS to connect the Load to the Emergency source. This is done by paralleling the Fast Test switch. A description of the Fast Test Mode function can be found in section 3.11.3 on page 12.

Reference the wiring diagram No. C1907 for further details. The customer connections are made on TS3. The associated wire numbers are 0, 177, 178 and 201.

Figure 3.17 — Remote Auto Control



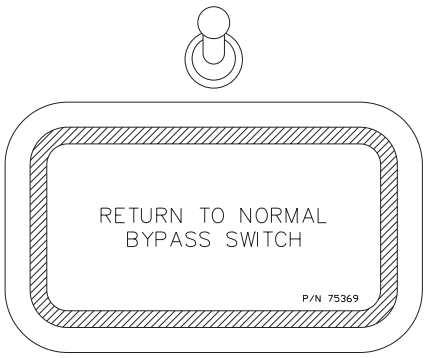
3.22 MANUAL BYPASS FOR RETURN TO NORMAL

The Manual Bypass for Return to Normal option includes a door mounted toggle switch and associated wiring (Figure 3.18).

This option will override the Return to Utility timer on the Inphase Monitor Control PCB. When the toggle switch is activated (pushed down), and the Return to Utility timer is active, the remaining time on the timer will be cleared. Once the timer is cleared the ATS mechanism will transfer and the Load will be connected to the Normal source.

If the toggle switch is not activated, the Return to Utility timer will function as normal. The retransfer of the ATS will be delayed until it times out.

Figure 3.18 — Manual Bypass for Return to Normal



3.23 PREFERRED SOURCE SELECTOR SWITCH

The Preferred Source Selector Switch option includes a door mounted rotary 2-position selector switch, customer connection terminal strip and associated wiring (Figure 3.17 on page 17).

This option is normally used when there is not a Utility supply present and both sources are a generator. It may be used when it is desirable for either source of power to serve as the preferred source. The other power source then becomes the backup source. The switch is manually operated

When the rotary switch is in position Source #1 the ATS will perform as a normal system. Generator #1 will be the primary source and generator #2 will be the backup source.

When the rotary switch is in position #2, the ATS will signal generator #2 to start and the ATS will transfer the Load to generator #2. If Source #2 fails, Source #1 will be signaled to start. The ATS mechanism will transfer the Load to Source #1. When Source #2 returns to service, the ATS will transfer the Load to Source #2.

Reference the wiring diagram No. C1907 for further details. The customer connections are made on TS2. The associated wire numbers are 178, 183, 253 and 254.

3.24 MANUAL 3-POSITION SELECTOR SWITCH (NORMAL-AUTO-STANDBY)

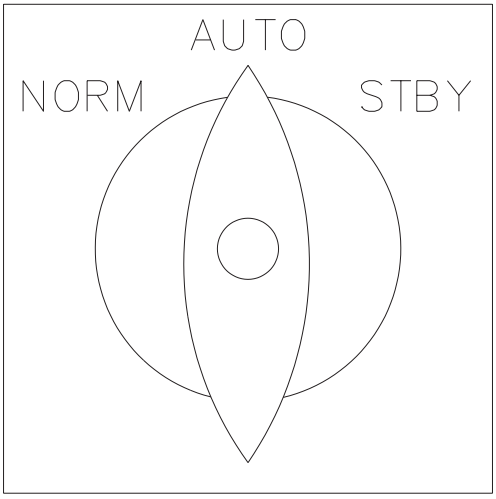
The Manual 3-Position Selector Switch option includes a door mounted rotary 3-position selector switch and associated wiring (Figure 3.20).

Under certain conditions it may be desirable to manually select the active power source. This can be done by means of the door mounted selector switch. The Normal - Auto - Standby, 3-position selector switch provides the following:

1. When the switch is set to the Normal position, the Load will be connected to the Normal source and any other transfer will be inhibited.
2. When the switch is set to the Auto position, the ATS will function as normal. See the Sequence of Operation section 3.13, page 13.
3. When the switch is set to the Standby position, the Load will be connected to the Emergency source and any other transfer will be inhibited.

Reference the wiring diagram No. C1907 for further details.

Figure 3.20 — Manual 3-Position Switch



3.25 SENSOR AND TIMER ADJUSTMENTS — SENSING CIRCUIT BOARD

◆ 3.25.1 VOLTAGE DROPOUT SENSOR

This sensor (Figure 3.21 on page 19) establishes the NORMAL power source voltage which generator start-up and transfer to STANDBY (Emergency) power source occurs. Adjust the sensor to any voltage between 75-95% of the nominal voltage Pickup Sensor setting, by turning the adjusting knob to the desired setting (in percent). Sensor is factory set to about 80% of the Voltage Pickup Sensor setting.

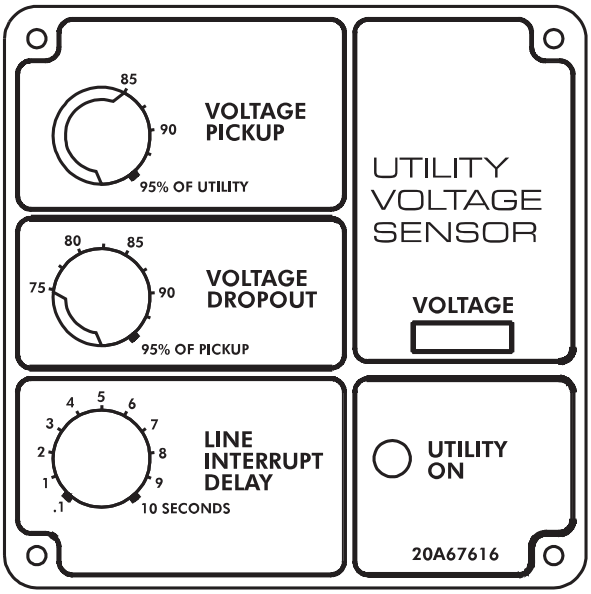
◆ 3.25.2 VOLTAGE PICKUP SENSOR

This sensor establishes the NORMAL power source voltage at which re-transfer back to that power source occurs. Turn knob to adjust setting to 85-95% of the nominal NORMAL source supply voltage. Sensor has been factory set to about 90% of nominal rated NORMAL source voltage.

◆ 3.25.3 LINE INTERRUPT DELAY TIMER

The timer establishes a definite time interval between NORMAL source voltage dropout below the setting of the Voltage Dropout Sensor and generator startup. This time interval is necessary to prevent false generator starts that voltage transients might otherwise cause. Adjust timer from 0.1 to 10 seconds; is factory set to about five seconds.

Figure 3.21 — Sensing Circuit Board Panel



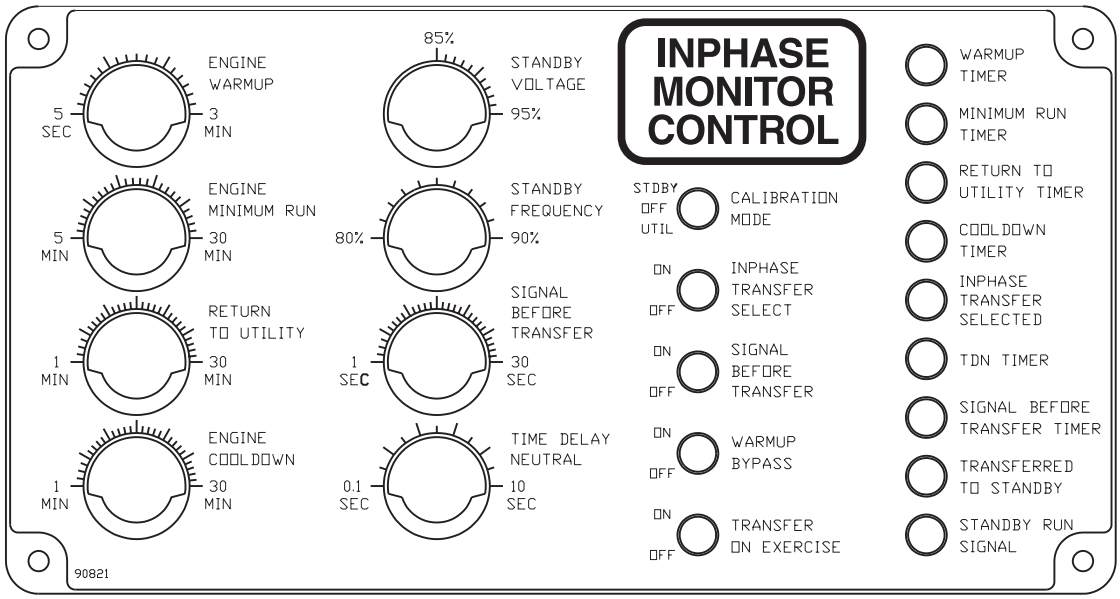
3.26 ADJUSTMENTS ON INPHASE MONITOR CONTROL CIRCUIT BOARD

The Inphase Monitor Control board is operational only when the generator set is running. Transfer will occur when UTILITY and GENERATOR voltage and phase are comparatively equal with a maximum difference of 20° between the power sources. To assure precision matching control, minimum voltage and frequency ranges are specified by the operator. In addition, each inphase control is programmed with the use of an on board DIP switch to match the actuation time of the corresponding switch. Inphase transfer is used only between two live power sources and NOT during a UTILITY source failure. The Inphase Monitor Control board (Figure 3.22) is designed to transfer loads under the following conditions:

- When generator set frequency is between 58-62 Hz (48-52 Hz for 50 Hz systems).
- When generator set and utility power source frequencies are within 2 Hz.
- When the generator set and utility source voltage are within 85-100 percent of normal voltage.
- When both power sources are able to come into phase within 10 seconds.
- When less than 10 seconds has elapsed since the engine warmup timer has indicated "go ahead."

If any one of the preceding conditions are not met within 30 seconds, the system will automatically revert to Time delay Neutral (if selected). If Time Delay Neutral is not selected, the switch will transfer immediately after failing to do an inphase transfer within the 30 second window.

Figure 3.22 — Inphase Monitor Control Panel



◆ 3.26.1 ENGINE WARMUP TIMER

Permits the engine to warm up before transferring LOAD from NORMAL to STANDBY power. Reset timer to any time interval between 5 seconds and 3 minutes; factory set to about 1 minute.

◆ 3.26.2 ENGINE MINIMUM RUN TIMER

Establishes the minimum length of time the generator must run before it can be shut down automatically. Timer prevents a cold engine from being shut down. It is factory set to about 20 minutes, but you can reset the interval between 5 and 30 minutes.

◆ 3.26.3 RETURN TO UTILITY TIMER

Establishes time interval between restoration of NORMAL source voltage above the setting of the Voltage Pickup Sensor and re-transfer back to that source. This time interval is necessary, to prevent re-transfer that otherwise might occur as a result of transient voltages. Timer may be reset to any interval between 1 and 30 minutes; factory set to about 5 minutes.

◆ 3.26.4 ENGINE COOL DOWN TIMER

Provides a time delay between automatic re-transfer back to the NORMAL source and engine shutdown. This permits internal engine-generator temperatures to stabilize at "no-load" prior to shutdown. Set timer between 1 and 30 minutes; factory set to about 10 minutes.

NOTE:

The actual time interval between re-transfer back to NORMAL and generator shutdown, is the time remaining on Engine Minimum Run timer or time setting of the Engine Cool Down Timer, whichever is longer.

◆ 3.26.5 STANDBY VOLTAGE SENSOR

After engine starts automatically, the system does not transfer LOAD to STANDBY power source until generator AC output voltage has reached the setting of this sensor. Factory set to about 90% of the nominal rated voltage, but you can reset between 85% and 95% of the unit's rated voltage.

◆ 3.26.6 STANDBY FREQUENCY SENSOR

This adjustment allows the installer or operator to select the minimum required frequency of the standby power source. It is adjustable between 80-90%. Factory set to 90%.

◆ 3.26.7 SIGNAL BEFORE TRANSFER TIMER

If you select this function, this timer will control the amount of time signal remains active. Timer is adjustable from 1 to 30 seconds; factory set to about 10 seconds.

NOTE:

The "Signal Before Transfer" feature provides a time delay that allows elevators to continue operating before transfer to another power supply occurs.

◆ 3.26.8 TIME DELAY NEUTRAL

This timer holds the transfer mechanism's main contacts in the "Neutral" position for the time you have selected. "Neutral" is the main contacts position where the LOAD is disconnected from both UTILITY and STANDBY power supplies. Timer is adjustable from 0.1 and 10 seconds; factory set to about 5 seconds.

