



B3605S & B3610S

HARDWARE INSTALLATION
MANUAL



Table of Contents

	Page
1.0 Overview of B3605S and B3610S	2
2.0 Drive Features	2
3.0 Installation instructions	2
3.1 Safety	2
3.1.1 Safety Guideline	2
3.2 Warranty	3
3.3 Unpacking the drive	3
3.4 Inspection Procedure	3
3.4.1 Quick Test Process	4
3.5 Mechanical Installation	4
3.5.1 Mechanical Specification - Dimensions	4
4.0 System Connections and Wiring Diagram	7
4.1 Electrical interface and Connections	7
5.0 Setting the Operating Speed Mode	9
6.0 Defective Equipment	11

1.0 Overview of B3605S and B3610S

The B3605S/B3610S are single quadrant PWM drives designed for use with 3 phase electronically commutated brushless motors. The B3605S/B3610S contains all the control elements necessary for operation and speed control. The user merely has to provide a simple, DC power supply and optional external switches.

The drive controls the load (motor) in one direction – the B3605S/B3610S is not designed for instantaneous reversing. If direction needs to be changed the motor has to come to a complete stop before the direction input status is changed.

2.0 Drive Features

- Single DC power supply, 12 Vdc ($\pm 5\%$) **or** 15 – 36 Vdc input. (see note regarding J1)
- The B3605S is 5 Amps continuous output current and the B3610S is 10 Amps continuous output current
- The drive is a single board (2.0 in x 3.5 in x 0.955 in).
- PWM clock frequency 25 KHz.
- Hall feedback control.
- 120 degree or 60 degree hall commutation – jumper selectable.
- Internal +12 Vdc supply for the motor's Hall Effect sensors and control logic
- Speed Command option, via on-board trimpot or external 0-10 Vdc or 0-5 Vdc command.
- Direction of rotation option, via on board jumper or externally controlled.
- External INHIBIT (ENABLE\) input.
- Speed Monitor output.
- FAULT (READY\) monitor output.

3.0 Installation Instructions

3.1 Safety

Read the complete manual before attempting to install or operate the B3605S or B3610S drives. By reading the manual you will become familiar with practices and procedures that allow you to operate these drives safely and effectively.

As a user or person installing these drives, you are responsible for determining the suitability of this product for the intended application. MCG is neither responsible for nor liable for indirect or consequential damage resulting from the inappropriate use of this product.

3.1.1 Safety Guidelines

Electrical shock and hazards are avoided by using normal installation procedures for electrical power equipment in an industrial environment. The drives should be installed in an industrial cabinet such that access is restricted to suitable qualified personal.

- Electrical hazards can be avoided by disconnecting the drive from its power source and measuring the DC bus voltage to verify it is the safe level.
- Make sure motor case is tied to earth ground.
- DO NOT operate the unit without connecting the motor to the appropriate terminals, high voltage is present at the motor terminal even when motor is not connected and voltage bus is present.
- Always remove power before making any connection to the drive.
- DO NOT make any connections to the internal circuitry. Connections should be made only to appropriate connectors.

- DO NOT use the ENABLE input as a safety shutdown. Always remove power to the drive for safety shutdown.
- Use power supply with sufficient capacitance.
- DO NOT spin the motor without power. The motor acts like a generator and will charge up the power capacitor through the drive. Too high a speed may cause over voltage breakdown in the power internal power devices. Note that the drive having an internal power converter that operates from the high voltage will become operative.

WARNING

Voltage potential inside the drive is the same as the DC power supply. All internal circuit should be considered “hot” when power is present.

Caution

The Unit should be only connected up skilled personnel.
Incorrect wiring can lead to overheating, damage to the PCB or malfunction.

For leads length in excess of 6.5 ft (2 m), the DC supply and signal leads must be cabled separately. Other leads that emit interference should be also separated.

DC Supply leads should be sized appropriately for the maximum output current of the drive and should be kept as short as possible. Long leads should be oversized to reduce voltage drop and should be twisted.

Warning

AC supply voltage will destroy the drive.

Warning

Ensure that the power supply voltage is switched off before carrying out the electrical connection.
Otherwise overheating, destruction of the circuitry, or malfunctions could occur.

To achieve the full rating of the drive, some type of additional cooling of the base plate is needed. This can be done by bolting it to an additional heatsink, a large mass that remains cool, or providing a small amount of air flow over the plate.

