Always “On” UPS Systems Inc.®

GES-TN11-Series – Multi-Phase Input, Multi-Phase Output

GES-502TN11 – GES153TN11

On Line: 5kVA, 6kVA, 8kVA, 10kVA, 12kVA, 15kVA

Operators Manual

Version 2.2

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Note

The instructions contained in this manual are not intended to cover all of the details or variations in equipment, or to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred directly to Always On UPS Systems Inc.

Any electrical or mechanical modifications to this equipment, without prior written consent of Always On UPS Systems Inc, will void all warranties and may void UL/cUL listing. Unauthorized modifications also can result in personal injury, death, or destruction or the equipment.

Uninterruptible Power Supply

Please complete the Warranty Card supplied with this UPS and return it by mail to Always On UPS Systems Inc. This activates the warranty.

If additional information or technical assistance is required call:

Always On UPS Systems Inc Sales and Technical Support Line

Toll free at 1-877-259-2976 Ext. 451 or (250) 491-9777 Ext. 451 or Fax (250) 491-9775

Or E-mail at sales@alwaysonups.com or visit our web site at www.alwaysonups.com

Or write to

Always "On" UPS Systems Inc.
Bldg 1 – 150 Campion Road,
Kelowna, BC,
V1X 7S8,
Canada

Please complete the following information for your records and to remain within this equipment manual.

Model Number: _____

Serial Number: _____

Date of Installation: _____

Inspected By: _____

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IMPORTANT SAFETY INSTRUCTIONS

- THIS MANUAL CONTAINS IMPORTANT INSTRUCTIONS THAT SHOULD BE FOLLOWED DURING INSTALLATION AND MAINTENANCE OF THE UPS AND BATTERIES.
- THE UPS SYSTEM IS NOT INTENDED FOR EXTERNAL USE UNLESS SPECIFICALLY DESIGNED FOR IT.
- ALL SERVICING MUST BE DONE BY QUALIFIED PERSONNEL. DO NOT ATTEMPT TO SERVICE THIS EQUIPMENT YOURSELF. OPENING OR REMOVING COVERS WILL RISK EXPOSURE TO DANGEROUS VOLTAGES. DO NOT LOCATE UPS IN AN AREA WHERE UNAUTORIZED PERSONNEL HAVE ACCESS.
- THE POWER SUPPLY FOR THIS UNIT MUST BE SINGLE PHASE RATED IN ACCORDANCE WITH THE EQUIPMENT DATA PLATE. IT MUST BE SUITABLY GROUNDED.
- DO NOT STAND BEVERAGE CONTAINERS ON THE UNIT.
- EXTERNAL SLITS AND OPENINGS IN THE CABINET ARE PROVIDED FOR VENTILATION. TO ENSURE RELIABLE OPERATION OF THE PRODUCT AND TO PROTECT FROM OVERHEATING, THESE OPENINGS MUST NOT BE BLOCKED OR COVERED. OBJECTS MUST NEVER BE INSERTED INTO VENTILATION HOLES OR OPENINGS.
- THE POWER OUTLET ON THE UPS DISTRIBUTION PANEL WILL BE LIVE WHEN THE UNIT'S POWER SWITCH IS ON, WHETHER OR NOT THE UNIT AC SUPPLY IS PRESENT.
- QUALIFIED PERSONNEL SHOULD BE CONSULTED WHEN:
  1. THE POWER CABLE HAS BEEN DAMAGED
  2. LIQUID HAS BEEN SPILLED INTO THE UNIT
  3. THE UNIT DOES NOT OPERATE NORMALLY EVEN THOUGH THE OPERATING INSTRUCTIONS HAVE BEEN FOLLOWED
- DO NOT PLACE MAGNETIC STORAGE MEDIA ON TOP OF THE UNIT, AS THIS CAN RESULT IN DATA CORRUPTION.
- THIS UPS WAS DESIGNED TO POWER ALL MODERN COMPUTER LOADS AND ASSOCIATED PERIPHERAL DEVICES, SUCH AS MONITORS, MODEMS, CARTRIDGE TAPE DRIVES, EXTERNAL FLOPPY DRIVES, ETC. DO NOT USE IT FOR PURE INDUCTIVE OR CAPACITIVE LOADS. IT IS NOT RATED TO POWER LIFE SUPPORT EQUIPMENT.

CAUTION:
ALL RECORDED MEDIA, SUCH AS DISKETTES, TAPES AND CARTRIDGES, SHOULD BE KEPT A MINIMUM OF 60CM FROM THE UPS. THE MAGNETIC FIELD CREATED BY OPERATION OF THE UPS MAY ERASE DATA ON THOSE DEVICES.

ATTENTION:
INSTALL THE ON-LINE UPS IN A WELL-VENTILATED AREA, AWAY FROM FLAMMABLE LIQUIDS, GASES, OR EXPLOSIVES. DO NOT LET THE UNIT COME INTO CONTACT WITH WATER. POTENTIALLY LETHAL VOLTAGES EXIST WITHIN THIS UNIT AS LONG AS THE BATTERIES ARE CONNECTED. DO NOT TOUCH ELECTRICAL CIRCUITS WHEN POWER IS CONNECTED TO THE UPS. TURN THE UPS "OFF" AND DISCONNECT THE UNIT FROM THE POWER SOURCE BEFORE REMOVING THE COVER PLATES.
ALL REPAIRS SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL. READ THIS MANUAL CAREFULLY BEFORE INSTALLING OR USING THE UNIT. FOLLOW ALL PROCEDURES, AS DESCRIBED, TO INSURE SAFE, RELIABLE OPERATION OF THE UPS.

SAVE THESE INSTRUCTIONS

MORE SAFETY INSTRUCTIONS

- DO NOT USE THIS EQUIPMENT FOR ANY PURPOSE OTHER THAN THE INTENDED USE.
- EXAMINE THE PACKAGING CONTAINER FOR DAMAGE. NOTIFY THE CARRIER IMMEDIATELY IF DAMAGE IS PRESENT.
- DO NOT DISASSEMBLE THE UPS.
- DO NOT OPERATE OR LOCATE NEAR WATER OR EXCESSIVE HUMIDITY.
- DO NOT USE OTHER MANUFACTURERS ACCESSORIES. MAY CAUSE DAMAGE OR UNSAFE CONDITIONS
- KEEP LIQUID AND FOREIGN OBJECTS FROM GETTING INSIDE THE UPS.
- DO NOT BLOCK AIR VENTS IN THE FRONT OF THE UPS OR AIR EXHAUSTS IN THE BACK.
- DO NOT PLACE OR OPERATE CLOSE TO GAS, HEATERS OR FIRE.
- DO NOT LET POWER CORDS CONTACT HOT SURFACES
- DO NOT PLUG APPLIANCES, SUCH AS HALF BRIDGE RECTIFIED LOAD, INTO THE UPS.
- USE CAUTION WHEN SERVICING BATTERIES. BATTERY ACID CAN CAUSE BURNS TO SKIN AND EYES. IF ACID IS SPILLED ON SKIN OR IN EYES, FLUSH ACID WITH FRESH WATER AND CONTACT A PHYSICIAN IMMEDIATELY.
- DO NOT OPERATE IF THE UNIT IS LEAKING LIQUID OR IF A WHITE POWDERY RESIDUE IS PRESENT.
- BATTERIES MAY CONTAIN METALS AND OTHER CHEMICAL HAZARDOUS WASTE. FOR PROPER DISPOSAL, CONSULT YOUR LOCAL STATE AND FEDERAL EPA AND OTHER ENVIRONMENTAL LAWS AND REGULATIONS.
- USE ONLY THE POWER SUPPLY CORD PROVIDED WITH THIS UNIT. THE POWER CORD FOR UPS IS WIRED IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE (NEC) SPECIFICATIONS. BE SURE THAT THE WALL OUTLET IS ALSO WIRED TO THESE SPECIFICATIONS.
- THE UPS CONTAINS ITS OWN ENERGY SOURCE (BATTERY). THE OUTPUT RECEPTACLES MAY BE LIVE EVEN WHEN THE UPS IS NOT CONNECTED TO AN AC SUPPLY.
- ONCE YOU HAVE CONNECTED THE BATTERY CONNECTORS, DO NOT ATTEMPT TO LIFT THE CABINETS.
- DO NOT CONNECT OR DISCONNECT BATTERY CABINETS WHILE THE UPS IS OPERATING FROM BATTERY.