◆ 3.26.9 CALIBRATION MODE SWITCH

This switch has three positions, identified as "STDBY", "OFF" and "UTIL". The switch allows the installer or operator to calibrate the circuit board to the existing generator set output voltage and to the existing UTILITY power source voltage. The board must be calibrated to both power source voltages in order to initiate transfer and re-transfer at the correct voltages. To calibrate the circuit board to the correct voltage, see "Calibrating the Circuit Board", section 3.27.

◆ 3.26.10 INPHASE TRANSFER SELECT SWITCH

This switch allows the operator or installer to select either "Inphase Transfer" or "Time Delay Neutral" operation. The switch may be positioned as follows:

- Switch at ON: Inphase transfer operation is selected.
- Switch at OFF: Time Delay Neutral is activated if selected.

◆ 3.26.11 SIGNAL BEFORE TRANSFER SWITCH

This switch allows the operator or installer to select the "Signal Before Transfer" feature or to turn OFF the feature. To activate the feature, set the switch to ON. To turn off the feature, set the switch to OFF. Refer to Section 3.20.2.

◆ 3.26.12 ENGINE WARMUP TIMER BYPASS SWITCH

To bypass Engine Warmup Timer and transfer as soon as generator voltage and frequency have reached the setting of the Standby Voltage and Frequency Sensors, set switch to ON. To place engine warmup Timer back into the automatic operating system, set the switch to OFF.

◆ 3.26.13 TRANSFER ON EXERCISE SWITCH

For transferring LOAD to the STANDBY source during the 7-day exercise cycle, set switch to ON. For no transfer during the exercise, set switch to OFF.

◆ 3.26.14 ADVISORY LAMPS

The advisory lamps (see Figure 3.22 on page 19) on the Inphase Control board consist of 9 LED's (light emitting diodes) and include the following:

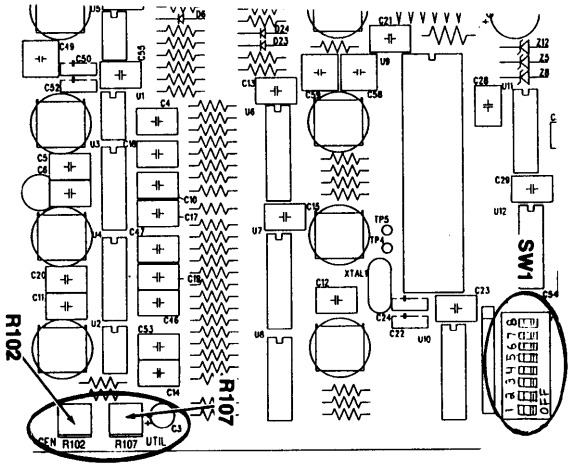
- The four red timer lamps will turn ON when their respective timers are activated.
- The "Inphase Transfer Selected" lamp goes ON when Inphase Transfer Select switch is set to ON, indicating the system will operate in its "Inphase" mode (and NOT in Time Delay Neutral mode).
- The Time Delay Neutral (TDN) Timer lamp will turn ON when the TDN timer is running.
- The Signal Before Transfer Timer lamp will turn ON for the duration of the Signal Before Transfer Timer, when it is turned ON.
- Transfer to Standby Lamp goes ON when LOAD has been transferred to STANDBY power source.
- Standby run Signal will go ON when the generator is running and the Inphase Monitor Control circuit board is operational and controlling the generator.

3.27 CALIBRATING THE INPHASE MONITOR CONTROL CIRCUIT BOARD

The Inphase Monitor circuit board must be calibrated to existing STANDBY and UTILITY source voltages if the system is to operate properly (Figure 3.23). To calibrate the circuit board, two adjustment potentiometers (R102 and R107) are provided in the lower left corner of the circuit board. The board must be calibrated as follows:

1. Check that UTILITY supply voltage is available to the system.
2. Start the generator, let it stabilize and warm up.
3. Set the Calibration Mode Switch to "STDBY" and observe the four top LED's on the circuit board (Warmup Timer, Minimum Run Timer, Return to Utility Timer and Cool down Timer). These are the RED lamps.
   - If the two upper LED's are illuminated, calibration is set too low.
   - If the two bottom LED's are illuminated, calibration is set too high.
4. On the circuit board, adjust potentiometer R102 until only the two center LED's are illuminated (Minimum Run and Return to Utility timers).
5. Now, set the Calibration Mode switch to "UTIL" and observe the four upper LED's on the circuit board.

Figure 3.21 — Inphase Monitor Control Circuit Board



6. Adjust potentiometer R107 until only two center LED's are illuminated (Minimum Run and Return to Utility).
7. Set the Calibration Mode Switch to "OFF". The Inphase Monitor Control board is calibrated.

NOTE:

With the Calibration Mode Switch set to "STDBY" or "UTIL", the four top LED's should turn ON in sequence. That is, the lights should sweep on and off, from one light to the next. Calibration is obtained when the two center lamps of the four (Minimum Run and Return to Utility) are illuminated. This establishes 100% rated voltage.

NOTE:

The Inphase Monitor Control circuit board should be calibrated when the transfer switch has been installed as part of an operating system. Also, replacement circuit boards must be calibrated.

DIP Switch Settings - WN-Type Transfer Switches

TRANSFER SWITCH	SWITCH RATED 208 VOLTS								SWITCH RATED 240/416/480/600 VOLTS							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
400 amps, 3-pole	*	on	on	off	off	on	off	on	*	on	on	off	on	off	off	on
400 amps, 4-pole	*	on	on	off	off	on	on	on	*	on	on	off	on	on	off	off

* Set Switch 1 to OFF for 60 Hz systems; set Switch to ON for 50 Hz systems

3.28 CIRCUIT BOARD SWITCH SW1

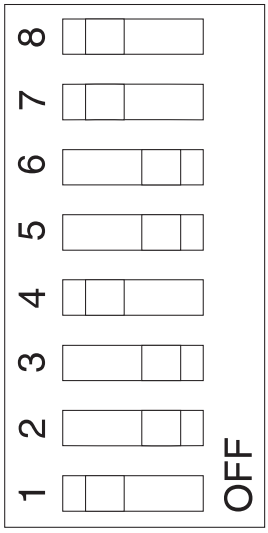
On the Inphase Monitor Control Board, a switch assembly consisting of a bank of eight miniature switches is identified as "SW1" is usually set up at the factory and should require no additional configuring (Figure 3.24).

NOTE:

On boards not installed at the factory, SW1 must be set by the installer. SW1 must be set to match the type of transfer switch in which the board is installed.

The individual switches on SW1 are numbered from "1" (bottom) through "8" (top), as shown in Figure 3.24. To make the circuit board compatible to the specific transfer switch assembly, set the switches as indicated in the chart at the bottom of page 21. Improper settings may cause transfer outside the 20-degree specification.

Figure 3.24 — Circuit Board Switch SW1



3.29 DISPLAY (FIGURE 3.25)

◆ 3.29.1 CURRENT TIME

The current time is selected with the time/alarm push-button and is displayed in 12:00 hour format on four 7 segment LED displays. The colon flashes at a rate of 0.5 seconds on/off to indicate normal operation and display of the current time.

◆ 3.29.2 EXERCISE TIME

The exercise time is selected with the time/alarm push-button, the exercise time for the selected day is displayed in a similar format to current time, except that the colon does not flash but is always ON to indicate that the exercise time is being displayed.

To change the exercise day that is being displayed use the "day" push-button when in this mode.

◆ 3.29.3 PM (TIME)

A single LED indicates PM (ON) time or AM (OFF).

◆ 3.29.4 DAY OF WEEK

The day of the week is indicated on the 7 individual day LEDs which represent Sunday through Saturday.

◆ 3.29.5 EXERCISE ON (EX)

A single LED indicates that the relay output is switched ON (exercise period).

◆ 3.29.6 POWER SAVING

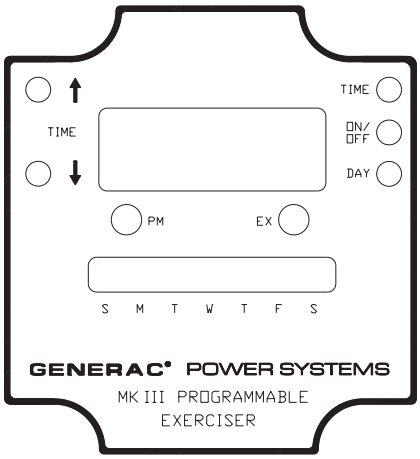
To minimize the power consumption of the unit, the unit will switch to a "dim" display mode of no keyboard activity is noted for 5 minutes. The display brightness is reduced to 50% of normal, but returns to 100% when any key is pressed.

◆ 3.29.7 DEFAULT TIMES

When the exerciser is first powered up, or if power is removed from the unit and the battery backup has expired, the default times will revert to:

Current time	9:00 am
Current day	Sunday
Sun-Sat exercise	9:00 am
Exercise period	20 minutes

Figure 3.25 — Display



3.30 EXERCISE TIMES

Exercise times may be set individually on a day by day basis. Exercise periods can overlap day's, i.e. if a time is set for 11:55 pm Sunday for 20 minutes, it will turn off at 12:15 am Monday.

The exercise period is globally programmable (common to all days), and is limited from 10-119 minutes.

3.31 PUSHBUTTONS (FIGURE 3.25)

◆ 3.31.1 UP ARROW ↑

The up arrow is used to step the time forward in increments of 1 minute. This feature has auto-acceleration such that if the button is held on, the step frequency will progressively increase to allow fast searching of a required time. As soon as the button is released, it will revert to normal speed.

◆ 3.31.2 DOWN ARROW ↓

The down arrow is used to step the time backwards in increments of 1 minute. It also has auto-acceleration.

◆ 3.31.3 TIME (TIME/ALARM TOGGLE)

This toggles the display between normal current time display and exercise time. When in exercise time mode the following happens:

1. The colon stops flashing to indicate exercise time mode.
2. The Sun LED flashes to indicate that it is initially selected. The rate of flashing is either:
   - 50:50% on/off to indicate exercise time is enabled.
   - 90:10% on/off to indicate exercise time is not enabled.
3. All other days that have exercise times enabled to ON are indicated by LED on, days that are disabled are set to LED off.

If the display is inadvertently left in this mode with no keyboard activity for more than 5 minutes, it will revert back to normal (current time) display.

◆ 3.31.4 ON/OFF (ALARM SELECT TOGGLE)

When in exercise mode, this button will toggle the exercise enable/disable status of the displayed day. The rate of flashing will change as above.

◆ 3.31.5 DAY

The day button is used to step forward through the days in either the current time or exercise time:

- In current time mode, the days will step through 7 states indicating Sunday to Saturday.
- In exercise time mode, the days will step through 7 states indicating Sunday to Saturday and will then display state 8 - all days LEDs flashing on/off together which represents the global exercise time period. In this mode, the exercise period may be changed using the up/down arrows as above but the on time is limited to between 10 and 119 minutes.

3.32 PROGRAMMING EXAMPLES

◆ 3.32.1 EXAMPLE 1 — CHANGE TIME FROM SUNDAY 9:00 AM TO WEDNESDAY 2:00 PM

1. Ensure that current time is displayed by flashing colon. If colon is not flashing, then press and release the "time" push-button once.
2. Press and hold the "Up arrow" push-button until the time steps to almost 2:00 pm - note that the pm LED will now be on.
3. Repeatedly press and release "Up arrow" push-button until exact time is obtained. If you go past 2:00 pm then use the "Down arrow" to step back to the required time.
4. Press the "Day" button to advance the day LED display until the LED next to "W" (Wednesday) is on.

