

HSU-128
USER'S MANUAL



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1 Introduction

We thank you for purchasing the Probe Products' HSU-128 Signal Conditioner system. This user's manual will assist you with the connections of the HSU-128 system unit to the computer and installation of the HSU-128 support software. Complete information on the use of all the commands and saving default values within the unit may be found in the programmer's manual.

The Probe Products HSU-128 Signal Conditioner in conjunction with LVDT, half-bridge or other displacement probes produce computer ready digitized data that is transferred to the host computer through an RS-232, USB or Ethernet connection. The HSU-128 is designed to produce reliable results with excellent gain and zero stability with respect to changes in ambient operating conditions.

Special features of the HSU-128 include:

- Digitally generated sine wave excitation/programmable frequency.
- Program controlled gain adjust.
- Setup information stored in unit.
- 16 inputs per unit, expandable to 128 inputs per computer.
- Selection of RS-232, USB or Ethernet interface to host computer.
- Selection of interface protocols: BINARY/ASCII/SETUP.
- Windows 98/NT/2000 and Linux platforms.

HSU-128 system consists of:

- 1- HSU-128 system unit with 16 transducer sockets
- 2- AC Power Adapter for HSU-128 including AC power cord.
- 3- USB or RS-232 cable.
- 4- HSU programming adapter (Necessary if changing initial protocol.)
- 5- Software on CD (HSU-128 Application program and USB driver).

Large systems may require more transducer inputs. Cable assemblies and boxes may be added to the system so that up to 128 transducers can be conditioned.

2 Specifications

General Information	
SYSTEM COMPONENTS:	1 - HSU-128 system unit with 16 transducer sockets
	1 – AC Power Adapter for HSU-128 including AC power cord.
	1 – USB or RS-232 Cable
	1 – HSU-128 programming adapter (option available)
	1 – Software on CD (HSU-128 Application program and USB driver)
SYSTEM UNIT SIZE:	3" x 5" x 13.5"
POWER REQUIREMENTS	AC Input: 100-240v;0.33-0.19A; 50/60w
MAXIMUM NUMBER OF TRANSDUCERS PER COMPUTER:	128
RESOLUTION:	16 Bits
TRANSDUCER TYPES:	LVDT; RVDT;
	Half-Bridge (Variable Reluctance);
	Inductive Proximity; Gaging;
	Long Stroke; In Any Combination
Oscillator Information	
OUTPUT:	2.5 kHz to 50 kHz, Regulated Amplitude
	Balanced, All Channels Synchronized (Other Frequencies Optional)
TYPICAL TEMPCO, FREQUENCY:	20 ppm/°C
TYPICAL SINE-WAVE DISTORTION:	<1%
MIN TRANSDUCER PRIMARY IMPEDANCE:	150 Ohms
TYPICAL TEMPCO, AMPLITUDE:	0.005%/°C
Demodulator Information	
INPUT IMPEDANCE	10k Ohms
TYPICAL LINEARITY ERROR:	Within 0.05% FS

3 Principles of operation

The HSU-128 is a self-contained intelligent signal conditioner system that connects up to 128 probes to any host computer through the USB, Ethernet or serial/RS232 port. A single HSU-128 provides signal conditioning for up to 16 transducers with measurement inputs grouped into 4 per module. These modules may be mixed and matched to be all of one type or a mixture of LVDTs, strain gages and/or digital inputs. It is expandable to a maximum of 128 transducers through the use of additional units.

The HSU-128 lends itself to dynamic gaging with the ability to program complex functions into channels that are returned after calculations within the HSU-128 system unit. Individual transducer signals or complex function results can be passed to the host computer using the USB, Ethernet or RS-232 connection with either a binary or ASCII message protocol.

To provide users with the powerful features of the HSU-128, an application program is furnished with the system. This application program, called 'HSUAPP', is available in a Windows version. This program can be used to set up a measurement system.

A powerful processor within the unit performs multiple real-time computations (such as A+B, max/min hold, TIR and trigonometric functions) before transferring measurements to the host computer. The form of the computations is user configurable to match the application. Measurement values can be presented in a way most meaningful to the operator.

