![GP:50 logo] **Pressure, Level & Temperature Transmitters & Transducers**

INSTALLATION MANUAL

Models 611/612 USB output

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Pressure, Level & Temperature Transmitters & Transducers

1. INTRODUCTION

1.1 Product Overview

USB PROTOCOLS

- ASCII Only

DEVICE FEATURES:
- Adjustable Response Time (1Hz up to 100Hz)
- Adjustable Baud Rate
- Adjustable Station Numbers
- Optional Continuous Output Streaming
- System Output Re-Zero Function (Allows unit to be re-zeroed in the field)
- Digital Shunt
- Auto device detect
- User Data Storage Bins
- Health Management

SOFTWARE:

Unit can be ordered with optional GP:50 Digi-Stand software package

Features include:

Auto- data logging to .txt file for import to Microsoft Excel
One button re-Zero of mV/V readings of sensor and Calibrated Pressure
Adjustable measurement rate
Intuitive and easy to use user interface
Compatible with Windows 10, 7, Vista, and Win XP

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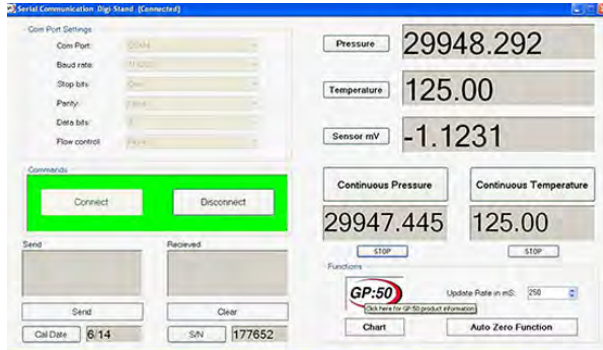***Figure 1****: USB Toolkit main screen.*

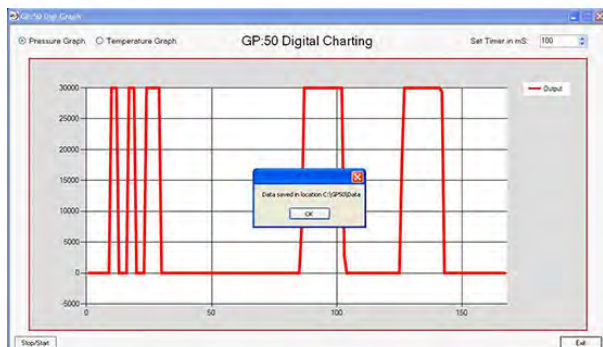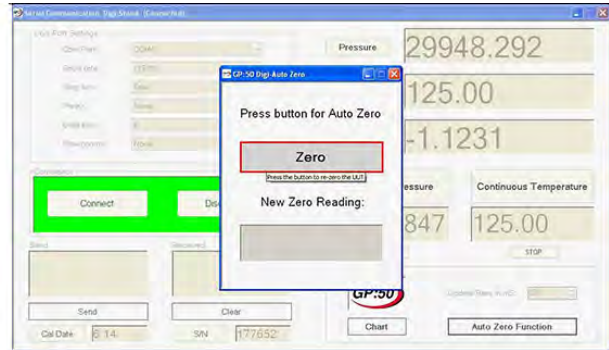***Figure 2****: USB Toolkit main screen.*

Figure 3*: USB Toolkit main screen.*
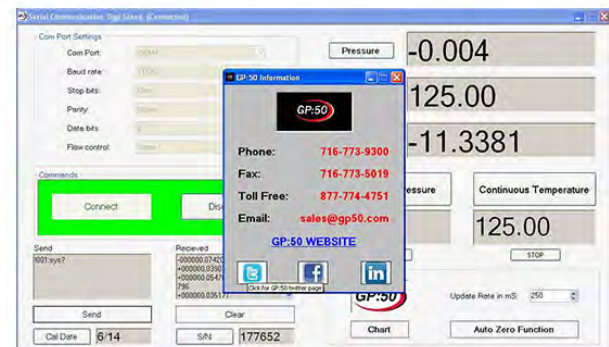
Figure 4*: USB Toolkit main screen.*

Figure 1. Screen shot of Digi-Stand Serial Communication User Interface. This displays the main screen with example of tooltip showing GP:50 information pop-up (Fig. 4)

Figure 2. Displays pop-up for Auto-zero function in lower right corner

Figure 3. Displays Digital Charting and txt file saved to C:\GP50

Figure 4. Displays GP:50 Contact Information highlighted in Fig. 1

Consult complete Digi-Stand User Guide for complete instructions.