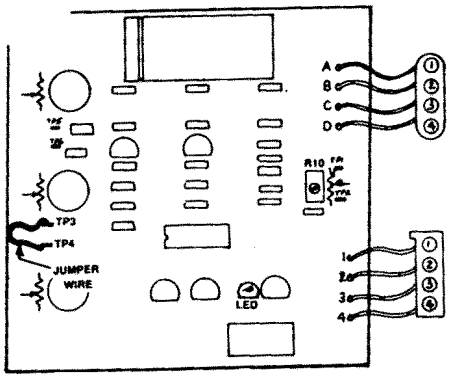
◆ 3.32.2 EXAMPLE 2 — SET EXERCISER ON FOR 14 MINUTES MON-FRI AT 10:00 AM

1. Press and release the "time push-button once to display the exercise time for Sunday, indicated by a static (ON) colon and a flashing "Sun" LED. If the colon is still flashing, then repeat this step.
2. The "Sun" LED should be flashing on/off 90:10, ON but briefly flashes OFF once every 2 seconds. This means that the exercise time is correctly set to OFF for Sunday. If it is 50:50, this indicates that the exercise time is set to ON, so press and release the "on/off" push-button once to toggle this state to OFF.
3. Press and release the "day" button to advance from Sunday to Monday, indicated by the "Mon" LED flashing.
4. Press and release the "on/off" push-button once to toggle the exercise state from OFF to ON. This will be indicated by the "Mon" LED now flashing on/off 50:50 approx. 4 times per second as described previously.
5. Repeat steps 3 and 4 for Tues., Wed., Thurs. and Fri. ensuring the correct on/off exercise status for each day.
6. Press and release the "day" button once more and the display will now show "0:20" which is the exercise period in minutes. This is common for all days and this display mode is indicated by all 7 "day" lights flashing simultaneously.
7. Use the Up/Down arrows to change the exercise period to 14 minutes.
8. Press and release the "time" push-button once to return the display mode to the current time.

3.33 CALIBRATE UTILITY VOLTAGE SENSING CIRCUIT BOARD

The utility sensing interface reduces utility source voltage at a fixed ratio. Thus, if utility voltage varies from the nominal, sensing voltage to the circuit board also varies. For that reason, you may need to calibrate the utility voltage sensing circuit board to match the system (Figure 3.26 on page 24).

Figure 3.26 — Utility Voltage Sensing Circuit Board



CAUTION

The installed transfer switch must be rated at a voltage and phase that is compatible with the utility and standby power supplies. DO NOT attempt to calibrate any utility voltage sensor board on any non-compatible unit trying to make the unit compatible.

Once the circuit board has been properly calibrated, the voltage that was present during calibration establishes 100 percent utility voltage for "pickup" and "dropout" settings. Utility source voltage must be available to the transfer switch during calibration.

NOTE:

You must also use this procedure to calibrate a replacement circuit board. Follow these instructions:

1. In the transfer switch enclosure, set the Safety Disconnect Switch to "Manual".
2. On the Utility Voltage Sensor circuit board, locate test points "TP3" and "TP4" and install a jumper lead.
3. Locate the small potentiometer "R10". Turn the potentiometer fully counterclockwise.
4. Now, turn the "R10" potentiometer SLOWLY clockwise until the "Utility On" light emitting diode (LED) just turns ON.
5. Remove the jumper wire from "TP3" and "TP4".
6. Reset the Maintenance Disconnect switch to "Automatic".

RESULTS:

- If the "Utility On" LED does NOT go on as described above, replace the utility voltage sensor board. Calibrate the new board and perform a "Normal Test" of the system.
- If the "Utility On" LED goes ON, discontinue the test.

4.1 OPERATE TRANSFER SWITCH

Operate the transfer switch at least once each month. This can be done by performing a NORMAL TEST of the system. Because the System Test switch only simulates failure of the UTILITY power source, service will be interrupted only during the actual transfer of the load.

4.2 CLEAN AND INSPECT TRANSFER SWITCH

Protect the transfer switch against construction grit, metal chips, excessive moisture and other harmful dirt at all times. At least once each year turn OFF all power supplies to the switch, then brush and vacuum away dust and dirt that has accumulated inside the enclosure. After cleaning, inspect the transfer switch carefully. Look for evidence of arcing, burning, hot spots, charring and other damage. If any of these are found, have the switch assembly checked by an authorized service technician.

4.3 7-DAY EXERCISER

On each transfer action, the LOAD will be disconnected from both power sources for a brief interval. During such brief intervals, the exercise timer is powered by the 9 volt battery. The display will blank out to conserve battery power. See section 4.6 for battery information.

4.4 LUBRICATION

Operating parts inside the transfer mechanism have been properly lubricated at the time of assembly. Under normal conditions no additional lubrication should be required. The service technician should lubricate all recommended points whenever major transfer mechanism components are replaced.

CAUTION

Use only specified greases to lubricate contactor parts. DO NOT USE ANY SUBSTITUTES.

Use the following lubricants for the:

1. Main Contacts (Between movable contact, busbars and ATS sliding contacts.)
   - Dow Corning (Molykote) BR2 Plus; (Mfg. by Dow Corning Co., USA)

- Liqui-Moly (Mfg. by DAI TO Co., Ltd., Japan)

2. Operating Mechanism (Used on the actuator, other parts of the contactors, and other parts of the mechanism. Excluding the movable contacts.)
   - Mobilgrease 28 (Mfg. by Mobil Oil Co.)
   - Mobiltemp SHC 32 (Mfg. by Mobil Oil Co.)
   - Polo Moly Complex Grease #NLG12 (Mfg. by Polo Lubricants, USA)
   - Rheolube 363 (Mfg. by Nye Lubricants Inc., USA)

4.5 MAIN CURRENT CARRYING CONTACTS

At least once annually, have an Authorized Service Technician check the main current carrying contacts in the transfer mechanism. He will repair or replace major components that have been found defective.

4.6 NINE-VOLT BATTERY

The transfer switch is equipped with an adjustable Inphase Monitor Control circuit board. The battery connects to a separate 7-day exerciser circuit board. Battery power for Exercise Timer operation is only needed during the short time interval when the transfer mechanism main contacts are at NEUTRAL position (LOAD disconnected from both power sources). It is recommended that the 9 volt battery be replaced once each year.

4.7 PROCEDURE TO BYPASS A FAILED ATS DURING UTILITY FAILURE

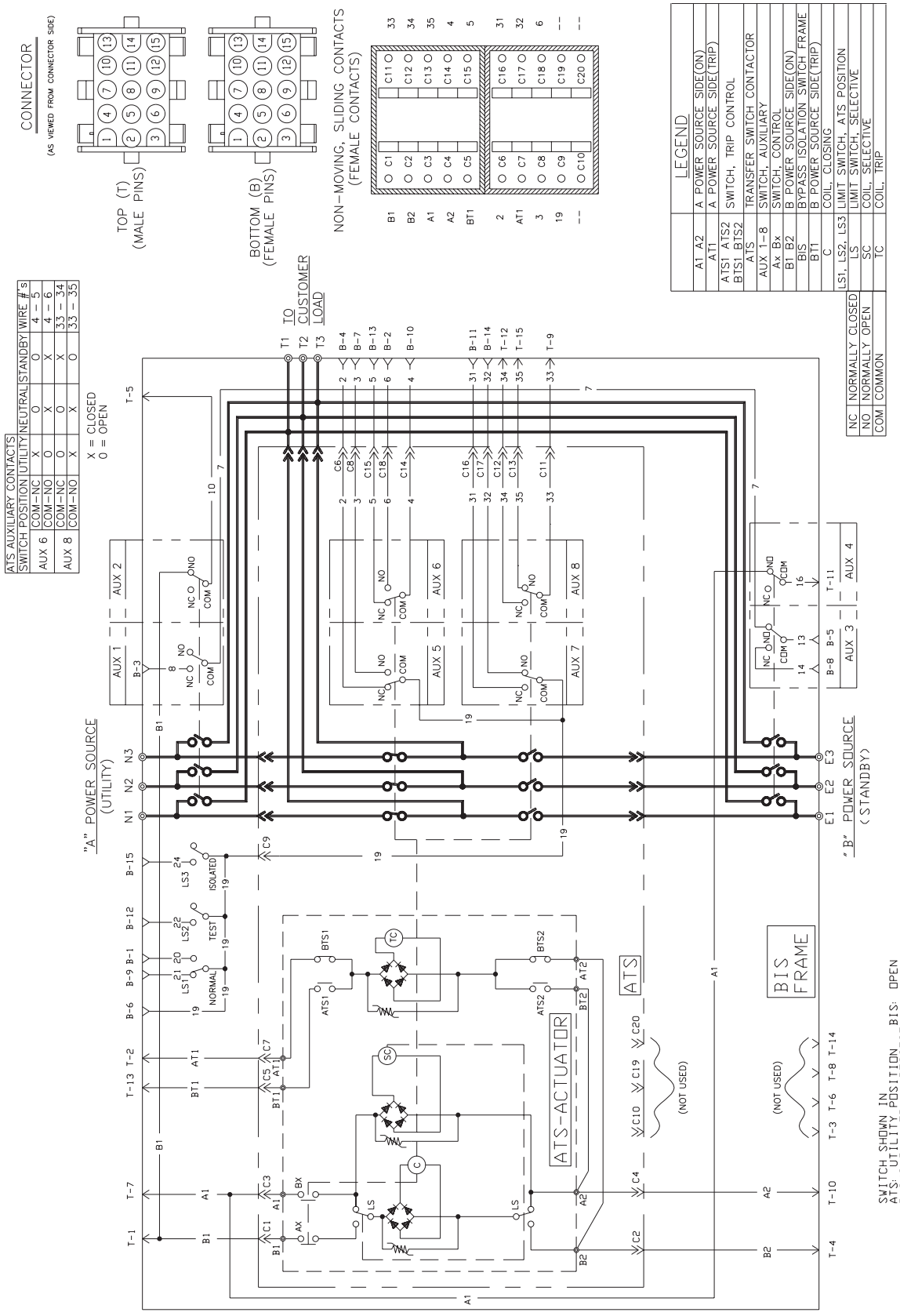
This procedure can be used to manually connect load to the emergency source in the event of an ATS mechanism failure. Perform the following steps:

1. Move Bypass Handle to Normal position.
2. Rotate Racking Enable Handle counterclockwise to Enable position.
3. Move Racking Handle to Test position.
4. Move Bypass Handle to Emergency position.

Refer to the Manual Operation of Racking Mechanism, Section 3.3, for instructions on how to isolate and remove ATS mechanism for repairs.

