

MR175

Handheld Serial Pendant

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Rev: C 1-February-2010

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UNITED STATES OF AMERICA

Revision History

Rev A: January 26, 2005

Product development document not controlled up to Revision A

Changed Molex Connector to WAGO 733-110

Software has serial number in the init string.

Changed ENABLE reporting to also report single button press

Added wire to PIN 9 for ENABLE button reporting

Rev B: December 16, 2009

Updated USA address

Added reference drawing for MR175 with cable

Added reference drawing for mounting plate

Documented Left Enable status bit on Byte 3

Rev B1: January 5, 2010

Clarify RS232 and RS422/RS485 serial interface connections

Rev C: February 1, 2010

Changed maximum update interval to 10mS ([Specifications](#)-pages 8 and 13)

Corrected ENABLE switch schematic ([CE-Compliant ENABLE Switch](#)-page 11)

Corrected all ENABLE status bit functions on Byte 3 ([MR175 Packet](#)-page 14)

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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 filled Polycarbonate plastics.

The MR175 incorporates functions:

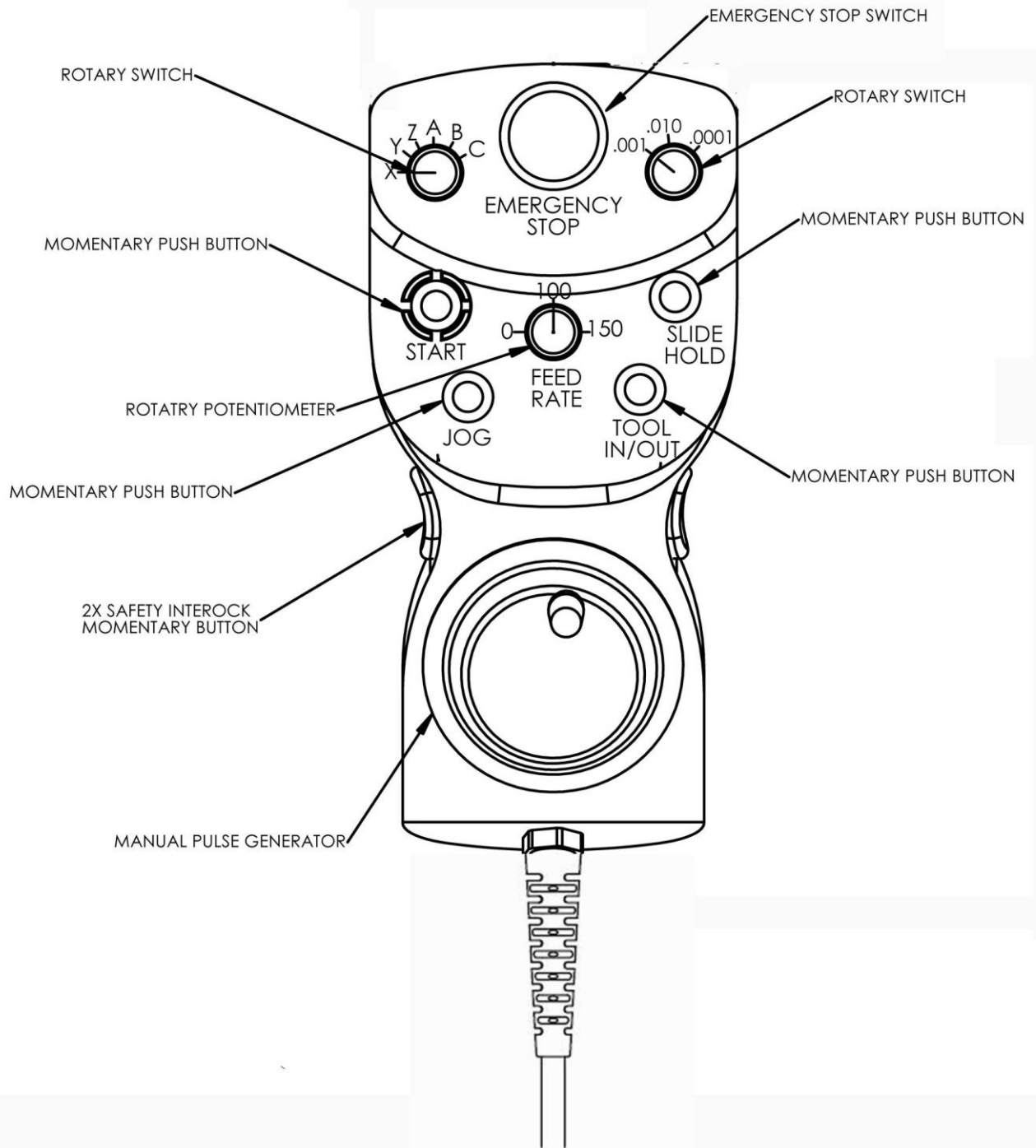
- Manual Pulse Generator (MPG) 100 pulses / 360°
- Axis Selector – Rotary Knob
- Scale Selector – Rotary Knob
- Feed-Rate Continuous Adjust – Potentiometer
- Start – Momentary Button
- Tool-In/Out – Momentary Button
- Slide-Hold – Momentary Button
- Jog – Momentary Button
- Emergency-Stop – Switch with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

