



## DO'S AND DON'TS CHECKLIST

For proper and reliable operation of the Motor Manager II, it is imperative that the steps, recommendations and practices listed below be adhered to at all times. This Do's and Don'ts checklist has been compiled as a result of years of trouble free operation by a variety of Multilin products.

### 1) MMII Grounding

Users are requested to ground terminals 13 (safety ground) and 14 (surge ground) directly to the GROUND BUS using a heavy gauge wire or braided cable. Terminals 13 and 14 will accept up to #12 AWG wire. These terminals must be grounded for proper filtering of noise, and protection against transient conditions.

### 2) Grounding of Phase and Ground CTs

- All phase CT and ground CT secondary windings must be grounded to the GROUND BUS to keep the potential difference to a minimum. If the CT secondary windings are not grounded, capacitive coupling could allow the CT secondary voltage to float up to the voltage of the mains. This is a serious safety hazard.
- It is also recommended that, in addition to the solid grounding of the ground CT described above, a shielded twisted pair cable be employed when using the Multilin 50:0.025 ground CT. The reasoning behind this recommendation is that the 50:0.025 ground CTs are typically used on high resistance grounded systems where the fault currents are limited to less than 200 A. The alarm and trip levels on these systems are usually between 0.5 A and 15.0 A. This equates to a secondary current of 0.25 mA to 7.5 mA. Due to the very low levels that must be monitored by the MMII, any noise picked up by these secondary wires must be kept to a minimum.

### 3) RS485 Communications Port

The MMII interfaces with PCs, PLCs and DCSs using the Modicon **Modbus RTU**<sup>®</sup> protocol. The MMII supports Modbus function codes 01, 03, 04, 05, 06, 07, 08 and 16. The communications port is very important due to the MMII's process and control applications. The port allows reading and writing of data, as well as full control to start and stop the motor from a remote location. For these reasons, proper wiring practices are critical.

- A shielded, twisted pair cable, such as 24 gauge Belden 9841 (120Ω characteristic impedance) or equivalent, **MUST** be used for the communications link. The cable should be routed away from all power carrying cables, such as the motor mains, power supply wiring, CT wiring and noisy contactors or breakers.
- When using the Multilin 232/485 converter box at the MASTER, **Multilin recommends placing no more than 32 Multilin devices** on the same data link which should be of **no greater length than 4000 ft**. The devices on the data link should be daisy chained for reliable operation. Star or stub connections are **not recommended**. If more than 32

devices are required to go onto the data link, or the distance must be greater than 4000 ft, consult the EIA 485 standard for more details on specific calculations. Another way to increase the number of units on the data link or the transmission length is to utilize a RS485 Repeater.

- The **shields** of the cable should be daisy chained to all of the MMII serial commons (terminal 38) and grounded **at the MASTER only**. This provides a common reference for all of the devices on the data link, as well as, grounding the data link without creating the potential for ground loops. The potential difference between the MMII safety ground (terminal 14) and the MMII serial common (terminal 38) **should not** exceed 36 V.
- A terminating network consisting of a 120 $\Omega$ /0.25W resistor in series with a 1nF/50V general purpose mono ceramic or equivalent capacitor **MUST** be placed across the + and - terminals at both ends of the data link (terminals 39 and 40 on the MMII). This is to provide the 200 mV separation between the + and - terminals of the device, as well as to eliminate any reflected signals and ringing.

#### 4) Switch Inputs

The MMII has 16 switch inputs that operate on 120 VAC. The MMII supplies the 120 VAC to the Switch Common terminals (57 & 58) for use in the control circuitry. **NOTE: Terminals 57 & 58 are live at 120 VAC.** An external source can be used to supply the circuitry into the MMII switch inputs providing that the external source is **in phase** with the control voltage of the MMII. The MMII switches the inputs on and off internally, to minimize power consumption, at a frequency determined by the control voltage. If the external source is not in phase with the control voltage to the MMII, the timing will be off which could cause errors when reading the switch inputs. If an external source is used to supply the control signals to the MMII switch inputs, the source should be fused to protect against fault conditions in the circuitry. Terminals 57 & 58 are protected with the same 2A fuse that protects the MMII power supply.

#### 5) Thermistor and Analog Inputs

Due to the small voltage levels coming into the MMII from the thermistor and external analog device, shielded cable is recommended to minimize any noise that may be picked up. These wires should be routed away from any power carrying cables.

#### 6) VT Input

The MMII has a single VT input which can be used to do a rough calculation of the power being consumed by the motor. The VT secondary voltages supported by the MMII software are 110 VAC or 120 VAC. The MMII can support other secondary voltages by recalculating the ratio with respect to 110 VAC or 120 VAC; however, the input voltage into the MMII terminals 15 and 16 **should not exceed 150 VAC.**

#### 7) STOP Switch Input

The STOP switch input on the MMII **MUST** be energized before the MMII is available to perform a start. If the contactor is being energized and de-energized externally to the MMII, this terminal will need a jumper from terminal 57 or 58 before the MMII will seal in Contactor A.

**8) Contactor Status Feedback**

The MMII **MUST** see feedback from Contactor A and Contactor B auxiliary contacts into the applicable status switch inputs (terminals 55 & 56) within 1 second of closing the contactor. If this feedback is not received, the MMII will open the contactor instead of sealing it in, and will alarm with an OPEN CONTROL CIRCUIT.