

MCU3 OPERATORS MANUAL



**BRADSHAW
COMMUNICATION
SYSTEMS**

MODEL MCU3 MOTOR CONTROL UNIT OPERATION INSTRUCTION MANUAL

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TABLE OF CONTENTS

	PAGE
INTRODUCTION.....	3
A. Manual Purpose.....	3
B. Manual Organization.....	3
C. Unit Specifications	3
D. Customer Support	3
GENERAL DESCRIPTION	4
A. Safety Precautions.....	4
B. Introduction	4
1. Typical System Configuration	4
2. Typical Photographs of the MCU3 & Optional Handheld Controller.....	5&6
C. MCU3 Circuit Breakers, Emergency Stop Switch, & Handheld Controller.....	6
1. Logic Power Circuit Breaker	6
2. Motor Power Circuit Breakers	6
3. Heater Power Circuit Breaker	6
4. Emergency Stop Switch	7
5. ACU or Local Handheld Control.....	7
6. Handheld Controller Axis Jog Switches	7
7. Handheld Controller Slew/Normal Speed Switch	7

INTRODUCTION

A. MANUAL PURPOSE

This manual contains operating instructions for the Bradshaw Communication Systems MCU3 Motor Control Unit. The instructions herein are provided for personnel responsible for monitoring and controlling an Earth Station Antenna using the MCU3. A nameplate label located inside the door of the MCU3 identifies the units' model number, part number, revision, and serial number. The serial number is used by Bradshaw Communication Systems (BCS) to identify the units' particular configuration of options.

This manual does not provide information pertaining to installation, troubleshooting, and/or maintenance of the MCU3. Information pertaining to these subjects is found only in the MCU3 Installation & Maintenance Manual, which, is intended only for qualified service personnel. The MCU3 contains no operator serviceable parts and all maintenance and/or repairs should be referred to qualified service personnel.

B. MANUAL ORGANIZATION

This manual is organized into the following two sections:

“Introduction” – This section provides manual purpose, manual organization, unit specifications, and customer support information.

“General Description” – This section provides safety precautions, typical system configuration, and a description of the operator controls and indicators found on the MCU3.

C. UNIT SPECIFICATIONS

Dimensions: 18" (45.7cm) high x 16" (40.6cm) wide x 10" (25.4cm) deep

Weight: 33 LBS (15.0 Kg)

Power Requirements: *P/N 00-01000-1* MCU3 w/208V VFD AZ/EL 3HP Max., POL 1/4HP Max.
3 Phase - 208 VAC+/-10%, 50/60Hz+/-5%, 35 Amps Max.
1 Phase - 230 VAC+/-10%, 50/60Hz+/-5%, 60 Amps Max.

P/N 00-01000-2 MCU3 w/208V VFD AZ/EL 5HP Max., POL 1/4HP Max.
3 Phase - 208 VAC+/-10%, 50/60Hz+/-5%, 53 Amps Max.
1 Phase - Contact Bradshaw Communication Systems

P/N 00-01000-3 MCU3 w/380V VFD AZ/EL 3HP Max., POL 1/4HP Max.
3 Phase - 380 VAC+/-10%, 50/60Hz+/-5%, 30 Amps Max.
1 Phase - Use P/N 00-01000-1

P/N 00-01000-4 MCU3 w/380V VFD AZ/EL 5HP Max., POL 1/4HP Max.
3 Phase - 380 VAC+/-10%, 50/60Hz+/-5%, 42.5 Amps Max.
1 Phase - Contact Bradshaw Communication Systems

For an exact power analysis for your system requirements please contact Bradshaw Communication Systems directly.

Environmental: Operational:
-40° to 50°Celsius (-40° to 122° Fahrenheit)
(with internal automatic heater operational)
0 - 100% Relative Humidity

Storage:
-20° to 60°Celsius (-4° to 140° Fahrenheit)
0 - 100% Relative Humidity

Enclosure: Wall Mounted Weatherproof NEMA 4X Fiberglass Polyester Enclosure
Hinged Cover with Pad-Lockable Quick Release Latches

Enclosure Color: Light Gray

D. CUSTOMER SUPPORT

Customer support, replacement parts, and repair are available 8AM – 5PM EST M-F by contacting Bradshaw Communication Systems at 770-844-9704 or by fax at 770-886-0205.

