PSP *TransConnect*™

Semi-Automatic Start, Meter Extender, Wired

Model TC-050M23W –
- - 12 kW, 50-amp, peak
- - 10 kW, 42-amp, continuous

Model TC-100M23W –
- - 25 kW, 100-amp, peak
- - 20 kW, 83-amp, continuous

Model TC-050M23Y –
- - 12 kW, 50-amp, peak
- - 10 kW, 42-amp, continuous

Application – outside of the building, behind the meter installation, 100 or 200 utility service interrupt, and generator size as stated above.

Typically this applies to a "manual crank or start" generator and requires the generator to have full power output (as determined within this product's control box) prior to automatic transfer. The standby generator can have automatic start features, but they would not be used with this unit. If you desire a totally automatic system, contact the factory for appropriate model series.

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Exception– referencemodel numbers ending in "Y", the generator size is limited by the 30-amp inletconnector and its associated cable – 7.2 kW peak.

US Patent No. 6,074,246 applies.

Safety – Warnings

Installing Behind Utility KWh Meter

The removal of the utility meter seal and KWh meter itself must be handled by authorized electric power company personnel (or their assigned contractor). Where possible turn off all building supply loads when the meter is pulled. This will reduce the arcing from the meter blades/connection. Authorized person should use suitable insulating gloves, protective clothing and eye protection, and be experienced in meter removal/installation.

Top meter lugs are always "Hot" and very dangerous, also the top fuses with the adapter module are always "Hot".

High Voltage – Utility LIVE 240 Voltage Potential

Within the socket extender, 240 volts (L1 and L2) is tapped from the LINE side of the utility service in order to determine outage and provide power for the *TransConnect* power supply. This means there is a LIVE 240 voltage potential at the bottom of the socket extender connector, within the cable, and within the control box itself. Proper caution in troubleshooting and internal examination must be exercised. The neon indicator lamps (circuit board upper right) is an indication of this live voltage. This voltage tap has two fuses within the socket extender (behind the meter itself) for protection against hardware damage and/or fire. But these fuses do not provide protection against human shock. Also fuse terminals are always "Hot", connected directly to utility LINE terminals.

Control Circuit Board, Upper Right Corner

This potential, very dangerous, LIVE voltage concern can be minimized or removed by disconnecting the cable connector at the bottom of the meter extender or by pulling off the 2-wire cable (red and black) at the control circuit board upper right corner.

240-Volt, Hot Terminals

Since the building LOAD connection and wiring can be fed from either utility or standby generator, the wiring and terminals associated with the LOAD in any compartment may

be voltage HOT when either power source is energizing. Use caution when handling or troubleshooting under the enclosure covers, observe the various warning decals at the various components.

Grounding and Bonding
This transfer switch product is installed and wired on the service entrance side of the distribution panel single point grounding/neutral. In reality (and the safest approach) neutral and ground are the same point throughout this transfer switch product. As shown on hookup drawing LH115 or LH116, page 2, use the following guidelines:

- - Temporary/Portable Generators
    1. 1. A 4-wire system with the generator neutral isolated at the generator.
    2. 2. Add a copper ground wire from the control box ground lug to the building ground stake/safety ground.
- - Permanent Generators
    1. 1. 4-wire hookup with the generator grounded at this control box case.
    2. 2. The generator neutral is isolated at the generator.
    3. 3. Generator neutral goes to isolated neutral block within this control box.
    4. 4. Add a copper ground wire from the control box ground lug to the building ground stake/safety ground.

Installation Guide

Installation – Power System

See page 1 Safety Warnings

In addition to the basic removal of the meter, inserting meter extension sleeve, mounting of the generator panel, etc.; it is extremely important the installer properly **groundbond** all components and verify correct ground/neutral connection at the meter socket center terminal. This can be correctly accomplished by the following steps:

1. 1. Remove the meter socket cover. (assumes you have your Power Company's permission to break the seal).
2. 2. Remove the KWh meter.
3. 3. Mount the metal generator control box under the existing meter socket enclosure and closely coupled to the service entrance meter enclosure with two 1" or larger conduits. Unless using a water tight hub on the top (Meyer's hub), entrance to the generator control box is probably at the side with an LB.
4. 4. Determine by local codes whether the conduit between the two enclosures is adequate grounding conductor and adequate for generator safety ground. Suggest installing a #8 ground between meter socket ground rod point, *TransConnect* box bottom ground lug, generator ground.
5. 5. Next, the control cable must be fed up the conduit to the meter enclosure. Make note of its attachment to the extender sleeve, keep access in the *TransConnect* control box, but away from relays, circuit board, etc.
6. 6. Having the socket extender part in your hand, notice the two current carrying conductors and a small green wire extending from the back. The two heavy current carrying wires and a

third (equal size) wire for generator neutral must be fed down the conduit into the generator control box.

a. a. Determine connection method at the main meter socket lug ground terminal.
b. b. Connect and prepare the current carrying neutral in such a way that the socket extender unit can be correctly plugged in.
c. c. Terminate the current carrying neutral and the extender green wire with an appropriate lug at the meter base single grounding point. Generally it is advised not to loosen the existing main service ground wire, but to use a piggyback lug and "clamp to" an existing lug, the copper ground conductor, main ground/neutral going into the building, etc.

7. 7. Mate the control cable connectors and carefully tuck away.
8. 8. Plug in the PSP *TransConnect* meter extender module. Note: "LINE" is at the top.
    a. a. Care must be exercised so the wires coming out the back of the extender are "tucked away" within the meter socket enclosure, also there must be sufficient length so the extender can be pulled off for future servicing.
9. 9. Reinstall the meter socket enclosure cover, seal as required.
10. 10. Reinstall the KWh meter. A meter ring with the proper seal is required.
11. 11. Within the control box, trim and terminate the current carrying black and red at the bottom of the generator relays, the third heavy wire (neutral or white) is connected to the neutral block, see drawing LH115 or LH116.

Generator Hookup – Power

1. 1. Generator hookup is at the bottom of the circuit breaker and the neutral block, see drawing LH115 or LH116. Use wire size required for the generator peak output capacity. Follow National Electric Code and local code requirements for type of electrical wire, size of electrical wire, and routing or protection of electrical cable between the control box and generator.
2. 2. Refer back to Grounding and Bonding paragraph.
3. 3. Be prepared to install the generator control box cover with the necessary meter seal after verifying the operational settings and 215-250 voltage at the red and black wire on the PC board, right, top (neon lights should be on).

Operational settings

See Safety – Warnings page 1.

There are three settings which need to be field adjusted or set for the specific installation.

1. 1. GENERATOR OUTPUT VOLTAGE PROTECTION – This model is equipped with a generator output voltage monitor feature requiring the generator to maintain (two second sampling delays) a voltage window of 105 to 135 volts (210-270) whenever generator is connected to the building load. If this feature is **not** desired cut white jumper wire on circuit board, labeled "V. W.".

2. 2. POWER OUTAGE/RETURN DEFINITION – Via a cut jumper you can select a longer Power Outage/Return Definition. This is the second jumper labeled "SP1". Comment: for this manual start model this is a minor function, suggest it remain jumpered.

Jumper	30 sec.

Jumper cut	2 min.

3. 3. TEST SWITCH – At the CB is a test switch. Basically pushing up the test switch simply opens the monitor circuit from the electric utility LINE voltage points. In other words, the test switch simulates an outage condition.

   Caution: If the test switch is fixed in the "test" position, the internal power outage monitor circuitry is dead and this product is ineffective. It is the user's responsibility to make sure the test switch is always free.

Generator Control Circuit Breaker – The 50A circuit breaker on the front of the generator control box is directly connected to the generator input. It will protect the system and can also protect the generator itself. It must be in the up position in order for the generator to supply power to the building.

Comments:

A. A. Prior to starting the generator, verify heavy loads such as water heater, dryer, and electric range are either off or their circuit breaker is turned off.
B. B. It is the user's responsibility to regulate the loads within the home at the level of the generator's capability or output.

Reset Button – Directly below the monitor LED, is a pushbutton. This is for resetting the main circuit board.

Light Monitor Information – LED next to Circuit Breaker

LED	Function
Off	Both power sources are off.
Green Full	Utility voltage is normal (both legs).
Green Pulsing	10-second delay hold, utility is the source.
Red Full	Generator power is the source and at normal voltage.
Red Pulsing	10-second delay hold, generator is the source.
Green/Red	Generator voltage is out of tolerance, and has been interrupted

(or)

Error detected in transfer sequence, push reset to recycle. See Troubleshooting section for further information.