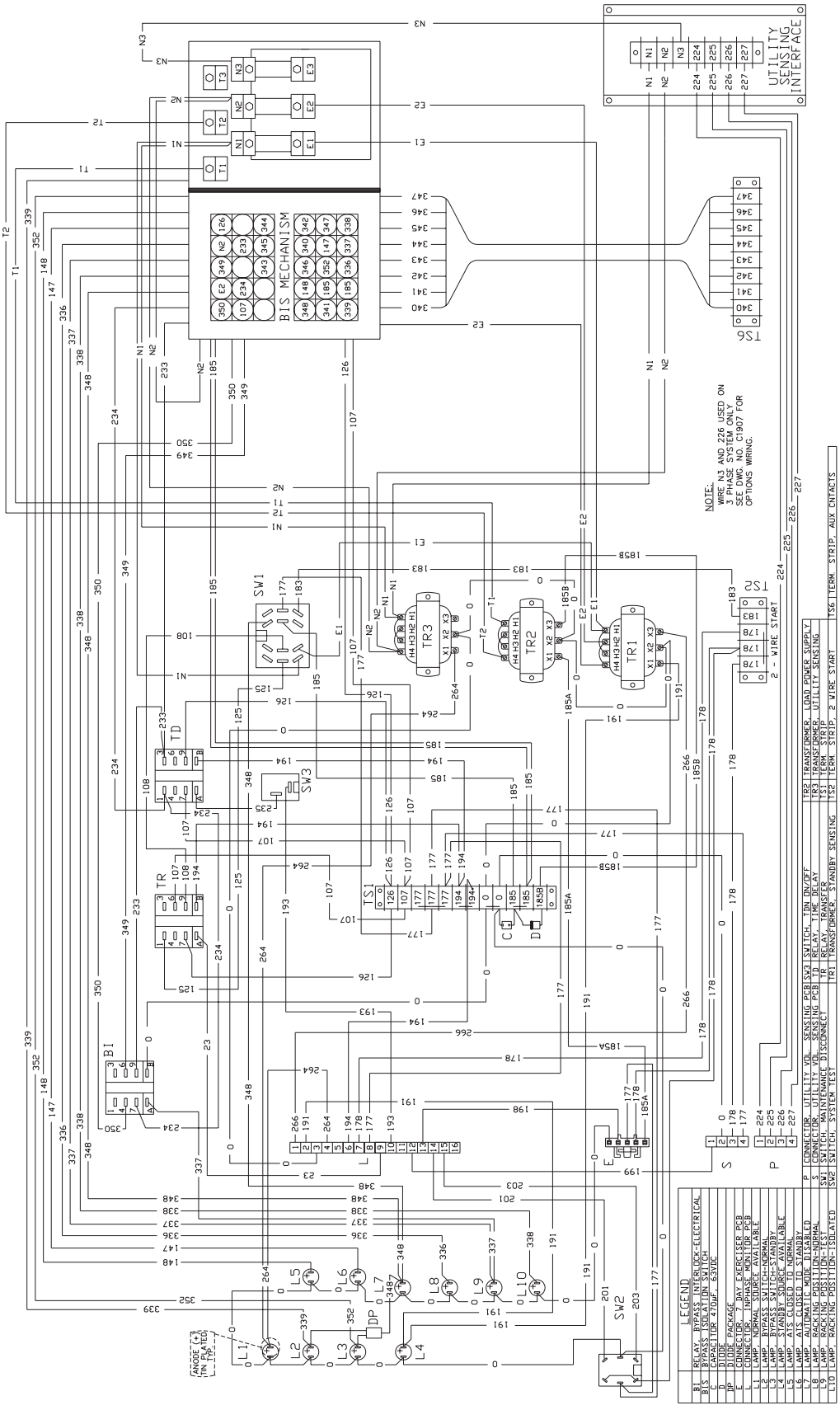
5.1 TROUBLESHOOTING

PROBLEM	CAUSE	CORRECTION
Bypass Handle will not move to Normal	1. ATS is not in Normal Position	1. Move ATS to Normal position. Use test switch to move main contacts electrically. Do not move ATS main contacts manually under load.
Bypass Handle will not move to Emergency	1. ATS is not in Emergency position	1. Move ATS to Emergency. Use door mounted System Test Switch to move ATS to Emergency position. Do not move ATS main contacts manually under load.
Racking Handle will not move from Normal to Test position	1. Racking Enable Handle is in Latch position 2. Bypass Handle is in Auto position	1. Move Racking Enable Handle to Enable position. 2. Move Bypass Handle to either position to match position of ATS main contacts.
Racking Handle will not move from Test to Isolated position	1. Racking Enable Handle is in Latch position	1. Move Racking Enable Handle to Enable position.
Racking Handle will not move from Isolated to Test position	1. Racking Enable Handle is in Latch position 2. ATS is not placed correctly in Racking mechanism	1. Move Racking Enable Handle to Enable position. 2. Check that ATS position indicator is at the Removal position. Retry moving of Racking mechanism.
Racking Handle will not move from Test to Normal position	1. Racking Enable Handle is in Latch position 2. Bypass Handle is not in same position as ATS	1. Move Racking Enable Handle to Enable position. 2. Move ATS to same position as Bypass Handle source selection. Retry moving of Racking mechanism.


CONNECTOR
(AS VIEWED FROM CONNECTOR SIDE)
TOP (T)
(MALE PINS)
BOTTOM (B)
(FEMALE PINS)
NON-MOVING, SLIDING CONTACTS
(FEMALE CONTACTS)
LEGEND
A1 A2 A POWER SOURCE SIDE(ON)
AT1 A POWER SOURCE SIDE(TRIP)
ATS1 ATS2 BTS1 BTS2 SWITCH, TRIP CONTROL
ATS TRANSFER SWITCH CONTACTOR
AUX 1-8 SWITCH, AUXILIARY
Ax Bx SWITCH, CONTROL
B1 B2 B POWER SOURCE SIDE(ON)
BIS BYPASS ISOLATION SWITCH FRAME
BT1 B POWER SOURCE SIDE(TRIP)
C COIL, CLOSING
LS1, LS2, LS3 LIMIT SWITCH, ATS POSITION
LS LIMIT SWITCH, SELECTIVE
SC COIL, SELECTIVE
TC COIL, TRIP
NC NORMALLY CLOSED
NO NORMALLY OPEN
COM COMMON
ATS AUXILIARY CONTACTS
SWITCH POSITION UTILITY NEUTRAL STANDBY WIRE #s
AUX 6 COM-NC X 0 0 4 - 5
COM-NO 0 X X 4 - 6
AUX 8 COM-NC 0 0 X 33 - 34
COM-NO X X 0 33 - 35
X = CLOSED
0 = OPEN
T1 T2 T3 IO CUSTOMER LOAD
"A" POWER SOURCE (UTILITY)
"B" POWER SOURCE (STANDBY)
AUX 1
AUX 2
AUX 3
AUX 4
AUX 5
AUX 6
AUX 7
AUX 8
ATS-ACTUATOR
ATS
BIS FRAME
LS1
LS2
LS3
NORMAL
TEST
ISOLATED
TC
SC
C
LS
AX
(NOT USED)
SWITCH SHOWN IN
ATS: UTILITY POSITION BIS: OPEN
RACKING: NORMAL POSITION

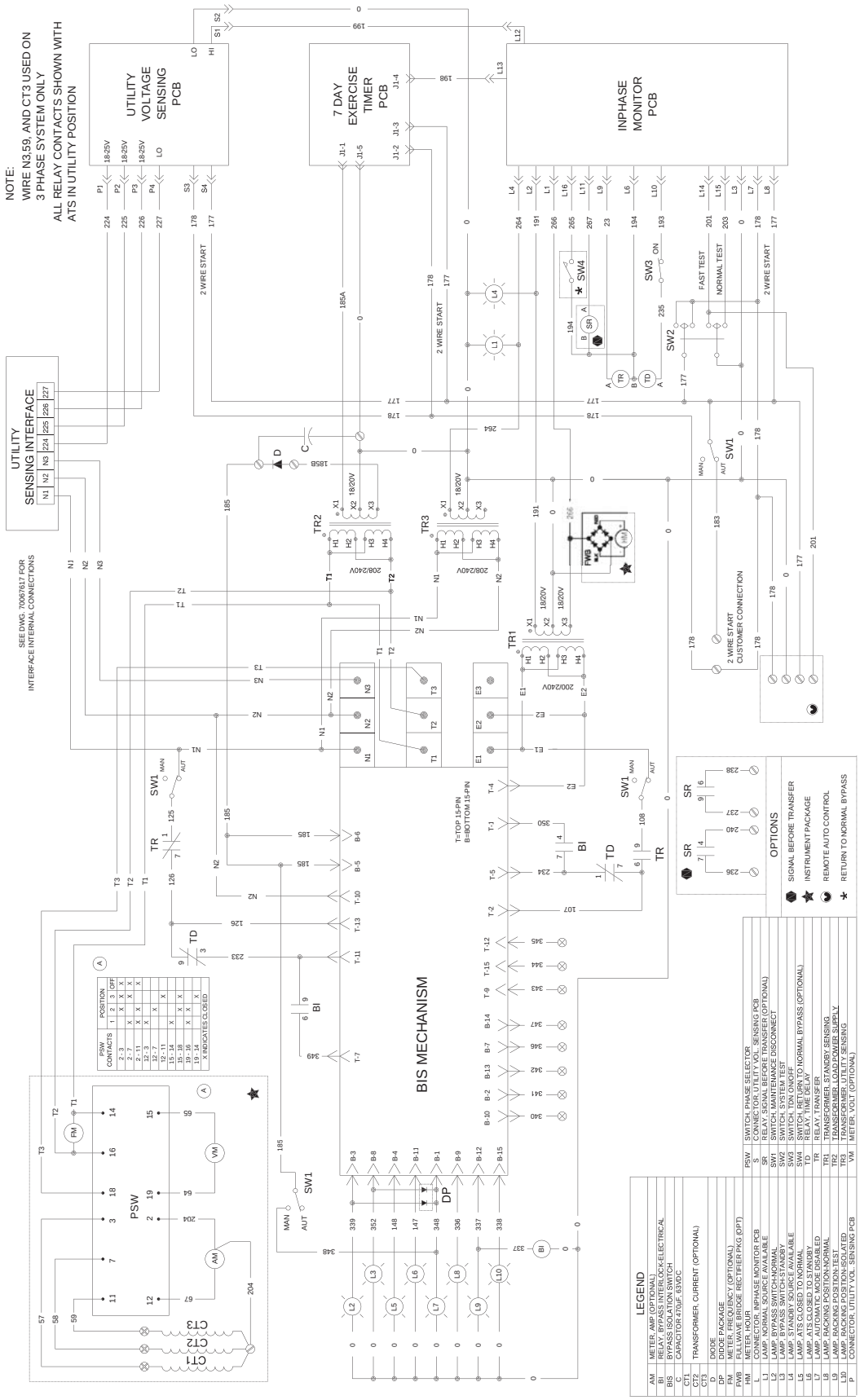
Generac GTS "B" Type Transfer Switch

Wiring Diagram - 100/200V; 110/220V; 115/200V; 120/208V; 120/240V - Drawing No. C1853-A



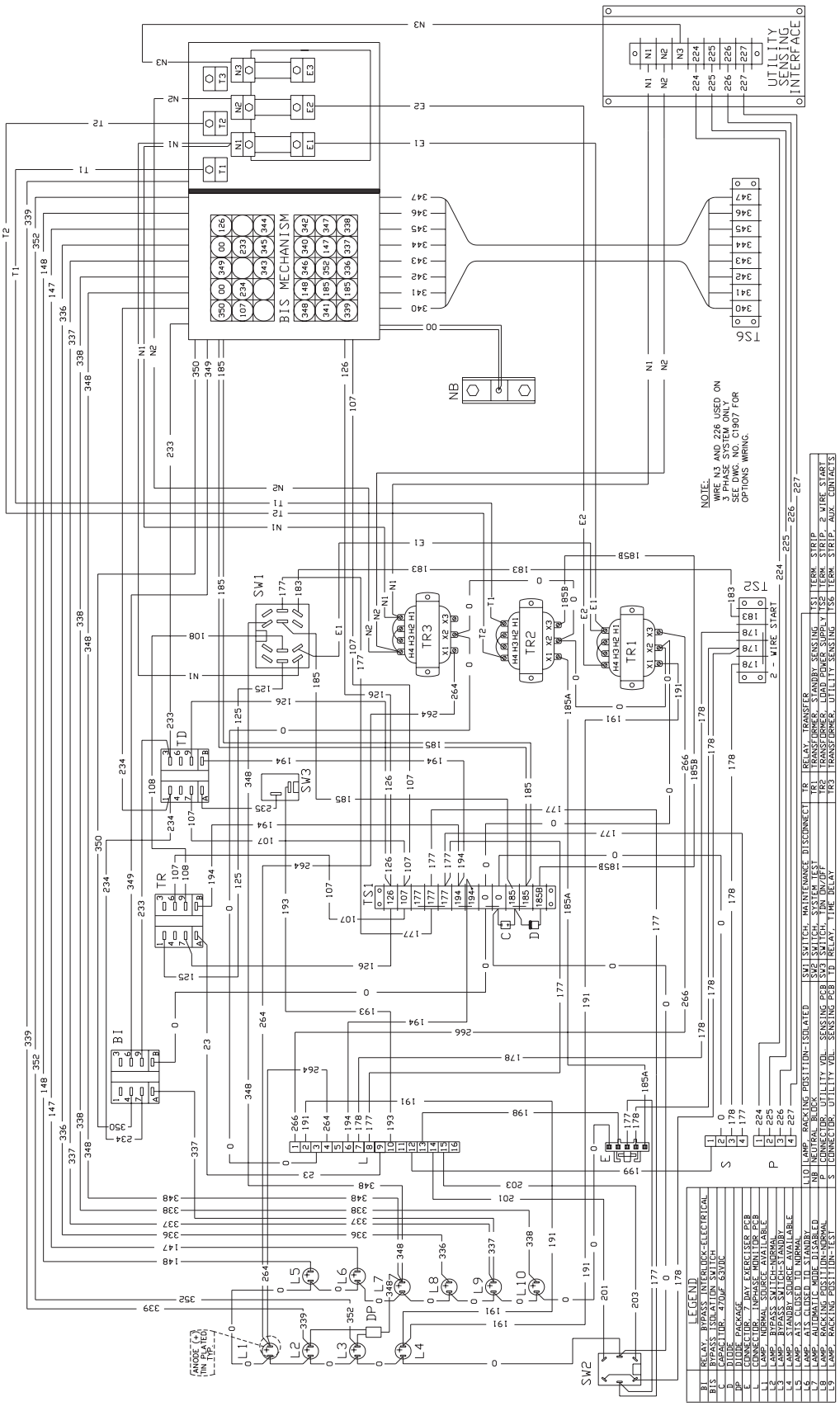
ELECTRICAL DATA

Electrical Schematic - 100/200V; 110/220V; 115/200V; 120/208V; 120/240V - Drawing No. C1851-A