Measurements can be directly imported into a variety of standard SPC software systems. The HSU-128's network compatibility allows use on a low cost diskless workstation where the operator gets instant dimensional data and the network provides for archiving, detailed analysis and report generation by a remote computer.

The HSU-128 has the capability to operate as a gaging device triggered by a footswitch and responding with ASCII data. The HSU-128 ASCII mode is simple to set up and use. There are several ASCII commands that allow the user to use their existing SPC package and increase functionality as well.

4 Connections and Controls

The controls for the HSU-128 are programmable from the host computer or set to default values by the software in the unit itself. The transducer inputs are installed in groups of 4. There are 16 transducer inputs per unit and these units may be chained together for a maximum of 128 inputs.

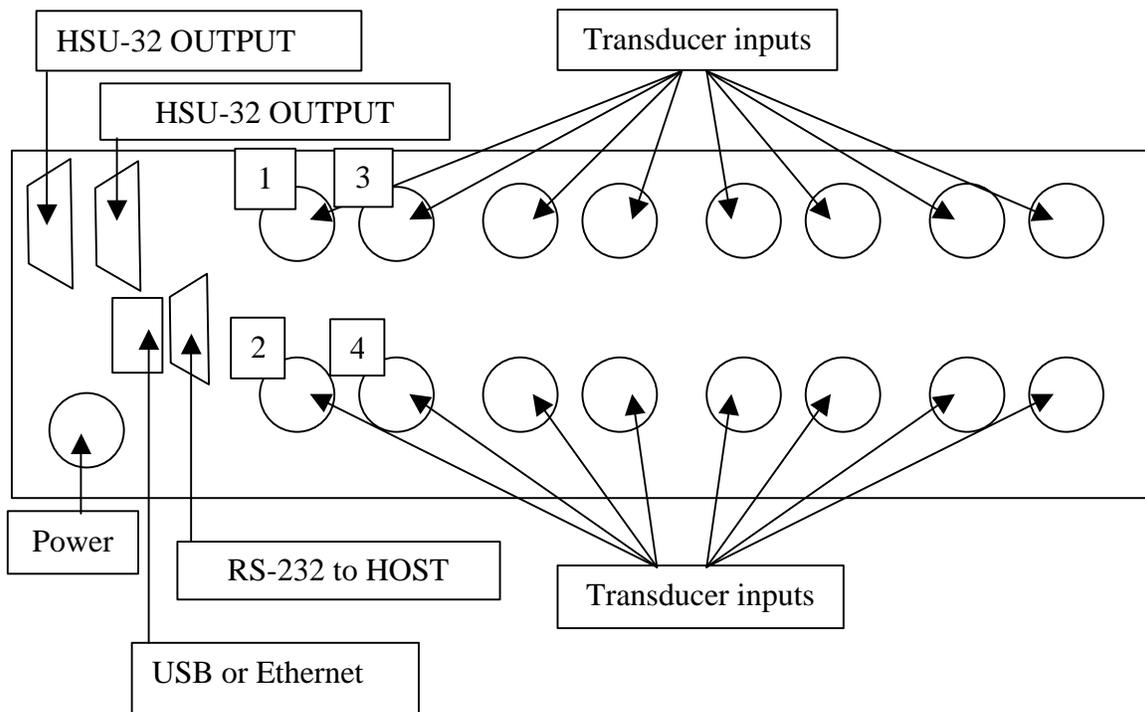


Figure 1

5 Electrical Connections

All electrical connections to the HSU-128 are made through the top of the unit. The connection locations are as shown in Figure 1.

The line power is received through a wall outlet to a transformer with the following specifications.

AC Input: 100-240 v 0.33-0.19 A 50/60 Hz

The RS-232 connector on the unit is a standard female connector. The cable needs to be a male to female for the connection from the unit to any RS232 com port on the PC.

The USB connector is a standard male to male on the cable. The cable supplied with the unit is approximately 6 feet.

The HSU-128 daisy chain output connector on the unit is female. The cable, supplied by Probe Products, may be of any length required.

The transducer connectors on the cable are male and may be supplied in any of 3 different configurations. The standard connector is the 5 pin shown on the left.