Comments

The generator output Voltage Window Test is a function which samples generator (2-second sampling delay) voltage output and expects a voltage window from 105 to 135 volts (210-270). If the generator falls out of this window, the generator relays are immediately opened. Unless otherwise specified, this is factory **Enabled**.

Startup

1. 1. First time turn on, keep the transfer switch control box circuit breaker **off**.
   Warning: If the transfer switch control box has an input voltage greater than 270, it will either prevent the generator relay from closing or the circuit board will blow up (whichever comes first).
2. 2. This semi-automatic series unit performs no transfer action until it senses generator power between 210 to 270 volts.
3. 3. If the generator has a "idle switch or idlematic", these typically should be off. Generator must maintain 210 volts or greater.
4. 4. Start the generator and verify proper voltage at the bottom of the circuit breaker.
5. 5. Turn **on** the circuit breaker.
6. 6. Verify utility monitor voltage at the upper right corner of control circuit board (inside).
   - - Both neons must be on or glowing.
   - - Can be verified with a meter at each L1 and L2 tab. Meter common is at ground or neutral.
7. 7. LED should be full green or just finished green pulsing.
8. 8. See Test Switch Sequence and hold test button to verify proper transfer and operation of the buildings power system.
9. 9. If the monitor LED is alternating green/red, there is a problem. See Troubleshooting section.

Test Switch Sequence

Generator must be plugged in and running prior to activating TEST switch. Generator circuit breaker and control box circuit breaker must be on, monitor light is green.

Note: Before beginning test sequence, open water heater circuit breaker, verify electric range and dryer are off, and verify the switches or loads within the building are less than the generator capacity.

1. 1. Activate test switch, be prepared to hold for about 2 minutes. No action for approximately 30 seconds.
2. 2. Utility source is automatically opened, an approximate 2-second pause of no power, generator automatically connects to pick up the load.
   - - Monitor light pulses red for 10 sec., then red on.
   - - Do not release TEST when LED is blinking.
3. 3. If the generator maintains a voltage between 105 and 135 volts (210-270), the generator will continue to supply the LOAD source. If the generator droops or runs away, see Typical Sequence and Light Monitor sections.
4. 4. After at least 1 minute, verify generator is operating correctly associated with household desired loads, then end the test sequence.
5. 5. Release the test switch.
   - Monitor light is off for 10 seconds.
6. 6. With the release of test switch, the generator source shall be <u>immediately</u> disconnected with a LOAD power off dip.

   Warning: If the generator is not immediately disconnected from the LOAD when the test switch is released, immediately turn off the generator, permanently disconnect the generator and request service for the PSP *TransConnect* system.

7. 7. After approximately 5 seconds the system verifies proper utility voltage and reconnects the utility switch for normal power. Monitor LED then pulses green for 10 seconds, then green full on.

Comment

1. 1. If "SP1" jumper is cut (see Power Outage/Return Definition section), the above times will be considerably longer.
2. 2. Also available is a test toggle switch – order TC-SB-SW.

Troubleshooting Guide

Safety – Warning – See previous section.

Monitor Light – See previous section.

Typical Sequence

Comments:

A. A. Prior to starting the generator, verify heavy load such as water heater, dryer, and electric range are either off or their circuit breaker is turned off.
B. B. It is the user's responsibility to regulate the loads within the home at the level of the generator's capability or output.

1. 1. Test switch is in normal or released position and monitor LED is full green – system is monitoring utility voltage and there is no outage.
2. 2. Power outage – LED is off and both 240 legs have dropped to 20 volts or less.
3. 3. The control box internal logic performs an orderly shutdown (has adequate power storage), utility does not interrupt at this point, internal logic will come back up with generator power from an orderly reset. If the generator is already connected and running, the sequence is the same as step 5 below.
4. 4. Manually start and/or connect generator power to control box input, red pulsing monitor light, control logic starts at reset, verifies no utility voltage and begins transfer.
5. 5. After 5 seconds of stable generator voltage, utility main interrupt switch is opened and generator relay is closed as the power source.
6. 6. Unless Voltage Window function is disabled, the system continuously monitors the generator voltage, must be maintained between 105 and 135 volts (210-270).
   -If the generator falls out of this voltage window, generator relay is opened and monitor light is alternating green/red.
   -After 60 seconds generator relay again closes applying generator power.
7. 7. The instant utility voltage is returned, generator is automatically interrupted but the system is in a delay mode verifying the utility voltage remains at proper level and constant.
8. 8. As soon as it is verified that the utility voltage is stable, the generator remains disconnected and the utility power is reconnected to the LOAD input.
9. 9. The generator needs to be turned off as a manual function.