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1.2   Warning

Pressurized vessels and associated equipment are potentially dangerous. The product described in this guide should be operated only by personnel trained in the procedures that will assure safety to themselves, to others, to the equipment, and to the product. Specific warnings are noted as ⚠ in specific installation/operation sections.

1.3   Unpacking and Inspection

All models covered in this manual are carefully tested, inspected, and packed. Upon receipt of the shipment thoroughly inspect the transducer. If you see any visible signs of obvious shipping damage, notify the freight company immediately.

1.4   Using this Manual

This manual is intended to help the end user install, maintain, and provide general service of GP:50 Model 611/612 USB Digital Output Pressure Transducer. The user should have a general understanding of current loops & general instrument control. All aforementioned models are precision instruments and should be given the same care as any other precision instrument during installation and operation.

2. INSTALLATION

2.1   Mounting/Process Connection

Model 611/612 can be ordered with a number of optional pressure ports depending on pressure range. Consult factory for availability. Installation of the device shall be in accordance with industry standard pipe fitting requirements for this size. During installation or removal, torque should only be applied at the wrench flats provided on the pressure port. As a general rule of thumb, the device shall be "wrench-tight" to avoid leakage from the process connection.

2.2   Installing Digi-Stand Software and Tera Term (HyperTerminal Replacement)

- Download USB driver and Digi-Stand software to PC
- Software available at links below

Digi-Stand Software:

https://www.dropbox.com/sh/p52sozx4hxty74b/AAB4eGmUzbXIEHgXm2ryvCHXa?dl=0

USB Drivers (In case they do not install automatically):

https://www.dropbox.com/s/xrojw0fhojqf75i/DSC%20USB%20Driver%20Setup.exe?dl=0

Tera Term: (Follow links for download)

https://ttssh2.osdn.jp/index.html.en

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- Connect the USB unit to an open com port connection on your computer or laptop
- Unzip the Digi-Stand application Zip file to a location on your C drive.
- Run the GP50 Digi-Stand application file, this will automatically install the application to your computer.
- Open the Digi-Stand application and select the COM port value that is populated.
- Click the *Connect* button, you should now be connected and have pressure data.
- Sensor is formatted for USB standard. The USB unit can connect to a PC by plugging into a USB port and does not require an external power supply as they appear as a single unit load and draw less than 100mA (70-80mA typ).
- Appropriate drivers must be installed which are supplied by GP:50. These create a virtual serial port allowing the USB unit to appear to the PC as a normal COM port device.
- The unit is supplied with a USB type A connector.

2.3   Default Serial Settings

- Baud Rate = 115200
- Stop bits = 1
- Parity = none
- Data bits = 8
- Flow control = none

ASCII Data Output

Sensor is formatted for the ASCII standard communications protocol. The ASCII protocol only uses basic printable characters, and so can be accessed with a simple terminal program like Windows 'Hyper Terminal'.

Communication

Communications are of the master/slave type. A central host device (normally a PC or PLC) acts as a bus master in control of all communications.

Communications consist of the master transmitting command messages addressed to the particular slave devices. The target slave may then transmit a 'response message' back to the master.

Because there is only one bus master and slaves never initiate communications, the master is in control of all communications. This enables multi-drop operation, i.e. a single master can control any number of slave devices at a time.

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Command Types

A single command sent to a device can instruct it to read from or write to an internal parameter value, or to execute a control action.

The device responds by returning data (for a parameter read) or a simple acknowledge (for a write action).

Addressing

Every slave device on the bus is identified by a unique address value known as its 'Station Number'. Each command message contains an address specifying to which slave device it is directed.

A slave will ignore all communications that are not addressed to it. Default station Number = 001.

Parameters

Parameters are the values used for all control settings and output values. They have a real-value storage type and may be either read/write, read-only, or write-only. Output or result values are mostly read only.

Configurable parameters are held in non-volatile storage, so control settings are retained permanently even when power is removed.

2.4   THE ASCII PROTOCOL

The ASCII protocol uses only printable characters and carriage-return ('<CR>'), which allows a "dumb" terminal device or a PC program like Hyper-Terminal or Tera Term to interrogate the device.

Host Command Message Format

The basic command request structure is shown in the following example, illustrating the message

"!001:SGAI=123.456<CR>", meaning write 123.456 to parameter SGAI on station 1:

Framing Character	Station Address	Separator	Command Identifier	Access Code	Data	End of Frame
!	001	:	SGAI	=	123.456	<CR>

An Explanation of Each Field is as Follows:

- **Framing Character:** A "!" character is used to signal the start of a new message. This character is only ever transmitted by the host for framing purposes.
- **Station Address:** A three-digit ASCII decimal number (000-999) determining which slave device(s) the command is intended for. All three digits must be sent.
- **Separator:** Always present. As no checksum or message verification technique is used, slaves use this as an extra check on message validity.