SYMBOLS

Protective grounding terminal; a terminal which must be connected to ground prior to making any other connection to the equipment.

A terminal to which or from which an alternating (sine wave) current or voltage may be applied or supplied.

A terminal to which or from which a direct current or voltage may be applied or supplied.

This symbol indicates the word "phase".

May be used in lieu of the wording "caution, risk of electric shock" for any cautionary marking.

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1. Introduction

Congratulations on your choice of the Always "On" TN Series On-Line Uninterruptible Power System (UPS). The TN Series features the very latest, top of the line, microprocessor technology and IGBT transistors for clean, highly regulated, PWM (Pulse Width Modulated) power. Also included within our high quality engineering is an output isolation transformer to provide the final touch to complete power conditioning and noise attenuation, even during bypass operation.

For ease of use, the TN Series utilizes an LCD display to graphically indicate load percentage, battery capacity and the mode of operation while simultaneously displaying numerically input voltage, output voltage, input frequency, output frequency and internal UPS temperature. It also provides user control of the self-diagnostic a feature available through a combination On/Alarm Silence/Manual Battery Test/Off/Bypass buttons, and two levels of alarms when the unit is operating on battery.

The TN Series incorporates an interface port for communications between the UPS and a LAN server or other computer system with various operating systems installed. This port provides detailed operating information including voltages, currents, and alarm status to the host system when used in conjunction with the shutdown software. Also available are the optional SNMP Adapter to permit remote monitoring and notification of UPS conditions via a network or the internet, and an AS-400 interface to allow for relay communications in PLC or contact environments.

1.1 Modes of Operation

The TN Series UPS is designed to operate as a continuously on-line dual conversion system in the following modes:

Normal - The critical AC load is continuously supplied by the UPS Inverter. The input Rectifier derives power from a utility AC source and supplies power to the Inverter while simultaneously float-charging the batteries.
Emergency - Upon failure of AC utility, the Inverter obtains power from the batteries without interruption. There are no interruptions in power to the critical load upon failure or restoration of the AC utility source.
Recharge - Upon restoration of AC utility, the Rectifier will automatically restart and supply DC power to the inverter and battery charger.
Automatic Restart - Upon restoration of AC utility, after an extended utility and complete battery discharge, the UPS will automatically restart and resume supplying power to the critical load. Also the battery charger will automatically start and recharge the batteries. [This feature is enabled in the factory and is capable of being disabled (consult factory).]
Static Bypass - The bypass will provide an alternate path for power to the critical load that is capable of operating in the following manner:

- ***Automatic*** - In the event of the inverter overload capacity be exceeded or should an internal failure occur, the UPS will perform an automatic transfer of the critical AC load from the inverter to the bypass source.
- ***Manual*** - Should the UPS need to be taken out of service for limited maintenance or repair, manual activation of the bypass will cause an immediate transfer of the critical AC load from the inverter to the bypass source. The input rectifier, inverter, and battery charging operations will be inhibited until the user transfers the UPS back to normal operation.

Maintenance Bypass – All TN Series units include provisions to allow for maintenance of the unit or replacement of batteries without interruption of power to the load. This will be done with the manually operated bypass switch included.

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2. Product Description

2.1. Theory of Operation

The UPS (Uninterruptible Power Supply) is designed to be installed between utility (commercial supplied power) and your loads. It is used to protect your loads from noticing any power fluctuations (eg. Blackouts, brownouts, over-voltage conditions). The UPS will supply a sufficient amount of steady, constant AC power during these power fluctuations, allowing the loads to be shutdown properly preventing possible damage to both hardware and software.

2.2. Block Diagram

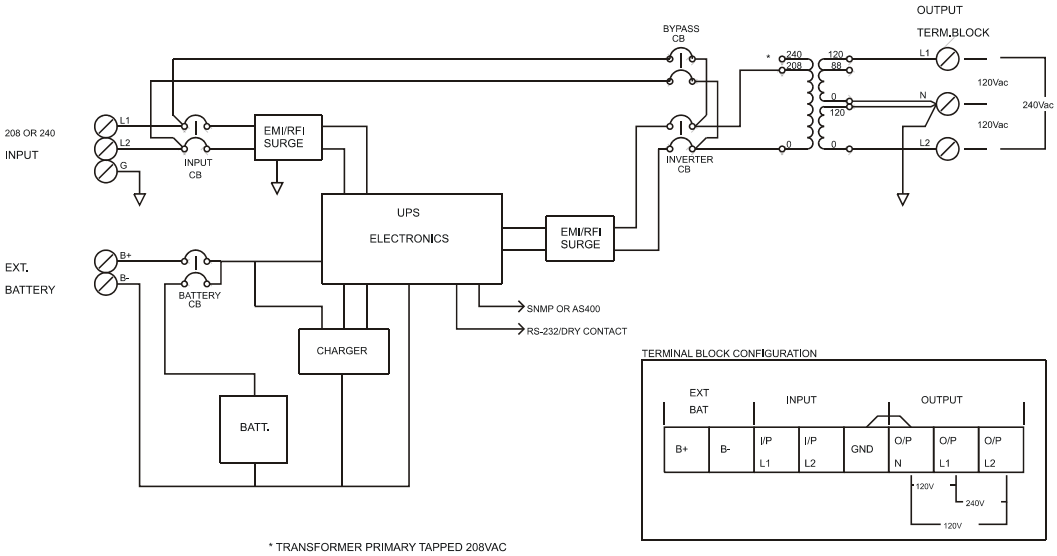

Figure 2.2.1
Block Diagram of TN Series

2.3. Description of Each Block

Input Breaker: Prevents the main distribution panel breaker from tripping when a UPS fault or over-current condition occurs.

EMI/RFI Filter: This filter attenuates the electrical noise associated with the polluted utility power to the UPS or noise (THD) generated by the UPS.

Rectifier / PFC / Charger: Incoming AC power is converted to a regulated DC output by the input rectifier/charger for supplying DC power to the inverter. The input rectifier/charger will provide input power factor correction and input current distortion correction.

PFC Control: By utilizing control circuits, the current drawn from the utility power is in-phase with the input voltage. The control circuit also allows the UPS to have a broader input voltage range (±25%).

Charger: Utilizes the DC bus voltage from the rectifier to charge the batteries (Quick Charge approx. 6hrs, Slow Charge approx. 10 hrs and Float).

Batteries: Sizes will vary in series and series-parallel configurations. Batteries are sealed lead-acid valve regulated gel cells.