GENERAL DESCRIPTION

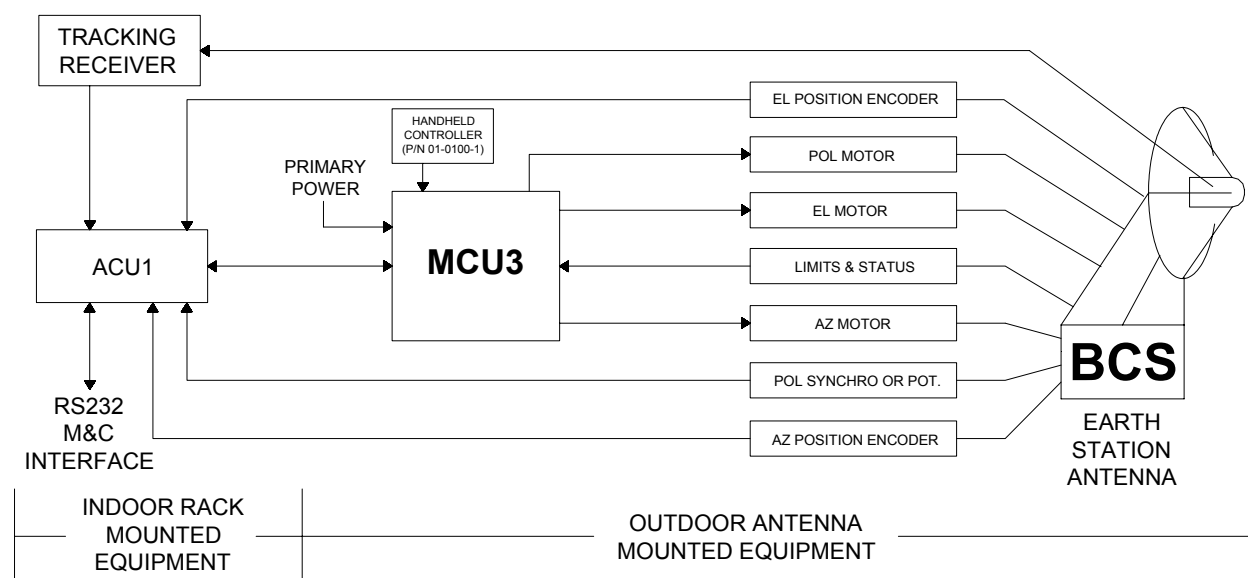
A. SAFETY PRECAUTIONS



Lethal voltages are present inside the MCU3. Emergency Stop switches and other interlocks will disable the system, but do not disconnect the MCU3 from primary power. Refer all troubleshooting and repair to qualified service personnel. The MCU3 contains no operator serviceable parts.

B. INTRODUCTION

The MCU3 is designed to allow automatic control via an Antenna Control Unit (ACU1) or local manual positioning of an earth station antenna when using the Handheld Controller (P/N 01-01000-1). Operators may use the controls on the Handheld Controller to provide control of the antenna at the antenna structure. The MCU3 is normally only a part of the complete antenna control system, however, the MCU3 combined with the Handheld Controller have all controls necessary to allow positioning of the earth station antenna. This redundancy is extremely useful in the unlikely event of an Antenna Control Unit failure or if local positioning is required for antenna maintenance or other. A typical antenna control system configuration using the MCU3 is depicted in Figure 1. Note that the addition of the motors and limit switches are all that is required to allow local positioning of the earth station antenna.



TYPICAL SYSTEM CONFIGURATION
FIGURE 1

The ACU1 is the main system component and contains the control logic electronics to generate motor drive commands. The motor control commands are produced in response to inputs from the position encoders, limit and status switches, front panel controls, and R.F. signal receiving equipment. Control may also be accomplished via the RS-232 monitor & control port.

The angular position of each axis is reported by synchro based position encoders that are mounted on their corresponding axes of the earth station antenna. The signal from these position encoders is converted in the ACU1 to provide an angular display on the front panel display as well as being used for automatic positioning modes.

For automatic satellite tracking operation (Steptrack), a D.C. signal proportional to signal strength is connected to the ACU1. This signal is then used by the ACU1 to optimize the antenna position when in Steptrack mode.

The ACU1 is connected to the MCU3, which produces the high voltage required to start and stop the earth station antennas' motors. Each axis has a motor that allows electrical control of the mechanical movement of each antenna axis. The MCU3 is a variable frequency drive (VFD) based unit allowing adjustable speed control of the azimuth and elevation motors. This variable speed is implemented via two adjustable speed ranges, "Track" speed and "Slew" speed. Each axis speed (on both azimuth and elevation axes) is independently adjustable to match the MCU3 drive speed commands to the antenna characteristics. By matching these drive commands to the antenna, optimal satellite tracking performance as well as a high slew rate for fast maneuvering may be obtained. The polarization speed is fixed and is directly proportional to the antenna polarization gearing. The MCU3 allows for simultaneous control of the three axis motors if the antenna is equipped with a motorized polarization axis.

