MPX-4S/4G™ Multiplexer

Connect Digital Gages and Serial Devices into a Serial Port

User's Guide

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INTRODUCTION

This manual covers the operations of the MPX-4S and MPX-4G multiplexers. The MPX-4S multiplexer is a 4-slot multiplexer that can accept 4G and 4SP modules in any of its slots. The MPX-4G multiplexer is a single slot multiplexer that is configured with a single 4G module.

MPX-4S MULTIPLEXER

The MPX-4S multiplexer is an interface system that allows you to connect digital gages, serial devices and other types of electronic equipment into a single RS232 serial port on devices such as a desktop PC or a printer. Digital gages supported by the multiplexer include those manufactured or distributed by Chicago Dial, Federal, Fowler, Mitutoyo, Ono Sokki and Sylvac. Most RS232 serial devices such as smart bar code wands, scales, etc. can also be used as multiplexer inputs. The multiplexer can support up to 16 input devices in a single MPX-4S unit and up to 48 input devices if 3 MPX-4S units are connected to a S/MUX multiplexer (available from MicroRidge Systems).

The multiplexer is configured through DIP switches or the MPX *Control Panel* program. It is highly recommended that you become familiar with the *Control Panel* program. This program is designed to run on a desktop PC and makes it very easy to configure the MPX.

Input modules currently available for the MPX-4S multiplexer are:

- 4 digital gage input module (4G-MOD).
- 4 serial port input module (4SP-MOD).

Input readings from most attached devices can be initiated by a command from the host computer, a read button on the device, a remote read switch connected to the channel read switch connector, or through the use of a remote read switch connected to the master read switch connector.

The MPX multiplexer can also do TIR and emulate other formats commonly used in other interfaces. The 4SP serial port modules are always active and can perform data parsing to extract the desired information from the received data.

System Components

A complete MPX-4S multiplexer system consists of:

- MPX-4S module with slots for 4 interface modules
- Input modules (1 to 4 of the following):
  - 4 digital gage input module(s) (P/N: 4G-MOD)
  - 4 serial port input module(s) (P/N: 4SP-MOD)
- Utilities diskette
- Operations manual

- Communications cable w/AC adapter (P/N: MPX-COM-1) or communications cable (P/N: DB25-EXT-10) with separate AC adapter (P/N: ADT-9-500 or ADT-9-1200).

MPX-4G MULTIPLEXER

The MPX-4G multiplexer functions in the same manner as an MPX-4S multiplexer with a single 4G-MOD installed. The package size of the MPX-4G multiplexer allows it to be installed in a half height disk drive slot on a desk top PC.

System Components

A complete MPX-4G multiplexer system consists of:

- Multiplexer with a 4G-MOD
- Utilities diskette
- Operations manual
- When used as a free standing unit, one of the following cable/power supply combinations are required. Communications cable w/AC adapter (P/N: MPX-COM-1) or communications cable (P/N: DB25-EXT-10) with separate AC adapter (P/N: ADT-9-500 or ADT-9-1200).
- When installed in a disk drive slot, an appropriate rail kit and power supply/interface cable is required. An optional serial interface board for a desktop PC is also available. Contact MicroRidge Systems for specific details.

OPERATION

The basic startup operation of the MPX multiplexer is straightforward and consists of the following steps:

1. Install the appropriate slot modules into the multiplexer.
2. Set the MPX and Slot DIP switches or set the MPX-1 DIP switch bank and configure the MPX with the *Control Panel* program.
3. Connect your gages and other devices to the connectors on the slot modules.
4. Connect one end of the communications cable to the multiplexer and connect the other end to an appropriate host computer or printer. If you are using a separate AC adapter, connect this adapter into the plug to the left of the RS232 connector on the back of the multiplexer. Be sure your separate AC adapter has the center pin as the negative terminal.
5. Plug in the AC adapter or press the reset button in the lower right-hand corner on the back of the multiplexer.
6. Wait for the LED's to come on and then turn off. A channel LED on a 4G module will blink 4 times very quickly if the multiplexer recognizes the device connected to that channel. The LED's on a 4SP module will all go on and then go off when the module has been initialized.
7. The master LED, located in the lower left corner of the front panel, will be on during the initialization process. At the end of the initialization process, the LED will turn off if the MPX has performed a cold start (setup parameters read from DIP switches). If a warn start (setup parameters loaded from nonvolatile RAM) has been performed, the master LED will blink several times at the end of the initialization process.
8. You are now ready to use the multiplexer

If you want to change a gage attached to a 4G module, you should perform the following steps:

1. Disconnect the gage from the multiplexer.
2. Connect your new gage to the multiplexer.
3. Press the reset button (the LED's will turn on and off as described above) or press the channel remote read switch, or request a reading from the channel with the <R? command.

MODES OF OPERATION (Data Formats)

There are several modes of operation or data formats available with the MPX multiplexer 4G and 4SP modules. In addition to the modes described here, there are additional modes available with the 4SP module. For a description of the additional 4SP modes, refer to the section in this manual describing the 4SP module.

The modes of operation are referred to as Standard, TIR, Printer emulation, Computer emulation and pass-through. The formats are provided to allow you to easily interface the

multiplexer into existing software and SPC systems. All of these formats are selectable through DIP switches or the *Control Panel* program.

Standard Mode

This data format consists of one to three data fields followed by a line feed (CR) or carriage return/line feed combination (CR/LF). The first data field which contains the measurement will always be transmitted while the second and third data fields, which contain the units and Channel ID, are optional. A typical reading and a description of each of the 3 fields is given below.

```
1   5    10   15                    Description
+---+----+----+--                  ---------------------------------
    1.1755,inch,A                   Typical measurement
```

Field 1	10 character measurement
Field 2	4 character units field. This is an optional field.
Field 3	1 or 2 character channel ID (A, B, C, etc. or 01, 02, 03, etc.) field. This is an optional field.
End-of-line	Carriage return or carriage return/line feed combination

Measurement Field

The first data field is the Measurement Field and it is 10 characters long. The measurement will be right justified in the field with one or more leading blanks. If additional fields follow, a comma will be transmitted at the end of the measurement field.

Units Field

The Units Field is an optional field and the output of this field is controlled by one of the DIP switches or the *Control Panel* program. This field is 4 characters long and will be terminated by a comma if the Channel ID field is also being transmitted. In most cases, this field will appear with the words inch or mm. For some gages, such as those from Federal, no units designation are provided as part of the gage output and, therefore, this field will always contain 4 blanks if output with readings from Federal gages. Other gages, such as those provided by Ono Sokki, may provide units other than inch or mm. If this field is used with the 4SP module, it will always contain 4 blanks.

Channel ID Field

The Channel ID Field is an optional 1 or 2-character field and the output of this field is controlled by two of the DIP switches or the *Control Panel* program. One of these switches specifies the 1-character (A, B, C, etc.) format or the 2-character (01, 02, 03, etc.) format. The other switch selects this field for output. The 1-character format is only supported for the first 32 gages. The only time you will need to be concerned with this 32 gage limit is when you are using the MPX multiplexer with the S/MUX multiplexer. It is possible to connect up to 3 MPX multiplexers into an S/MUX multiplexer and have a 48 gage input system.

End-of-Line Field

The End-of-Line Field consists of a carriage return or a carriage return/line feed combination. The actual sequence of characters sent is determined by one of the DIP switches or the *Control Panel* program. Typically, if the information is being transferred to a computer, the MPX should be set to provide only a carriage return at the end of the line. If the information is being transferred to a printer, one would typically set the MPX to provide both a carriage return and line feed.

Left Justify Mode

The left justify mode is identical to the standard mode, except none of the leading blanks in the measurement field are sent. Since the number of digits in the reading will vary, the length of the field is not constant like in the stanard mode.

TIR Mode

This data format contains four lines of information with each line consisting of one to four data fields followed by a line feed or carriage return/line feed combination. The first data field which contains the measurement will always be transmitted while the second, third and fourth data fields, which contain the units, label and Channel ID, are optional. A typical TIR reading might appear as shown below.

```
1   5    10   15   20                    Description
+---+----+----+----+-                  ---------------------------------
       238,inch,num,A                   Number of measurements
    1.1755,inch,min,A                   Minimum measurement
    1.1817,inch,max,A                   Maximum measurement
     .0062,inch,TIR,A                   TIR  (max meas - min meas)
```

The description of each of the 4 fields is given below:

Field 1	10 character measurement
Field 2	4 character units field. This is an optional field.
Field 3	3 character label (num, min, max or TIR). This is an optional field.
Field 4	1 or 2 character channel ID (A, B, C, etc. or 01, 02, 03, etc.) field. This is an optional field.
End-of-line	Carriage return or carriage return/line feed combination

Measurement Field

The first data field is the Measurement Field and it is 10 characters long. The measurement will be right justified in the field with one or more leading blanks. If additional fields follow, a comma will be transmitted at the end of the measurement field.