Inverter: The term inverter will denote the solid-state equipment and controls used to convert power from the input rectifier or batteries to regulated AC power for supporting the loads. The inverter will produce 50 or 60Hz (auto-selectable) using Insulated Gate Bipolar Transistors (IGBT's) switching at approximately 18kHz, above the audible frequency range, and without low frequency magnetic components. The inverter is of pulse width modulated (PWM) design capable of providing the specified AC output with a very small tolerance (±2%).

CPU/Control/User Interface: The CPU controller monitors and maintains all systems within the UPS while permitting communication between the UPS, user and peripheral devices.

Static By-pass: A static transfer switch and bypass circuit is provided as an integral part of the UPS. The inverter has an overload rating of 105% rated load continuously, 150% rated load for 20 seconds, 200% rated load for one and a half cycles. The inverter will automatically transfer to bypass if these overload conditions are exceeded. The static transfer switch control logic will contain an automatic transfer control that senses the status of the inverter logic signals, operating and alarm conditions. This control circuit will provide an uninterrupted transfer of the load to a normal input source (or alternate bypass source). Transfers are made when an overload or malfunction occurs within the UPS, without exceeding the transient limits specified herein.

Maintenance By-pass: Allows for power wrap-around from input directly to output, while still utilizing the output isolation transformer, permitting maintenance and up-keep of the UPS system.

Transformer: An output isolation transformer is included. The output transformer is factory installed inside the UPS module cabinet. The same transformer through tap selection for additional system flexibility will serve any input and output voltage configurations in the UPS module.

3. Handling

3.1. Delivery

Check condition of equipment on delivery. Contact the carrier and supplier immediately if the packaging or unit is damaged.

3.2. Initial Inspection

Unpack the UPS carefully, notice the packing method, and retain the box and packing material. If you must return the UPS at any time, you must repack it the way it was originally shipped. Visually inspect the UPS for damage that may have occurred during shipment. If there is damage, or anything is missing, contact the dealer from whom you purchased the unit, and save the packaging for future shipment. When the unit has passed the initial inspection, record the Installation date on the back panel of the unit and in the space provided towards the front of this manual.

Included with UPS System:

1. User manual
2. Communication cable
3. Software package
4. AS400 cable (when optional AS400 included)

3.3. Storage

1. If the on-line UPS is to be stored prior to installation, it should be placed in a dry, well-ventilated area where it will not be exposed to dirt, moisture or other contaminants.
2. Extreme storage temperatures are:
   i. -30°C to +60°C without battery
   ii. -20°C to +45°C with battery for a short period
3. Maximum storage period for battery is 6 months at 20°C or 3 months at 30°C.

Important:

1. When the UPS and/or battery banks are to be stored for longer than 3 months, it is recommended the batteries are recharge every 3 months.
2. Do not stack these units.

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4. Installation

4.1. Location

The TN Series UPS is intended for installation in a temperature and humidity controlled indoor environment, free of conductive contaminants with unrestricted airflow. Ambient temperature must not exceed 40°C (104°F).

IMPORTANT: Maximum battery life is obtained by placing the battery in a room at an ambient temperature of 15°C to 25°C. Battery life decreases by half for every 10°C above 25°C.

The unit is fitted with castor wheels for moving it over a short distance.

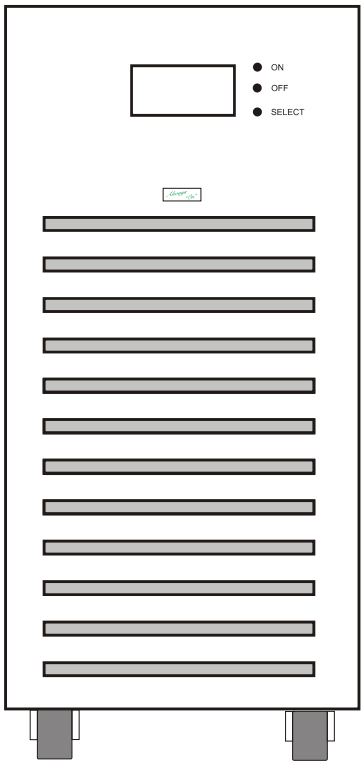

Figure 4.1.1
Front View

Air vents are located on the front, rear and sides of the UPS system. Do not position the UPS in an enclosed area with restricted airflow. Allow a minimum of 100mm (4 inches) around the UPS, with a minimum of 300mm (12 inches) at the rear for easy operator access to the connections and the rear panel mounted input/output/battery/maintenance breakers. (Figure 4.1.2)

Maintenance/Servicing of the TN Series requires access to all side of the UPS system and battery banks. Provide the necessary free space and flexible wiring to allow complete access to the UPS system.

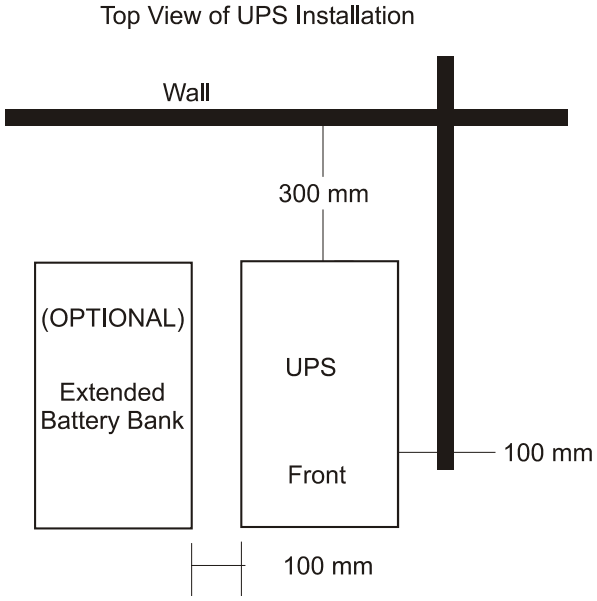

Figure 4.1.2
Top View

4.2. Electrical Considerations

The UPS shall be installed by a qualified technician and wired in accordance with local and national electrical codes.

The following information is for recommendation only.

1.1.1. Input

The commercial supply input cable shall be connected to the UPS via a dedicated double pole circuit breaker, rated to handle the input current and be capable of breaking at the maximum prospective short circuit current of this branch circuit. The breaker is to be mounted within two meters (six feet) of the UPS and be readily accessible to the operator.

1.1.2. Output

Provide adequately sized cabling and distribution panel and circuit breakers to supply the critical loads with the power available.

1.1.3. Optional Battery Bank AC Supply

If battery banks have been purchased ensure a separate double pole breaker is available to connect to the battery bank chargers. One 15A double pole breaker will power three battery bank chargers.

4.3. Protection

Protection circuit breakers are to be installed on both the input and output sides. The input protection breakers include 2-pole bypass breaker and AC input breaker.

The output over current protection is provided by one 2-pole circuit breaker and software.

In view of the on-line UPS's short circuit capacity, special provisions must be made to ensure circuit breaker rating of load slide protection devices in the event of a short circuit.

