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UNITED STATES OF AMERICA

EC Declaration of Conformity

We

MICRONOR INC.
3483 Old Conejo Rd
Newbury Park, CA 91320
USA

declare under sole responsibility that the below listed Product, manufactured in the United States of America, meets the intent of the Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the official Journal of the European Communities:

EN 50081-1 Emissions:	EN55022	Radiated, Class B
	EN 55022	Conducted, Class B
	EN 60555-2	Power Harmonics
EN 50082-1 Immunity:	IEC 801-2	Electrostatic Discharge
	IEC 801-3	RF Radiated
	IEC 801-4	Fast Transients
	IEC 801-5	Surge
Product:	MR175 hand-Held Pendant	

Table of Contents

Product Description

The MICRONOR INC. MR175 Hand-Held Pendant Station was developed to make the man-machine interface easier, safer and compatible with the base pendant station. The elegant and ergonomically well-fitting control was developed from the ground-up including the actual users of such devices at each design stage. The result of this development effort is increased functionality and ergonomics. The case is made from durable glass Polycarbonate plastics.

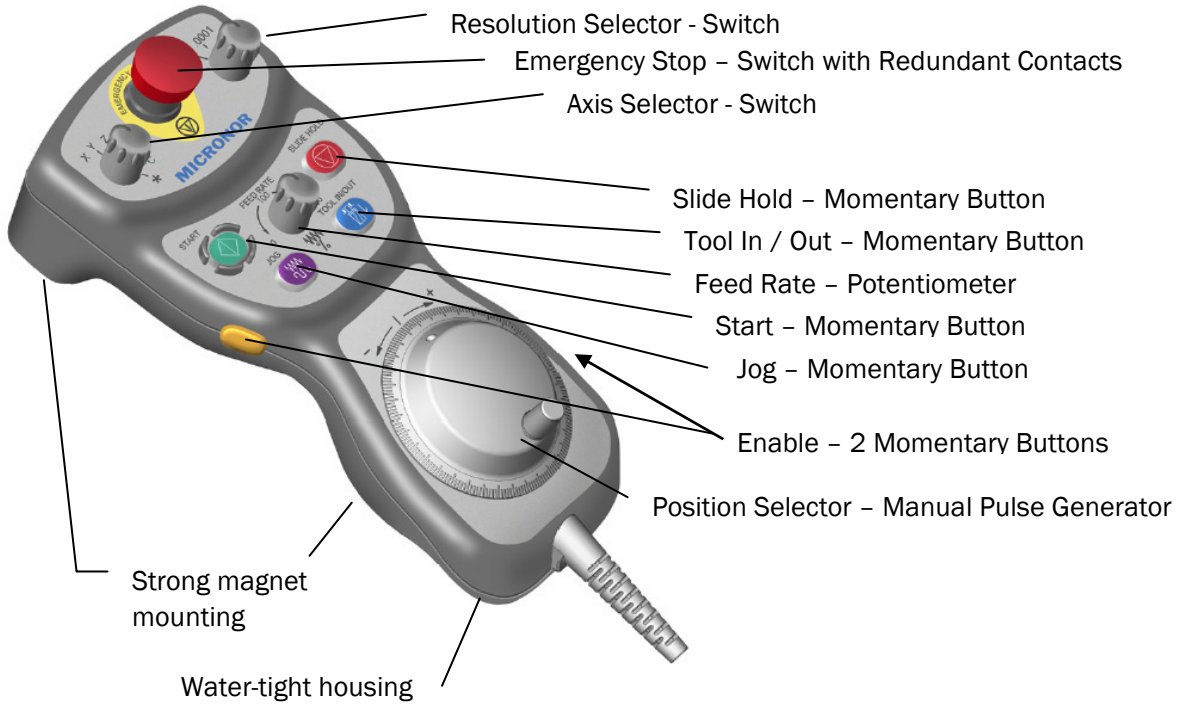
The MR175 incorporates functions:

- Manual Pulse Generator (MPG) 100 pulses / 360°
- Axis selector – Rotary Knob
- Scale Selector – Rotary Knob
- Feed-Rate Continuous Adjust – Potentiometer
- Start – Momentary Button
- Tool-in/Out – Momentary Button
- Jog – Momentary Button
- Emergency-Stop – Switch with redundant contacts

All switches and controls are monitored by an internal microprocessor that communi-cates via serial RS-485 (peer to peer) interface to the main station, allowing for a lightweight, yet rugged cable design and standardized interfacing with the CNC control computer. All switch debouncing and A/D conversions are performed locally within the MR175. The host computer receives commands via a transmission packet of 11 bytes that can easily be queried for switch status.