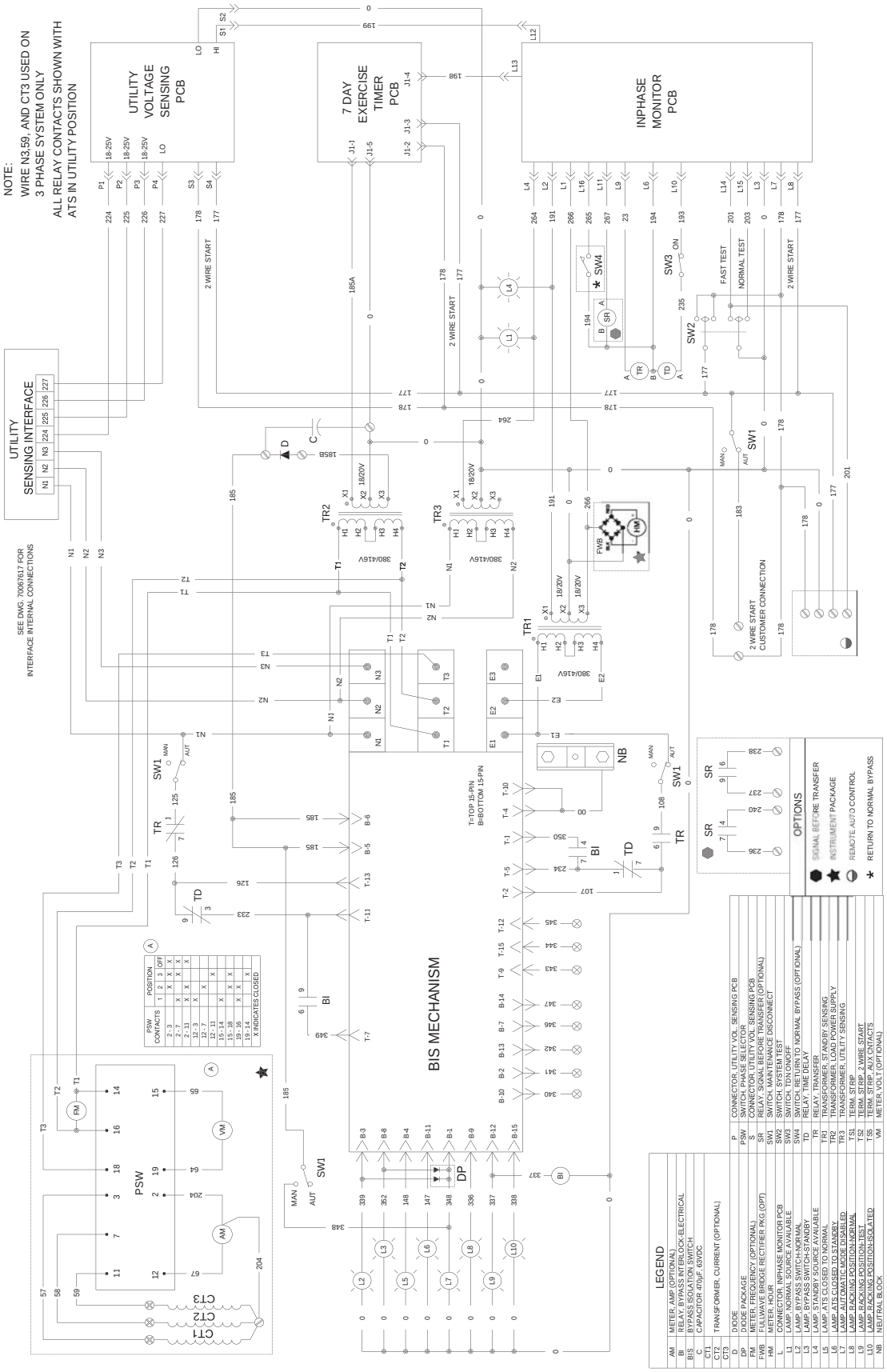
Generac GTS "B" Type Transfer Switch

Wiring Diagram - 220/380V; 231/400V; 240/416V; 3-Pole - Drawing No. C1899-A



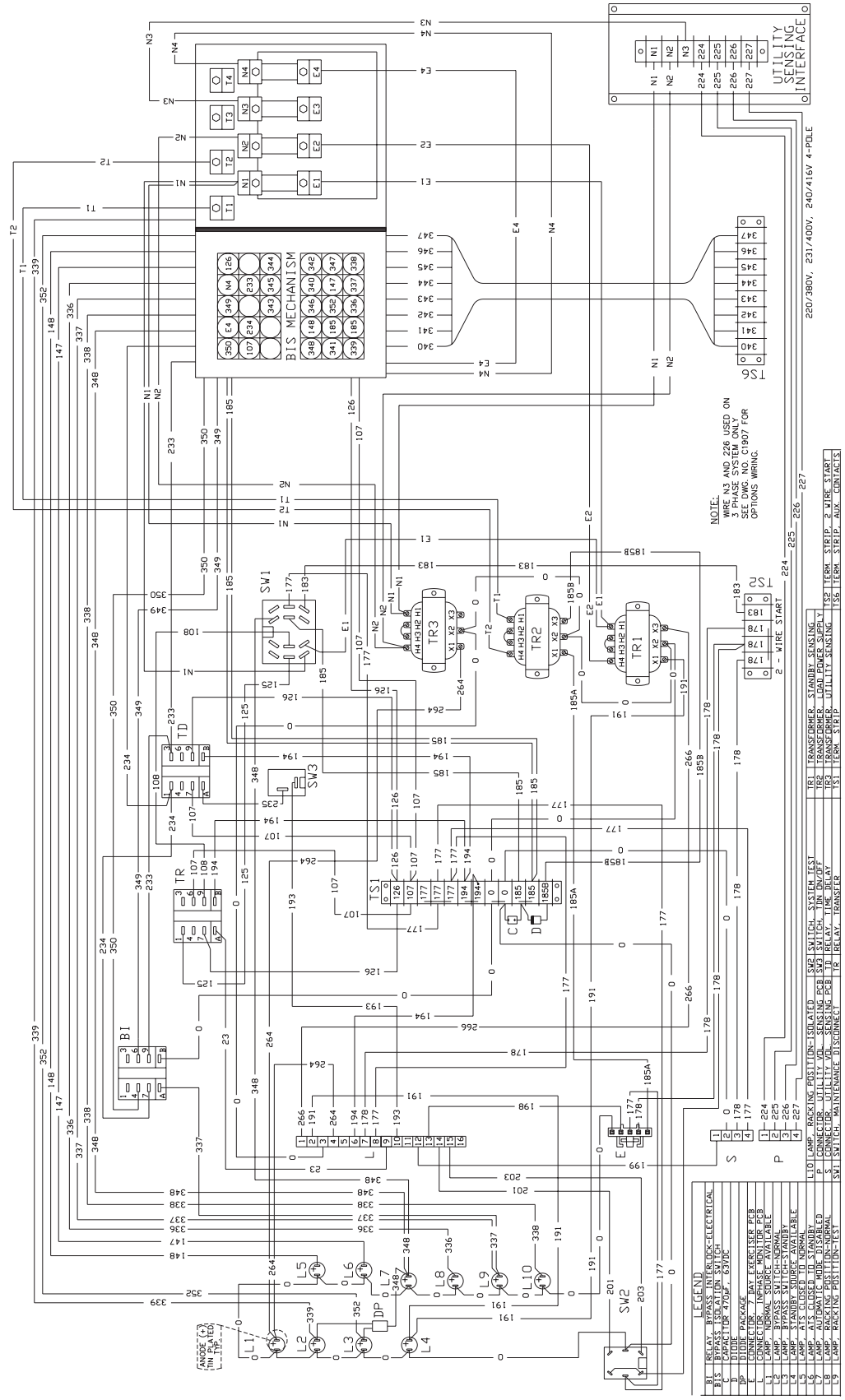
Generac GTS "B" Type Transfer Switch

Electrical Schematic - 220/380V; 231/400V; 240/416V; 3-Pole - Drawing No. C1901-A