Units Field

This optional field is identical to that used in the Standard mode.

Label Field

The Label Field is an optional 3-character field and is output when the channel ID field is selected for output. If this field is output, it will contain a 3-character label (num, min, max, or TIR).

Channel ID Field
This field is identical to that used in the Standard mode. If this field is selected for output, the label field will also be output.

End-of-Line Field
This field is identical to that used in the Standard mode. This field will contain a carriage return or a carriage return/line feed combination.

Starting and Stopping TIR Measurements
TIR measurements can be initiated by a remote read switch, read button on the gage or a command from the host computer. The multiplexer can be configured to take TIR readings while a remote read switch is being pressed or to start the TIR measurements when the switch is pressed the first time and stop the TIR measurements when the switch is pressed again. If a remote read switch is connected to the master read switch connector, TIR's for all configured channels can be stopped and started by pressing the master read switch.

Stopping and starting TIR measurements.

Desired Operation	Procedure/Setup
Stop and start TIR measurements with a host computer command	Use <R? or <B? command to start the TIR. Use <R? or <S? command to stop the TIR. Refer to the Commands Section for details on the use of these commands. The TIR can also be stopped with a read switch (master or channel), if the switch is not configured for continuous read.
Start TIR when remote read switch is pressed and stop TIR when switch is pressed a second time.	Configure the MPX with the *Control Panel* program or set the appropriate MPX 2 or slot DIP switches for single read mode. The TIR can also be stopped with the <R? or <S? commands.
Start TIR when remote switch is pressed and stop TIR when switch is released.	Configure the MPX with the *Control Panel* program or set the appropriate MPX 2 and/or slot DIP switches for continuous read mode.

Printer Emulation Mode
This data format consists of a 24 character (4 fields separated by commas) string followed by an end-of-line field as described above. The description of each of the 4 fields is given below:

```
1   5    10   15   20                    Description
+---+----+----+----+----                 -----------------------------------
2374,    1.1755,     ,01                 Typical measurement
```

Field 1	4 character reading number (1 to 9999)
Field 2	10 character measurement
Field 3	5 character blank field
Field 4	2 character channel ID (01, 02, 03, etc.)
End-of-line	Carriage return or carriage return/line feed combination

Mitutoyo MUX-10 Emulation Mode

This data format consists of the 13 character string sent by the MUX-10. A typical reading might appear as: **01A+001.1755**. The description of each of the 13 digits is given below:

Digit 1	Data format code (always 0)
Digit 2	Channel number (typically 1 or 2) The actual channel ID's are specified by DIP switches 8.3 and 8.4.
Digit 3	Measurement item (always A)
Digit 4	Sign (+ or -)
Digits 5 to 12	Measurement
Digit 13	Carriage return

CONNECTORS & CONTROLS

Front Panel

The front panel contains two toggle switches, a master LED and master read switch connector. All of these front panel controls are located along the left side of the MPX-4S and along the top edge of the MPX-4G. The toggle switches are used to set and control the step, manual and auto modes of the master remote read switch. By using the toggle switches in conjunction with the master read switch, a single remote read switch (i.e., footswitch, etc.) can be used to initiate readings on all of the MPX channels.

Channel Select Toggle Switch

If the read mode toggle switch is set to step (S) or manual (M) this switch is used to select the previous (P) or next (N) channel from which a reading will be obtained when the master read switch is pressed. When the switch lever is pushed up, the previous channel is selected, when it is pushed down, the next channel is selected. The currently selected channel can be identified by a steady glow of the channel LED. If the read mode toggle switch is set to auto (A), this switch is not functional.

Read Mode Toggle Switch

This 3-position toggle switch is used to set the operational mode for the master remote read switch. The modes that can be selected are step (S), manual (M) and auto (A).

Step Mode

When the toggle is in this position, each time the master remote read switch is pressed a reading will be obtained from the current channel and then the next channel will be selected. If you want to skip the reading from a channel use the channel select toggle switch to select a new current channel.

Manual Mode

When the toggle is in this position, each time the master remote read switch is pressed a reading will be obtained from the current channel and the currently selected channel does not change. This mode enables the user to obtain multiple reading from a single channel. When a new channel needs to be selected, press the channel select toggle switch to get to the desired channel.

Auto Mode
When the toggle is in this position, each time the master remote read switch is pressed the MPX will obtain a reading from all of the channels that have gages connected. The first channel read is the lowest number channel with a gage. In this mode the channel select toggle switch is not functional.

Master LED
The master LED is on during a system reset and when the transmit buffer contains data that needs to be sent to the host computer or printer. Once the reset process is complete or the transmit buffer is empty, the master LED is turned off.

Master Read Switch
A foot switch or hand operated remote read switch can be connected to the master remote read switch connector and can be used to tell all gages or input devices to take a reading (this assumes that the device attached to a channel will respond to a request from the multiplexer). The cable from a remote read switch can be terminated with a Switchcraft Micro-Plug, P/N 850, a Radio Shack P/N 274-289 or 274-290, or equivalent. Adapters are also available from companies such as Radio Shack to convert the 2.55 mm (3/32 inch) diameter remote read switch connector to other sizes. Do not apply any power to the remote read switch connector.

Reset Button (MPX-4G)
The reset button for the MPX-4G is located in the upper left-hand corner (similar to the Ctrl-Alt-Del keys on a desktop PC).

Each slot module will also contain connectors and LED's. Refer to the appropriate slot module sections of the manual for the description of these connectors and LED's.

Back Panel
The back panel of the multiplexer contains several connectors, switches and slot access holes (MPX-4S only). The specific items accessible from the back of the multiplexer are as follows:

1. 25-pin RS232 connector for serial communications and connection of AC adapter power supply.
2. AC adapter connector (power can be applied through this connector or the 25-pin D-sub connector). This connector requires that the AC adapter has a center negative pin. The typical power requirements for the AC adapter are 9 to 14 volts DC at 300 ma. If you have more than 1 4SP module installed, you may need a larger current capacity AC adapter.
3. Reset button (MPX-4S) located in the lower right-hand corner (similar to the Ctrl-Alt-Del keys on a desktop PC).
4. Master DIP switches labeled MPX 1 and MPX 2.
5. Slot DIP switches labeled Slot 1, Slot 2, Slot 3 and Slot 4.
6. Access holes used to assist in the removal of the slot boards (Extractor access holes).

7. Board extractor tool used to screw into the access holes and push the slot boards out of the multiplexer.

The reset button is located to the right of the 25-pin D-sub connector and is used to reset the multiplexer to its default conditions (warm or cold start) based upon the settings of the DIP switches and to initialize the unit so that it will recognize a different type of gage attached to its 4G module input channels. This reset function can also be performed by sending the appropriate command from the host computer (see "Commands" section).

When the multiplexer goes into a reset mode, it will take the multiplexer handshake line low (pin 6 on the 25-pin D-sub connector). When the reset process is complete, the handshake goes high indicating that the multiplexer is ready to receive commands. An application program can monitor this handshake line to determine when the reset process is complete.

USER COMMAND

The user command function allows the user to transfer a custom command string into the MPX. This command string can be executed by the MPX when the master read switch is pressed. The length of the command string is limited to 250 characters.

Examples

Typically you would use this command string when you needed to take multiple reading from a channel, when you needed to delay the start of the reading process or you needed to process a sequence of commands with embedded delays. Several examples of how you might use the user command is illustrated below. Please refer to the setup section to determine how to configure the MPX to utilize the user command.

Example 1

You have 3 gages connected to channels A, B and C of the MPX and you need to take 3 readings from channel A, 1 from channel B and 3 from channel C. Using the <US command you would load the string <RA<RA<RA<RB<RC<RC<RC into the MPX. When you press the master read switch, the MPX will execute this command string.

Example 2

You have 2 MPX multiplexers connected to an S/MUX. You want to use a single foot switch to have each MPX read all of the gages connected to the MPX units. This single foot switch has a Y-cable and can be connected to the master read switch on each MPX. Since both MPX multiplexers are connected to the same serial port through an S/MUX, you do not want the second MPX to start taking readings until the first MPX has read all of its gages and sent the reading to the serial port. Let's assume that you have determined that the first MPX will complete its read cycle in less than 2.7 seconds. If you tell the second MPX to delay the start of its read cycle by 3.5 seconds (2.7 seconds + a little extra time) you will be certain that all of the reading from the second MPX will be sent to the serial port after the first MPX has completed its read cycle. The uses string that you should load into the second MPX is <Q2500<Q1000<R*. The <Q command tells the

MPX to pause 2.5 seconds (2,500 msec) and then pause 1.0 seconds before executing the <R* (read all channels) command.