Model	Recommended Minimum Breaker for Rated output	Rated Output Current	
		200,220,230,240V 1∅ 2 wire 100/200,110/220, 115/230,120/240V 1∅ 3 wire	100, 110, 115, 120V 1∅ 2 wire
GES-502TN11	30A	30A	60A
GES-602TN11	30A	30A	60A
GES-802TN11	40A	40A	80A
GES-103TN11	60A	60A	100A
GES-153TN11	100A	80A	160A

Table 4.3.1 *Selection of Recommended Input Breakers (Not supplied with UPS System)*

Output short circuit capacity of inverter is shown below:

90A / 50ms-90ms	5kVA
90A / 50ms-90ms	6kVA
130A / 50ms-90ms	8kVA
160A / 50ms-90ms	10kVA
190A / 50ms-90ms	12kVA
240A / 50ms-90ms	15kVA

Table 4.3.2 *Output Short Circuit Capacity of Inverter*

4.4. Rear View Diagrams

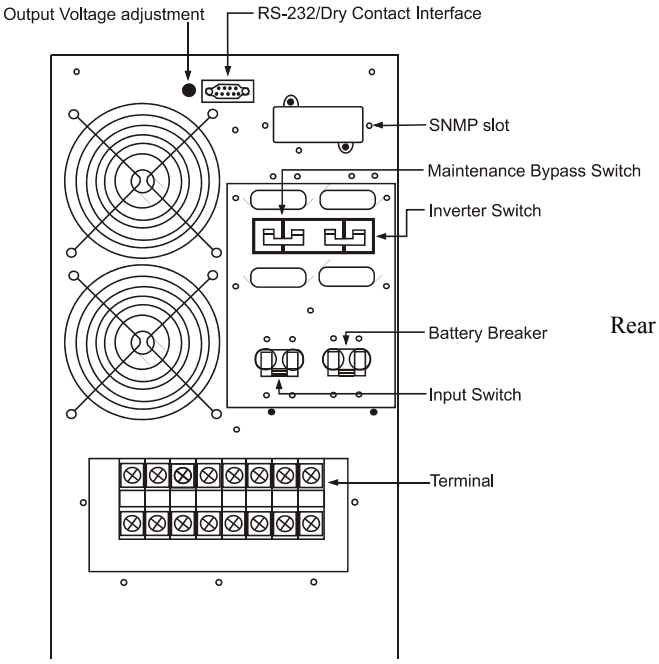

Figure 4.4.1
Rear view of the 5 and 6kVA UPS

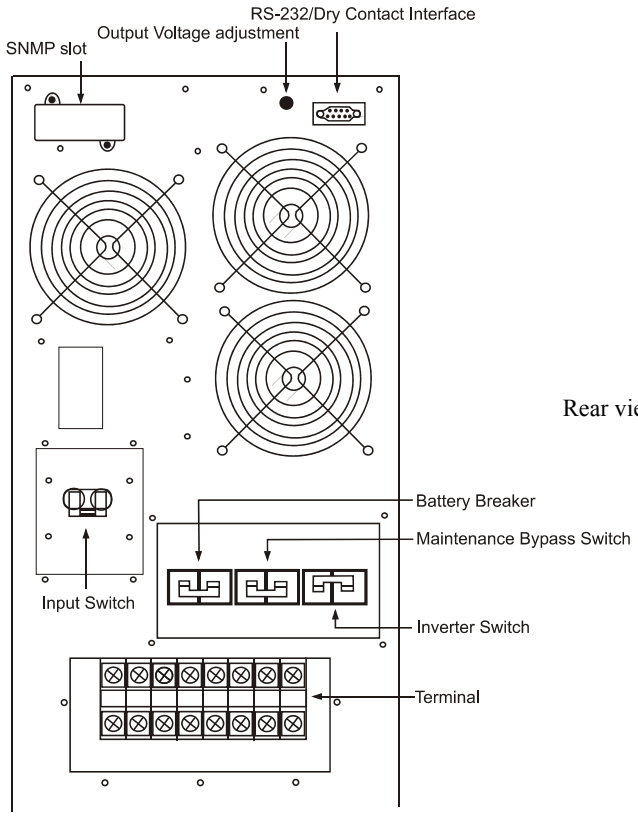

Figure 4.4.2
Rear view of the 8, 10, 12, and 15kVA UPS

4.5. Input, Output and External Battery Connection

The UPS is supplied with an input, output and battery terminal block assembly located on the rear of the UPS system.

The cable sizes and distribution methods used during installation are subject to the local and national electrical codes of practice, therefore are not detailed here.

Permanent wiring must be routed to the terminal block using appropriate materials as required by local and national codes.
External battery bank connections are described later in this manual.
Ensure UPS is provided with an adequate ground (earth).

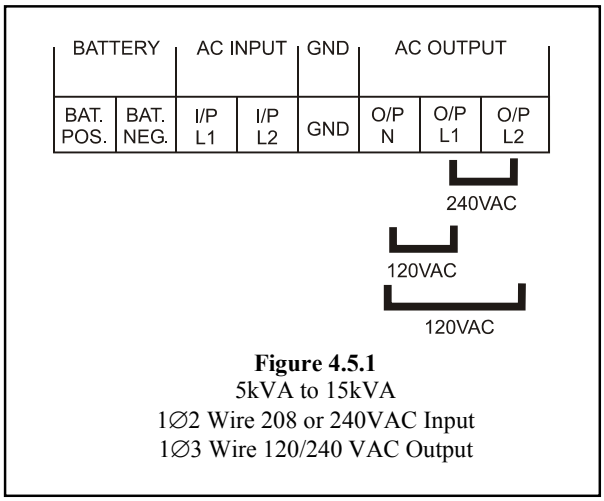

Figure 4.5.1
5kVA to 15kVA
1∅2 Wire 208 or 240VAC Input
1∅3 Wire 120/240 VAC Output

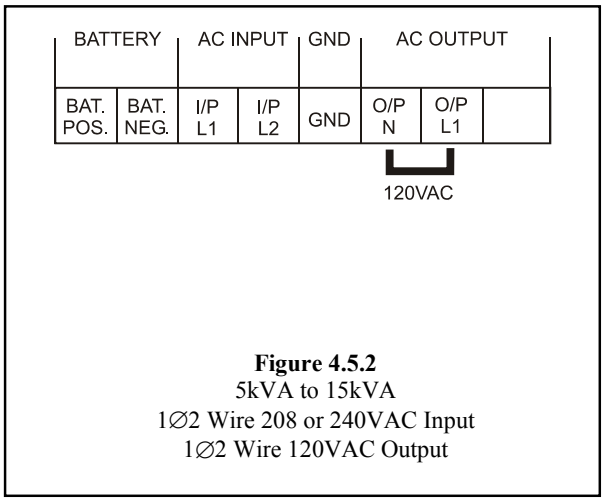

Figure 4.5.2
5kVA to 15kVA
1∅2 Wire 208 or 240VAC Input
1∅2 Wire 120VAC Output

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5. Start-up/Shutdown

Make sure the UPS is installed on a sturdy surface, in a well-ventilated room and that the exhaust fans and ventilation grills are not obstructed.

WARNING!
These procedures must be followed, step-by-step, otherwise damage may occur.

5.1. Turn On Procedure:

1. Battery Breaker
- Battery breaker lock plate needs to be removed if one is present.
- Switch the "BATTERY" Breaker to the "ON" position. (Wait 10 seconds)

2. Input breaker
- Switch the "INPUT" Breaker to the "ON" position.
- Front Panel (LCD Display) will light up, fans will start, etc. (Wait 10 seconds)
- "8888" will appear on the numeric display (LCD Display).
- "LINE" indicator will be lit up.
- "BATT" capacity display will be lit up.
- Charger will be enabled.
- There will be no output voltage from the UPS.

3. On button (front panel)
- Press and hold the Front Panel "ON" button for one (1) second.
- After the beep, the UPS will do a Turn On/Self Test diagnostics and then start normal operation of the inverter.
- The numeric display will start to read the output voltage, etc.
- "INV" indicator will light up.
- "LOAD" capacity display will light up.