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- **Command Identifier:** Up to 4 alpha-numeric characters, case insensitive, giving the name of the required command.
- **Access Code:** Defines what sort of response is expected.
    - '**=**' means write data is expected to follow.
    - '**?**' means the host is expecting to receive read data back.
    - <CR> (i.e. nothing more before end) means the command is an action type (execute).
- **Data:** An ASCII decimal-formatted number, can include 0…9, '**+**', '**–**', '**.**' and spaces. This field can have a maximum length of 15 characters.
- **End of frame:** A <CR> is always present to indicate the end of the message.

Summary

- A command message begins with '**!**', followed by a three-digit station address, then a '**:**', and finishes with a <CR>.
- The '**!**' and <CR> *only* appear at the beginning and end of commands respectively.
- From the '**:**' to the final <CR> is the command 'instruction' (of read, write, or execute type).
- All instructions begin with an alphanumeric command identifier of up to 4 characters, and end with a non-alphanumeric (which may be the final <CR>).

Slave Response Message Formats

Each slave monitors the bus for command messages. It responds to any message that is addressed to it by sending a response message.

To be accepted by a slave device, a message must start with '**!**', the correct three-digit slave address and '**:**', and end with <CR>, with no intervening extra '!'.

The slave will then *always* respond.

There are Three Possible Types of Response: acknowledge (ACK), acknowledge with data (ACK-with-data) for a read, and not-acknowledge (NAK):

- ACK is a single <CR> character. This confirms an execute or write command.
- ACK-with-data is a decimal number, followed by <CR>. This confirms a read and returns the data value.
- NAK is an '?' <CR> sequence. The device rejected the command.

There Are Several Possible Reasons for A NAK Response:

- Command identifier not recognized.
- Badly formatted command: Missing command identifier, unrecognized access-code character, or unexpected character somewhere else.
- Access attempted not supported by this command.

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Notes

- From receipt of the host's terminating <CR> to a response from the device (if any) will be at most 50mS. After this, it can be assumed there is no response.
- There is no value-checking: A slave *cannot* NAK a command because a write data value is 'unsuitable' in some way, only if write access itself is disallowed.
- For the ACK-with-data (i.e. a successful read command), the returned value consists of printable ASCII characters finishing with a <CR>, formatted according to the DP and DPB settings as follows.

COMMAND EXAMPLES

Write Command

If the device accepts the command, then a <CR> is transmitted. There is no error checking on the data received by the device.

> Example:
>
> A command to set the RATE parameter to three on station 1 could look like this –
> **!001:RATE=3<CR>**
> Assuming a device with STN=1 is present, it will respond with – **<CR>**

Read Command

Returns the requested value specified by the command.

The returned value is formatted according to the DP and DPB values: The response consists of a sign character (±), DPB decimal digits before a decimal point, DP digits after the point and a terminating <CR>: The length of the response is thus fixed at DP+DPB+3 characters.

> Example:
>
> A command to read the SYS output could look like this –
> **!001:SYS?<CR>**
> if the value=32.1, and format settings are DP=3 and DPB=5, the response string will be –
> **+00032.100<CR>**

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Action Command

If the device accepts the command, then a <CR> is transmitted.

> Example:
>
> A command to reset device 14 would look like –
> **!014:RST<CR>**
> the response string will be just –**<CR>**

Broadcast Commands

If the station address in a command message is "000", this means a broadcast command:

All slaves act as normal on a broadcast command, but do not respond.

> Example:
>
> A command to all devices on the bus to sample their inputs would look like this –
> **!000:SNAP<CR>**
> - there is no response

Bad Commands

If any command is not understood by the device then a "?" is transmitted followed by a <CR>.

> Example:
>
> A un-recognized command, correctly addressed to station 173 –
> **!173:XYWR?<CR>**
> produces the general error response – **?<CR>**

All Commands will follow the same syntax as above examples.

2.5   Command Set for Use with Hyper-terminal

Command ID	Description	Misc.	Setting
SYS	Main pressure output of sensor	Use this to read actual pressure output	
TEMP	Main temperature output of sensor	Use this to read actual temperature output	
MVV	mV/V reading of sensor	Use this to read actual mV/V output	
USR1	User storage bin 1	Contains the Serial Number of Unit	User can access USR3…9 for storage
USR2	User storage bin 2	Contains Calibration Date of unit	ddmm.yy format.