Setup

In order to use the user command you must set certain MPX master DIP switches and the read mode toggle switch. Since the user command string is stored in the MPX battery backed memory, the MPX must be configured for a warm start. If the MPX is configured for a cold start, the user string will be lost when the MPX is reset or power is removed. The DIP switches that must be set are as follows.

MPX Master switch 1.8 = Off (warm start)
MPX Master switch 2.5 = On (enable user command)

You also need to set the read mode toggle switch to auto mode. The user command will not be executed if the read mode toggle switch is in the step or manual mode.

Partial Command Execution

In example 1 listed above all 3 gages will be read when you press the master read switch. However it is also possible to setup the command string so that channel A is read when you press the switch the first time, channel B is read when you press the switch again and channel C is read when you press the switch a third time. To divide the string in example 1 into 3 sub-strings, insert a comma (,) between the strings. The revised example 1 string would be <RA<RA<RA,<RB,<RC<RC<RC.

Loading Commands into the MPX

Currently the user strings must be manually loaded into the MPX with the MPX_TEST.EXE test program. A future version of the MPX Control Panel software will support the user command string.

Loading String with MPX_TEST.EXE

Start the MPX_TEST.EXE communications test program and use the <US command to load the string into the MPX. To load the command string <RA<RA you would enter the command <US<RA<RA. Press the Enter key on the keyboard to tell the MPX that you have completed the entering of the string. To verify that you have entered the string correctly, use the <UR command.

POWER REQUIREMENTS

The MPX multiplexer is typically shipped with an AC adapter that can supply up to 500 ma at 7.5 volts. In most cases this AC adapter is sufficient to supply the power requirements of the MPX. However, if you are using multiple 4SP modules it is recommended that you utilize a larger capacity AC adapter. The table below summarizes the power requirements for several MPX configurations.

Typical MPX power requirements with various slot modules.

Description	Number of slot modules		Current, ma
	4G	4SP	
MPX-4S with no slot modules installed	--	--	60
MPX-4S/MPX-4G with a single 4G modules	1	--	70
MPX-4S with 4-4G modules	4	--	100
MPX-4S with a single 4SP module and no devices connected to the 4SP module	--	1	135
MPX-4S with a single 4SP module and 1 serial device connected to the 4SP module	--	1	185
MPX-4S with a single 4SP module and 4 serial devices connected to the 4SP module	--	1	335
MPX-4S with a single 4G and 4SP module (4 serial devices connected to the 4SP module)	1	1	345
MPX-4S with 4- 4SP modules and 4 serial devices connected to each of the 4SP modules	--	4	1,160

REMOVAL OF SLOT MODULE (MPX-4S)

A slot module can be removed by removing 4-Phillips screws and pushing the module out of the multiplexer case with the board extractor screw (8-32 x 3/4" screw). Be sure to disconnect all communication, power and gage cables before removing the module. To remove a module perform the following steps:

- Remove the 2-Phillips screws that secure the top face plate. These face plate screws are located on the sides of the multiplexer near the top edge.
- Remove the top and bottom Phillips screws that hold the module plate.
- Using the board extractor screw, carefully push the module out of the slot. The extractor screw is found along the left edge of the back panel.
- Gently pull the front of the module to fully remove it from the multiplexer case.
- Remove the board extractor screw and return it to its storage location along the left edge of the case.

There are two types of screws used on the multiplexer. The Phillips screws are intended to be removed by the user. The Allen head screws should not be removed by the user unless the EPROM is being changed..

MASTER DIP SWITCHES

There are 2 master DIP switch banks accessible from the back of the multiplexer. These switches are labeled MPX 1 and MPX 2. There are also 4 slot DIP switches and internal DIP switches on the 4SP modules that can be set to configure the slots. Refer to the appropriate slot module section for the description of the slot DIP switches. All of the DIP switches except MPX 1 can be configured through the *Control Panel* program.

Master DIP switch settings for MPX 1 and MPX 2.

MPX Switch	Description
1.1 & 1.2	Baud rate. Off - Off = 19.2K On - Off = 9600 Off - On = 2400 On - On = 1200
1.3 & 1.4	Communications parameters. Off - Off = E-7-1 On - Off = O-7-1 Off - On = N-8-1 On - On = N-7-2
1.5, 1.6 & 1.7	Handshake. Off - Off - Off = None Off - On - Off = None (reserved for future use) Off - Off - On = None (reserved for future use) On - On - On = None (reserved for future use) Off - Off - On = Software (XON/XOFF) Off - On - Off = Hardware with starting channel = A or 01. Off - On - On = Hardware with starting channel = Q or 17 On - Off - Off = Hardware with starting channel = 33
1.8	Cold or warm start. If you are using the *Control Panel* program to configure the MPX, this switch should be in the Off position (warm start). On = Cold start Off = Warm start
2.1	End-of-Line Field. Send a carriage return (CR) or a carriage return and line feed (LF) at the end of each measurement. On = Send CR and LF Off = Send CR only
2.2	Continuously read or take a single reading from all channels when the master read switch is pressed. On = Continuous read Off = Single read
2.3	Set the channel ID for the Standard mode to a 1 or 2 digit format. The 1 digit format gives channel ID's as A, B, C, etc. The 2 digit format gives channel ID's as 01, 02, 03, etc. Refer to DIP switches 1.5, 1.6 and 1.7. On = 2 digit ID Off = 1 digit ID
2.4	Contact bounce. This is the amount of time that a read switch must be open before another switch closure is accepted as a read request. On = 20 msec Off = 100 msec
2.5	User command string. If a string is downloaded with the <US command, this string will be executed when the master read switch is pressed On = Use user commands when master read switch toggle is set to auto Off = User commands disabled
2.6	Unused
2.7	Unused
2.8	Protocol used to communicate with the MPX to obtain gage readings. On = Computer mode emulation Off = MicroRidge protocol

SELECTION OF THE STARTING CHANNEL NUMBER

The starting channel number is selected with the hardware handshake DIP switches 1.5, 1.6 and 1.7. The starting channel numbers can be A (or 01), B (or 17) or 33. If you use a hardware handshake, you would normally set the starting channel to A. However, if you had 2 or 3 MPX multiplexers connected to an S/MUX multiplexer you would probably want each of the MPX multiplexers to utilize different channel numbers. Refer to the following section for a description of the S/MUX multiplexer.

USING MPX MULTIPLEXERS WITH THE S/MUX MULTIPLEXER

The S/MUX multiplexer is a serial line multiplexer available from MicroRidge Systems. If you connected 3 MPX multiplexers to an S/MUX multiplexer, you would be able to interface up to 48 (16 devices/MPX multiplexer) gages or other supported devices into a single serial port. When using the MPX with the S/MUX it is important to set the MPX for a hardware handshake. If you do not set the MPX for a hardware handshake, you may end up with more than one MPX transmitting data at once on the serial line. When you set the hardware handshakes, you will probably want to specify a different starting channel number for each of the MPX multiplexers. When a starting channel is specified, the slot number and master DIP switches ID's are also specified as shown in the following table.

Starting channel numbers.

Starting Channel Number	Usable Channel Numbers	Slot Numbers
A or 01	A to P or 01 to 16	1 to 4
Q or 17	Q to ` (ASCII 96) or 17 to 32	5 to 8
33	33 to 48	9 to 12

The channel numbers and slot numbers are used with computer commands such as <R?, <M?, etc. For a more detailed description of the use of the S/MUX multiplexer refer to the S/MUX Operations manual.

4-DIGITAL GAGE INPUT MODULE (4G-MOD)

Several gage families are supported by the 4G module. If a manufacturer not listed here produces a gage that uses an output that is compatible with one of the listed gages, then that gage should also work with the 4G module. The gage families that have been tested and are supported by the 4G module are as follows:

- AngleStar
- Chicago Dial
- Federal Maxum
- Federal µMaxum
- Digitrix/Maxcal
- Mitutoyo
- Ono Sokki
- Sylvac UltraCal II

SUPPORTED GAGES

AngleStar

The AngleStar from Lucas Manufacturing must be interfaced with a cable as described in Appendix E. The output from this gage is very similar to the Mitutoyo output and is identified as a Mitutoyo gage. Readings can be initiated by the read button on the gage, remote read switch or a command from the computer.