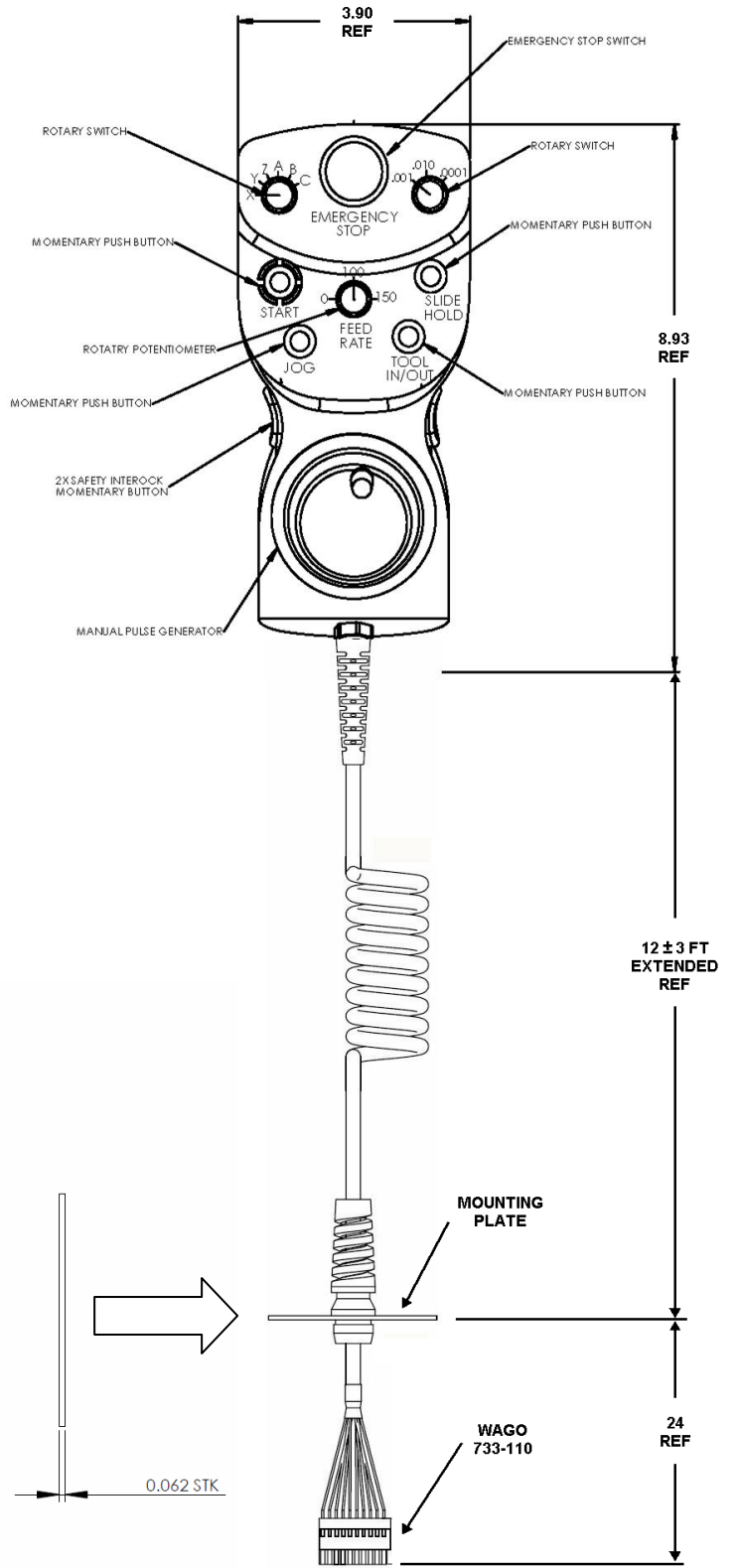
All switches and controls are monitored by an internal microprocessor that communicates via a serial RS-485 (peer to peer) interface to the main station, allowing for a lightweight, yet rugged cable design and standardized interfacing with the CNC control computer.

All switch de-bouncing 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.

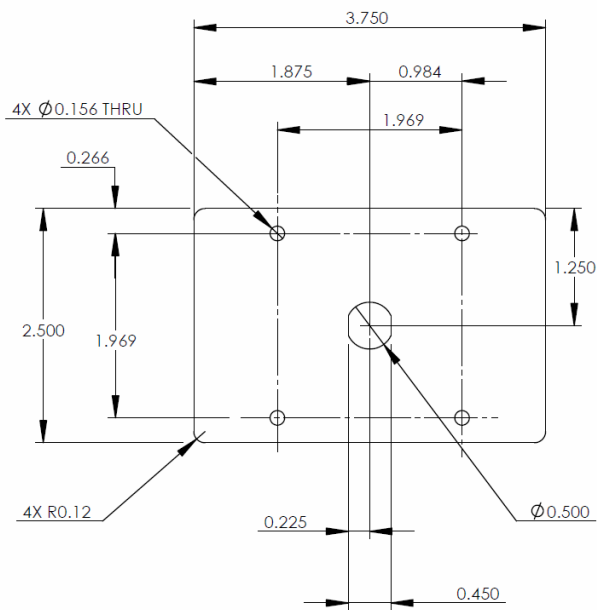


Customization of this unit is accomplished by selecting the appropriate controls and adapting the firmware within the MR175.





**Mounting Plate
(Aluminum)**



ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE NOTED

Warranty Information

MICRONOR INC. warrants this product to be free from 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 indicated 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 Fiber Optic Connector interfaces, 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.

Contact Information

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Specifications

Specification General:

Description	Specification
Electrical Voltage Current	15V to 26V DC 70mA typ. / 100mA (max)
Serial Interface	MR175-1: RS422/RS-485 Full Duplex MR175-2: RS232 Full Duplex
Bit Rate	57,600 baud
Manual Pulse Generator	100 pulses / 360° mechanical step detent
Data Format	11 byte packet transmission at 10ms 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.)
Ingress Protection	IP64 Dustproof and splash resistant
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 in Shipment

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.