Customization of this unit is accomplished by selecting the appropriate controls and adapting the firmware within the MR175.

Features of MR175



Warranty Information

MICRONOR INC. warrants this product to be free defects in material and workmanship for a period of 1 (one) year from date of shipment. During the warranty period we will, at our option, either repair or replace any product that proves to be defective. To exercise this warranty, write or call your local MICRONOR INC. representative, or contact MICRONOR INC: headquarters. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicate service facility. Repairs will be made and the instrument returned transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

Limitations of Warranty

This warranty does not apply to defects resulting from unauthorized modification or misuse of any product or part. This warranty also does not apply to fuses or AC line cords.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability of fitness for a particular use. MICRONOR INC. shall not be liable for any indirect, special or consequent damages.

Specifications

Specification General:

Description	Specification
Electrical Voltage Current	 15V to 26V DC 70mA typ. / 100mA (max)
Serial Interface	RS-485 Full Duplex
Bit Rate	57,600 baud
Manual Pulse Generator	100 pulses / 360° mechanical step detent
Data Format	11 byte packet transmission at 60ms max interval See section Communications for details.
Data Integrity	16 bit Checksum

Cable Specification:

Description	Specification
Jacket Diameter	0.21in
Jacket Material	PUR
Number of conductors	8
Cable length extended	15 feet ±2ft

Environmental specifications:

Description	Specification
Temperature Working Storage	 0° to +60°C -30° to +80°C
Humidity	30% to 85% RH (working temp.)
Sealed	Splash proof to Nema 6 Occasional short time submersion
Drop	3 feet on all six surfaces

Initial Preparation

Unpacking and Inspection

The unit was carefully inspected mechanically and electrically before shipment. When received, the shipping carton should contain the following items listed below. Account for and inspect each item before the carton is discarded. In the event of a damaged instrument, write or call MICRONOR INC. in Newbury Park, California. Please retain the shipping container in case reshipment is required for any reason.

Damage Shipment

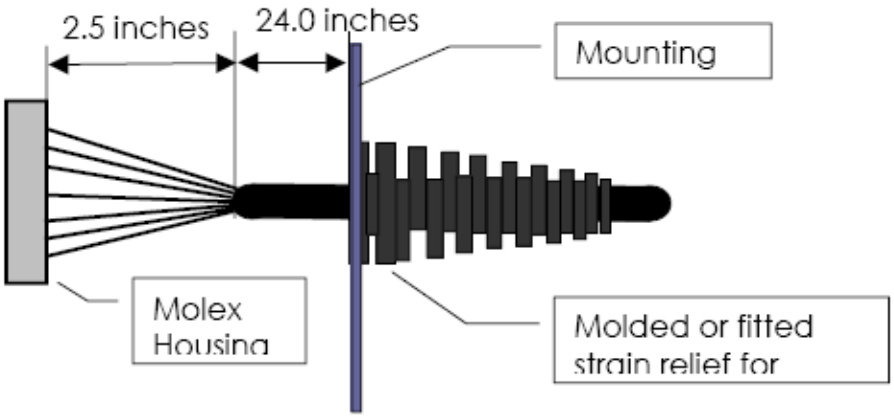
All instruments are insured when shipped by MICRONOR INC. If you receive a damaged instrument you should:

1) Report the damage to your shipper immediately.
2) Inform MICRONOR INC.
3) Save all shipping cartons

Failure to follow this procedure may affect your claim for compensation.