5.2. Turn Off / Shutdown Procedure:

1 Off button (front panel)
- Press and hold the Front Panel "OFF" button for one (1) second.
- After the beep the Inverter will shutdown. "INV" indicator will go out.
- "8888" will appear on the numeric display.
- "LOAD " capacity display will go out.
- Charger will be enabled.
- There will be no output voltage from the UPS. (Wait 10 seconds)

2 Input breaker
- Switch the "INPUT" Breaker to the "OFF" position.
- The UPS will do a Power Down sequence.
- Front Panel Display will be extinguished.
- Fans will stop. (Wait 10 seconds)

3 Battery Breaker
- Switch the "BATTERY" Breaker to the "OFF" position.

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6. Front Control Panel

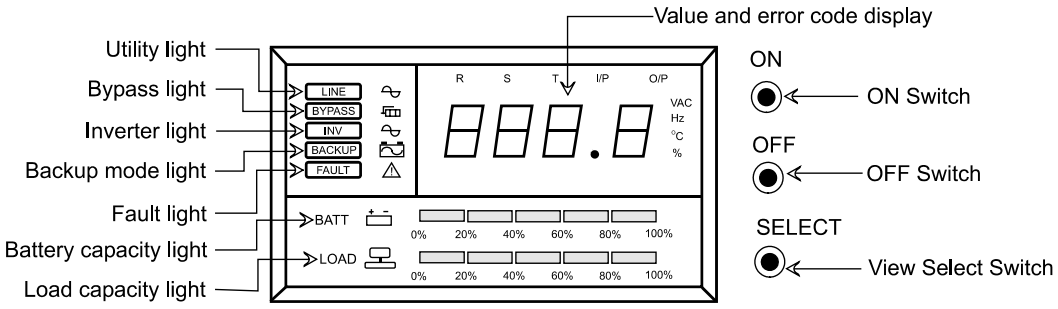

Figure 6.1
Front Control Panel

Utility Light: Indicates that AC utility is within normal operating parameters.
Bypass Light: Indicates the UPS is in static bypass mode.
Inverter Light: Indicates the inverter is supplying power to the load.
Backup Mode Light: Indicates the UPS is in backup mode.
Fault Light: Indicates that there is a functional problem with the UPS (refer to Fault Codes below).
Battery Capacity Light: Indicates the percentage of battery capacity.
Load Capacity Light: Indicates the percentage of load connected.

Select Button – Push to scroll through the following five displays:

1. Output voltage
2. Input voltage
3. Output frequency
4. Input frequency
5. The temperature inside the UPS

Fault Codes – There are seven fault indication codes:

1. E01 – Output fault
2. E02 – Temperature fault
3. E03 – Output short circuit
4. E04 – Overload fault (exceeding 150%)
5. E05 – DC BUS fault
6. E06 – Charging voltage fault
7. E07 – Battery fault

Load Indicator	% of Load	Battery Indicator	% of Battery Capacity
Light No. 5	Over 96%	Light No. 5	Over 91%
Light No. 4	76-95%	Light No. 4	76-90%
Light No. 3	51-75%	Light No. 3	51-75%
Light No. 2	26-50%	Light No. 2	26-50%
Light No. 1	10-25%	Light No. 1	0-25%

Table 6.1 *LED Read Outs On Load and Battery*

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7. Audible Alarm

7.1. Backup mode

The UPS will beep once every four (4) seconds when the unit is in back-up mode. (beep - - - beep - - - beep) [Slow beep]

NOTE: The UPS incorporates a mute function. When the UPS is beeping press the "ON" button on the front display to mute. Press the "ON" button again to reactivate.

7.2. Low Battery

The UPS will beep once every second when the batteries are almost depleted. (beep - beep - beep) [Fast beep]

NOTE: When a low battery condition occurs the mute function is disabled.

7.3. Fault

The UPS will sound a continuous beep and the fault light indicator will illuminate. (beeeeep) [Continuous beep]

NOTE: Error code may be displayed, consult Front Control Panel section for description of codes.

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8. Maintenance Bypass Operation

(Qualified Technicians or Service Personnel Only)

The purpose of the Maintenance Bypass Switch and Inverter Switch is to provide a "Manual Bypass" function. This function will remove the UPS electronics from the load for maintenance while still supplying power to the load. These switches are located at the back of the UPS under a removable cover plate to prevent accidental operation.

During normal operation the Inverter Switch is in the "ON" position, and the Maintenance Switch is in the "OFF" position.

Caution:
If the Maintenance Switch is turned "ON" during normal operation (both the Inverter and the Maintenance Switches are "ON") and the unit is not in static bypass mode, utility power will be paralleled with the inverter, and the utility will be fed directly into the inverter output. This will cause a fault condition and possible damage to the UPS.

8.1. To put the UPS into "Manual Bypass" mode:

(a) Press and hold the ON and OFF buttons at the same time for five (5) seconds. Release only after you hear the beep sound. The UPS has now been forced to static bypass mode.
(b) Turn "ON" the MAINT. Switch.
(c) Turn "OFF" the INV. Switch.
(d) Perform Turn Off / Shutdown Procedure as per Section 5.2.

The UPS electronics are now shutdown and you may begin maintenance work.

8.2. To restore the UPS to normal operation:

(a) Perform Turn On / Start-up Procedure as per Section 5.1.
(b) Press and hold the ON and OFF buttons at the same time for five (5) seconds. Release only after you hear the beep sound. The UPS has now been forced to static bypass mode.
(c) Turn "ON" the INV. Switch.
(d) Turn "OFF" the MAINT. Switch.
(e) Press and hold the ON and OFF buttons at the same time for five (5) seconds. Release only after you hear the beep sound. The UPS has now been forced back to inverter (normal) mode.

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9. Battery Maintenance

- On initial start-up it is recommended the batteries have a minimum of eight (8) hours of charging to ensure proper operation.
- During normal operation of the UPS, the charge level of the batteries will be maintained automatically.
- The typical recharge time to 90% from 0% charge level is 6-8 hours
- Under normal operating conditions, the supplied batteries are expected to last approximately five (5) years, or 200 discharges, from date of receipt.
- Refer to the purchase date you recorded in this manual if you suspect that the batteries have been exhausted.
- If the UPS is to remain in storage for an extended period of time, it is strongly recommended that the UPS be powered up for a period of twenty-four (24) hours, every three (3) months, to recharge the batteries and prevent premature failure.

10. Environmental Protection

The UPS incorporates sealed maintenance free lead-acid batteries. When replacing the batteries, the defective batteries must be disposed of carefully to prevent any risk of environmental pollution by the harmful products they contain (lead and acid). Please refer to local and regional environmental codes when disposing of the batteries.

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11. Battery Replacement

When replacing batteries, use the same number and the following types of batteries:

UPS Rating	Number of Batteries	Type of Batteries
5kVA	Twenty (20)	12VDC – 7Ah
6kVA	Twenty (20)	12VDC – 7Ah
8kVA	Twenty (20)	12VDC – 9Ah
10kVA	Forty (40)	12VDC – 7Ah
12kVA	Forty (40)	12VDC – 7Ah
15kVA	Forty (40)	12VDC – 7Ah

Table 11.1 *Battery Types and Quantities*

Attention:

Potentially lethal voltage exists within this unit as long as the battery supply is connected. During any service work, the battery supply should be disconnected by turning off the battery breaker (under cover), located at the rear panel of the UPS.

Battery cabinet assembly is heavy. Use suitable lifting equipment.

Caution:

Servicing of the batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions.
Keep unauthorized personnel away from the batteries.
Do not dispose of batteries in a fire. They may explode.
Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic.
A battery can present a risk of electrical shock and high short circuit current. The following precautions should be observed when working on batteries:

- Remove watches, rings, and other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Determine whether the battery is grounded. If grounded, remove the source of the ground connection. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such a shock is reduced if grounds are removed during installation and maintenance (applicable to a UPS and a remote battery supply not having a grounded supply circuit).