Chicago Dial

Three versions of the Chicago Dial Indicator are supported. The differences between the versions relate to the number of valid decimal places (3, 4 or 5). The output strings from the CDI gages do not indicate the number of decimals and therefore the number of decimals must be reflected by the cable wiring and DIP switch position 3. The cables required for the CDI gages are described in Appendix E. Readings can be initiated from a remote read switch or a command from the computer.

Digitrix/Maxcal

The Digitrix and Maxcal gages must be interfaced with a cable as shown in Appendix E. Readings can only be initiated by the read button on the gage. Readings cannot be initiated by a remote read switch or a command from the host computer.

Federal Maxum

The Federal Maxum gages must be interfaced with a cable as shown in Appendix E. Readings can be initiated by a remote read switch or a command from the host computer.

Federal µMaxum

The Federal µMaxum gages looks like a Mitutoyo gage to the MPX and must be interfaced with a cable as shown in Appendix E. If this gage is off when the MPX is reset, the gage will

automatically be turned on and identified by the MPX. If the gage is out of range (gage on and screen is blank) no value will be reported by the MPX. Readings can be initiated by a remote read switch or a command from the host computer.

Mitutoyo
Mitutoyo gages are interfaced using the standard cables as supplied by Mitutoyo. No special cables are required. Readings can be initiated by the read button on the gage (if one exists), a remote read switch or a command from the host computer.

Ono Sokki
The Ono Sokki family of gages must use a cable as described in Appendix E. Readings can be initiated from a remote read switch or a command from the computer.

Sylvac UltraCal II
Gages based on the Sylvac chip can be interfaced with two different cables. These cables are referred to as the "slow mode" and the "fast mode" cables. With the "slow mode" cable, readings must be initiated by a remote read switch or a command from the host computer. When the multiplexer is reset with the "slow mode" cable attached, no resetting or zeroing is done to the gage.

When the multiplexer is reset with a "fast mode" cable, the gage is zeroed at its current location and the zero button on the gage then becomes a read button. If you use the "fast mode" cable, be sure to have the gage in the zero position before resetting the multiplexer.

With both of these cables, readings can be initiated by a remote read switch or a command from the computer. When the gage is in the "slow mode" a new reading is available to the multiplexer every 250 milliseconds. If the gage is in the "fast mode" a new reading is available to the multiplexer about every 20 milliseconds. Refer to Appendix E for the specific cables required for the Sylvac type of gage.

When using a Sylvac gage with a "fast mode" cable, on rare occasions the gage may be taken out of the "fast mode." If this happens, it will be necessary to reset the multiplexer in order to put the gage back into the "fast mode."

RESULTS MULTIPLIER

Some gages output a measurement with an inverted sign or the decimal place shifted 1 place to the right or left. To adjust for this, the user can set a results multiplier for the 4G module in the MPX *Control Panel* program. This multiplier allows you to invert the sign on the measurement and shift the decimal 1 place to the right or the left.

SLOT DIP SWITCHES

There is a DIP switch bank for each slot accessible from the back of the multiplexer. These switches are labeled Slot 1, Slot 2, etc. The DIP switches for the 4G-module have the following meanings:

4G-MOD slot DIP switch settings.

DIP Switch Position	Description
1	Units field for Standard and TIR modes. On = Send units Off = Do not send units
2	Channel ID field for Standard and TIR modes. On = Send channel ID (also send TIR label if in TIR mode) Off = Do not send channel ID
3	This field is only used for Sylvac and CDI gages. Units (Sylvac only): For Sylvac based gages, this switch is read to determine the appropriate gage units. On = Units are inch Off = Units are mm Decimals (CDI only): For CDI gages this switch sets the number of decimals places when the G-CDI-3/5D cable is used.. On = 3 places to the right of the decimal Off = 5 places to the right of the decimal
4	Continuously read slot channel or take a single reading. On = Continuous read Off = Single read
5, 6 & 7	Mode of operation. Off - Off - Off = Standard mode Off - Off - On = Left justify mode On - Off - Off = TIR mode Off - On - Off = Emulation mode On - On - Off = Mitutoyo MUX-10 mode
8	Unused

4-SERIAL PORT INPUT MODULE (4SP-MOD)

The 4SP serial port module supports 4-RS232 serial ports and can only be used with the MPX-4S multiplexer. Each port can be configured separately for baud rate, communications parameters, read switch operation, parsing strings, etc. Many of the parameters can be set through the available DIP switch banks, however it is recommended that one use the MPX_CTL.EXE program on a PC to set the parameters.

SLOT DIP SWITCHES

There are 6 DIP switch banks that can be configured for each 4SP module. One of the DIP switch banks is accessible from the back of the MPX and is labeled as the slot DIP switch. The other five DIP switch banks are located on the 4SP module card and are only accessible if the module is removed from the MPX.

The slot DIP switches for the 4SP module have the following meanings:

4SP-MOD slot DIP switches.

DIP Switch Position	Description
1 & 2	Baud rate for 4SP input connectors. Off - Off = Do not use this position On - On = 9600 On - Off = 4800 Off - On = 1200
3	Communications parameters. On = N-8-1 Off = E-7-1
4	Channel ID field for Standard and TIR modes. On = Send channel ID (also send TIR label if in TIR mode) Off = Do not send channel ID
5	Continuously read slot channel or take a single reading. On = Continuous read Off = Single read
6	Unused
7	Unused
8	Unused

It is recommended that you use the MPX_CTL.EXE program to set all the 4SP module parameters rather than use the DIP switch banks.

COMPUTER COMMANDS

The multiplexer can be controlled from a host computer through the use of a series of computer or control commands. These commands consist of a start code followed by one or more command codes. The multiplexer has the ability to buffer up to 5,000 input characters from the host computer. Under most operating scenarios, the user will not have to be concerned with overflowing the receive buffer on the multiplexer; however, if your application will be sending a large number of commands in a short period of time, your application may need to utilize a software or hardware handshake to control the flow of information being sent to the MPX. See the section on "User Developed Software."

Each command begins with a start code. This start code consists of the Esc character (ASCII 27) or the < character (ASCII 60). The multiplexer does not care which one of these characters you use for the start code. The command codes consist of letters and numbers. The letters can be either upper case or lower case or any combination thereof. For example, the command <a or <A both produce the same results. The listing of the available commands and a description of their responses is given below. On those commands that produce a response, the End-of-Line Field (carriage return or carriage return/line feed) will be the same as that set for the measurements output. The exception to this is for the <A (Acknowledge) and the <H (Help listing) commands. When a command needs a channel identified (A, B, C or 01, 02, 03, etc.), you can use the letter ✳ to mean all channels. For example sending the command <R✳ has the same effect as sending <RA, <RB, <RC, etc..

When sending commands do not include any blank characters in the middle of the command. If you have started to send a command and want to cancel it, send either a space or a carriage return.

Computer commands available on the MPX multiplexer.

Command	Description	Typical Response
< ✳	Send copyright, version, program generation date and serial number information	3 lines of text.
<xx	Select channel xx (01, 02, 03, etc.) as the new active channel. The command only works if the read mode toggle switch is in the step or manual mode.	The LED for the newly selected channel will be turned on.
<A	Acknowledge multiplexer present. This command returns a single character only. It does not return a carriage return on a carriage return/line feed. This command is useful for determining if the multiplexer has processed all of the previous commands sent to it.	>
<B?	Begin continuous read on Channel ? (? = A, B, C, etc. or 01, 02, 03 etc. or ✳ for all channels).	Continuous readings from appropriate channel or all channels if channel = ✳.
<C	Clear the measurements waiting to be sent from the multiplexer transmit buffer.	None
<D	Disable all user initiated gage read requests. Once this command is sent, the multiplexer will only respond to read requests sent from the host computer.	None
<E	Enable all gage read requests. Sending this command will allow the multiplexer to respond to commands from the host computer or a read switch.	None
<G?	Reset the counters used in the Printer emulation mode to zero (? = A, B, C, etc. or 01, 02, 03 etc. or ✳ for all channels).	None
<H	Help listing. This command is probably best used from the MPX_TEST program provided with the multiplexer package.	Several screens of information.
<M?	Show slot module types and ID's (? = 01, 02, 03, 04 or ✳ for all slots). If the starting channel number has been set to 17, ? = 05, 06, 07 or 08. If the starting channel number has been set to 33, ? = 09, 10, 11 or 12.	Four lines of text showing module type and module ID. The 4 lines of text are preceded by a CR or CR/LF.
<Qxxxx	Pause the MPX for xxxx msec. The time in msec must not exceed 2500 msec (2.5 seconds). If the time is greater than 2500, the command is ignored. This command is typically used with the user command (<US).	MPX will suspend operation for xxxx msec
<R?	Read channel ? (? = A, B, C, etc. or 01, 02, 03 etc. or ✳ for all channels).	Measurement string from the requested channel or all channels if channel = ✳.
<S?	Stop continuous readings on channel ? (? = A, B, C, etc. or 01, 02, 03 etc.). Channel ✳ means all channels.	None
<T?	Type of gage attached to channel ? (? = A, B, C, etc. or 01, 02, 03 etc. or ✳ for all channels).	Type of gage attached to requested channel or all channels if channel = ✳. The response is preceded by a CR or CR/LF.
<UR	Read the user command currently stored in the MPX.	User command string.