If the earth station antenna being controlled by the ACU1 has a linearly polarized feed, the ACU1 polarization option is employed. This option allows the ACU1 to receive a signal from an additional position encoder (either a synchro transmitter or potentiometer depending upon configuration) and to control the additional polarization motor via the MCU3. By adding the additional position encoder and motor the ACU1 can remotely control the rotation of the earth station antenna polarization feed horn.

The ACU1 is generally rack mounted and located in the control room area, while the position encoders, limit switches, MCU3, and motors are generally located on the earth station antenna structure. The Handheld Controller (when plugged into the MCU3) automatically takes local control of the antenna, locking out ACU1 remote control and allowing direct control of all antenna axes in both track and slew speeds. The R.F. tracking equipment is generally located in the control room area with the ACU1.

PHOTOGRAPHS OF THE MCU3 & HANDHELD CONTROLLER

The following typical photographs of the MCU3 and Handheld Controller may be referred to for the functional discussion in Section C.



MCU3 (Cover Door Open)



MCU3 Handheld Controller

C. MCU3 CIRCUIT BREAKERS, EMERGENCY STOP SWITCH, & HANDHELD CONTROLLER

1. Logic Power Circuit Breaker

The power circuit breaker turns the MCU3 internal power supply on and off as well as protecting it from over-current conditions. The circuit breaker features rocker style operation. When the circuit breaker is in the " I " position, the MCU3 logic power is ON. Conversely, when the circuit breaker is in the " O " (or tripped) position, the MCU3 logic power is OFF. A red LED indicator located on the MCU Logic PWA illuminates red anytime logic power is 'ON'.

2. Motor Power Circuit Breakers

Each VFD, motor control circuit and earth station antenna axis motor is protected by a circuit breaker capable of removing power to the VFD, control circuit and motor in the event of an over-current condition. Each circuit breaker is clearly labeled to identify the associated axis of protection.

3. Heater Power Circuit Breaker

The heater circuit breaker provides heater circuit protection and allows the automatic heater circuit to be turned "ON" and "OFF". The circuit breaker features rocker style operation. When the circuit breaker is in the " I " position, the MCU3 heater circuit is ON. Conversely, when the circuit breaker is in the " O " (or tripped) position, the MCU3 heater circuit is OFF. The automatic heater circuit maintains the minimum required temperature inside the enclosure to allow the MCU3 electronics to operate properly at low temperatures. The heater is automatically switched "ON" at approximately 32 degrees Fahrenheit (0 degrees Celsius) and then "OFF" after the enclosure reaches approximately 50 degrees Fahrenheit (10 degrees Celsius). CAUTION: IF POWER HAS BEEN REMOVED AT TEMPERATURES BELOW 32 DEGEES FAHRENHEIT, THE OPERATOR MUST ALLOW THE HEATER TO HEAT THE MCU3 PRIOR TO SWITCHING ON THE MOTOR POWER CIRCUIT BREAKERS OR VFD DAMAGE MAY OCCUR.

4. Emergency Stop Switch

The Emergency Stop Switch is provided to allow the operator (or anyone realizing an emergency condition related to antenna movement) to stop all antenna axes movement despite the origin of control. The switch is a large red button located on the middle right side of the MCU3. The switch features latching operation, with a push to activate, pull to reset style operation. The switch is clearly labeled "Emergency Stop".

5. ACU or Local Handheld Control

Plugging in the Handheld Controller enables the operator to switch between remote automatic control provided by the Antenna Control Unit (ACU1) or local manual control via axis jog switches on the Handheld Controller. When the Handheld Controller is plugged into the MCU3, control of the antenna is via the Handheld Controller. Conversely, when the Handheld Controller is NOT plugged into the MCU3, control of the MCU3 is via the ACU1 (if connected). When the Handheld Controller is plugged into the MCU3, control is forced away from the ACU1 and an ACU1 status message "Local Control" will be displayed. The Handheld Controller connector is located at the bottom right/front of the MCU3. The connector is protected from the elements by a lanyard attached protective cover that must be removed prior to plugging in the Handheld Controller.

6. Handheld Controller Axis Jog Switches

The Handheld Controller Axis Jog Switches allow simultaneous or singular movement of each of the antenna's axes when the Handheld Controller is plugged into the MCU3. The switches feature a spring centered toggle style operation which forces each switch back to its center (no axis commanded) position. All Handheld Controller switches are dust and waterproof (as is the entire handheld assembly) to allow use even in severe conditions.

7. Handheld Controller Slew/Normal Speed Switch

The Handheld Controller SLEW/NORMAL Switch enables the operator to switch between high slew speed and normal track speed. The switch features toggle style operation. When the switch is toggled to the "SLEW" position, high slew speed movement is commanded. Conversely, when the switch is toggled to the "NORMAL" position, normal track speed movement is commanded.