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12. Software Setup For Standard Software Applications

NOTE: This UPS can operate normally without setting up the software.

1. Install Software package included with the UPS (follow software instruction included with CD).
2. Connect the UPS to the computer via the RS-232 cable included with the software package.
3. Start software.

NOTE: Use the connecting cord supplied by the manufacturer, or the monitoring software will not work. Follow the "read me" file on the disk to run the setup.

12.1. RS-232 Interface

A 9-pin female SUB-D connector is provided on the UPS's rear panel to provide a communications link between the UPS and the computer. Using this software package the user can check the operating status of the UPS system.

UPSilon 2000 lets you monitor local UPS's as well as remote units by TCP/IP from your central location. UPSilon 2000 can be configured to automatically send emails when an event occurs such as a power outage. It can also call a pager when an event occurs with the use of a modem. The display is a real time display of the graphical display of UPS status including input/output voltage, frequency, load, temperature, and capacity. Will shutdown the system in a safe fashion before the batteries run out. UPSilon 2000 can also broadcast messages to remote computers running ClientMate (Included) and even send them commands to shutdown.

Pin Assignment:

UPS Port	*Computer Port*
Pin 9 – TXD (transmit data)	Pin 2 – RXD (receive data)
Pin 6 – RXD (receive data)	Pin 3 – TXD (transmit data)
Pin 7 – GND (signal ground)	Pin 5 – GND (signal ground)

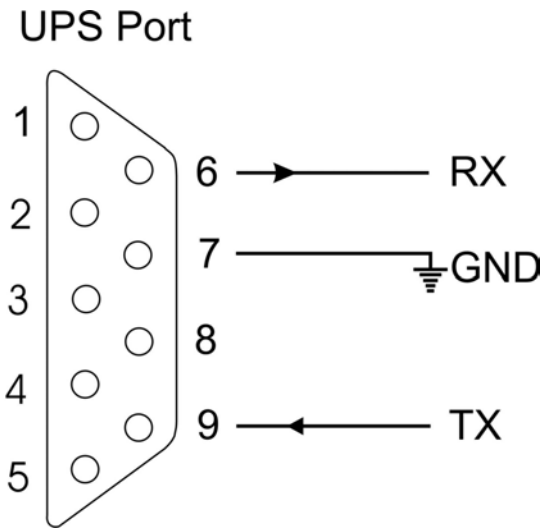

Figure 12.1.1
Pin out of RS-232 port on UPS

12.2. Dry Contact

Incorporated in the same port as the RS-232 port, located on the rear panel of the UPS, These open collection (photo-coupled) ports provide status information of the UPS operation. These signals enable the UPS to notify an unattended computer or automation device being supported by the UPS of a power anomaly. The connected device can then be programmed to recognize these signals and initiate a shutdown sequence.

Maximum conduction levels are 40VDC at 40mA.

Pin #	Function Explanation	I/O
2	Power fail – normally open status, will become closed when activated.	OUTPUT
4	Reference GND for pins 2, 5.	OUTPUT
5	Battery low – normally open status, will become closed when activated.	OUTPUT
6	Remote shutdown of UPS – keep this pin high (+5V~+12V) for 500ms to shutdown the UPS. Available when system is in battery mode.	INPUT
7	Reference GND for pin 6	INPUT

Table 12.2.1 *Pin Assignment*

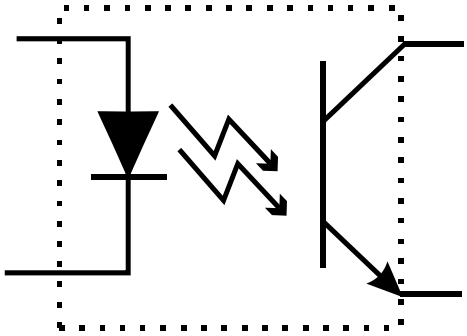

Figure 12.2.1
Schematic Of Photo-Coupled Transistor

13. Optional Extras

13.1. Installation Procedure for (Optional) Extended Battery Cabinets

Attention:
Choose the correct battery pack voltage, according to the UPS rated capacity. Do not connect too few or too many batteries, as this could cause electrical shock, damage or death.

Caution:
It is important to follow the correct procedures for connecting the battery packs. If the procedures are not followed properly, it will increase the chance of electrical shock, damage or death. Follow the procedure to avoid any possible danger.

Attention:
Ensure correct battery bank voltage and polarity before connecting.
Ensure UPS is "OFF" and battery breakers are "OFF"
Do not connect the wires to the UPS first, electrical shock will occur.

Caution:
Observe the appropriate cable connections regulation (e.g. National Electrical Code – NEC in the USA) at all times. Using cables of improper size may damage your equipment and cause fire hazards. Ground the UPS and the load equipment to a common point to prevent looping.

1) Battery Cabinet(s) should be installed as close as possible to the UPS system. (Cable to be as short as possible)

2) The DC Voltage of the Battery Cabinet must be the same as the DC Voltage of the UPS system. Battery Bank Voltage is 240VDC nominal.

3) Before connecting the Battery Cabinet to the UPS:
   i) You Must Power down the UPS and remove input AC supply.
   ii) Battery (UPS) Breaker MUST BE in the "Off" position on the UPS system and Battery Bank.
4) Battery cable (supplied) is hardwire attached to the Battery Cabinet and the UPS.

5) If multiple battery banks have been purchased connect all batteries banks together in a parallel fashion (Batt. Pos. to Batt. Pos. and Batt. Neg. to Batt. Neg. see Figure 13.1.1) before connecting the final battery bank to the UPS.

6) Connect Batt. Pos. lead from battery banks to Batt. Pos. on terminal strip on UPS.

7) The minimum tightening torque shall be no less than 35 ft lb/in.

8) Additional battery banks for the TN series UPS's require an additional 208VAC or 240VAC (multi-phase) supply to power the additional charger (provided with the battery bank). Connections are shown in Figure 13.1.1. (Cable not supplied).

Start-up Procedure

1) Install the UPS system and Battery Bank(s) as per recommendations within this manual.
2) Once all connections are secure, turn all the Battery Breaker(s) "On" starting from farthest away from the UPS.
3) Perform the Turn On / Start-up Procedure for the UPS (Section 5.1).