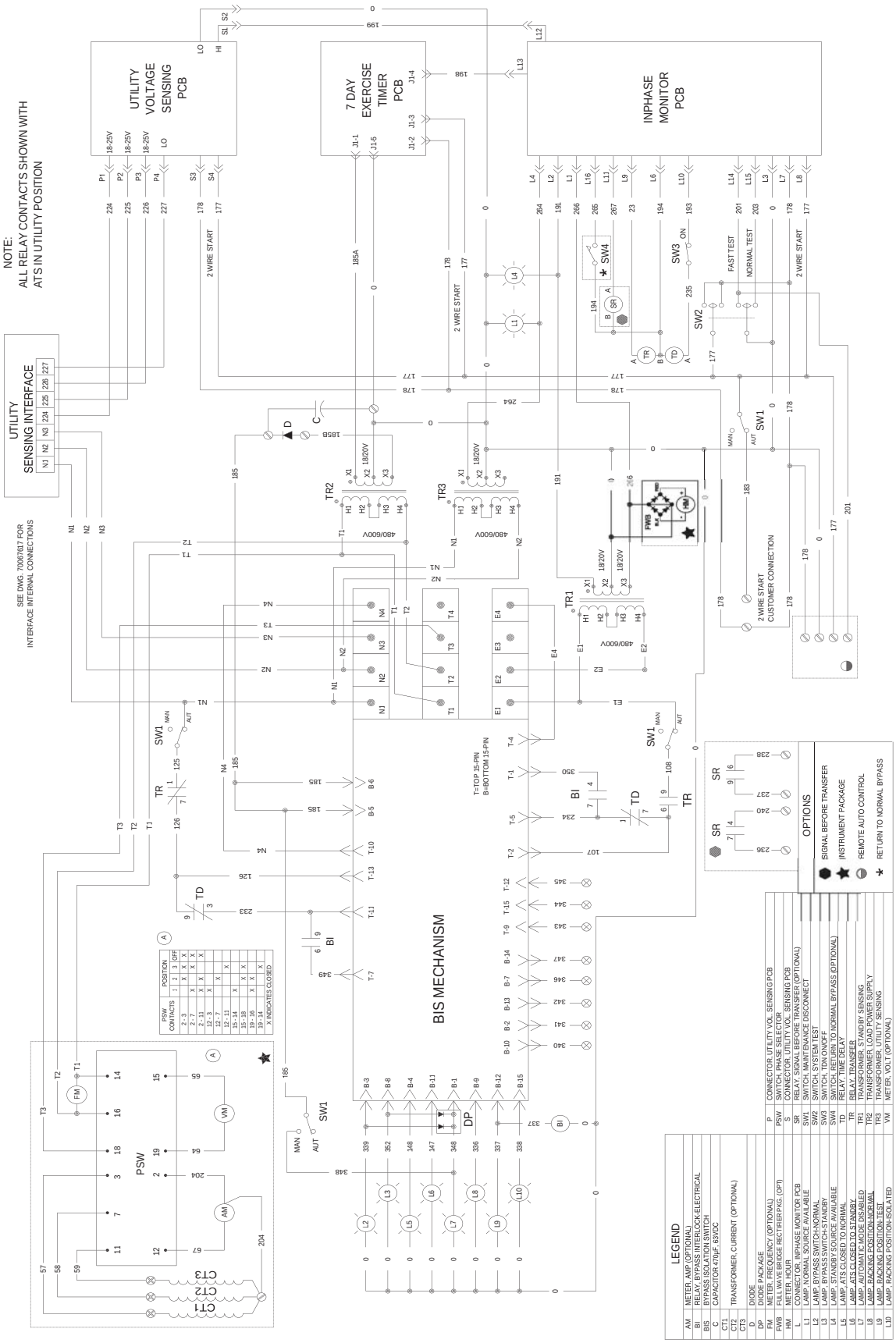
Generac GTS "B" Type Transfer Switch

Wiring Diagram - 220/380V; 231/400V; 240/416V; 4-Pole - Drawing No. C1900-A



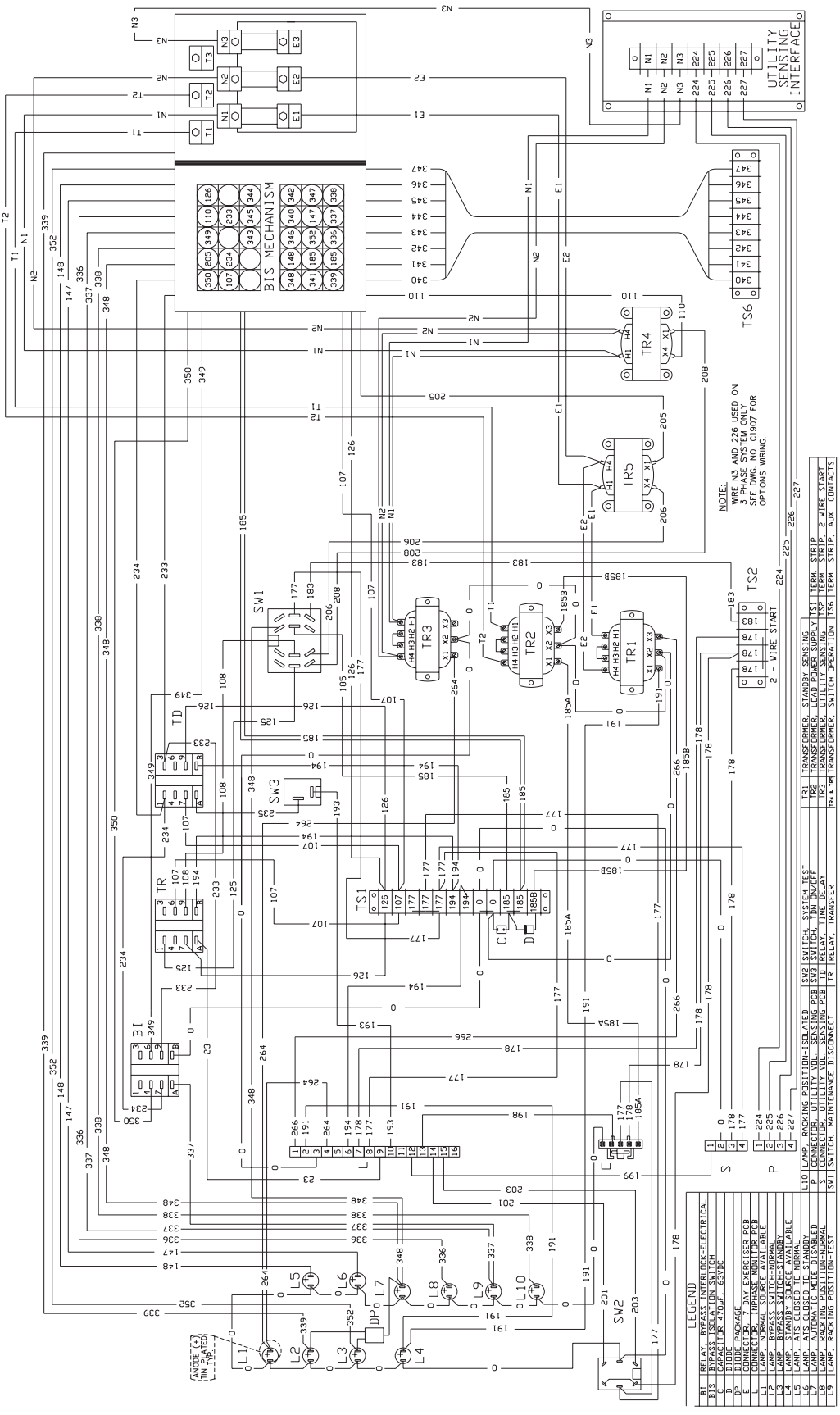
ELECTRICAL DATA

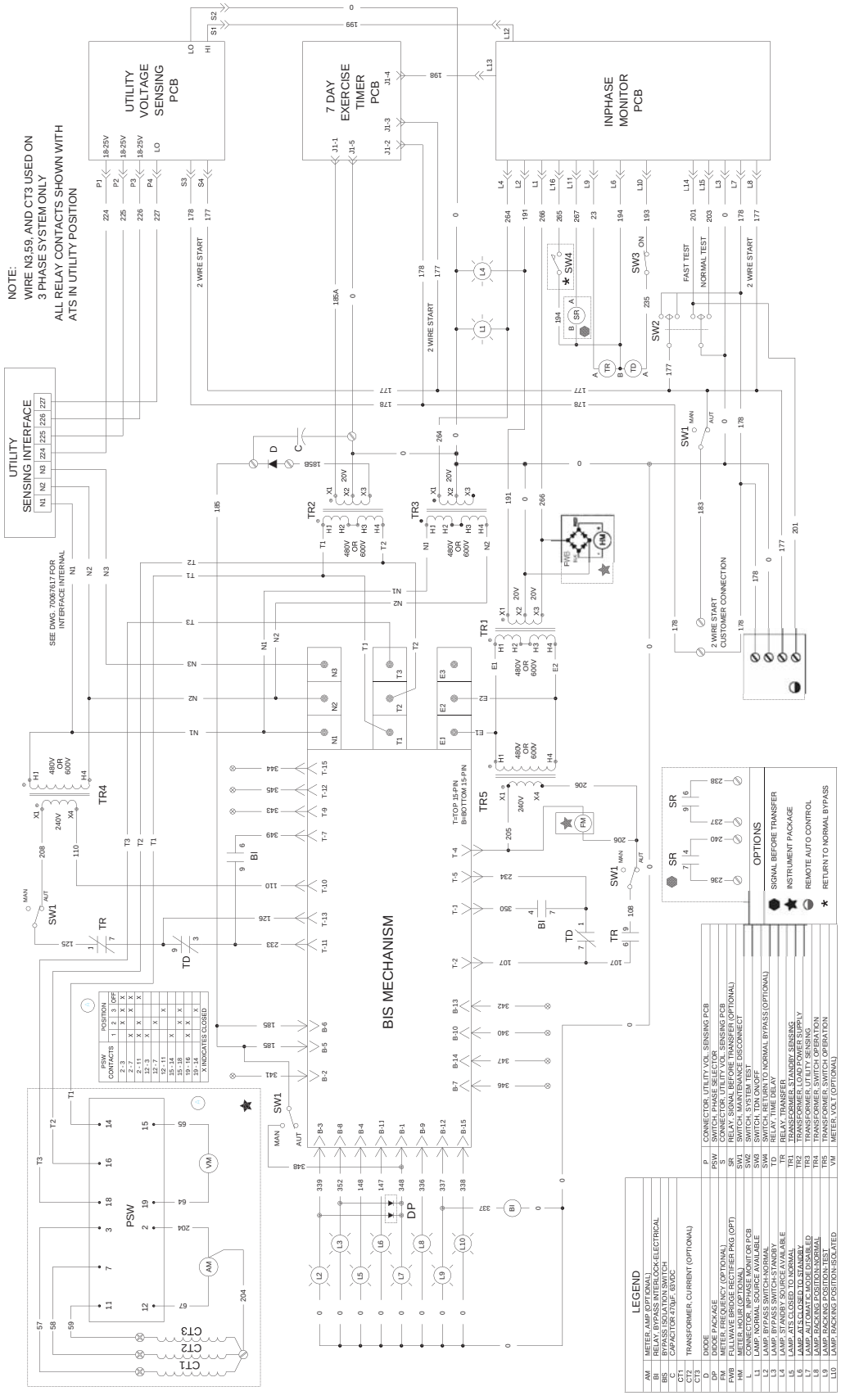
Electrical Schematic - 220/380V; 231/400V; 240/416V; 4-Pole - Drawing No. C1902-A



Generac GTS "B" Type Transfer Switch

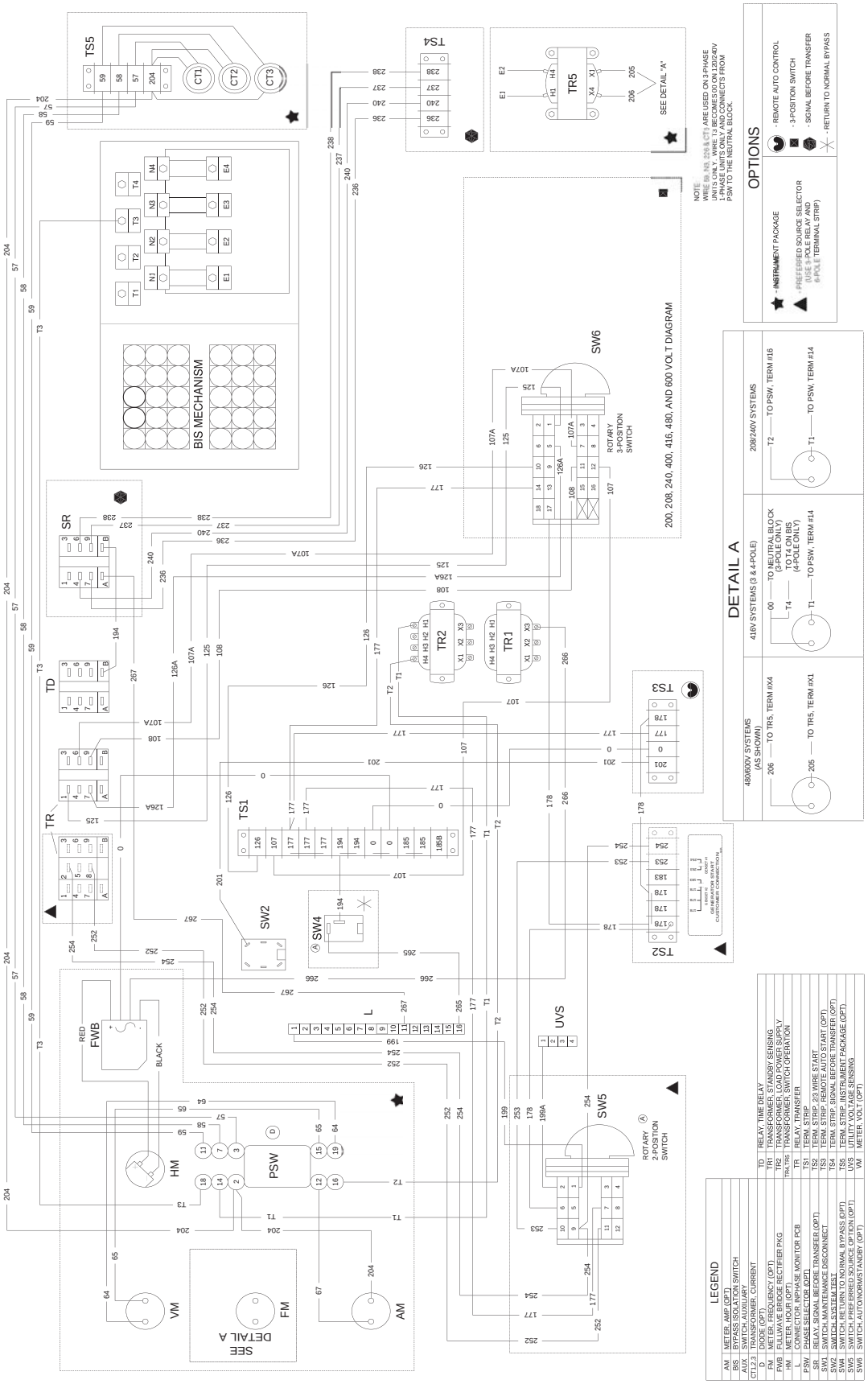
Wiring Diagram - 277/480V; 346/600V - Drawing No. C1787-A