6 General Operating Instructions

The HSU-128 has been calibrated at the factory with probes purchased with the unit. Should recalibration be required for any reason you must call Probe Products for the procedures to calibrate the unit.

The HSU-128 System may be set up for use with the RS-232 or the USB interface. The Ethernet connection is currently being finalized and is available upon request. The RS-232 may use 9600, 19200 or 38400 baud rates. The transmission protocol used is 8 bits, no parity and 1 stop bit. The USB connection works through the USB driver supplied with the HSU-128 system.

The HSU-128 supports three basic message protocols. These are:

- **ASCII protocol**
All communication to and from the HSU-128 is done by printable ASCII characters. This protocol is most useful in connecting the HSU-128 to existing applications that can accept data from RS-232 data sources.
- **BINARY protocol**
All communication to and from the HSU-128 is done through binary data packets. This protocol is typically used where a custom application is being written for the HSU-128. The binary protocol is identical to the protocol used with the Probe Products HSI-24. Applications previously written for the HSI-24 can be easily ported to the HSU-128 with this protocol.
- **PROGRAMMING MODE protocol**
This protocol uses ASCII data and only functions in the RS-232 interface when the PROGRAMMING ADAPTER is detected. Plugging the HSU-128 PROGRAMMING ADAPTER between the HSU-128 and the host computer and cycling the HSU-128 power initiates the PROGRAMMING MODE protocol. The PROGRAMMING MODE protocol allows selection of the interface (RS-232 or USB), baud rate (if RS-232) and command protocol (BINARY or ASCII) to be used.

6.1 HSU-128 Setup and Initial Test

Suggested order of setup and test:

1. Install HSUAPP program.
2. Setup HSU-128 hardware.
3. Run the HSUAPP program to verify HSU-128 operation.
4. Install USB driver.(if USB is to be used)
5. Change HSU-128 interface, baud and protocol settings with the PROGRAMMING MODE.

6.1.1 Install HSUAPP Program

In the HSUAPP folder on the CD, double click on the **setup.exe** program. This will install the HSUAPP program.

6.1.2 Setup HSU-128 Hardware

Follow these steps to install the HSU-128 hardware.

1. Note: Do not connect the power supply to the AC supply line before connecting the HSU-128 to the power supply.
2. Plug the power supply into the mating connector on the HSU-128 unit. Rotate the power connector-locking ring clockwise to lock the power connector to the HSU-128 unit.
3. Connect a 9-pin RS-232 interface cable between the HSU-128 and a COM port on your PC. It is suggested that initial tests be done using the RS-232 serial interface. The HSU-128 is initially setup for RS-232 interface at 38400 baud rate using the ASCII protocol. Once proper operation is verified through the RS-232 interface, you can use the PROGRAMMING MODE to change the interface, baud rate and/or protocol.
4. Using the IEC AC cord, plug the HSU-128 into a source of power.
5. The HSU-128 has no power switch. When it is plugged in, it is on.

6.1.3 The HSUAPP Program

The first time the *HSUAPP* program runs, the *HSU Connection Wizard* appears. Select the COM port you will be using and select 38400 as the baud rate. Press the *Test Connection* button and make sure the communications with the HSU-128 are functioning. You will not be able to proceed until the communications is functioning properly. The HSUAPP program uses the ASCII protocol.

Proceed through the rest of the *HSU Connection Wizard*,. After pressing the *Finish* button, the Wizard will close and the main *HSUAPP* window will appear.

The port settings for the connection to the HSU-128 are saved in the Windows Registry. The next time the HSUAPP program is run, the settings you entered will be automatically restored from the Windows Registry. Should there be a problem, the HSU Connection Wizard will reappear.

If you need to change the settings, you can force the HSU-128 Connection Wizard to appear by running the application program with the command line option: `/COMMSETUP`. To run an application with command line arguments you can select Run in the Start menu and then type `HSUAPP /COMMSETUP` in the text entry box. You may also set command line parameters to always be used whenever a program is run by creating a shortcut and add the command line parameters to the target text box in the shortcut properties.

Note the program name `hsuapp.exe` may be upper or lowercase, but the command line option `/COMMSETUP` must be entered in all uppercase.

Here is a summary of the other command line options.