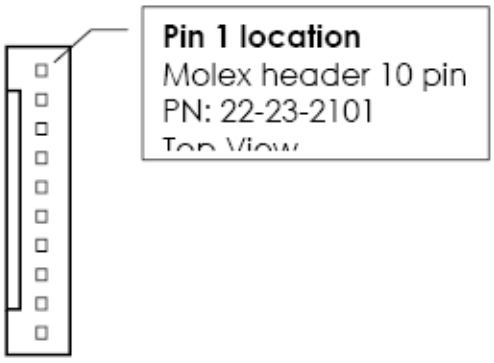
Hardware Interface

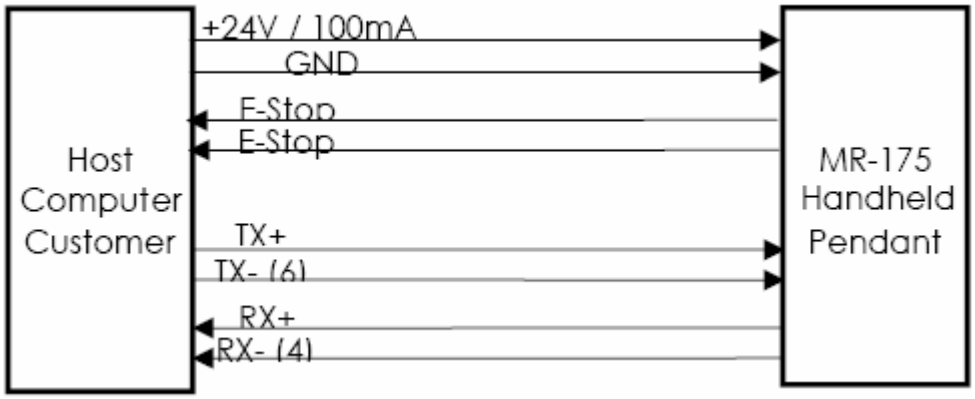
The hardware interface is accomplished by 8 wires terminated into a 10-pin Molex Connector Housing. The customer provides a compatible PCB header interface.



Pin # Side 1 Handheld	Function	Color	Function	Pin # Side 2 Machine
1	GND	brown	GND	1
2	+24V / 70mA	red	+24V / 70mA	2
3	TX+	orange	RX+	3
4	TX-	yellow	RX-	4
5	RX+	green	TX+	5
6	RX-	blue	TX-	6
7	E-Stop	purple	E-Stop	7
8	E-Stop	black	E-Stop	8
9	+5V	---	--	n/c
10	shield	shield	Shield	10

Molex Header (PCB) Orientation (Top View)





Communications

Serial Interface Specification

- RS-485 Full-Duplex Single Drop Point to Point
- 57,400 Baudrate
- 1 Start Bit
- 8 Data Bits
- 1 Stop Bit

Data Exchange Protocol

Although primarily a transmit device, the MR175 is capable of both transmitting and receiving data. All commands to the MR175 are single character codes and do not require any termination characters such as LF (Line feed) or CR (carriage return) characters. If additional characters are sent, they will be ignored.

When the MR175 is powered up, it transmits an identification string “MR175 Version x.xx”, and then it will start transmitting in Binary mode. One packet is transmitted with the initial states, and each time the user presses a button or otherwise moves a control necessitating the initiation of a transmission packet.

> **Note:** The potentiometer values are internally converted to a binary number between 0 and 220 counts. A/D reading uncertainties can cause the transmission string to be transmitted without any user interactions.

During normal usage, the transmission packet is sent from the MR175 whenever the operator initiates a change on the MR175 controls. Packet are never sent faster then 60ms from the previously sent package.

The host computer must acknowledge each package with a **"c"** command after checking the data and the checksum. If the data was not received properly, the host computer shall acknowledge and request the packet again with an **"e"** command.
The **"e"** command instructs the MR175 to retransmit the previous packet again with the same data.

The host computer has the ability to query the MR175 with an **"r"** (request) command. The MR175 will respond by sending the current binary packet. The **"r"** command is useful for the host to periodically check if the MR175 is still connected and working properly.

Note that commands sent to the MR175 are not case sensitive.

If the host fails to respond to a transmission (with either a **"c"** or an **"e"** within 120ms, the MR175 will send another packet with updated information.

MR175 Transmission Packet

All 11 bytes of the entire fixed length transmission packet are always sent.