Standard Contents

- Hand-held pendant with coiled cable
- Manual and CDROM (one set per shipment)

Hardware Interface

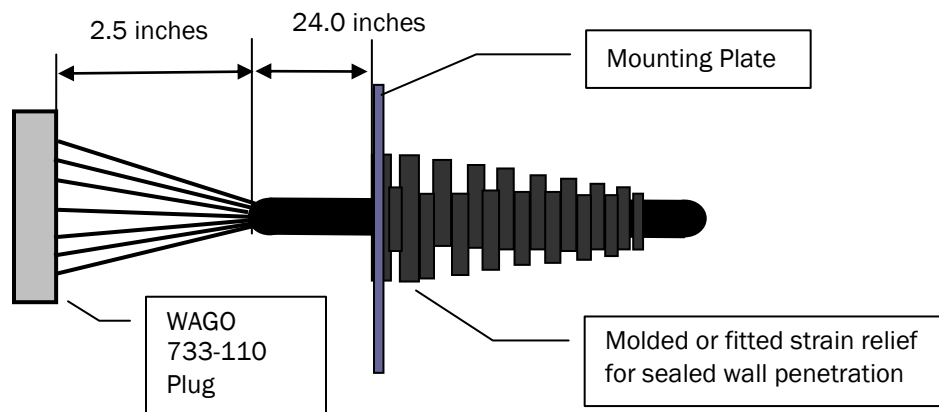
There are two configurations of the MR175 pendant depending on the type of serial interface. Both models use the same 10-pin WAGO interconnection but wired differently according to the difference in the serial interface option:

- MR175-1, Pendant with RS485 Serial Interface
- MR175-2, Pendant with RS232 Serial Interface

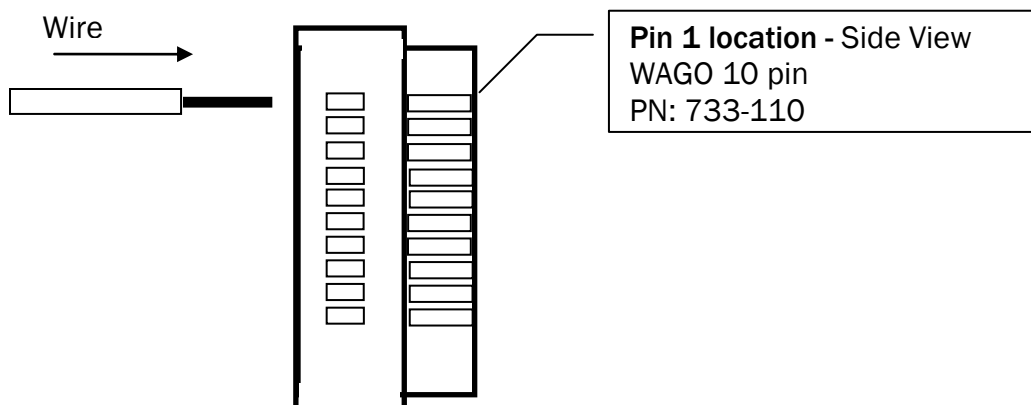
The following subsections describe the wiring interface of these configurations.

Common Interface Features

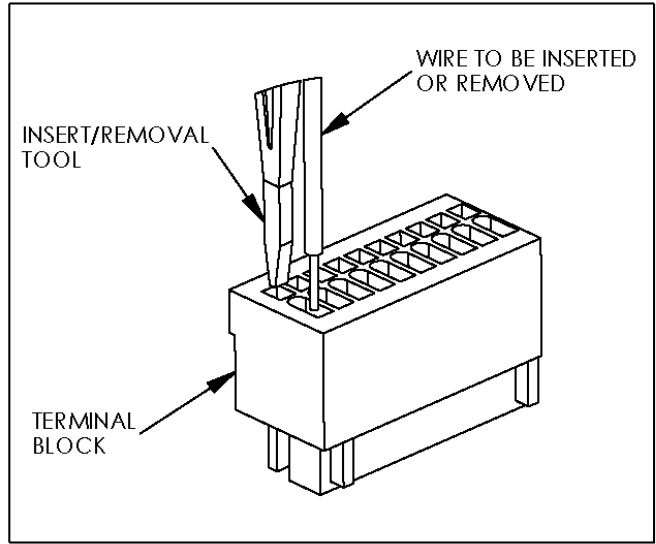
As shown in the figure below, common to both models is the use of the same 10-pin WAGO QuickConnect plug, 733-110. The customer must provide the compatible PCB header for interconnection.



The detail of the WAGO QuickConnect plug 733-110 is shown below.

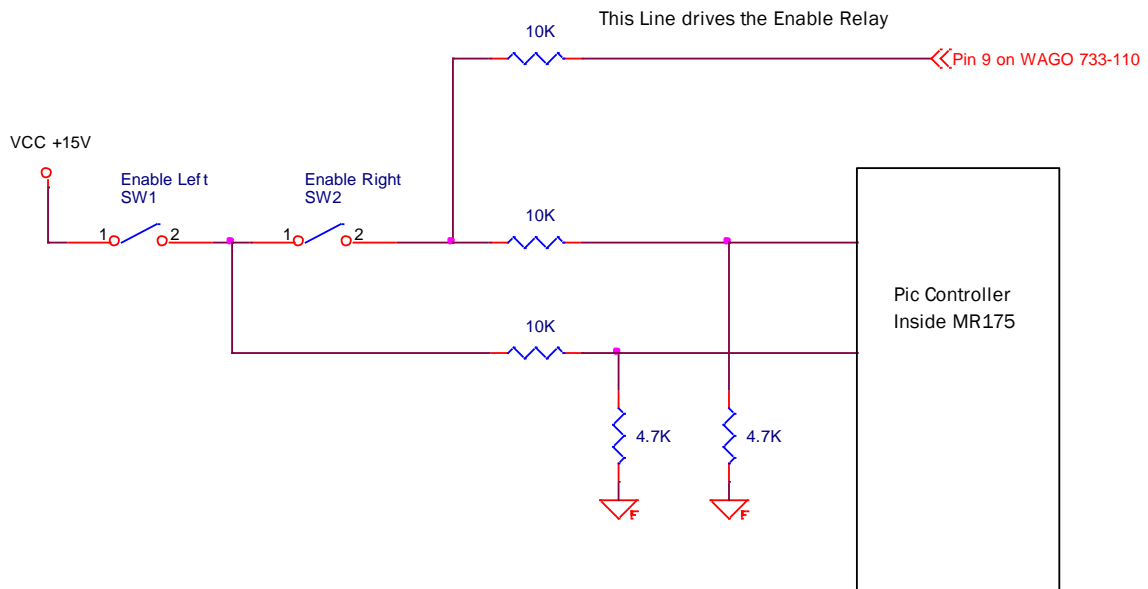


If it is desired to rewire or change the connector, use a WAGO 233-335 wire insert/removal tool as shown here:



CE-Compliant ENABLE Switch Wiring

The ENABLE switches are hardwired to pin 9 as shown in the following schematic diagram. When both switches are simultaneously depressed, the output on pin 9 goes to +15V through a 4.99K Ohm resistor. The resistor is there to help limit the current - even in case of a short.



MR175-1 Connections for RS422/RS485 Serial Interface

Model MR175-1 pendant features an RS422/RS485 serial interface wired into a WAGO 733-100 plug as follows:

MR175 Pin # (WAGO 733-100)	Wire Color	MR175 ^{4.99k} Signal Function	Signal Direction	HOST Pin # (PCB Header)	HOST Signal Function
1	brown	GND	←	1	GND
2	red	+24V	←	2	+24V / 100mA
3	orange	TX+ (Y)	→	3	RX+ (A)
4	yellow	TX- (Z)	→	4	RX- (B)
5	green	RX+ (A)	←	5	TX+ (Y)
6	blue	RX- (B)	←	6	TX- (Z)
7	purple	Hardwired E-Stop	→	7	E-Stop
8	black	Hardwired E-Stop	→	8	E-Stop
9	White	Hardwired Enable	→	9	Enable
10	shield	Shield	Shield	10	Shield

MR175-2 Connections for RS232 Serial Interface

Model MR175-2 pendant features an RS232 serial interface wired into a WAGO 733-100 plug as follows:

MR175 Pin # (WAGO 733-100)	Wire Color	MR175 Signal Function	Signal Direction	HOST Pin # (PCB Header)	HOST Signal Function
1	brown	GND	←	1	GND
2	red	+24V	←	2	+24V / 100mA
3	orange	TX	→	3	RX
4	yellow	---		4	---
5	green	RX	←	5	TX
6	blue	---		6	---
7	purple	Hardwired E-Stop	→	7	E-Stop
8	black	Hardwired E-Stop	→	8	E-Stop
9	White	Hardwired Enable	→	9	Enable
10	shield	Shield	Shield	10	Shield

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 plus a unique serial number : **"MR-175 V: xx.xx SN: xxxxx"**. <Cr><Lf>. The xxxxx serial number is left padded with 0's. 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 approx. 230 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. Packets are never sent faster than **10ms** 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 computer fails to respond to a transmission (with either a **'c'** or an **'e'** within 120 ms, 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 each transmission except when the resend command 'e' requests a repeat send. Then the packet counter will not increment which indicates a packet is being resent.

Byte 3: Momentary Switch Data

B7	B6	B5	B4	B3	B2	B1	B0
Enable (Both)	Right Enable	Left 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 230 counts relates to the potentiometer state 0% to 100%. There is an approx. 2-3 count dead spot at the beginning and end of the Potentiometer. i.e the potentiometer must be turned a few degrees before the output changes from 0 counts. That is done to assure that the potentiometer always reaches 0 regardless of analog voltage drift that occurs in the A/D converter.

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 230 counts relates to the potentiometer state 0% to 100%

Byte 9: Error Data (described below)

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

See Error code table

Bytes 10-11: Checksum (2'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

The checksum is the two's complement of the total sum from bytes 1 to 9 which includes the error byte.

Commands to the MR175 (single 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	0	0	1	1	0	0	1

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 retransmits 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 packet number shall be incremented by one.

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 good 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 the byte.

The error count exists 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 Rotary 1 all contacts open
10	Rotary Switch 1	Invalid Rotary 1 shorted contacts
11	Emergency Switch	E-Switch status Bad, External contact monitor this indicates that the normally closed switch which drives an external relay has opened up. Maybe E-switch failure within the unit. If the E-switch is engaged (activated) then this error indicates that no external voltage is present. Normally an external voltage is present because this E-switch contact drives a relay that shuts off power to the servos of the machine.
12	Emergency Switch	E-Switch status, Internal contact fault. The internal contact hat is normally closed has opened up and is a possible cause by a bad E-switch contact.
13	Rotary Switch 2	Invalid Rotary 2 all contacts open
14	Rotary Switch 2	Invalid Rotary 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. This error is also reported when the Emergency switch is activate at start up. To clear error. Release the E-switch and then reinitialize the unit.
26	Undefined	
27	Undefined	
28	Undefined	