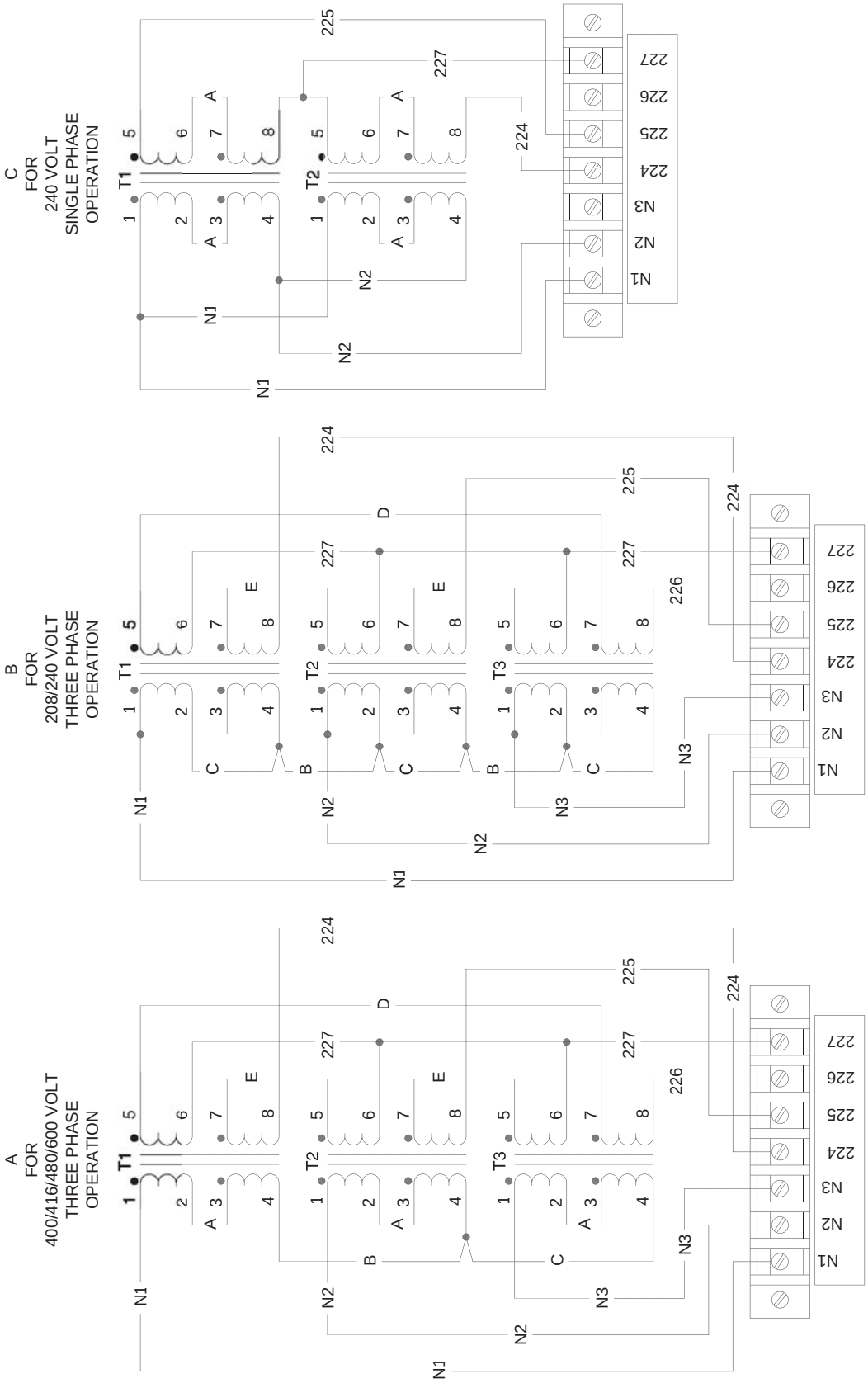



NOTE:
WIRE N3.59, AND CT3 USED ON 3 PHASE SYSTEM ONLY
ALL RELAY CONTACTS SHOWN WITH ATS IN UTILITY POSITION
UTILITY VOLTAGE SENSING PCB
7 DAY EXERCISE TIMER PCB
INPHASE MONITOR PCB
UTILITY SENSING INTERFACE
SEE DWG. 70067817 FOR INTERFACE INTERNAL
BIS MECHANISM
2 WIRE START
2 WIRE START CUSTOMER CONNECTION
FAST TEST
NORMAL TEST
SW1 MAN AUT
SW2
SW3 ON
SW4
TR1
TR2
TR3
TR4
TR5
TR
TD
SR
DP
PSW
AM
VM
FM
CT1
CT2
CT3
OPTIONS
SIGNAL BEFORE TRANSFER
INSTRUMENT PACKAGE
REMOTE AUTO CONTROL
RETURN TO NORMAL BYPASS
LEGEND
AM METER, AMP (OPTIONAL)
BI RELAY, BYPASS INTERLOCK-ELECTRICAL
BIS BYPASS ISOLATION SWITCH
C CAPACITOR 4.0MF, 60VDC
CT1 TRANSFORMER, CURRENT (OPTIONAL)
CT2
CT3
D DIODE
DP DIODE PACKAGE
FM METER, FREQUENCY (OPTIONAL)
FWB FULLWAVE BRIDGE RECTIFIER PKG (OPT)
HM METER, HOUR (OPTIONAL)
L CONNECTOR, INPHASE MONITOR PCB
L1 LAMP, NORMAL SOURCE AVAILABLE
L2 LAMP, BYPASS SWITCH-NORMAL
L3 LAMP, BYPASS SWITCH-STANDBY
L4 LAMP, STANDBY SOURCE AVAILABLE
L5 LAMP, ATS CLOSED TO NORMAL
L6 LAMP, ATS CLOSED TO STANDBY
L7 LAMP, AUTOMATIC MODE DISABLED
L8 LAMP, RACKING POSITION-NORMAL
L9 LAMP, RACKING POSITION-TEST
L10 LAMP, RACKING POSITION-ISOLATED
P CONNECTOR, UTILITY VOL. SENSING PCB
PSW SWITCH, PHASE SELECTOR
S CONNECTOR, UTILITY VOL. SENSING PCB
SW1 RELAY, GEN. SET START/STOP (OPTIONAL)
SW1 SWITCH, WATERPACKE DISCONNECT (OPT.)
SW2 SWITCH, SYSTEM TEST
SW3 SWITCH, TDN ON/OFF
SW4 SWITCH, RETURN TO NORMAL BYPASS(OPTIONAL)
TD RELAY, TIME DELAY
TR RELAY, TRANSFER
TR1 TRANSFORMER, STANDBY SENSING
TR2 TRANSFORMER, 120/240V 1 PHASE
TR3 TRANSFORMER, UTILITY SENSING
TR4 TRANSFORMER, SWITCH OPERATION
TR5 TRANSFORMER, SWITCH OPERATION
VM METER, VOLT (OPTIONAL)

Generac GTS "B" Type Transfer Switch

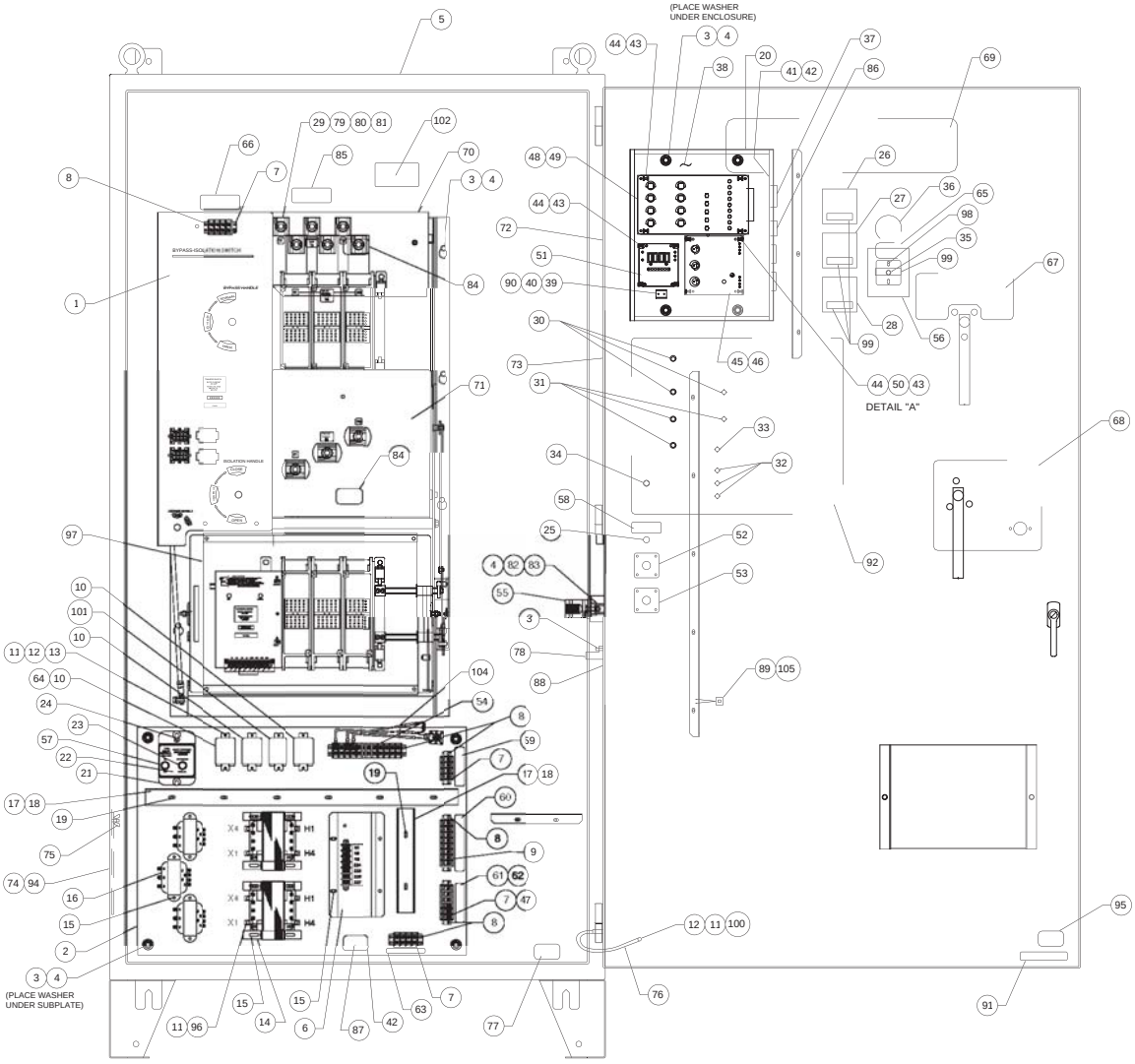
Wiring Diagram - Drawing No. C1907-D

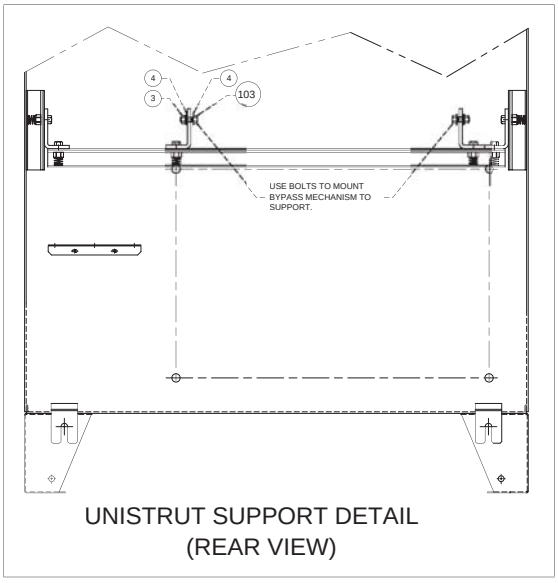



A
FOR
400/416/480/600 VOLT
THREE PHASE
OPERATION
B
FOR
208/240 VOLT
THREE PHASE
OPERATION
C
FOR
240 VOLT
SINGLE PHASE
OPERATION
T1
T2
T3
N1
N2
N3
224
225
226
227

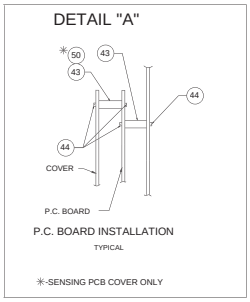
Generac GTS "B" Type Transfer Switch

Assembly Drawing - Drawing No. C1905-A





UNISTRUT SUPPORT DETAIL
(REAR VIEW)

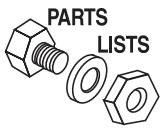


- ★ - INSTRUMENT PACKAGE
- ✳ - RETURN TO NORMAL BYPASS
- ▲ - PREFERRED SOURCE SELECTOR (USE 3-POLE RELAY AND 6-POLE TERMINAL STRIP)
- ◡ - REMOTE AUTO CONTROL
- ▰ - 3-POSITION SWITCH
- ⬬ - SIGNAL BEFORE TRANSFER
- ** - AFFIXED TO OUTSIDE OF DOOR

NOTE: HARNESS CONFIGURATION DEPENDS ON MODEL NUMBER.

TRANSFER SWITCH INSTALLATION INSTRUCTIONS:

STEP 1) DROP SWITCH ONTO STUDS WITH ENCLOSURE LAYING HORIZONTAL.
STEP 2) FINGER TIGHTEN NUTS - LEAVE 1/4" GAP BETWEEN NUT AND SWITCH BASE.
STEP 3) RAISE ENCLOSURE ABOUT 80 DEGREES.
STEP 4) SHIMMY SWITCH UNTIL STUDS FIT INTO TOP OF KEY HOLE ON SWITCH BASE.
STEP 5) FASTEN SWITCH TO BAR FULLY TIGHT.
STEP 6) FINISH TIGHTENING NUTS ON STUDS TO SECURE SWITCH TO ENCLOSURE.
STEP 7) FASTEN BAR TO ENCLOSURE.