3.2 Warranty

The MCG B3605S & B3610S have a one-year warranty against defects in material and assembly. Products that have been modified by the customer, physically mishandled or otherwise abused through mis-wiring, incorrect switch settings and so on, are exempt from the warranty plan.

3.3 Unpacking the Drive

1. Remove the drive from the shipping carton and remove all packing materials from the drive. The materials and the carton may be retained for storage or shipment of the drive.
2. Check all items against the packing list. A label located on the side of the drive identifies:
 - Model number
 - Serial number
 - Manufacturing date code

3.4 Inspection procedure

To protect your investment and ensure your rights under warranty, MCG recommends the following steps are performed upon receipt of the drive:

1. Inspect the drive for any physical damage that may have been sustained during shipment.

2. Perform procedures described in section 3.4.1 before storing or installing the servo drive
3. If you find damage, either concealed or obvious, contact your purchaser to make claim with the shipper. Contact your distributor to obtain a Return Material Authorization (RMA) number. Do this as soon as possible after you receive the drive.

3.4.1 Quick Test Process

A quick operational test can be performed as follows:

1. Install or move jumpers such that:
 - i. BR3, BR5, BR7 are installed,
 - ii. BR1, BR2, BR6 NOT installed.
 Exceptions:
 - iii. 60 degree comm.. motors – do not install BR7
 - iv. 12 volt applications – install BR1
2. Connect motor
3. Connect DC Power
4. Motor should run in CW direction with speed adjustment possible via R13 trimpot.

3.5 Mechanical Installation

Mount the drive in an enclosure providing protection to IP54, protected against dust and splashing water, or IP65, protected against water jets and dust free air.

Many NEMA type 4 cabinets provide this type and level of protection. Minimum cabinet requirements are:

- Depth: 3 inches, allow one more inch for cabling
- Ventilation to dissipate the heat generated by the drive B3605S 10 watts or B3610S 15 watts
- The air should also be free of corrosive or electrically conductive contaminants.
- Internal cabinet temperature should not exceed 113 F (45 degrees C). Operating temperature range 32 - 113 F (0 - 45 degrees C).

3.5.1 Mechanical Specifications - Dimensions

Position the drive in a vertical position on a flat, solid surface. This surface should be able to support the approximate weight of the drive.

- Bolt the drive in the cabinet using the mounting two slots in the rear side (B3610S), or the four mounting holes in the side of the drive (B3605 - cold plate mounting).
- Minimum unobstructed space of 2 inches (50 mm) at the drive top and bottom is required.
- Minimum one inch on each side.
- Free of excessive vibration or shock.

The B3605S	The B3610S
Length x width x height 2.000 x 3.500 x 0.955 (inches) 50.800 x 88.900 x 24.257 (mm)	Length x width x height 2.000 x 3.500 x 1.542 (inches) 50.800 x 88.900 x 39.167 (mm)
Weight - 3 oz (85 gm)	Weight – 3.5 oz (100 gm)