Command	Description	Typical Response
<Usxxx	Send the user command string xxx to the MPX. This command string can be up to 250 characters. This command string is processed by the MPX when the MPX DIP switch 2.5 is On and the Master read switch is pressed (read mode must be set to auto)	None
<V	Model number and software version.	MPX-4S-00-32-B, 3.05
<W	Do a "Warm start." This will reload the multiplexer configuration parameters from the nonvolatile memory. When this command is sent, you should wait until the LED's have gone off before sending additional commands. When this command is sent, the multiplexer handshake line (pin 5 and/or 6 on the 25-pin connector) goes low. When the reset process is complete, this handshake line goes high.	None
<X	Get the DIP switch settings. This will include the 2 MPX DIP switches, the 6 slot DIP switches and the internal DIP switches on any 4SP modules.	Several labeled line of 1's & 0's.
<Z	Do a "Cold start." This will reset all of the multiplexer configuration parameters to the default and DIP switch settings. When this command is sent, you should wait until the LED's have gone off before sending additional commands. When this command is sent, the multiplexer handshake line (pin 5 and/or 6 on the 25-pin connector) goes low. When the reset process is complete, this handshake line goes high.	None

UTILITY SOFTWARE

There are several programs and files contained on the utility diskette included with the multiplexer system. The disk provided with the system is an IBM-PC compatible 5.25" 360K floppy.

VERSION.DOC

This ASCII text file consists of version numbers, release dates and modifications made to the files contained on the disk.

README.DOC

This ASCII text file contains a brief description of the programs on this disk.

MPX_TEST.EXE

The MPX_TEST.EXE program is a communications test program for testing the communications between your desktop PC and the multiplexer. This program can be used with serial port 1 or 2 (COM1: or COM2:) on your PC and supports most of the communication configurations that can be set with DIP switch MPX 1. When the program starts, you will be asked for the serial communications port you are using and the baud rate/communications parameters to use. To communicate with the multiplexer, use the commands described in the "Commands" section of this manual. Many of the commands can also be selected with the function keys. Remember that you can use either the Esc character or the < character for the start code and that the command codes can be upper or lower case.

Unshifted, Alt and Ctrl function keys have been defined for this program. The meanings are as follows:

Unshifted function keys for communications test program.

Function Key	Label	Description
F1	**Read A**	Get a reading from the device connected to channel A. The command <RA is sent.
F2	**Read All**	Get a reading from all of the devices connected to the multiplexer. The command <R∗ is sent.
F3	**Start A** or **Stop A**	Start or stop continuous readings for channel A. The command <BA (start continuous readings) or <SA (stop continuous readings) is sent.
F4	**Start All** or **Stop All**	Start or stop continuous readings for all channels. The command <B∗ (start continuous readings) or <S∗ (stop continuous readings) is sent.
F5	**MPX Help**	Show the multiple screen Help display. The command <H is sent.
F6	**Warm Start**	Restart the multiplexer with the parameters stored in nonvolatile memory. The MPX will also determine the type of gage attached to each of the 4G module channels with this command is sent.. The command <W is sent.
F7	**Model & Ver**	Display the multiplexer and 4SP modules model and software version numbers. The command <V is sent.
F8	**Copy-right**	Display the multiplexer and 4SP copyright, model, software version, program generation date and serial numbers. The command <∗ is sent.
F9	**Exit Prog**	Exit the MPX_TEST program.

Alt function keys for communications test program.

Function Key	Label	Description
Alt F1	**Clear MPX**	Clear the measurement transmit buffer in the MPX and all of the receive measurement buffers on the 4SP modules. The command <C is sent.
Alt F2	**Mod Types**	Show the type of module installed in each slot. The command <M∗ is sent.
Alt F3	**Gage Types**	Show the type of gages connected to each 4G module. The command <T∗ is sent.
Alt F4	**DIP Sw**	Show the types of modules installed in each slot. The command <X is sent.
Alt F5	**Cold Start**	Restart the multiplexer and read the current DIP switch settings. Do not use the parameters stored in nonvolatile memory. The MPX will also determine the type of gage attached to each of the 4G module channels with this command is sent.. The command <Z is sent.

Ctrl function keys for communications test program.

Function Key	Label	Description
Ctrl F1	**New Line**	Move the input cursor down 1 line and place it in column 1. Nothing is sent to the multiplexer.
Ctrl F2	**Show ASCII** or **Show Hex**	Display all of the received information in ASCII or Hex. The hex display is very useful in determining if you have control characters multiple linefeeds, etc. in you data string.
Ctrl F3	**DTR Ready** or **DTR Wait**	Set the DTR (pine 20) handshake high (Ready) or low (Wait).
Ctrl F4	**New Baud**	Select a new serial port, baud rate and communications parameters.
Ctrl F5	**Clear Buffr**	Clear the receive data buffer in the PC.

When the Ctrl is pressed the current serial port and port rate is displayed in the lower right hand corner of the screen

MPX_CTL.EXE

The MPX *Control Panel* program is used to edit, store and transfer setup information to the MPX Multiplexer. If the MPX is connected when the program is started you will be asked if you want to upload the current setup data from the MPX. When the setup data is saved, it will always be saved to a disk file and if the MPX is connected, you will be asked if you also want to download the setup data to the MPX.

Some of the parameters that are set by the MPX Setup Program can be set by MPX DIP switches. However, there are several parameters associated with the 4SP module that can only be set by this program.

The parameters that are downloaded to the MPX, are stored in nonvolatile memory. A lithium backup battery is used to power the nonvolatile memory. This battery should have a life of at least 10 years.

USER DEVELOPED SOFTWARE

Developing software to communicate with the MPX multiplexer should be fairly straight forward. The commands that an application program can send to the multiplexer are outlined in the "Commands" section. To help the programmer become familiar with the specific operation of these commands, one should make use of the MPX_TEST program included with the system.

Perhaps the item that will need special attention deals with the handshakes between your host computer and the multiplexer. There are two handshakes that need to be dealt with and are described below.

MPX to Host Computer Handshake
There is no real handshake line from the multiplexer to the host computer. The handshake line from the multiplexer (pin 5 or 6 on 25-pin D-sub) can be used to monitor the reset process, but cannot be used to tell if the multiplexer receive data buffer is full. The multiplexer receive data buffer consists of 500 bytes on the 8K RAM version and it would be very unusual if you have to be concerned with overflowing this buffer. The primary purpose of this handshake line is to control the flow of information on the serial line when several MPX multiplexers are connected to the S/MUX multiplexer.

This handshake line is taken low whenever the multiplexer is reset. The reset can be the result of pressing the reset button on the unit itself or sending the <Z command. This line will remain low until the reset process has been completed. At that time it will be taken high. An application program can monitor this line to determine when the reset process has been completed.

If your application program needs to determine if all of the commands sent to the multiplexer have been processed, it can use the <A (acknowledge) command. When your application program detects the > character (response from <A command), you know that all of the commands that have been sent to the multiplexer have been processed.

Host Computer to MPX Handshake
There are three different handshake modes that can be set on the multiplexer to determine if it is okay to send data to the host device. These handshake modes consist of the following:

1. No handshake (switch MPX 1.5 = 1.6 = 1.7 = Off).
2. Hardware handshake (switch settings based upon desired starting channel ID).
3. Software handshake (switch MPX 1.5 = 1.6 = Off and switch MPX 1.7 = On).

If the no handshake option is selected, the multiplexer will send data to the host device as soon as it is available.

If a hardware handshake mode is selected, the multiplexer will only send information if the handshake line from the host is high. If this line is low, the multiplexer will hold the information in its internal buffer until this handshake line goes high. This handshake can be on

pin 4 or 20. The handshake pin is controlled by the internal jumpers on the controller board located behind the left front panel of the multiplexer.