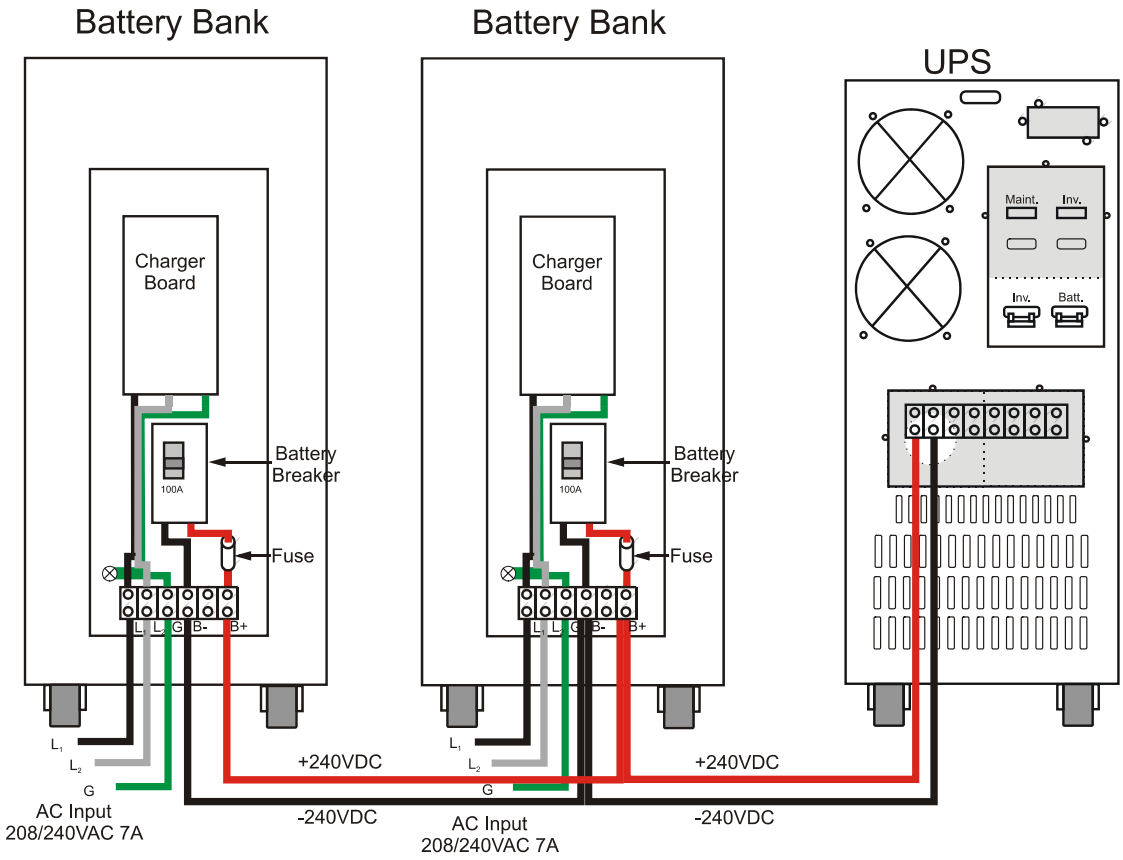

Figure 13.1.1
Battery Bank and UPS Connections

13.2. AS-400 and Dry Contact (Optional)

Located on the rear panel of the UPS is a 25 Pin connector, which provides status information through relay contacts and control by photo-coupled inputs.

Pin Assignment (DB 25pin male connector)

Input signal pin assignment:

Remote emergency power off: Pin 24, 25
When pin 24 and pin 25 are shorted, the UPS will power off immediately.

Back-up mode remote shut down: Pin 22, 23
If $V_{pin22} > V_{pin23}$ (5V~12V), the UPS will power off after a 40 second delay.

Output signal pin assignment:

Fault	Pin 1, 2, 3
On Battery	Pin 4, 5, 6
Battery Low	Pin 7, 8
On Bypass	Pin 9, 10
On Inverter	Pin 11, 12

Dry Contact Capacity:
Total maximum power rating is 30W
Maximum voltage rating is 250VAC
Maximum current rating is 3A

Optional
Instrumentation Terminal Strip
Allow for easy connection of wires if 25pin connector is not available

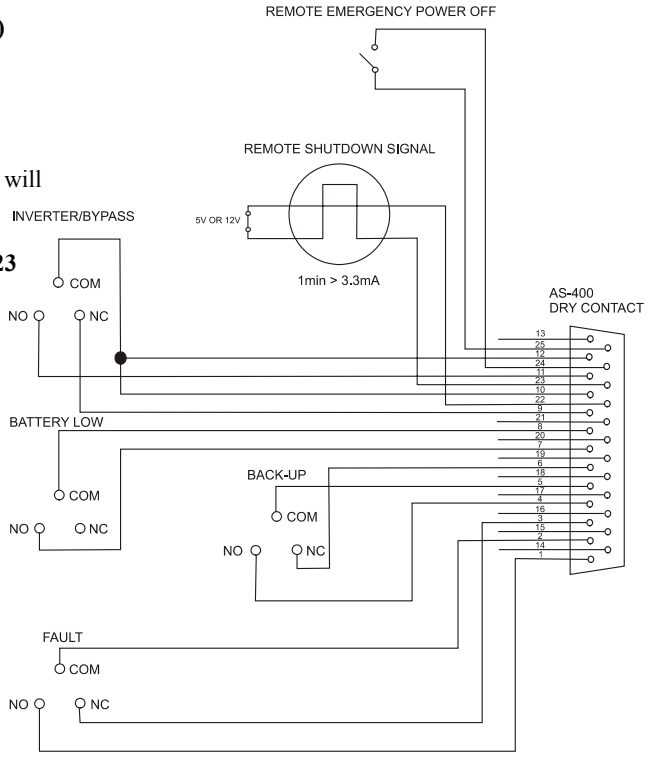

Figure 3.13.1
Line drawing of AS-400 Communications interface

Output Truth Table

State	Pin 1,2	Pin 2,3	Pin 4,5	Pin 5,6	Pin 7,8	Pin 9,10	Pin 11,12
Normal	Open	Closed	Open	Closed	Open	Open	Closed
Fault	Closed	Open	***1**	***1**	***1**	Closed	Open
On Battery	Open	Closed	Closed	Open	***1**	Open	Closed
Battery Low	Open	Closed	Closed	Open	Closed	Open	Closed
On Bypass	***1**	***1**	***1**	***1**	***1**	Closed	Open
On Inverter	Open	Closed	***1**	***1**	***1**	Open	Closed

***1** = Inactive. State may be "open" or "closed" condition

Table 13.3.1 *Output Truth Table*

13.3. SNMP (Web Accessible Monitoring) Adapter

The Always "On" Simple Network Management Protocol (SNMP) adapter is a web-based management product that uses multiple, open standards such as Telnet, HTTP, and SNMP to provide full management of supported devices.

The SNMP Adapter is designed to connect directly to the network and allow for network broadcasting of UPS conditions as well as remote access to the UPS system to monitor parameters and displays.

For set-up instructions view the READ ME file provided with the set-up disk.

14. TROUBLESHOOTING

The following chart of unusual situations includes some possible problems and solutions occurring under daily operation. If the UPS loses its basic functions, please check the following items before contacting you're the factory or service center:

1. Is the UPS connected to the power source?
2. Is the input voltage and frequency within operating parameters?

When you contact Always On for service, please provide the following information:

1. UPS model name and serial number.
2. Date the problem occurred.
3. Complete description of the problem.

TROUBLESHOOTING CHART

Problem	Possible Reasons	Solutions
UPS will not operate after pressing On/Off switches or no lights or warning sounds appear.	Input power source failure	Check power source
	Breaker switch on rear panel has been opened	Press breaker switch to "On" position
	Time of pressing "On" button is too short	Press "On" button longer than 1 second
	Output short circuit or UPS overload	Turn off UPS, remove all load to insure no problems with it or internal short circuit. Press "On" button longer than 1 second
Indicates no utility and warns every several seconds	No power source input	Check power source input
	Breaker switch on rear panel has been opened	Turn breaker switch to the "On" position
Fault light on and buzzer keeps beeping	UPS has failed	Contact dealer or service center for help
Buzzer keeps beeping	Overload	Take off some load
Utility indicating light is flashing	Voltage of utility is exceeding UPS input range	Save digital data and shutdown the applying program to ensure utility is within UPS range
Available time of batteries is too short	Batteries have not been charged; UPS overload; Batteries are aged and cannot be charged fully	Keep UPS "On" for over 8 hours to recharge the batteries. Check the load and remove any non-crucial equipment
	The charger has failed	Contact dealer or service center for help
The battery light is flashing when power of UPS is supplied by utility	Battery voltage is too low or batteries have not been connected	Check that UPS batteries are well connected. Replace any damaged battery packs immediately.