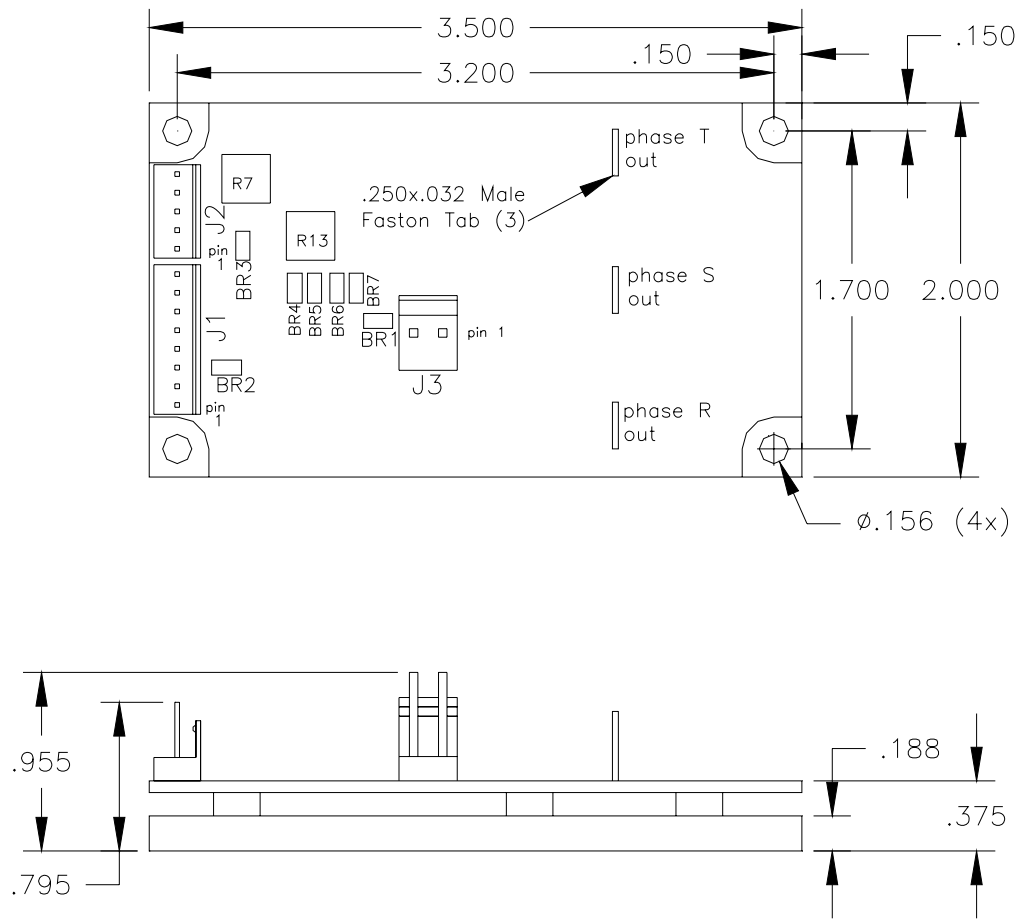


Figure (1) General Mechanical Outline for B3605S

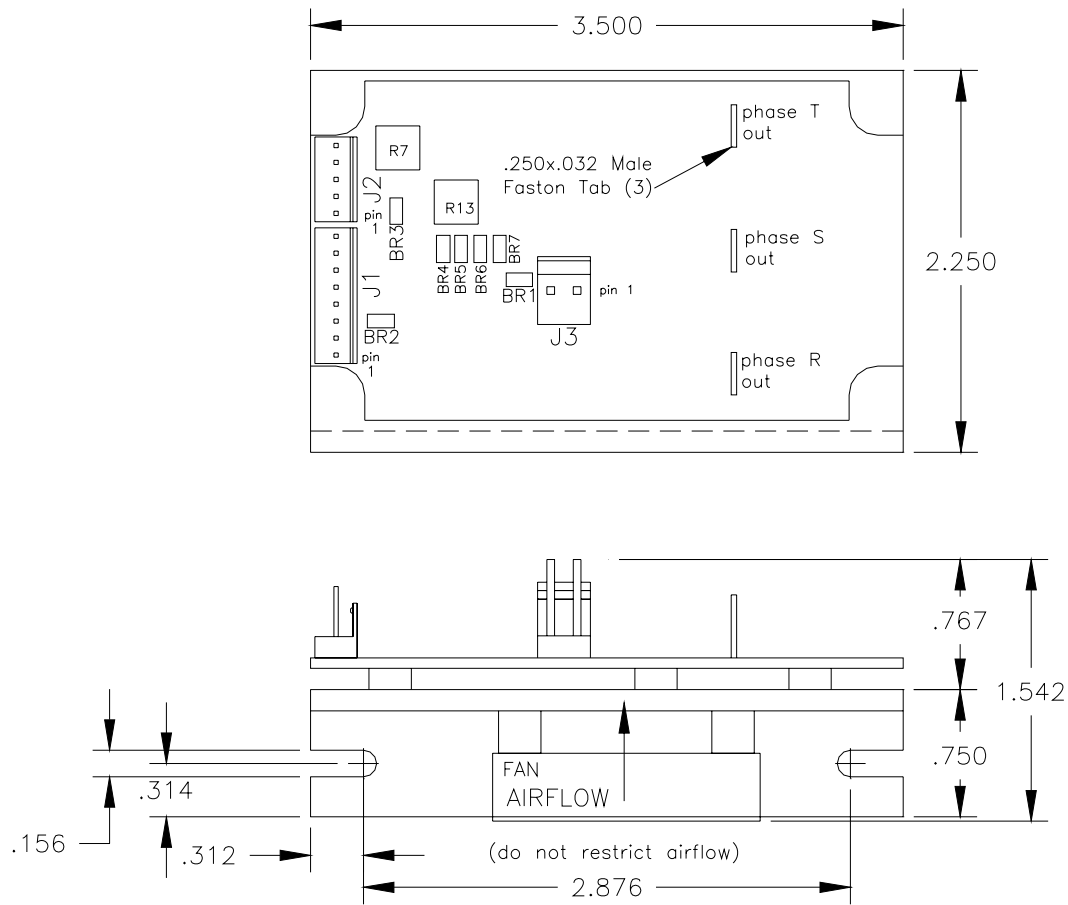


Figure (2) General Mechanical Outline for B3610S

Ambient temperature
32 – 113 °F
0 – 45 °C

Storage Temperature
-40 to + 185 °F
-40 to + 85 °C

Maximum heat sink temperature – 140 °F (60 °C)

4.0 System Connections and Wiring Diagram

The following diagram shows an installation of the B3605S or the B3610S in a typical system. Your system may vary from this configuration. Typical components used with these brushless drivers include:

- DC brushless servo motor
- External switches
- Power supply

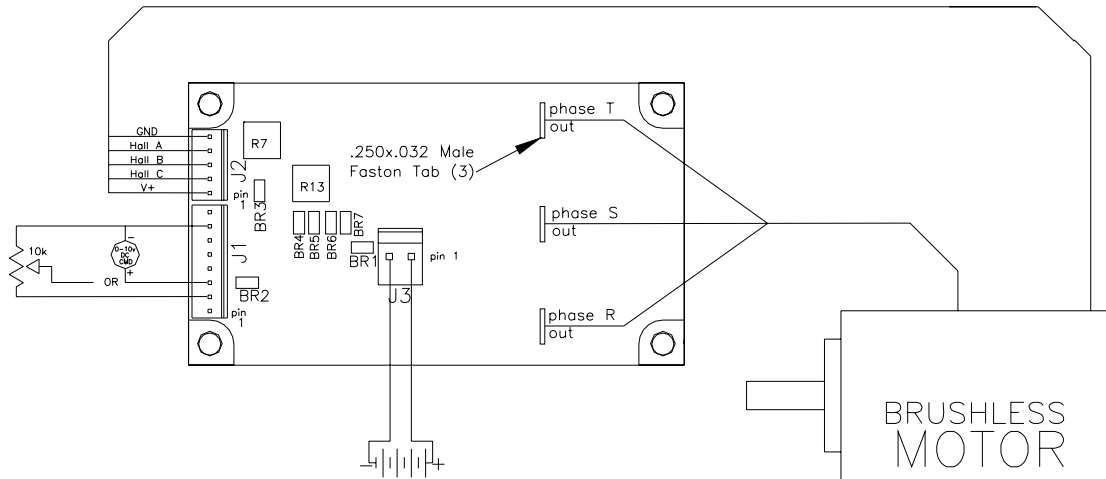


Figure (3) General Wiring and Connection Diagram

4.1 Electrical Interfacing and Connections

The drive has three I/O (input/output) connectors.

- J1 - Signal connector, AMP type, 8 pin connector.
- J2 - Motor Feedback connector, AMP type, 5 pin connector.
- J3 - DC power supply input, AMP type, 2 pin connector

J1 – Connector Pinout

1	Speed Monitor Output
2	Power for External Speed pot
3	External Speed Command
4	REV or FWD\
5	INHIBIT or ENABLE\
6	FAULT or READY\
7	GND
8	GND

Mating Connector for J1

Body AMP 770602-8 or equivalent
 Contacts AMP 770666-1 or equivalent

J2- Connector Pinout

1	V+ (12 Vdc for Halls)
2	HALL C
3	HALL B
4	HALL A
5	HALL Return (GND)

Mating Connector for J2

Body AMP 770602-5 or equivalent

Contacts AMP 770666-1 or equivalent

J3- Connector Pinout

Selecting a DC Power Supply –

The drive operates from a single unregulated DC power supply. It is recommended to select a power supply voltage which does not exceed the maximum recommended voltage input for the drive.