Byte 1: Start of Transmission (ASCII P)

B7	B6	B5	B4	B3	B2	B1	B0
0	1	0	1	0	0	0	0

This byte is a fixed starting marker. The P character may change for certain debug mode transmissions. See command characters.

Byte 2: Packet Count (0 – 255)

B7	B6	B5	B4	B3	B2	B1	B0
X	X	X	X	X	X	X	X

The packet counter is incremented with each transmission except when the resend command 'e' requests a repeat send. Then the packet counter will not increment which is an indication that a packet previously sent is being resent.

Byte 3: Momentary Switch Data

B7	B6	B5	B4	B3	B2	B1	B0
Enable	-	-	E-Switch	Tool	Slide	Jog	Start

Byte 4: Rotary Switch Data

B7	B6	B5	B4	B3	B2	B1	B0
-	Mult-b2	Mult-b1	Mult-b0	-	Axis-b3	Axis-b1	Axis b0

Bytes 5-6: MPG Encoder Data (+ 32767, - 32,768 counts, big endian)

B7	B6	B5	B4	B3	B2	B1	B0
Sign	EN-b14	EN-b13	EN-b12	EN-b11	EN-b10	EN-b9	EN-b8

EN-b7	EN-b6	EN-b5	EN-b4	EN-b3	EN-b2	EN-b1	EN-b0

Note that the MPG encoder count data is the relative number of clicks of the MPG since the last acknowledged transmission.

Byte 7: Potentiometer #1 Data –Feed Rate as unsigned byte

B7	B6	B5	B4	B3	B2	B1	B0
Feed-b7	Feed-b6	Feed-b5	Feed-b4	Feed-b3	Feed-b2	Feed-b1	Feed-b0

An unsigned number of 0 to 220 counts relates to the potentiometer state 0% to 100%

Byte 8: Potentiometer #2 Data - TBD as unsigned byte

B7	B6	B5	B4	B3	B2	B1	B0
tbd-b7	tbd-b6	tbd-b5	tbd-b4	tbd-b3	tbd-b2	tbd-b1	tbd-b0

This potentiometer is not implemented in the MR175 byte transmits the same number as byte 7.
An unsigned number of 0 to 220 counts relates to the potentiometer state 0% to 100%

Byte 9: Error Data (described below)

B7	B6	B5	B4	B3	B2	B1	B0
0	Ecnt-b1	Ecnt-b0	Err-b4	Err-b3	Err-b2	Err-b1	Err-b0

Seen Error code table

Bytes 10-11: Checksum (1's complement of sum of preceding bytes, big endian)

B7	B6	B5	B4	B3	B2	B1	B0
CS-b15	CS-b14	CS-b13	CS-b12	CS-b11	CS-b10	CS-b9	CS-b8
CS-b7	CS-b6	CS-b5	CS-b4	CS-b3	CS-b2	CS-b1	CS-b0

Commands to the MR175 (signal characters)

Note: All single character commands may be either upper or lower case.

Set Output to Debug Mode (ASCII A)

B7	B6	B5	B4	B3	B2	B1	B0
0	1	0	0	0	0	0	1

Set Output to Binary Mode (default at start-up, ASCII B)

B7	B6	B5	B4	B3	B2	B1	B0
0	1	0	0	0	0	1	0

Transmission Received with No Errors (ASCII C)

B7	B6	B5	B4	B3	B2	B1	B0
0	1	0	0	0	0	1	1

Transmission Received with Errors (ASCII E)

B7	B6	B5	B4	B3	B2	B1	B0
0	1	0	0	0	1	0	1

Request Transmission Packet (ASCII R)

B7	B6	B5	B4	B3	B2	B1	B0
0	1	0	1	0	0	1	0

Reset and Initialize unit as in power up (ASCII I) (Will also check stuck keys)

B7	B6	B5	B4	B3	B2	B1	B0
0	1	0	1	0	0	1	0

The MR175 transmits a full transmission packet upon power up, and upon change in state.

Following any transmission, the MR175 will wait for 120ms for a response. If the host does not respond within 120ms a second updated (new) transmission packet is sent.

If the response is “C”, unit waits for more user input and sends the next packet when appropriate.

If the response is “E”, unit transmits the last packet and continues monitoring user input.