If the software handshake (XON/XOFF) is selected, the multiplexer will stop sending information when it receives the XOFF character (ASCII 19) and will resume sending information when it receives the XON character (ASCII 17).

If you are using the multiplexer to send measurements at a fairly slow rate; for example, if the only time a measurement is sent is when an operator presses a read button, you may not have to be concerned with the computer handshake. Typically, when the computer handshake is required is when you are placing the multiplexer in a continuous read mode and will be sending a large amount of information to the host device.

DIAGNOSTICS PROCEDURES

Problems with the multiplexer can be classified into two broad categories:

1. Communications between the multiplexer and the host computer.
2. Communications between the gage and the multiplexer.

The first steps that should be taken in troubleshooting are as follows:

1. Verify that all cables are properly connected and that the AC adapter is connected to a 110-volt outlet.
2. Verify that the gage cable is properly wired.
3. Be sure the gage is turned on.
4. Press the reset button on the multiplexer to verify it has power. The LED's will come on and then go off if it does have power.

MPX TO HOST COMPUTER

Generally, it will be easiest to track down a problem if you can get access to a desktop IBM-PC compatible and make use of the MPX_TEST program. With this program, you will be able to verify proper communications between the multiplexer and the desktop PC. You will also be able to determine the gage type that has been detected on each of the input channels. Refer to "Utility Software" section for a description of the MPX_TEST program.

If you are losing information being sent from the multiplexer and you are using an 8088 based PC running at 4.77 MHz, try setting the baud rate to 1200. If your system has other TSR's loaded and/or you are using two serial ports, your PC may not be fast enough to reliably operate at baud rates higher than 1200.

GAGE TO MPX

If communications between the multiplexer and the desktop PC are satisfactory, but the multiplexer will not recognize the gage, try substituting a different gage and cable on the chance that you may have a defective cable and/or a defective gage.

When you press the reset button on the multiplexer, you should see the following:

1. The master LED should come on and then each channel ID LED will come on one at a time. If the LED's do not come in check your power source.
2. If the multiplexer finds a gage connected to the channel, the LED's will blink 4 times.
3. If they do not blink, verify the following:
    - Gage is turned on.
    - Cables are wired properly.
    - Cables are connected properly.

If you need further assistance, contact MicroRidge Systems, Inc.

APPENDIX A: MPX 25-PIN SERIAL PORT CONNECTOR

The following table describes the function of each of the pins on the multiplexer RS232 serial port connector. The interface cables for this connector are described in Appendix B.

MPX serial port connector.

Multiplexer 25-pin Connector	Description
2	Receive data from host (RxD).
3	Transmit data to host (TxD).
4	Handshake from host computer (RTS) The factory default setting is for the DTR handshake (pin 20) to be the active handshake line.
5	Handshake from multiplexer (CTS). The factory default setting is high for this line.
6	Handshake from multiplexer (DSR). This line is normally used to control access to the RS232 line when the MPX multiplexers are used with the S/MUX multiplexer.
7	Signal ground and power supply ground.
9	7 to 15 volts DC from AC adapter or other DC power source. The ground from the AC adapter should be connected to pin 7.
20	Handshake from host computer (DTR) The factory default setting is for this line to be the active handshake.

APPENDIX B: 4SP 15-PIN SERIAL PORT CONNECTORS

There are two 15 pin D-sub connectors on the face of the 4SP module. Each of the connectors provides access to two of the serial ports. The top connector is for ports 1 and 2, while the bottom connector is for ports 3 and 4. The pinouts for the connectors are shown in the table below.

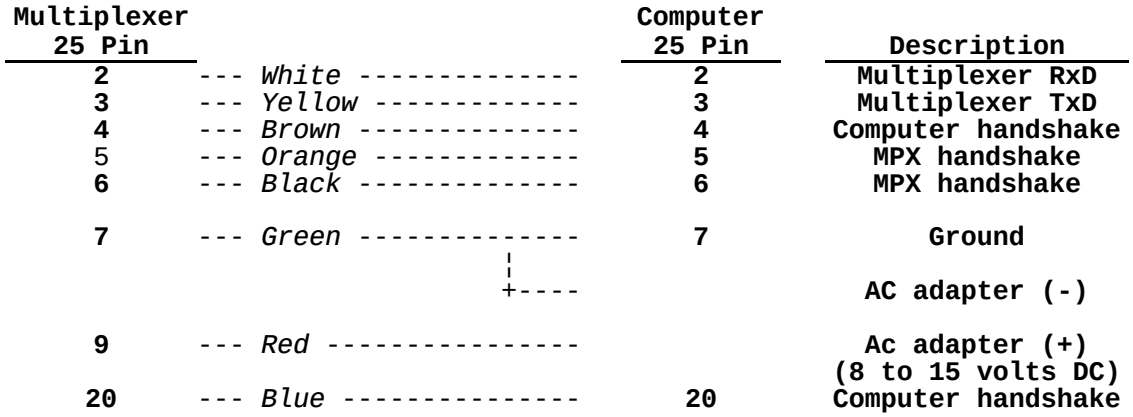
4G-MOD slot DIP switches

4SP Module 15-pin D-sub Connector	Description
1	Signal ground for port 1.
2	Transmit data (TxD) for port 1.
3	Receive data (RxD) for port 1.
4	DTR handshake line (output line, 4SP to remote device) for port 1.
5	DSR handshake line (input line, remote device to 4SP) for port 1.
6	Normally open control switch for port 1.
7	-10 VDC supply, 5 ma maximum current
8	7-12 VDC from AC adapter
9	Signal ground for port 2.
10	Transmit data (TxD) for port 2.
11	Receive data (RxD) for port 2.
12	DTR handshake line (output line, 4SP to remote device) for port 2.
13	DSR handshake line (input line, remote device to 4SP) for port 2.
14	Normally open control switch for port 2.
15	5 VDC supply, 20 ma maximum current

APPENDIX C: COMMUNICATIONS CABLE MPX-COM-1

The following diagram shows the RS232 communications cable for use between the multiplexer and the 25-pin serial port on an IBM-PC. The AC adapter must be able to provide 8 to 15 volts at 300 ma.

If an AC adapter is plugged directly into the AC adapter plug on the multiplexer, you should eliminate the AC adapter shown on the cable below.



The AC adapter supplied with the standard communications cable has an unregulated DC output of 9 VDC @ 500 ma.

APPENDIX D: 4SP 15 to 25 PIN ADAPTER CABLES

The following diagrams show the wiring for the single (P/N: 4SP-25M-1) and dual (P/N: 4SP-25M-2) 15 to 25 pin adapter cables. The 25 pin male connectors on these cables are configured to look like a 25 pin serial port connector on a desktop PC.

The wiring for the single adapter cable (P/N: 4SP-25M-1) is shown below. If this cable is connected to the top 15 pin connector on the 4SP module, it will be connected to port 1. If is connected to the bottom 15 pin connector, it will be connected to port 3.

4SP Module 15 Pin		25 Pin Connector	Ports 1 or 3 Description
1	--- *Bare* ---	7	Ground
2	--- *Yellow* ---	2	4SP TxD
3	--- *White* ---	3	4SP RxD
4	--- *Blue* ---	20	DTR handshake (output from 4SP to remote device)
5	--- *Black* ---	6	DSR handshake (input from remote device to 4SP)
6	--- *Brown* ---	11	Normally open control switch
7	--- *Green* ---	10	-10 VDC, 5 ma max
8	--- *Red* ---	9	7 to 12 VDC
	+----	4	RTS handshake (always high)
15	--- *Orange* ---	25	5 VDC, 20 ma max

The wiring for the dual adapter cable (P/N: 4SP-25M-2) consists of the diagram shown on the previous page plus the diagram shown below. If this dual cable is connected to the top 15 pin connector on the 4SP module, it will be connected to ports 1 and 2. If is connected to the bottom 15 pin connector, it will be connected to port 3 and 4.

4SP Module 15 Pin		25 Pin Connector	Ports 1 or 3 Description
9	--- *Bare* ---	7	Ground
10	--- *Yellow* ---	2	4SP TxD
11	--- *White* ---	3	4SP RxD
12	--- *Blue* ---	20	DTR handshake (output from 4SP to remote device)
13	--- *Black* ---	6	DSR handshake (input from remote device to 4SP)
14	--- *Brown* ---	11	Normally open control switch
7	--- *Green* ---	10	-10 VDC, 5 ma max
8	--- *Red* ---	9	7 to 12 VDC
	¦		
	+----	4	RTS handshake (always high)
15	--- *Orange* ---	25	5 VDC, 20 ma max

APPENDIX E: 4G-MOD INTERFACE CABLES ANGLESTAR GAGES

The following table shows the location of the pin numbers on the 10-pin header located on the multiplexer and the cable. The pin numbers shown represent the view looking directly at the 10-pin header on the multiplexer or the cable.