1	Input Power - 12 VDC +/- 5%, <u>OR</u> 15 – 36 Vdc <u>Note:</u> For 12 Volt Operation, Install BR1 and for all other voltages, remove BR1.
2	Power Return - GND

Mating Connector for J3

Body AMP 770849-2 or equivalent

Contacts AMP 770522-1 or equivalent

Multiple Axis Power Wiring

The DC supply may be common to more than one drive. The power lead from each drive should terminate at the power supply terminals. When multiple amplifiers are installed in a single application, caution regarding grounding loops must be taken. Any time there are two or more possible current paths to a ground connection, damage can occur or noise can be introduced in the system.

The following rules apply to all multiple axis installations, regardless of the number of power supplies used.

- Never “daisy chain” any power or DC common connections.
- Use the “star” connection for each servo drive by running separate twisted power supply wires to each power connection on each drive.
- The upper limit on the DC supply can not exceed 36 Vdc.
- To prevent noise, do not bundle the motor leads with the power supply leads or command leads.
- The DC power supply must be located as close as possible

Motor Winding Connections

Phase R	Motor winding R - 0.250 x 0.032 Male Faston Tab
Phase S	Motor winding S - 0.250 x 0.032 Male Faston Tab
Phase T	Motor winding T - 0.250 x 0.032 Male Faston Tab

5.0 Setting the Operating Speed Mode

The desired operating speed mode can be set means of jumpers BR2 and BR3 located on the board.

- Mode 1 - For on-board speed command, remove BR2, install BR3 and adjust speed with R13
- Mode 2 – For external speed command with external POT, remove BR3, install BR2, use 10 Kohm pot with wiper connected to J1-3 and ends connected to J1-2 and J1-7.
- Mode 3 – For external command with external analog signal (0-10 Vdc), remove BR3, install BR2, and set R13 fully CW (you may use R13 to attenuate the input signal).
- Mode 4 - For external command with external analog signal (0-5 Vdc), remove BR3, install BR2, install BR4, and set R13 fully CW (you may use R13 to attenuate the input signal).

Setting up the direction of rotation

- REV or FWD\ input – this input is internally pulled HIGH for CCW rotation.
- When using external control, remove BR5.
- When this input (J1-4) is pulled LOW externally (by connecting it to J1-7 or J1-8) or by installing BR5 internally will set the direction of rotation the CW direction.

Setting up the Start and Stop operation

- INHIBIT or ENABLE\ - this input is internally pulled HIGH (no motion or stop motion).
- Remove BR6 for continuously enabled system.
- When this input (J1-5) is pulled LOW (by connecting it to J1-7 or J1-8) or by removing BR6 will allow for motion operation.

Sensing the drive status

- FAULT or READY\ - this output line (open drain) will go low when the drive is ready for motion.
- If the driver is faulted this output will be high.

Hall Commutation Angle setup

- For motors with 120 degrees commutations – BR7 should be installed.
- For motors with 60 degree commutations, please remove BR7.

Speed Monitor Output

- This line is an output for the HALL A\.
- The frequency of the Hall sensor is proportional to the motor speed.
- Motor speed in RPM can be calculated from the following equation
$$\text{Motor Speed (RPM)} = (\text{Hall Sensor frequency (Hz)} * 60 * 2) / (\text{Number of Poles})$$

Speed Range - This drive will be optimized at the factory for the OEM desired speed and performance.