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SZ	System zero	Subtracts SZ amount from SYS output	Factory set to 0.0
STN	Station number	Sets the address of the unit.	Factory set to 001
RATE	Output update rate parameter	Can set per Rate chart (only up to 100Hz)	Factory set to 3 = 10Hz
BAUD	Baud rate selection	Can be set per Baud chart	Factory set to 3=115200
STAT	Error Register	Can be polled by user to determine errors	See chart
DP	Digits after point	Set # of digits after decimal point	Factory set to 2
SNAP	Pressure input snapshot	Reads pressure input of all devices on bus	The value is stored in SYSN register
DPB	Digits before point	Set # of digits before decimal point	Factory set to 6
RST	Reboot	Use this to reboot / power cycle the device	

* All command ID's are case insensitive.

Baud rate control:

BAUD value:	0	1	2	3	4	5	6	7	8	9
Baud Rate (bps):	2400	4800	9600	19K2	38K4	57K6	76K8	115K2	230K4	460K8

Output Rate control:

RATE value:	0	1	2	3	4	5	6	7	8	9	10
Update Rate (Hz):	1	2	5	10	20	50	60	100	200	300	500

* The Temperature output is set to automatically update every 5 seconds, and is not affected by the update

System Zero, SZ

This command subtracts the amount SZ from the main pressure output value SYS. SZ is factory set to 0. By sending a value to SZ, the main pressure output becomes: SYS = SYS – SZ.

The user can use this command to offset the output by any amount.

Error Reporting

The STAT register can be polled by the user to indicate the errors shown in the following table:

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Bit	Value	Description	Name
0	1	Setpoint output status	SPSTAT
1	2	Digital Input status	IPSTAT
2	4	Temperature under range (TEMP)	TEMPUR
3	8	Temperature over-range (TEMP	TEMPOR
4	16	Strain gauge input under-range	ECOMUR
5	32	Strain gauge input over-range	ECOMOR
6	64	Cell under-range (CRAW)	CRAWUR
7	128	Cell over-range (CRAW)	CRAWOR
8	256	System under-range (SRAW)	SYSUR
9	512	System over-range (SRAW)	SYSOR
10	1024	(unused - reserved)	Unused
11	2048	Load Cell Integrity Error (LCINTEG)	LCINTEG
12	4096	Shunt Calibration Resistor ON	SCALON
11	8192	Stale output value (previously read)	OLDVAL
14	16384	(unused - reserved)	Unused
15	32768	(unused - reserved)	Unused

The errors listed above along with their bit values are shown. The cell and system over and under range errors can be used to indicate over and under pressure values which can be programmed into the device by GP:50 corresponding to pre-determined pressure range values.

Reading Snapshot

SNAP, SYSN

The action command SNAP can be used to sample the pressure output of all USB units connected to the same Bus. The main use of this command is where a number of different inputs need to be sampled at the same instant. Normally, multiple readings are staggered in time because of the need to read back results from separate devices in sequence.

By broadcasting a SNAP command, all devices on the bus will sample their pressure inputs within a few milliseconds and save that value in the SYSN register. The resulting values can then be read back in the normal way from all the devices' SYSN parameters.

Continuous Output Streaming

By setting the STN parameter (Station Number) to 998, the unit will continuously output the SYS (Pressure Output) value automatically from power up. If a unit is in broadcast mode (station address set to 998, all commands to communicate to the unit must now take place on station address 998. For example, a command to read pressure on station address 001 (!001:SYS?<CR>) will now look like (!998:SYS?<CR>).

IMPORTANT MESSAGE

When changing the parameters of the device, the device must be power cycled before these changes take effect. If a power cycle is not possible, the user can issue a reset command which will act as a re-boot.

The Command ID for a reboot is **RST**.

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This command must be issued in order for changes to the Output Rate, Station Number, as well as other parameter changes to take effect.

Ensure media is compatible with 316 and 17-4 stainless steel (standard material, optional materials available) check part number to verify wetted material to avoid premature corrosion of the diaphragm. This can cause performance degradation and eventual sensor failure.

Properly tighten process connections before applying pressure to ensure no leaks or mechanical failure can occur.

Never insert sharp objects into diaphragm. This could cause permanent damage to the sensor and/or mechanical failure/diaphragm rupture.

2.6   Power Supply Connection

Consult power requirements listed on the Calibration Record provided with each serialized individual unit. For best operation, the pressure transducer needs clean regulated power with output impedance less than 20Ω. As loads are added to the current loop (galvanic barriers, current measuring devices resistors), the minimum excitation voltage must increase in order to maintain proper operating voltage. Refer to datasheet for additional electrical specifications.