15. TECHNICAL DATA

Standard Models (Isolation XFM Included)

TN11 SERIES	MODEL NO.	GES-502TN11	GES-602TN11	GES-802TN11	GES-103TN11
INPUT	CAPACITY	5kVA/3.5kW	6kVA/4.2kW	8kVA/5.6kW	10kVA/7kW
	PHASE / FREQUENCY	1 Ø (3 WIRE + G) 50/60Hz			
	RATED VOLTAGE (Nominal)	208 / 220 / 240VAC			
	VOLTAGE RANGE	170 - 276VAC			
	POWER FACTOR	£ 0.98			
OUTPUT	VOLTAGE / PHASE	120, 120/208, 120/240, 110/220VAC (3 WIRE + G)			
	VOLTAGE REGULATION	± 2%			
	TOTAL CURRENT	20.8A	25A	33.3A	41.7A
	FREQUENCY ACCURACY	50Hz / 60Hz ± 0.5%			
	THD	< 3% LINEAR LOAD; < 5% RECTIFIED LOAD			
	LOAD POWER FACTOR	0.7			
	SLEW RATE	1Hz / SECOND			
	TRANSIENT RESPONSE	± 4% (100% LOAD CHANGE)			
	OVERLOAD CAPACITY	105% - 150% FOR 20 SECONDS			
	CREST FACTOR	3:1			
	EFFICIENCY (AC-AC)	> 85%			
	TRANSFER TIME	0ms			
	OUTLETS	HARD-WIRED			
BATTERY	BATTERY TYPE	SEALED LEAD ACID - MAINTENANCE FREE			
	VOLTAGE	240VDC	240VDC	240VDC	240VDC
	RECHARGE TIME	5 - 8 HOURS; RECOVERY = 90%, TYPICALLY			
BACKUP POWER TIME	FULL LOAD	15 MIN.	10 MIN.	15 MIN.	10 MIN.
	HALF LOAD	30 MIN.	25 MIN.	30 MIN.	25 MIN.
EXTENDED RUN TIME		AVAILABLE - CONSULT BATTERY BANKS			
PROTECTION	OUTPUT SHORT	YES			
	ABNORMAL VOLTAGE	YES			
	I/O NOISE PROTECTION	COMMON & NORMAL MODE NOISE SUPPRESSION			
	I/O SPIKE & TRANSIENT PROTECTION	YES			
INTERFACE	COMMUNICATION	RS 232 / DRY CONTACT / (OPTIONAL SNMP OR AS400)			
	DISPLAY	LEDs and LCD STATUS PANEL			
	AUDIBLE ALARMS	ON BATTERY, LOW BATTERY, OVERLOAD, FAULT			
ENVIRONMENT	OPERATING TEMPERATURE	0-40°C			
	HUMIDITY	0% - 90% (NON-CONDENSING)			
	AUDIBLE NOISE	≥ 55 dBA AT 1 METER FROM UNIT			
SAFETY APPROVAL	SAFETY	UL1778, CSA C22.2			
	EMI / RFI	FCC CLASS A			
	SURGE / TRANSIENT	IEEE C62.41 CAT.A			
PHYSICAL DATA	WxDxH in mm	260x555x700	260x555x700	340x640x980	340x640x980
	WEIGHT in kg	114	114	200	250

TN11 SERIES	MODEL NO.	GES-123TN11	GES-153TN11	GES-203TN11
INPUT	CAPACITY	12kVA/8.4kW	15kVA/10.5kW	20kVA/14kW
	PHASE / FREQUENCY	1 Ø (3 WIRE + G) 50/60Hz		
	RATED VOLTAGE (Nominal)	208 / 220 / 240VAC		
	VOLTAGE RANGE	170 - 276VAC		
	POWER FACTOR	£ 0.98		
OUTPUT	VOLTAGE / PHASE	120, 120/208, 120/240, 110/220VAC (3 WIRE + G)		
	VOLTAGE REGULATION	± 2%		
	TOTAL CURRENT	50A	62.5A	83.3A
	FREQUENCY ACCURACY	50Hz / 60Hz ± 0.5%		
	THD	< 3% LINEAR LOAD; < 5% RECTIFIED LOAD		
	LOAD POWER FACTOR	0.7		
	SLEW RATE	1Hz / SECOND		
	TRANSIENT RESPONSE	± 4% (100% LOAD CHANGE)		
	OVERLOAD CAPACITY	105% - 150% FOR 20 SECONDS		
	CREST FACTOR	3:1		
	EFFICIENCY (AC-AC)	> 85%		
	TRANSFER TIME	0ms		
	OUTLETS	HARD-WIRED		
BATTERY	BATTERY TYPE	SEALED LEAD ACID - MAINTENANCE FREE		
	VOLTAGE	240VDC	240VDC	240VDC
	RECHARGE TIME	5 - 8 HOURS; RECOVERY = 90%, TYPICALLY		
BACKUP POWER TIME	FULL LOAD	10 MIN.	10 MIN.	10 MIN.
	HALF LOAD	25 MIN.	25 MIN.	25 MIN.
EXTENDED RUN TIME		AVAILABLE - CONSULT BATTERY BANKS		
PROTECTION	OUTPUT SHORT	YES		
	ABNORMAL VOLTAGE	YES		
	I/O NOISE PROTECTION	COMMON & NORMAL MODE NOISE SUPPRESSION		
	I/O SPIKE & TRANSIENT PROTECTION	YES		
INTERFACE	COMMUNICATION	RS 232 / DRY CONTACT / (OPTIONAL SNMP OR AS400)		
	DISPLAY	LEDs and LCD STATUS PANEL		
	AUDIBLE ALARMS	ON BATTERY, LOW BATTERY, OVERLOAD, FAULT		
ENVIRONMENT	OPERATING TEMPERATURE	0-40°C		
	HUMIDITY	0% - 90% (NON-CONDENSING)		
	AUDIBLE NOISE	≥ 55 dBA AT 1 METER FROM UNIT		
SAFETY APPROVAL	SAFETY	UL1778, CSA C22.2		
	EMI / RFI	FCC CLASS A		
	SURGE / TRANSIENT	IEEE C62.41 CAT.A		
PHYSICAL DATA	WxDxH in mm	340x640x980	340x760x1160	340x760x1160
	WEIGHT in kg	250	255	265

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16. CONTACT INFORMATION

16.1. Additional Purchases or Upgrades

Always "On" UPS Systems Inc.
Bldg 1 – 150 Campion Road,
Kelowna, BC, Canada, V1X 7S8
Phone: (250) 491-9777 Ext 451
Fax: (250) 491-9775
Email: sales@alwaysonups.com
Website: www.alwaysonups.com

16.2. QA / Warranty Questions

Always "On" UPS Systems Inc.
Bldg 1 – 150 Campion Road,
Kelowna, BC, Canada, V1X 7S8
Phone: (250) 491-9777 Ext 209
Fax: (250) 491-9775
Email: qa@alwaysonups.com
Website: www.alwaysonups.com

16.3. Software Questions

Always "On" UPS Systems Inc.
Bldg 1 – 150 Campion Road,
Kelowna, BC, Canada, V1X 7S8
Phone: (250) 491-9777 Ext 204
Fax: (250) 491-9775
Email: webmaster@alwaysonups.com
Website: www.alwaysonups.com