Operating the MR175 on a Windows PC

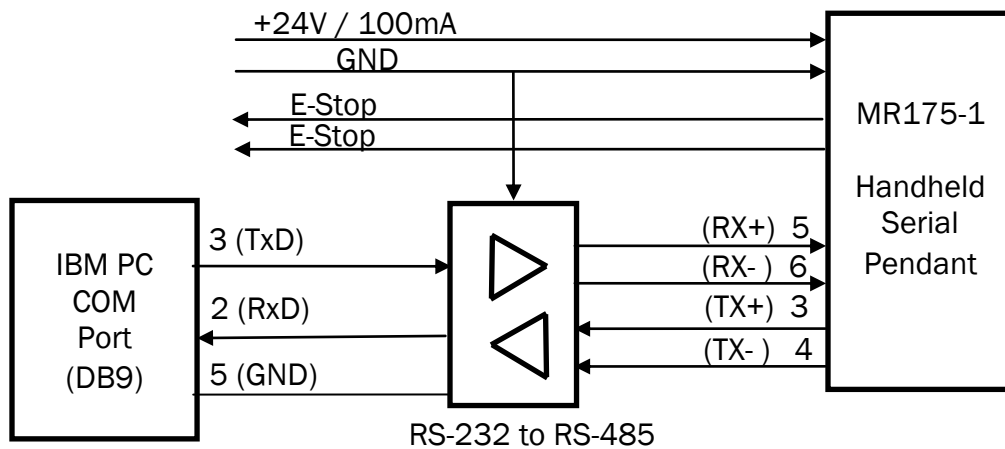
NOTE: Converting the MR175-1 RS485 line driver outputs for RS232 operation is as described in the figure below. The MR175-2 is already configured with an RS232 interface, however, the output will need to be wired to the proper D-sub connector to connect directly to a PC..

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

If the MR175 is delivered with the RS485 interface then it is necessary to use an interface converter box that translates the RS-485 signal levels to RS-232 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.

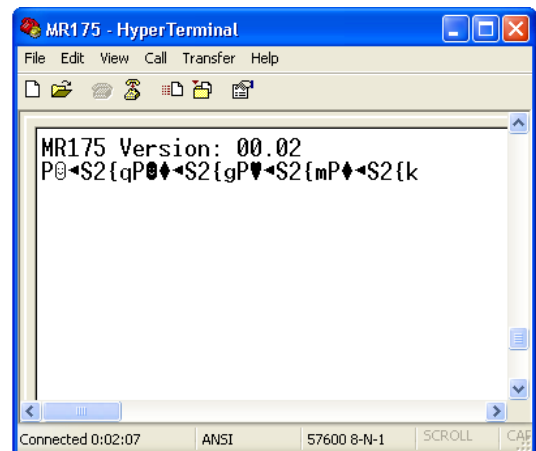


Note: Provide 24V power to the MR175

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:

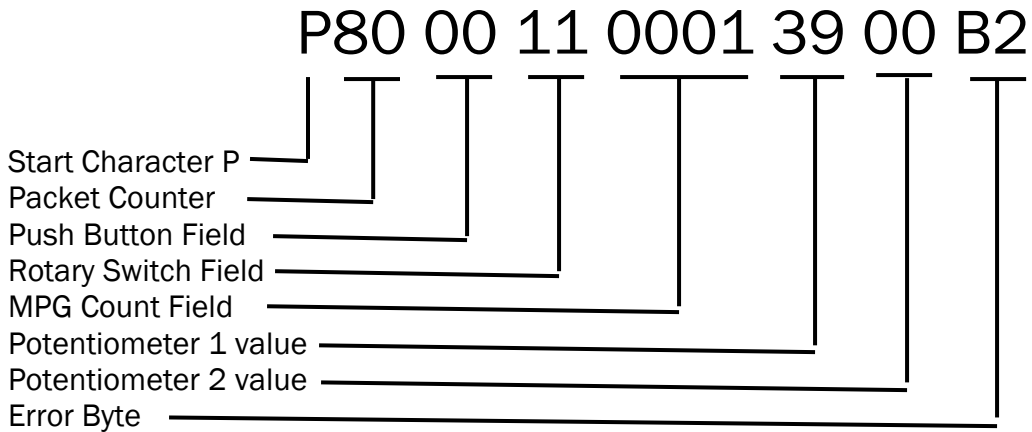
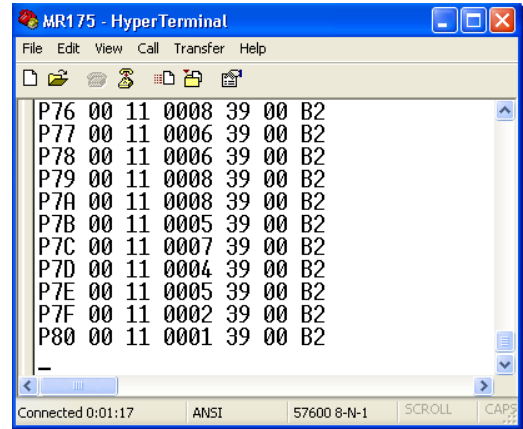
Since the MR175 is programmed to output in binary format you may see some garbled text on the screen.



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 stops 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 ACETONE based cleaning products.

The magnets may regularly attract ferromagnetic metal shavings. To clean use a pad with isopropyl alcohol and wipe off the bottom 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 connector 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:

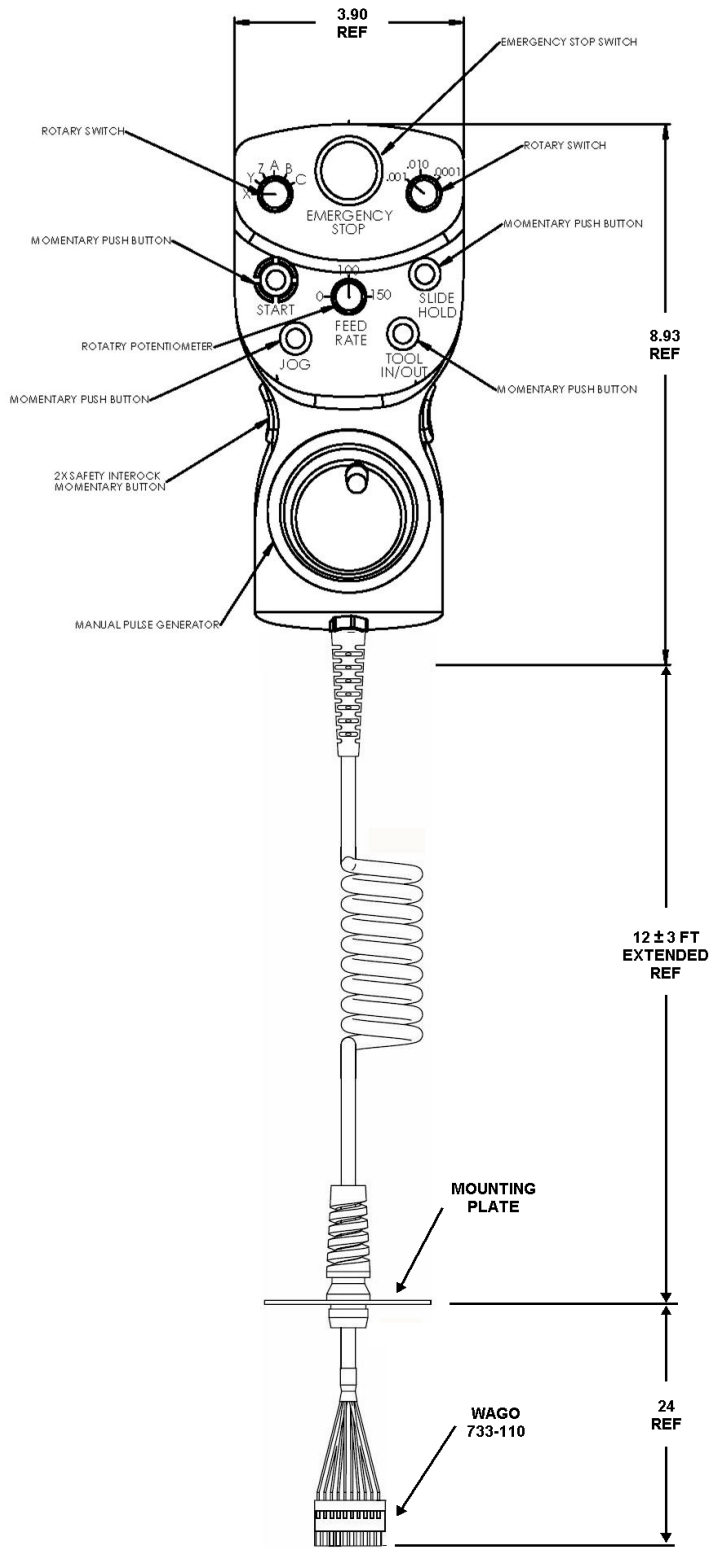
Any other necessary repair shall be done by the factory.

Reference Drawings

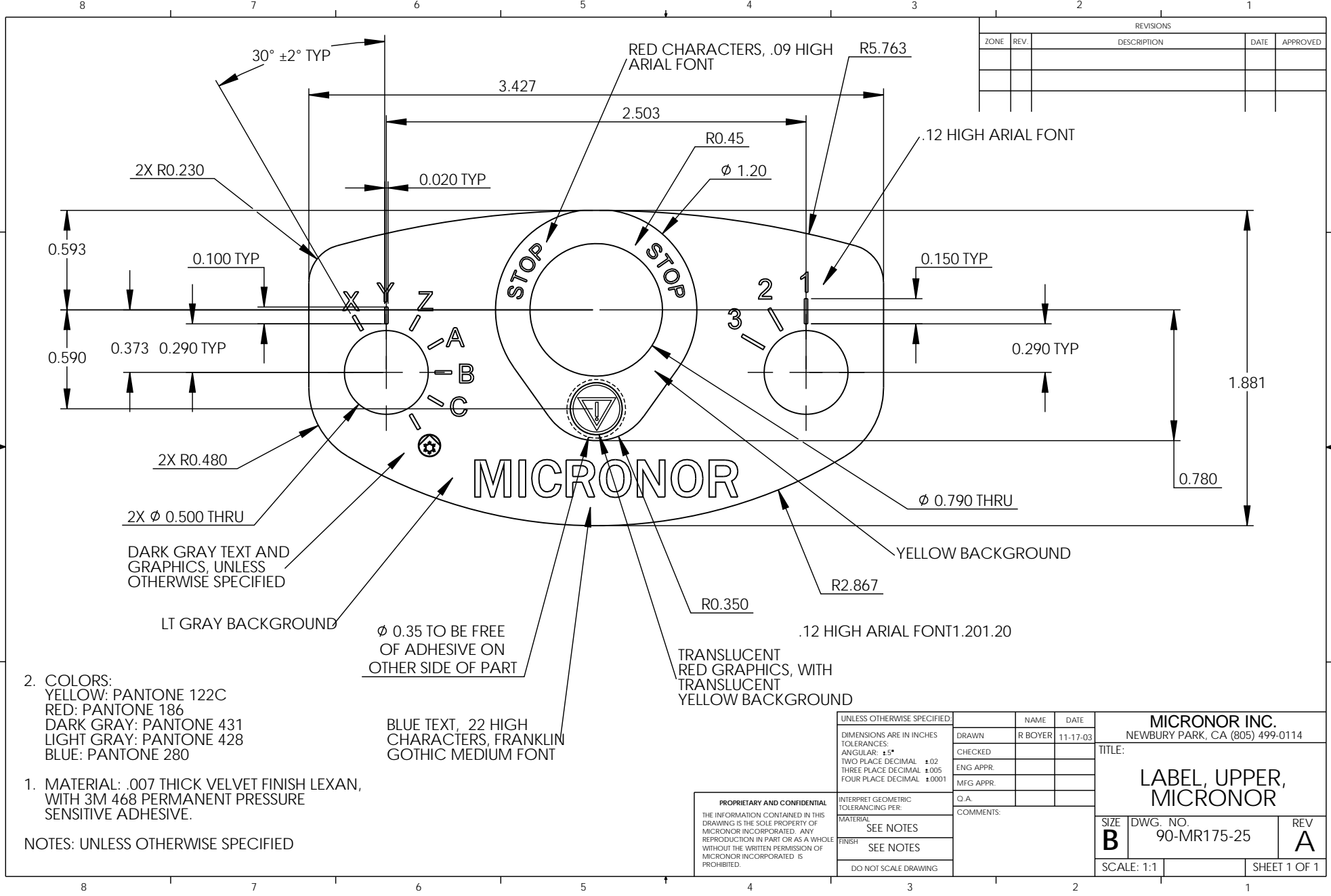
The following reference drawings follow this page:

- MR175 Reference Drawing
- Top Label, 90-MR175-25
- Bottom Label, 90-MR175-20
- Rectangular Mounting Plate, 78-MR175-45

MR175 Reference Drawing



ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE NOTED



REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED

2. COLORS:
 YELLOW: PANTONE 122C
 RED: PANTONE 186
 DARK GRAY: PANTONE 431
 LIGHT GRAY: PANTONE 428
 BLUE: PANTONE 280

1. MATERIAL: .007 THICK VELVET FINISH LEXAN,
 WITH 3M 468 PERMANENT PRESSURE
 SENSITIVE ADHESIVE.

NOTES: UNLESS OTHERWISE SPECIFIED

BLUE TEXT, 22 HIGH
 CHARACTERS, FRANKLIN
 GOTHIC MEDIUM FONT

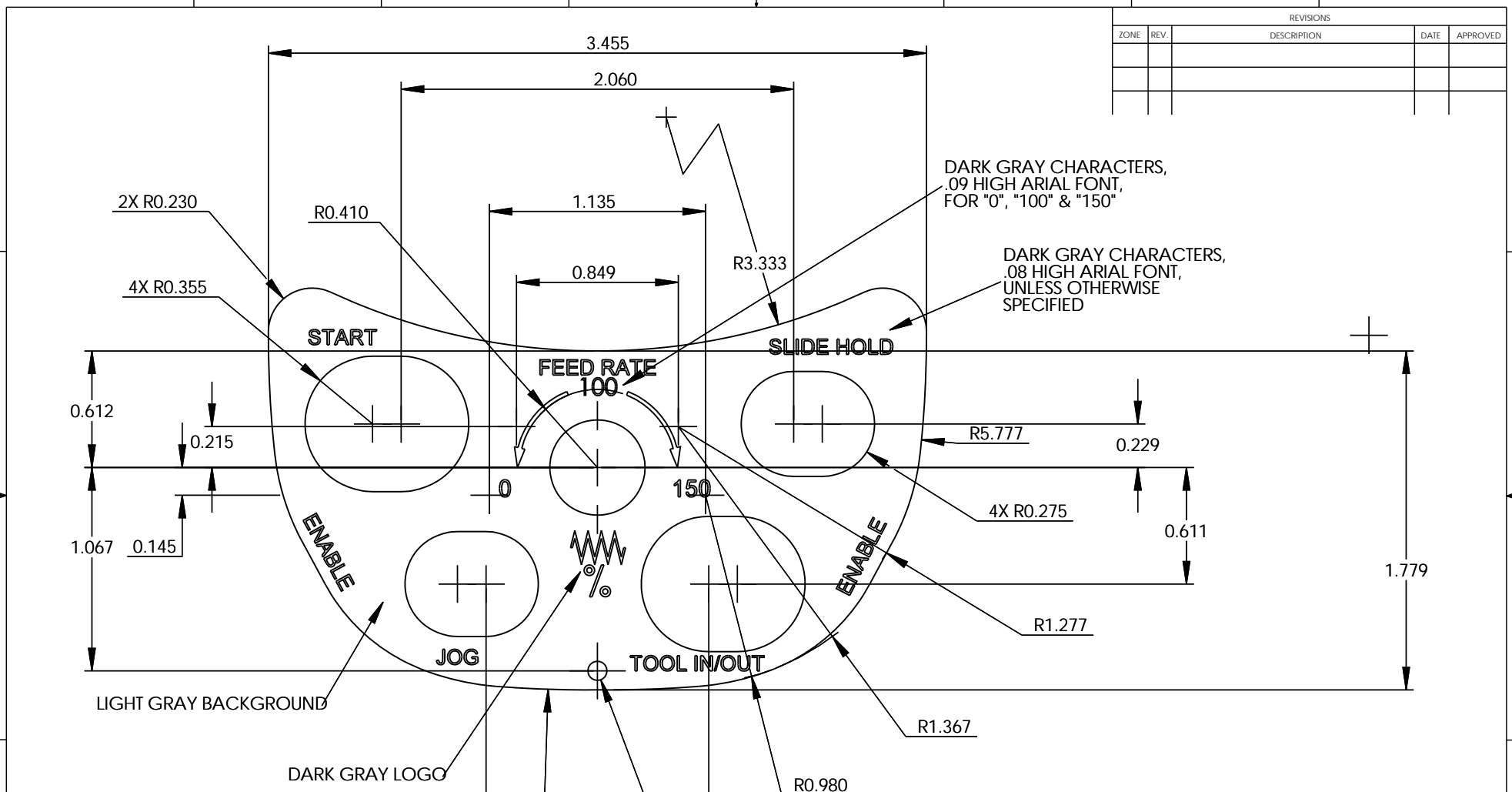
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UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	R BOYER	11-17-03
TOLERANCES:	CHECKED		
ANGULAR: ±5°	ENG APPR.		
TWO PLACE DECIMAL ±.02	MFG APPR.		
THREE PLACE DECIMAL ±.005	O.A.		
FOUR PLACE DECIMAL ±.0001	COMMENTS:		
INTERPRET GEOMETRIC TOLERANCING PER:			
MATERIAL:			
SEE NOTES			
FINISH:			
SEE NOTES			
DO NOT SCALE DRAWING			