ITEM	PART NO.	QTY.	DESCRIPTION
1	0C1163	1	BIS SW-B 400A600V3P
	0C1894	1	BIS SW-B 400A600V4P
2	0C1910	1	SUBPLATE-BIS
3	064101	19	NUT LOCKING 3/8"-16
4	022131	19	WASHER, FLAT 3/8"-M10
5	0C1890	1	ENCLOSURE-BIS NEMA 12
	0C1909	1	ENCLOSURE-BIS 400A INST
6	072158	1	INTERFACE, 3PH 400A
	072160	1	INTERFACE-3P 400V 50/60
	067617030A	1	INTERFACE-3PH, 416/480V
	067617030B	1	INTERFACE-3PH, 208/240V
	086961	1	INTERFACE-1PH, 240V
◒●★7	046689	REF.	TERM BLK 4POS #6PNL
8	0A1661	--	RIVET POP, 156D x .5 LG
9	057701	REF.	TERM BLK 8POS #6PNL
●10	063617	REF.	RELAY 12VDC 10A DPDT
11	022264	--	LOCK WASHER #8-M4
12	038150	--	WASHER, FLAT #8-M4 SS
13	0A2284	--	8-32 x 1/2" FASTENER
14	072162	2	TRANS 600/240V 200VA
	064126	2	TRANS 480/240V 200VA
15	056893	--	CRIMPTITE 10-24 x 1/2"
16	090975	3	XFRMR 240/40 25 VA (480V & BELOW)
	095394	3	XFRMR 600/40 25 VA (600V ONLY)
17	091472	24"	WRG DUCT 1 x 1.5 6 FT.
	091472	8"	WRG DUCT 1 x 1.5 6 FT.
18	091472A	24"	WIRE DUCT CVR 1"
	091472A	12"	WIRE DUCT CVR 1"
19	091477	8	RIVET, WIRE DUCT MNT
20	0C1652	1	ENCLOSURE-PCB
21	074509	1	SWITCH BRACKET
22	074511	1	DECAL-TDN. MAINT. SW.
23	055868	REF.	SWITCH, TOGGLE 4PDT
24	0A2111	2	10-32 x 5/16" FASTENER
✳25	072827	REF.	SWITCH, TOGGLE SPST
★26	070044	1	VOLTMETER AC 0-600
★	070043	1	VOLTMETER AC 0-300
★27	070042	1	METER, FREQ 55-65 Hz
★	070042A	1	METER, FREQ 45-55 Hz
★28	070059	1	AMMETER AC 0-600
29	0A7822	--	LUG 1; 600-4 / 2; 250-1/0
30	0C2163A	3	LED & HOLDER-GREEN
31	0C2163B	3	LED & HOLDER-RED
32	0C2163C	3	LED & HOLDER-YELLOW
33	0C2163D	1	LED & HOLDER-FLSH YLW
34	055142	REF.	SWITCH, TOGGLE DPDT
★35	074386	1	3PH VOLT/AMP SELECT SW
★36	070081	1	HOUR METER
37	072252	1	GROMMET 1/16"- 1 3/8"
38	0C1721	1	DOOR,, PCB ENC
39	063982	1	BATT CLIP-9V TRANSIS
40	029357	2	RIVET AVDEL 3/32" x 1/8" LG
41	0C1720	2	SD GUIDE-NEW PCB ENC
42	036261	8	POPRVT 1/8" x .23 SSTL
43	064525	16	STANDOFF HEX 3/4"
44	064526	40	HWHS #6 x 3/8" SELT TAP
45	067629	1	ASS'Y STANDARD SENSING
46	067616020A	1	ASS'Y STANDARD SENS CVRPLT
47	046357	REF.	TERM BLOCK 6POS #6PNL
48	092734	1	ASS'Y INPHASE MONITOR
49	094200A	1	ASS'Y INPHASE COVER PLATE
50	068337	4	STANDOFF, HEX 1"
51	0A8637	1	AAS'Y-MK3 EXECISER
▲52	074613	1	SW 2POS SOURCE SELECT
■53	074614	1	SW 3POS NORM/AUTO/STNDY
54	055911	REF.	TERM BLK 12POS #6PNL
55	0C2162	1	ASS'Y-NEUT BLOCK 300-400A
56	0C2060	1	COVER, PHASE SEL. SW.
57	028199	REF.	SWITCH, TOGGLE SPST
✳58	075369	1	DECAL-RET TO NRM BYPASS
●59	075355	1	DECAL-SIGNAL BEFORE XFER
60	0C2179	1	DECAL-BIS CUST CONN
61	091466	1	DECAL-2 WIRE TERM STR
62	098876	1	DECAL-DUAL START
◒63	074571	1	DECAL- REMOTE AUTO CONTROL
▲64	057334	REF.	RELAY, 12DC 10A 3P3T
**★65	0C2603	1	DECAL-PHASE SELECT A/V
★66	064114	1	DECAL-CUST CONN CTS
**67	0C2152	1	DECAL-BIS BYPASS HANDLE
**68	0C2151	1	DECAL-BIS RACKING HANDLE
**69	0C1897	1	DECAL-GENERAC POWER SYSTEMS
70	0C6610	REF.	TERMINAL COVER-BIS #1
71	0C6611	REF.	TERMINAL COVER-BIS #2
72	063385A	1	DECAL-SWITCH INFO
73	073619S	1	DECAL-TEST SEQ 400 B
	095089A	1	DECAL-600V 3/400A RTGS
74	063321	1	HANDLE, XFER SW 100-400A
75	025870	1	WING NUT, 1/4"-20
76	0536210193	1	GND WIRE-ENCLOSURE DOOR
77	-----	1	DECAL-UL
78	057329	1	LUG 13/32" 1-350 TO 6
79	0A8261	--	HHCS, 1/4"-28 x 5/8" .625TH
80	022473	--	FLAT WASHER 1/4"-M6
81	022097	--	WASHER SPL LOCK 1/4"-M6
82	031578	2	HHCS 3/8"-16 x 1 1/2"
83	022237	2	WASHER SPL LOCK 3/8"
84	0C8308	2	DECAL-TER. SHOCK HAZARD
85	064510	1	DECAL-TERMINAL NOTE
86	038057	1	GROMMET 1/16"-7/8"
87	063578	1	DATA PLATE-GTS
88	067210A	1	DECAL-GROUND LUG
89	063378	--	CABLE TIE HOLDER
90	063998	1	BATTERY, 9V TRANSISTER
91	077228	1	DECAL-ENCLOSURE TYPE
92	0C1898	1	DECAL-BIS DOOR LIGHTS
93	064120	--	CURRENT TRANS 0-600 (NOT SHOWN)
94	074525	1	DECAL-MANUAL OPERATION
95	095282	1	DECAL-LIVE CIRCUIT
96	056893	8	CRIMPTITE #10-24 x 1/2"
97	0C1163000B	REF.	BIS CAR ASSY 400A 3P
	0C1894000B	REF.	BIS CAR ASSY 400A 4P
★98	0C4979	2	HWHS #8 x 3/8" SELF TAP
★99	0C4895	4	DECAL-SHOCK HAZARD
100	022471	2	HEX NUT #8-32
101	081767	REF.	RELAY 24VDC 10A DPDT
102	054199	1	DECAL-HIGH VOLTAGE
103	029745	2	HHS 3/8"-16 x 1"
104	0C3387	1	ASS'Y CAP + DIODE
105	064761	--	TIE WRAP 5 5/8" LG (NOT SHOWN)
106	0C2351	1	HARNESS, 400A BIS SW (NOT SHOWN) SEE NOTE

NOTE: HARNESS CONFIGURATION DEPENDS ON MODEL NUMBER.

NOTES

GENERAC POWER SYSTEMS STANDARD TWO-YEAR LIMITED WARRANTY FOR GENERAC TRANSFER SWITCH SYSTEMS

NOTE: ALL UNITS MUST HAVE A START-UP INSPECTION PERFORMED BY AN AUTHORIZED GENERAC DEALER.
For a period of 2 (two) years from the date of sale/start date, Generac Power Systems, Inc. will, at its option, repair or replace any part(s) which, upon examination, inspection, and testing by Generac Power Systems or a Generac Power Systems Authorized Warranty Service Facility, is found to be defective under normal use and service, in accordance with the warranty schedule set forth below. Any equipment that the purchaser/owner claims to be defective must be returned to, and examined by the nearest Generac Power Systems Authorized Warranty Service Facility. All transportation costs under the warranty, including return to the factory, are to be borne and prepaid by the purchaser/owner. This warranty applies only to Generac Power Systems Transfer Switch applications, as Generac Power Systems, Inc. have defined Transfer Switch application, provided said Transfer Switch has been initially installed and inspected on-site by a Generac Power Systems Authorized Service Dealer or branch thereof. A scheduled maintenance agreement with a local Authorized Generac Power Systems Dealer is highly recommended to verify adequate service has been performed on the unit throughout the warranty period.

WARRANTY SCHEDULE

- **YEAR ONE** — 100% (one hundred percent) coverage on mileage*, labor, and parts listed.
- **ALL COMPONENTS**
- **YEAR TWO** — 100% (one hundred percent) coverage on parts listed.
- **ALL COMPONENTS — *PARTS ONLY**
- *Travel allowance is limited to 300 miles maximum, or 7.5 hours maximum (per occurrence), **round trip**, to the nearest authorized Generac Service Facility.
- A Generac Power Systems, Inc. Transfer Switch is highly recommended to be used in conjunction with the genset. If a non Generac genset is substituted for use and directly causes damage to the Generac Transfer Switch, no warranty coverage shall apply.
- All warranty expense allowances **are** subject to the conditions defined in Generac Power Systems Warranty, Policies, and Procedures Flat Rate Manual.
- Units that have been resold **are not** covered under the Generac Power Systems Warranty, as this Warranty **is not** transferable.

THIS WARRANTY SHALL NOT APPLY TO THE FOLLOWING:

1. Any unit built/manufactured prior to January 1, 2002.
2. Unit enclosure is only covered against rust or corrosion the first year of the warranty provision.
3. Costs of normal maintenance i.e. tune-ups, associated part(s), adjustments, loose/leaking clamps, installation and start-up.
4. Use of Non-Generac replacement part(s) will void the warranty in its entirety.
5. Any failure caused by contaminated fuels, oils, coolants/antifreeze or lack of proper fuels, oils or coolants/antifreeze.
6. Failures due, but not limited to, normal wear and tear, accident, misuse, abuse, negligence, or improper installation or sizing.
7. Failures caused by any external cause or act of God such as collision, fire, theft, freezing, vandalism, riot or wars, lightning, earthquake, windstorm, hail, volcanic eruption, water or flood, tornado, hurricane, terrorist acts or nuclear holocaust.
8. Products that are modified or altered in a manner not authorized by Generac Power Systems in writing.
9. Any incidental, consequential or indirect damages caused by defects in materials or workmanship, or any delay in repair or replacement of the defective part(s).
10. Failure due to misapplication, misrepresentation, or bi-fuel conversion.
11. Telephone, telegraph, teletype or other communication expenses.
12. Living or travel expenses of person(s) performing service, except as specifically included within the terms of a specific unit warranty period.
13. Rental equipment used while warranty repairs are being performed i.e. rental generators, cranes, etc..
14. Overtime labor or more than one person performing repairs.
15. Any and all expenses incurred investigating performance complaints unless defective Generac materials and or workmanship were the direct cause of the problem.
16. *Engine coolant heaters (block-heaters), heater controls and circulating pumps after the first year.
17. *Starting batteries, fuses, light bulbs, and engine fluids, tires, brakes and overnight freight cost for replacement part(s).

THIS WARRANTY IS IN PLACE OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, SPECIFICALLY, GENERAC POWER SYSTEMS MAKES NO OTHER WARRANTIES AS TO THE MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

GENERAC POWER SYSTEMS ONLY LIABILITY SHALL BE THE REPAIR OR REPLACEMENT OF PART(S) AS STATED ABOVE. IN NO EVENT SHALL GENERAC POWER SYSTEMS BE LIABLE FOR ANY INCIDENTAL, OR CONSEQUENTIAL DAMAGES, EVEN IF SUCH DAMAGES ARE A DIRECT RESULT OF GENERAC POWER SYSTEMS, INC. NEGLIGENCE.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to you. Purchaser/owner agrees to make no claims against Generac Power Systems, Inc. based on negligence. This warranty gives you specific legal rights. You also may have other rights that vary from state to state.

GENERAC® POWER SYSTEMS, INC. · P.O. BOX 8 · WAUKESHA, WI 53187
PH: (262) 544-4811 · FAX: (262) 544-4851

Bulletin 0166260SBY / Printed in USA 5.02