10 Pin Header on Multiplexer

9	**7**	**5**	**3**	**1**
10	**8**	**6**	**4**	**2**

10 Pin Socket on Cable

1	**3**	**5**	**7**	**9**
2	**4**	**6**	**8**	**10**

The following table shows the cable connections required for the AngleStar gages.

Cable connections for AngleStar Gages

10 Pin Header	Connection	Description	Gage Connector Pin No.
1	To Gage	Ground	1
2	To Gage	Data	2
3	To Gage	Clock	3
4	To Gage	Ready for data	4
5	To Gage	Request for data	5

APPENDIX E: 4G-MOD INTERFACE CABLES CHICAGO DIAL GAGES

The following table shows the location of the pin numbers on the 10-pin header located on the multiplexer and the cable. The pin numbers shown represent the view looking directly at the 10-pin header on the multiplexer or the cable.

10 Pin Header on Multiplexer

9	7	5	3	1
10	8	6	4	2

10 Pin Socket on Cable

1	3	5	7	9
2	4	6	8	10

6 Pin Socket on CDI Gage Cable

1	3	5
2	4	6

CDI gage reading contain 3, 4 or 5 decimal positions, however the decimal position is not part of the gage output string. The number of decimal positions for each series of CDI gages is as follows:

- 3 decimals for 100 and 400 series gages
- 4 decimals for 300 and 700 series gages
- 5 decimals for 200 and 900 series gages

If you are using a gage with 4 decimal places you should use cable G-CDI-4D. If you are using a gage with 3 decimal places you should use cable G-CDI-3/5D and set DIP switch 8.8 to on. If you are using a gage with 5 decimal places you should use cable G-CDI-3/5D and set DIP switch 8.8 to off.

The following table shows the cable connections required for the Chicago Dial gages.

Cable connections for G-CDI-4D (4 decimal places)

10 Pin Header	Connection	Description	Pin No. & Wire Color
1	To Gage	Ground	5 - Black
2	To Gage	Data line A	3 - Red
3	To Gage	Clock	6 - White
6	To Gage	Data line C	2 - Green
7	To Gage	Data line B	1 - Yellow
8	To Gage	Data line D	4 - Blue

Cable connections for G-CDI-3/5D (3 or 5 decimal places)

10 Pin Header	Connection	Description	Pin No. & Wire Color
1	To Gage	Ground	5 - Black
2	To Gage	Data line A	3 - Red
3	To Gage	Clock	6 - White
4	Connect to pin 1	Decimal position ID	
6	To Gage	Data line C	2 - Green
7	To Gage	Data line B	1 - Yellow
8	To Gage	Data line D	4 - Blue

Chicago Dial lists the following wire colors in their documentation:

Pin 1	Data line B	Yellow
Pin 2	Data line C	Green
Pin 3	Data line A	Red
Pin 4	Data line D	Blue
Pin 5	Ground	Black
Pin 6	Strobe (clock)	White

APPENDIX E: 4G-MOD INTERFACE CABLES DIGITRIX/MAXCAL GAGES

The following table shows the location of the pin numbers on the 10-pin header located on the multiplexer and the cable. The pin numbers shown represent the view looking directly at the 10-pin header on the multiplexer or the cable.

10 Pin Header on Multiplexer

9	**7**	**5**	**3**	**1**
10	**8**	**6**	**4**	**2**

10 Pin Socket on Cable

1	**3**	**5**	**7**	**9**
2	**4**	**6**	**8**	**10**

The following table shows the cable connections required for the Digitrix/Maxcal gages.

Cable connections for Digitrix/Maxcal Gages

10 Pin Header	Connection	Description	Gage Connector Pin No.
1	To Gage	Ground	1
2	To Gage	Data	2
3	To Gage	Clock	4
9	To Gage	Read button	5

APPENDIX E: 4G-MOD INTERFACE CABLES FEDERAL MAXUM GAGES

The following table shows the location of the pin numbers on the 10-pin header located on the multiplexer and the cable. The pin numbers shown represent the view looking directly at the 10-pin header on the multiplexer or the cable.

10 Pin Header on Multiplexer

9	**7**	**5**	**3**	**1**
10	**8**	**6**	**4**	**2**

10 Pin Socket on Cable

1	**3**	**5**	**7**	**9**
2	**4**	**6**	**8**	**10**

The following table shows the cable connections required for the Federal Maxum gages. Assembled cables are available directly from MicroRidge Systems (P/N: G-FED-MAX).

Cable connections for Federal Maxum Gages

10 Pin Header	Connection	Description	Gage Connector Pin No. & Wire Color
1	To Gage	Ground	5 - White
2	To Gage	Data	3 - Brown
3	To Gage	Clock	2 - Green
4	To Gage	Sign	4 - Black
6	Connect to pin 10	Gage ID jumper	
10	To Gage	+5 volts to gage & Pin 6	1 - Red

APPENDIX E: 4G-MOD INTERFACE CABLES FEDERAL µMAXUM GAGES

The following table shows the location of the pin numbers on the 10-pin header located on the multiplexer and the cable. The pin numbers shown represent the view looking directly at the 10-pin header on the multiplexer or the cable.

10 Pin Header on Multiplexer

9	**7**	**5**	**3**	**1**
10	**8**	**6**	**4**	**2**

10 Pin Socket on Cable

1	**3**	**5**	**7**	**9**
2	**4**	**6**	**8**	**10**

The following table shows the cable connections required for the Federal µMaxum gages. The connector used on the µMaxum gage is an Amphenol C091-31M007-200-1. The Federal part number for this connector is ECN-01720. Assembled cables are available directly from MicroRidge Systems (P/N: G-FED-MCRO).

Cable connections for Federal µMaxum Gages

10 Pin Header	Connection	Description	Gage Connector Pin No. & Wire Color
1	To Gage & Capacitor	Ground	3 - Yellow
2	To Gage	Data	6 - Brown
3	To Gage & Capacitor	Clock	7 - Orange
5	To Gage	Request for data	4 - Green

The capacitor referenced in the table above is connected between pins 1 and 3 on the 10 pin header and has a value of 680 pf.

APPENDIX E: 4G-MOD INTERFACE CABLES MITUTOYO GAGES

The following table shows the location of the pin numbers on the 10-pin header located on the multiplexer and the cable. The pin numbers shown represent the view looking directly at the 10-pin header on the multiplexer or the cable.

10 Pin Header on Multiplexer

9	**7**	**5**	**3**	**1**
10	**8**	**6**	**4**	**2**

10 Pin Socket on Cable

1	**3**	**5**	**7**	**9**
2	**4**	**6**	**8**	**10**

The following table shows the cable connections required for the Mitutoyo gages.

Cable connections for Mitutoyo Gages

10 Pin Header	Connection	Description	Gage Connector Pin No.
1	To Gage	Ground	1
2	To Gage	Data	2
3	To Gage	Clock	3
4	To Gage	Ready for data	4
5	To Gage	Request for data	5

The connections shown in the above table reflect the standard cables available from Mitutoyo.

APPENDIX E: 4G-MOD INTERFACE CABLES ONO SOKKI GAGES

The following table shows the location of the pin numbers on the 10-pin header located on the multiplexer and the cable. The pin numbers shown represent the view looking directly at the 10-pin header on the multiplexer or the cable.

10 Pin Header on Multiplexer

9	7	5	3	1
10	8	6	4	2

10 Pin Socket on Cable

1	3	5	7	9
2	4	6	8	10

The following diagram shows the cable required for the Ono Sokki gages.

Ono Sokki Gage		10 Pin Header	Description
1	--- *Red* ----------	1	Ground
2	----------	3	Clock
3	----------	2	Data
4	----------		
5	----------		

APPENDIX E: 4G-MOD INTERFACE CABLES SYLVAC ULTRA-CAL II GAGES

The following table shows the location of the pin numbers on the 10-pin header located on the multiplexer and the cable. The pin numbers shown represent the view looking directly at the 10-pin header on the multiplexer or the cable.

10 Pin Header on Multiplexer

9	**7**	**5**	**3**	**1**
10	**8**	**6**	**4**	**2**

10 Pin Socket on Cable

1	**3**	**5**	**7**	**9**
2	**4**	**6**	**8**	**10**

The following table shows the cable connections required for the Sylvac gages.