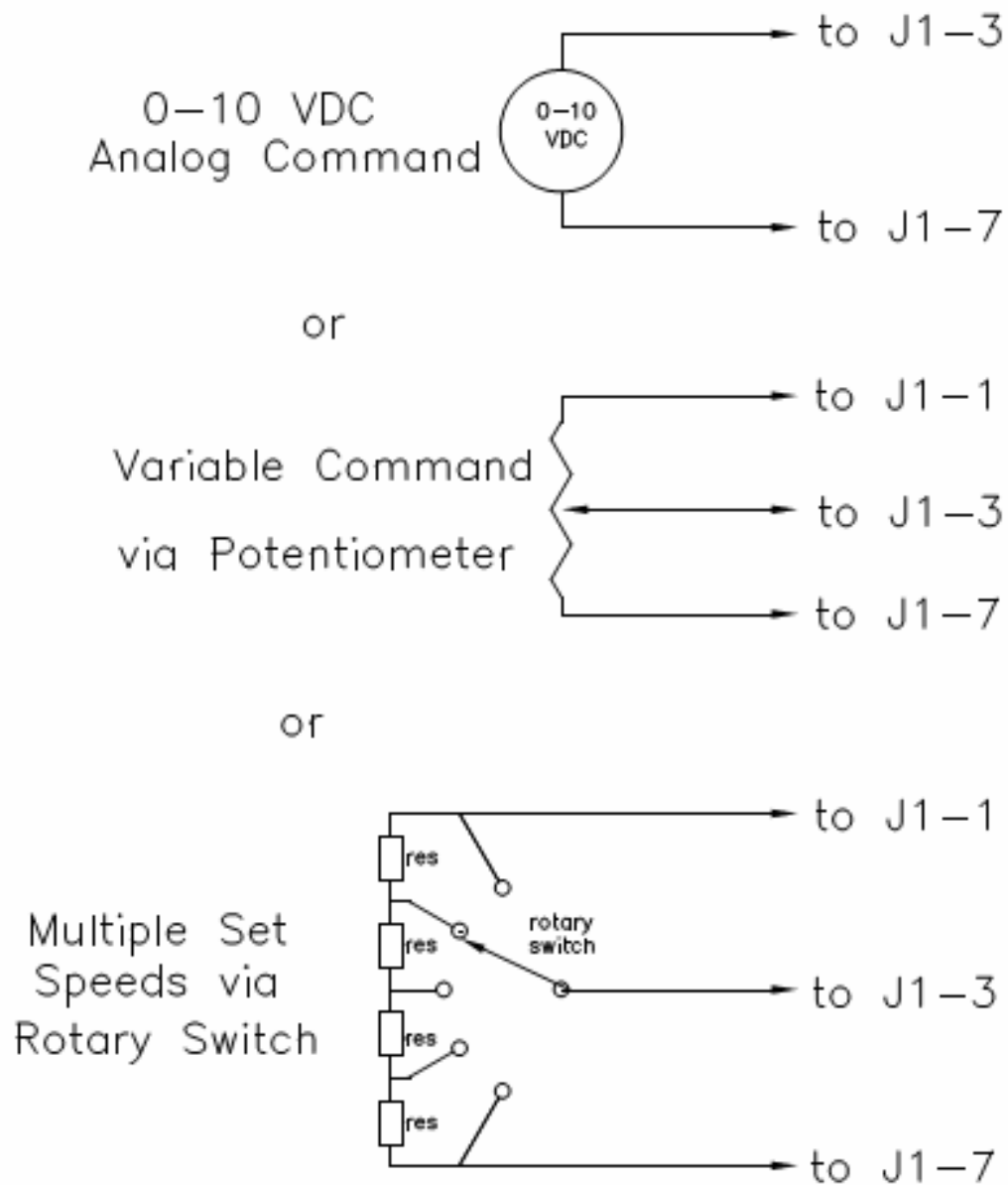


Figure (4) B36xxS Speed Command Options

6.0 Defective Equipment

If you are unable to correct the problem and the drive is defective, you may return the drive for repair or replacement. There are no field serviceable parts in the drive.

NOTE

To save unnecessary work and repair charges please write a note and attach to the defective drive explaining the problem.

Return Procedure

To ensure accurate processing and prompt return of any MCG products, the following procedure must be followed:

1. Call your local MCG Rep/distributor to obtain an RMA number.
2. Do not return any goods without an RMA number.
3. Goods received without any RMA number will NOT be accepted and will be returned to sender.
4. Pack the returned goods in the original shipping carton.
5. MCG is NOT responsible or liable for damage resulting from improper packaging or shipment.
6. Repaired units are shipped via UPS ground delivery. If another shipping method is desired, please indicate so on when requesting an RMA number and also indicate this
7. information along with the return goods.

NOTE

Do not attempt to return the BS3605S or BS3610S or any other equipment without a valid RMA#. Returns received without a valid RMA# will not be accepted and will be returned to the sender.

Pack the drive in its original shipping carton. MCG, Inc. is not responsible or liable for damage resulting from improper packaging shipment.

Ship the drive to:

MCG, Inc.
1500 N. Front Street
New Ulm, MN 56073
Attn.: Repair Department RMA# _____



*Contact your local distributor or call 1-888-624-3478 (US & Canada)
For Customer Service & Technical Support
Internet: www.mcg-net.com
Email: sales@mcg-net.com*