If no response occurs within 120ms, or a response is received other than “c” or “e”, the MR175 will modify the last transmitted packet as follows, and send the updated packet:

The start of transmission byte is then as ASCII “S” indicating a second attempt.

The packet number shall be incremented by one.

Incoming invalid characters are reported as Error 5, invalid command. Cr, LF are discarded without error.

Exceptions

Transmission Errors:

The RS-485 peer to peer link is very robust and errors are unlikely to occur. In the case transmission errors do occur, it can be recognized by the host when testing the two-byte checksum. The best remedy for an erroneous packet is to request a repeat packet by sending command **“e”**.

An unrecognized command received by the MR175 will be reported as “Error: 5 Invalid Command”. The exception is that CR/LF are simply ignored.

Functional Errors:

To assure faultless operation, the MR175 has extensive self-checking mechanism and built-in plausibility tests. Should a malfunction occur, it is reported by means of the error codes listed below.

Most error codes are automatically reset once the faulty condition is removed.

The exception is:

Error 5 Unrecognized Command (This will reset upon receiving a food command).

The following errors must be cleared sending command “I” initialize

Error 1, Firmware (Program) Checksum Error
Error 2, Watchdog Timer
Error 25, Key pressed at start-up

When encountering an error message the host computer has several options:

1.) Send “r” command to request a new packet and determine if error was reset.
2.) After approximately one second retry “r” command again.
3.) Send initialization “I” command.
4.) If allowable – ignore error and log error for later repair.
5.) Prompt operator to reset unit by means of pushing the reset button located below the Feed Rate Potentiometer using a small screwdriver.
6.) Disable unit and exchange with good unit.

Error Reporting

Error reporting consists of both an error type (the lower five bits of the byte) and an error count in bits 6-5 of byte.

The error count exist for multiple errors detection, but only one can be reported.

Whenever errors are detected, the count shall be set to a non-zero value indicating the number of errors detected (maximum of 3). For multiple errors, the error code shall be prioritized to the lowest number error code shown in the table below.

Error Code	Type	Description
0	No error	
1	Program memory CS	Checksum of the program memory does not match. Detected at start-up
2	Watch Dog Timer	The Watch-Dog Timer reset the unit.
3	Undefined	
4	Undefined	
5	Invalid Command	Incoming characters that have no meaning to the MR175
6	Undefined	
7	Undefined	
8	Undefined	
9	Rotary Switch 1	Invalid Switch 1 all contacts open
10	Rotary Switch 1	Invalid Switch 1 shorted contacts
11	Emergency Switch	Invalid E-Switch status, normally closed is open
12	Emergency Switch	Invalid E-Switch status, normally open is closed
13	Rotary Switch 2	Invalid Switch 2 all contacts open
14	Rotary Switch 2	Invalid Switch 2 shorted contacts
15	Undefined	
16	Potmeter Reference	Potentiometer 1 or 2 5V reference is outside range
17	Potmeter 1	P1 wiper is outside range
18	Potmeter 2	P2 wiper is outside range
19	Potmeter High Side	Potentiometer 1 or 2 fault high side is outside range
20	Potmeter Low Side	Potentiometer 1 or 2 fault low side is outside range
21	Undefined	
22	Undefined	
23	Undefined	
24	Undefined	
25	Switch A	Switch is pressed at start up. Query switch field to determine which switch is stuck.
26	Undefined	
27	Undefined	
28	Undefined	