2.7   Wiring & Grounding

Consult wiring listed under Electrical Connections on the Calibration Record provided with each serialized individual unit. Do not run wires next to power lines, electrical systems, motors, generators, or any other equipment which may generate a significant amount of electrical noise or magnetic fields.

2.8   Environment
The operating temperature range should be from 32°F to 185°F (0°C to 85°C). Mount the unit as close to the process as possible with the ambient temperature surrounding the electronics falling within the operating range. See datasheet for further temperature limits.

Protect electrical connection from direct/continued exposure to fluids. Moisture ingress can occur and cause eventual electrical failure.

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3. OPERATION & MAINTENANCE

Model 611/612 is designed to produce USB digital output in direct proportion to pressure. Specific pressure range, input voltage requirements and electrical connections are marked on unit.

⚠ Install only after verifying both input power and line pressure are off and at zero.

⚠ Replace broken fasteners (available through the factory) as they may compromise the seal and cause contamination and/or electronics failure.

⚠ Observe safe ESD handling precautions to avoid static damage to sensitive components.

4. TROUBLESHOOTING & RETURN INFORMATION

No output

- Verify baud rate is correct
- Verify station number is correct
- Verify Com Port value is correct
- Verify power supply voltage meets transducer requirements
- Verify pressure if being applied
- Verify output load is not shorted

Advanced Troubleshooting:

If COM port shows up, and Baud Rate is correct, unit may be in broadcast mode (Station address set to 998). When unit is in this mode, it is not able to communicate with the Digi-Stand software program (Digi-Stand program can only communicate to unit if Station address is set to 001). In order to fix, HyperTerminal or similar terminal emulator program must be used to change the station address back to 001 by sending the following command: !998:STN=001<CR>. A check to confirm unit is in broadcast mode is to open HyperTerminal and connect to the unit. Once connected, the unit will start transmitting pressure values in decimal format automatically and continuously. If this does occur, then the unit can be confirmed it is in broadcast mode.

There also exists a broadcast command station number (Station Number 000) that will allow communication to a unit if the station number becomes lost. Sending command !000:STN=001<CR> will change the station number back to 001.

If COM port is not found in device manager, the drivers may still need to be installed. Install the USB drivers (link for download is contained in section 2.2) and disconnect / re-connect USB unit to computer.

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Erratic output or zero drift

- Verify pressure applied is constant
- Verify power supply remains within specifications
- Inspect USB cable for discontinuity or damage
- Verify output with a multi-meter
- Check insulation resistance between amplifier and transducer case

Slow Response

- Verify pressure port is not clogged

If the problem persists, please call the factory as indicated below for assistance. Please have the following information ready:

- Serial number
- Model number
- Which action caused device failure
- Baud Rate of device
- Station Number of device

Contact: sales@gp50.com
Phone: (716) 773-9300

Repairs should only be done by GP:50. Repairs done by customer will void any warranties and may cause permanent damage to unit. Repairs done by customer on Intrinsically Safe units will void the approvals and are a potential explosion hazard.

Returned products that have been exposed to hazardous substances must be cleaned prior to return and include the Material Safety Data Sheet for all substances.

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5. WARRANTY

GP:50 warrants its products to the original customer/purchaser against defects in material and workmanship for a period of one (1) year from the date of delivery by GP:50, as shown in its shipping documents, subject to the following terms and conditions:

Without charge GP:50 will repair or replace products found to be defective in materials or workmanship within the warranty period provided that:

1. The product has not been subjected to abuse, neglect, accident, incorrect wiring (not provided by GP:50), improper installation or servicing, or use in violation of instructions furnished by GP:50.

2. As to any prior defect in materials or workmanship covered by this warranty, the product has not been repaired or altered by anyone except GP:50 or its authorized service agencies.

3. The serial number has not been removed, defaced or otherwise changed.

4. Examination discloses, in the judgment of GP:50, a defect in materials or workmanship which developed under normal installation, use and service.

5. GP:50 is notified in advance of, and approves, the return by issuing a Return Material Authorization Number; and the products are returned to GP:50 transportation prepaid. Products returned without an RMA number will not be accepted and be returned to sender at sender's expense.

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For a copy of our warranty policy and to fill out a warranty registration form, visit our website at: https://www.gp50.com/products/warranty/

For assistance with repairs, call our Repair Dept. at 716-773-9300, ext. 237, or complete a Repairs, Returns, RMA form at: https://www.gp50.com/resources/repairs-returns-rma/.

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