Cable connections for Sylvac Ultra-Cal II "slow mode"

10 Pin Header	Connection	Description
1	To Gage	Ground
2	To Gage	Data
3	To Gage	Clock
8	Connect to Pin 10	Gage ID jumper
10	Connect to Pin 8	+5 volts

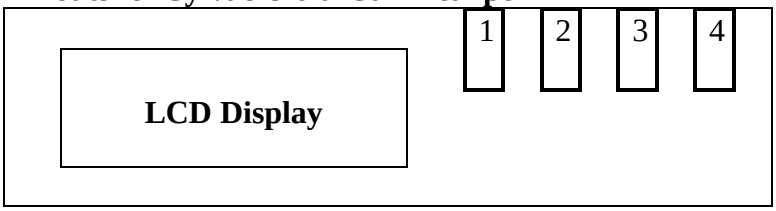
Cable connections for Sylvac Ultra-Cal II "fast mode"

10 Pin Header	Connection	Description
1	To Gage	Ground
2	To Gage	Data
3	To Gage	Clock
7	Connect to Pin 10	Gage ID jumper
8	Connect to Pin 10	Gage ID jumper
10	Connect to Pin 7 & 8	+5 volts

In addition to the connections shown in the two tables above, you must connect a 680 pf capacitor between pins 1 and 2, and a 680 pf capacitor between pins 1 and 3. If you use the 10-pin connector and circuit board assembly available from MicroRidge Systems (P/N: MR-10P-CONN), the necessary capacitors are included and the circuit board provides for easy attachment of the capacitors.

The outline of the Sylvac caliper reading unit is shown below. You can use this sketch to determine the location of the clock, data and ground connections required for the interface cable.

Pinouts for Sylvac Ultra-Cal II caliper



Pin 1 = -1.5 volts
Pin 2 = Data
Pin 3 = Clock
Pin 4 = Ground

APPENDIX F: 4SP-MOD INTERFACE CABLES SYLVAC PROTRACTOR

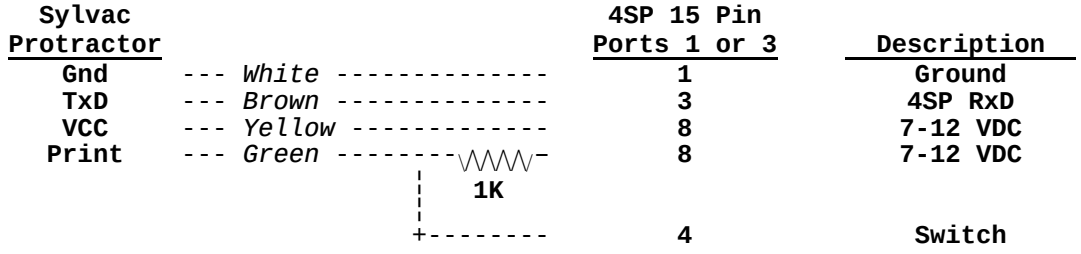
The Sylvac protractor is an RS232 device that should be used with a remote read switch, one of the cable shown below and specific MPX control panel program (MPX_CTL.EXE) settings. It is capable of sending a new reading every 500 msec.

This serial device has a print (send data) button on the unit, however the user is required to have a "calibrated finger" in order to get a single reading from the device. If the print button is not held long enough, you will not send any readings, if it is held to long, you will send multiple readings. The proper length of time to hold the print button down ranges up to 500 msec. If the remote read switch connected to the 4SP module is used with the proper control panel settings, you will not have a problem getting a single reading from the protractor

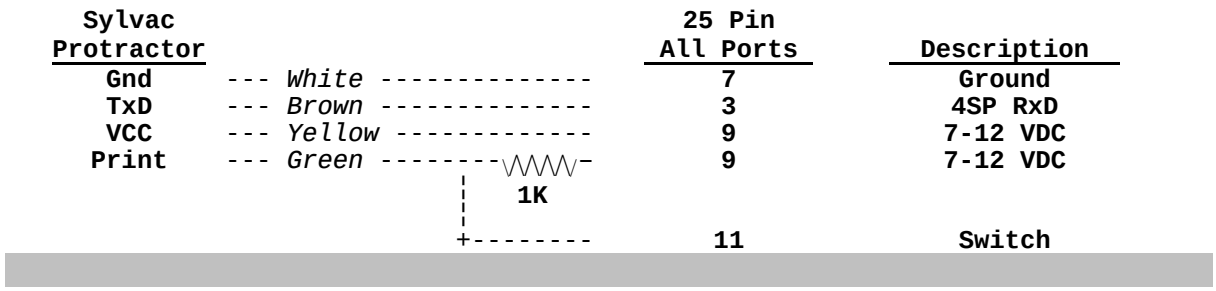
This MPX control panel program settings required or recommended are shown below. Since this device sends a CR/LF combination at the end of a measurement, typically you would use the CR as the end-of-packet character and remove all LF's.

```
Baud rate ............ 1200
Comm parameters ...... N-7-1
Handshake ............ None
Remote read switch ... Open switch contacts
End-of-packet char ...  13
Remove input LF's .... Yes
```

The following diagram is for connecting the protractor directly to a 15 pin connector for ports 1 or 3 on the 4SP module. If the protractor is to be connected directly to ports 2 or 4, make the following changes in pin assignments: 1 ➞ 9, 3 ➞ 11 and 6 ➞ 14.



If you are connecting the protractor to the optional 25 pin 4SP adapter cable (P/N: 4SP-25M-2 or 4SP-25M-1), use the following diagram for all ports.



APPENDIX F: 4SP-MOD INTERFACE CABLES
SYLVAC ULTRA-CAL III

The Sylvac Ultra-Cal III caliper is an RS232 device that can initiate a reading with the read button on the gage or a remote read switch.

The required MPX control panel program settings are shown below.

```
Baud rate ............ 4800
Comm parameters ...... E-7-1
Handshake ............ None
Remote read switch ... Take handshake line low
End-of-packet char ...  13
```

The following diagram is for connecting the Ultra-Cal III directly to a 15 pin connector for ports 1 or 3 on the 4SP module. If the Ultra-Cal III is to be connected directly to ports 2 or 4, make the following changes in pin assignments: 2 ➞ 10, 3 ➞ 11 and 4 ➞ 12.

Sylvac Ultra-Cal III		4SP 15 Pin Ports 1 or 3	Description
2	----------	4	4SP DTR
3	----------	3	4SP RxD
4	----------	2	4SP TxD
7	----------	8	7-12 VDC

If you are connecting the Ultra-Cal III to the optional 25 pin 4SP adapter cable (P/N: 4SP-25M-2 or 4SP-25M-1), use the 9 pin to 25 pin adapter supplied with the Ultra-Cal III.

APPENDIX F: 4SP-MOD INTERFACE CABLES
Fowler Digi-Max

This description is based on the Digi-Max model 1040 digital test indicator. This device can send data continuously (ALL mode) or 1 measurement per read request (1PEr mode). The description provided here is for the 1 measurement per read request mode. This device will require a remote read switch or a computer command to obtain a reading.

This MPX control panel program settings are shown below. Since this device sends a CR/LF combination at the end of a measurement, typically you would use the CR as the end-of-packet character and remove all LF's.

```
Baud rate ............ 1200
Comm parameters ...... N-8-1
Handshake ............ None
Remote read switch ... Close switch contacts
End-of-packet char ...  13
Remove input LF's .... Yes
```

The following diagram is for connecting the Digi-Max directly to a 15 pin connector for ports 1 or 3 on the 4SP module. If the Digi-Max is to be connected directly to ports 2 or 4, make the following changes in pin assignments: 1 ➞ 9, 3 ➞ 11 and 6 ➞ 14.

Fowler Digi-Max	Digi-Max Description		4SP 15 Pin Ports 1 or 3	4SP Description
1	**Ground**	-- *White* --	**1**	**Ground**
2	**Transmission request input**	-- Green --	**6**	**Switch**
3	**Serial data output**	-- *Brown* --	**3**	**4SP RxD**
4	**Battery +**	-- *Yellow* -		

If you are connecting the Digi-Max to the optional 25 pin 4SP adapter cable (P/N: 4SP-25M-2 or 4SP-25M-1), use the following diagram for all ports.

Fowler Digi-Max	Digi-Max Description		25 Pin All Ports	4SP Description
1	**Ground**	-- *White* --	**7**	**Ground**
2	**Transmission request input**	-- Green --	**11**	**Switch**
3	**Serial data output**	-- *Brown* --	**3**	**4SP RxD**
4	**Battery +**	-- *Yellow* -		

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