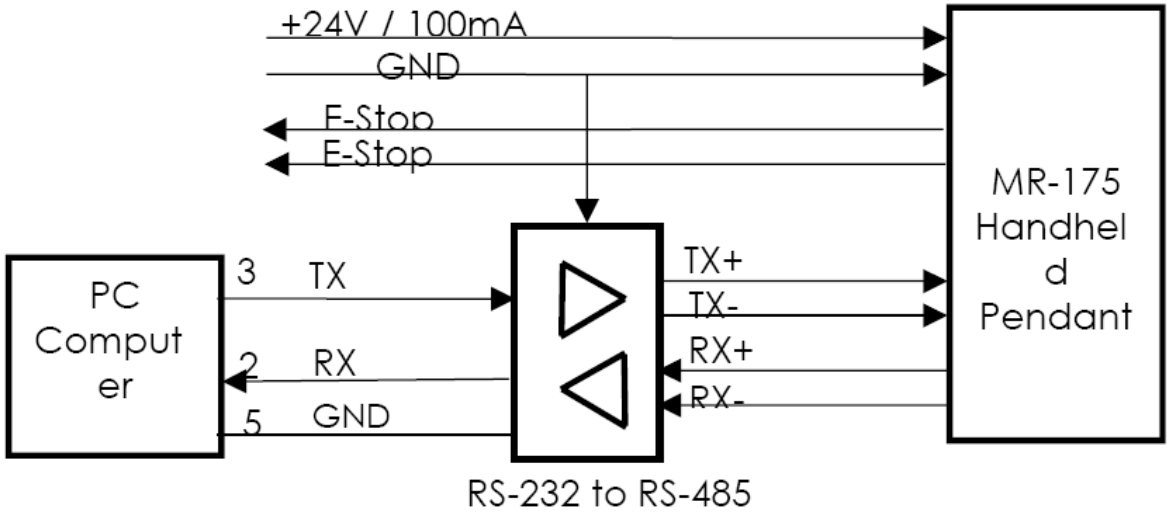
Operating the MR175 on a Windows PC

It may be desireable to connect the MR175 to a PC to test functions.

If the MR 175 is delivered with the RS485 interface then it is necessary to use an interface converter box that translates the RS485 signal levels to RS232 signal levels. Commercial off-the-shelf interface adapters are available. There are numerous sources for these devices such as Buy Converter.

http://www.buyconverter.com/signal_converters/6780.asp

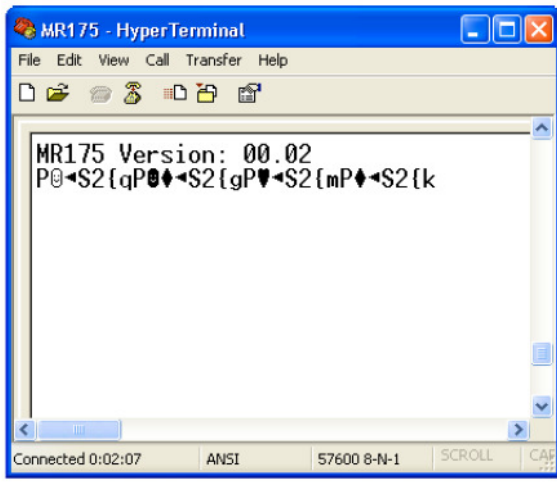
Connect the MR175 to the converter box and the RS232 side to the PC serial input connector. No Hand-Shake signal lines are required.



Note: Provide 24V power to the MR175

Use the Microsoft Hyperterminal as the communications platform. You can normally find the terminal program under Programs >> Accessories >> Communications >> Hyperterminal on any Windows Platform. Adjust the baudrate to 57,600 and select “No Handshaking”.

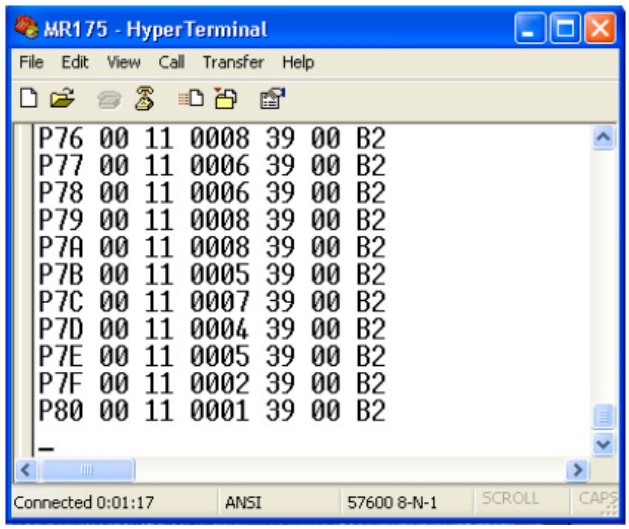
Turn on the MR175 by applying power to it. The MR175 will now output the initialization string as shown to the right:



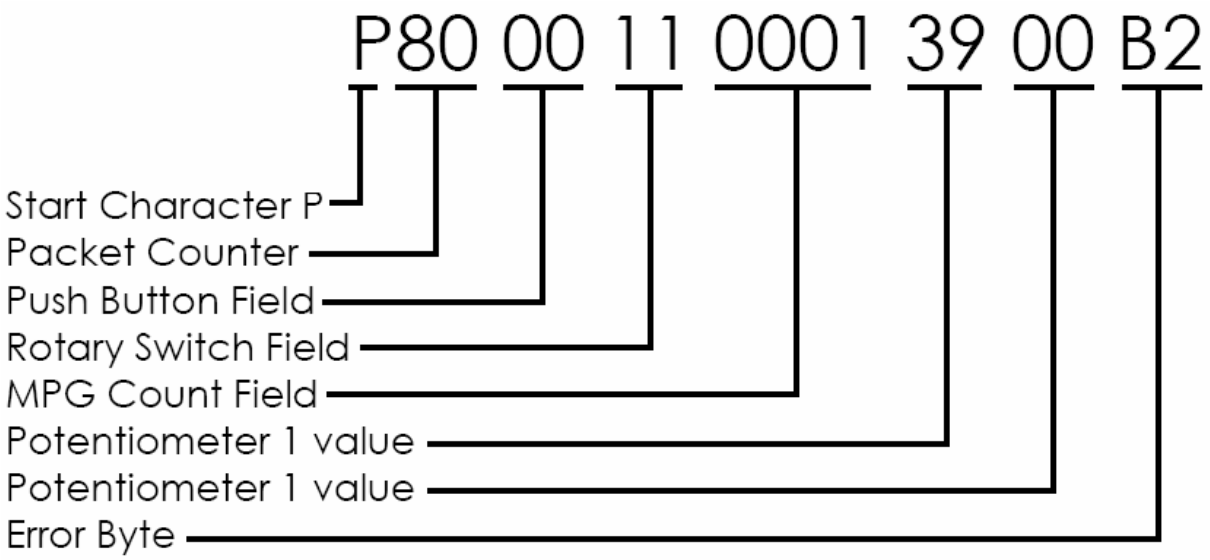
Since the MR175 is programmed to output in binary format you may see some garbled text on the screen.

Type the command “a” for ASCII output and the output will now be in ASCII hex for each byte in the packet.

ASCII Hex output after the “a” command has been sent to the MR175.



Move the controls on the MR175 and the output packet will show a change in the appropriate values.



The ASCII debug mode allows for easy testing of the unit. Keep in mind however that the error code will not be 0 since we do not send a timely acknowledgement.

Maintenance and Service

The MR175 is typically “hardwired” into the customers pendant control unit.
Maintenance is typically restricted to cleaning the unit. If for any unforeseen reason the MR175 stop transmitting or stop responding then it may be reset by pushing a recessed small button located between the JOG and TOOL-In/Out button. This button can be depressed using a small screwdriver or a paperclip pin.

Cleaning:

The unit maybe cleaned with typical household detergents. Use a damp cloth to wipe off any dirt grease etc. Do not use ACETON based cleaning products.
The magnets may regularly attract ferromagnetic metal shavings. To clean use a pad with isopropyl alcohol and wipe off the button area of the magnets until the metal shavings are removed and the magnet surface is clean again.

Magnets:

The magnets are covered with a silicon pad for protection of the magnet. Do not remove the pad as it will expose the magnet. Magnets are made of rear-earth metals and are brittle. Magnets without a protection will easily shatter.

Cable Replacement:

In the harsh environment of machine shops it is possibly that the cable becomes damaged or severed. In this case the cable maybe replaced by opening up the unit and the entire cable be replaced with a new replacement cable.

- ✓ Remove the bottom cover of the MR175
- ✓ Loosen the screw on the manual pulse generator where shielding wires are attached.
- ✓ Unplug the 10pin Molex connection from the PC board.
- ✓ Carefully slide out the cable boot and discard the damaged cable
- ✓ Install new cable following the steps above in reverse order.

Other Repairs:

Any other necessary repair shall be the factory.