Utility Unstable – Unpredictable or Undefined Operational Conditions

There are potential electric utility power source intermediate conditions and possible non-compliant generator output conditions which may not necessarily result in automatic transfer or the ability for the generator to provide standby power. There are a lot of details behind the following conclusions, if interested in further information ask for internal discussion document LC101. The major reason for the following operational conditions is safety and making sure the PSP *TransConnect* Transfer system does not inadvertently cause danger with the electric utility grid. The PSP *TransConnect* system cannot feasibly or economically include logic for all possible utility service voltages or conditions.

Design Ground Rules

1. 1. The detected definition of **"outage"** is not necessarily the same as **"standby power"**.
2. 2. The loss of utility incoming power (outage) is defined as **either** leg below 100 volts.
    - - In a practical real life situation, if one incoming 240 leg is open its voltage will not necessarily be zero volts.
3. 3. **Standby power** activation is not possible unless **both** utility legs are below 50 volts AC.
4. 4. Voltage levels down to approximately 60 volts AC on **either** incoming 240 leg prevents the engagement of the generator relay.
    - - Example- 120 volts on L1 and 70 volts on L2 means generator relay cannot be engaged.
    - - 120 volts on L2 and 20 volts on L1, still no generator relay activation.
    - - 50 volts on L1 and 20 volts on L2, generator relay can be activated.
    - - Any leg voltage between 60 and 100 volts, could be in an unpredictable logic state, **but** definitely generator relays will not activated.
5. 5. The positive condition for "clean" generator transfer is **both** incoming 240 legs below 50 volts AC.
6. 6. If outage return is not 110 volts on both legs, generator may be running but no transfer or generator power.
7. 7. The generator output must have **both** 240 legs greater than 110 volts for generator relay activation.

Comment
The situation outlined above is "best effort" approach, to maintain competitive equipment cost. It is very feasible and possible to add a precision low voltage and L1 and L2 phase detector on the utility L1 and L2 monitor lines. This can control the action of the transfer switch. When the utility drops below a preset 103-volt point or there is a complete loss of L1 or L2 (individually), this optional plug-in detector presents a true outage signal to the standard *TransConnect*™ control board. Order option TC-UMON-01.

Fuses

Socket Extender – LINE, 3-amp, slow blow (do not substitute type, must be specific MDA with 10,000-amp interrupt rating).

Other Checks

1. 1. Utility power monitor L1 and L2 is direct from the socket extender LINE terminals. This is protected within the socket extender (behind the meter) with two 3-amp fuses. Proper power outage or utility monitor is not possible unless BOTH fuses are okay.

- - Visual verification of this utility L1 and L2 monitor is the neon lamps, circuit board upper right. There are possible conditions where one fuse could be open and still have a glow on the other neon lamp. The only positive verification is the volt meter check, each leg to neutral and across L1 and L2.
- - Volt meter verification of utility L1 and utility L2 monitor can be made on the circuit board upper right tabs marked UL1 and UL2.

2. 2. Initial installation, unit will not transfer with test button – the small green wire coming off of the bottom of the internal black disconnect switch in the socket extender must be tied to a proper return ground. This is an internal, low voltage, monitor point for the internal 200A disconnect switch.
3. 3. Monitor LED is alternating green/red – this would indicate two fault conditions:
   - - Generator voltage is out of tolerance and generator relay is open or interrupted. See other sections on "Voltage Window" enable/disable.
   - - An error or incorrect condition was detected in the transfer sequence. Push reset to retry.
   - - **Warning** – do not push reset more than once or twice. If the unit continues to lock up with the green/red alternating, call your service representative for assistance and additional troubleshooting details.

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