MICRONOR INC. NEWBURY PARK, CA (805) 499-0114		
TITLE: LABEL, UPPER, MICRONOR		
SIZE B	DWG. NO. 90-MR175-25	REV A
SCALE: 1:1		SHEET 1 OF 1

REVISIONS

ZONE	REV.	DESCRIPTION	DATE	APPROVED



DARK GRAY CHARACTERS,
.09 HIGH ARIAL FONT,
FOR "0", "100" & "150"

DARK GRAY CHARACTERS,
.08 HIGH ARIAL FONT,
UNLESS OTHERWISE
SPECIFIED

LIGHT GRAY BACKGROUND

DARK GRAY LOGO

2. COLORS:
DARK GRAY: PANTONE 431
LIGHT GRAY: PANTONE 428

1. MATERIAL: .007 THICK VELVET FINISH LEXAN,
WITH 3M 468 PERMANENT PRESSURE
SENSITIVE ADHESIVE.

NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGULAR: ±5°
TWO PLACE DECIMAL ±.02
THREE PLACE DECIMAL ±.005
FOUR PLACE DECIMAL ±.0001

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INTERPRET GEOMETRIC
TOLERANCING PER:
MATERIAL:
SEE NOTES
FINISH:
SEE NOTES
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	R BOYER	9-29-03
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

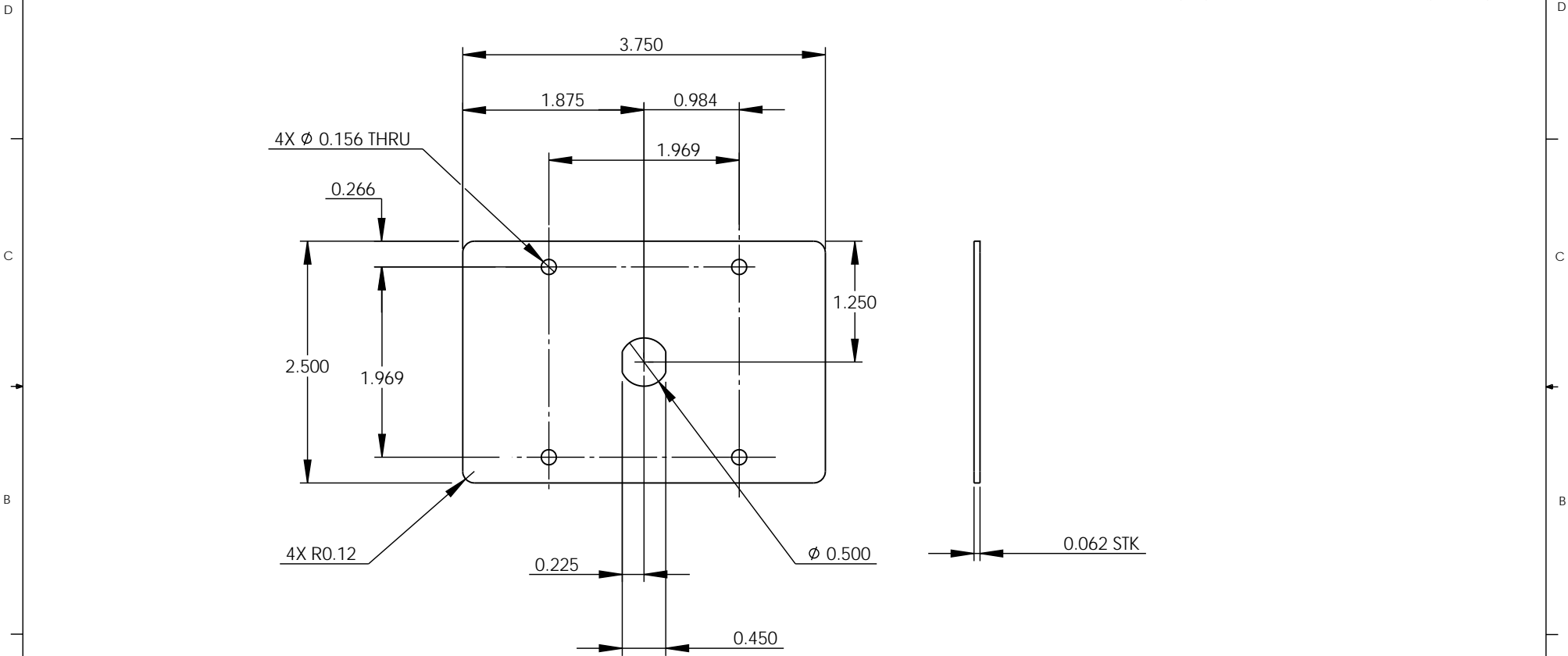
MICRONOR INC.
NEWBURY PARK, CA (805) 499-0114

TITLE:
LABEL, LOWER

SIZE B	DWG. NO. 90-MR175-20	REV A
SCALE: 2:1	SHEET 1 OF 1	

8 7 6 5 4 3 2 1

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	NEW RELEASE	11-12-04	RGB



1. PARTS TO BE FREE OF BURRS AND SHARP EDGES.
 NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED:	NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN R BOYER	11-12-04
TOLERANCES:	CHECKED	
ANGULAR: ±5°	ENG APPR.	
TWO PLACE DECIMAL ±0.02	MFG APPR.	
THREE PLACE DECIMAL ±0.005	C.A.	
FOUR PLACE DECIMAL ±0.0001	COMMENTS:	
INTERPRET GEOMETRIC TOLERANCING PER:		
MATERIAL		
ALUM ALLOY		
FINISH		
CLEAR ANODIZE		
DO NOT SCALE DRAWING		

MICRONOR INC. NEWBURY PARK, CA (805) 499-0114		
TITLE: MOUNTING PLATE, CABLE CLAMP		
SIZE B	DWG. NO. 78-MR175-45	REV A
SCALE: 1:1		SHEET 1 OF 1

8 7 6 5 4 3 2 1