- `/COMMSETUP` This forces the Connection Wizard to run.
- `/ENABLESETUP` This enables the use of the setup menus. Without this command line option, no setup functions are allowed if they have been disabled in the system setup menu.

The next four command line options control what is displayed when the program starts and how it is displayed.

- `/BARS` Bar graph style display
- `/NUMS` Numeric style display
- `/LVDT` The raw inputs are displayed
- `/CHAN` The channels are displayed
- `/GROUPS` The groups are displayed

Although you can have both numeric and bar graph displays at the same time, you cannot have LVDTs and Channels displayed at the same time.

These startup options may also be set another way. They may be set or reset in the HSU-128 Application program in the system setup menu. The command line options will override any of the startup options set through the application program but it is a convenient way of setting these options if you are going to be using them all the time. All the options may be turned on and off for the next time the HSU-128 Application program is started. You should however be careful when the Disable setup menus is selected. If you select this option in the setup menu, then the only way that it can be enabled again is through the command line.

6.1.4 Install USB Driver

If you are going to connect the HSU-128 through the USB port, you will need to install the USB Driver. Probe Products supplies the USB driver in the file USB.ZIP.

Double click on the **USB.ZIP** file and follow the instructions to unzip the files into a working directory. This may be any temporary directory.

The USB installation guide for Windows 98, an232-03.pdf, is included in the USB.ZIP file. The USB installation guide for Windows 2K is an232-05.pdf.

Follow the instructions in the installation guide an232-03.pdf or an232-05.pdf to install the driver depending on the system you have. A note about the installation: the pdf file indicates the file as being on drive A: (A:\FTDIBUS.INF), however, you will be using the file from the working directory that you created when you unzipped USB.ZIP. Also, you must ensure that you do not select a COM port number that is in use or physically in the computer.

If you have any questions, call PROBE PRODUCTS at (716) 773-5554.

6.1.5 Using the HSU-128 Programming Mode

To change the HSU-128 Communication settings you need to insert the HSU-128 programming adapter in the RS-232 line between the computer and the HSU-128.

The communication settings are always changed using the RS-232 interface and a program such as HyperTerminal, even if the current HSU-128 interface is set to the USB or Ethernet interfaces. Some internal DIP switches set the baud rate for the programming mode. These are set at 9600 baud and should not be changed.

With the HSU-128 programming adapter in the line, power-up the HSU-128. When the HSU-128 powers on it will detect the presence of the programming adapter and enter programming mode. You will need to use a

terminal emulation program to interact with the HSU-128 in programming mode. You can use the HyperTerminal provided with Windows. Set the HyperTerminal to 9600 baud, 8 data bits, no parity and no handshaking.

Press the ENTER key on the host computer about four times in a row. This indicates to the HSU-128 that you want to program it in interactive mode. It will display a small menu. Press the indicated keys to get the selections you need. When you are done, be sure to press 'S' to save the changes.

If you made any changes, it is a good idea to record them somewhere. This will avoid confusion resulting from mistaken communication settings.

Remove power from the HSU-128 and remove the programming adapter.

7 HSU-128 ASCII Protocol Command Summary

This is an abbreviated list of the commands that are available in the HSU-128 ASCII message protocol. It is meant to give you an idea of the command structure. For a complete list of commands in both binary and ASCII protocols, refer to the HSU-128 Programmer's Manual.

All commands start with the '~' tilde character and end with the '↵' carriage return character. The hex codes for these are 7e and 0d. The '~' character tells the HSU-128 that a new command is about to be sent. Any previous characters in the HSU-128 input buffer are discarded. The '↵' character tells the HSU-128 that the command should be executed. The HSU-128 will execute the command and respond as required. The spaces within the command are denoted by <SP>.

7.1 Read a Channel

HOST → HSU-128
~C1<SP><channel number>↵

HSU-128 → HOST
~00<SP><channel number><SP><channel value>↵

Example:
~C1<SP>1↵ Read channel 1
~00 001 +0.00235↵ Response

7.2 Arm Footswitch to Read a Channel

HOST → HSU-128
~CA<footswitch input><SP><channel number>↵

HSU-128 → HOST
@00<SP><channel number><SP><channel value>↵

Example:
~CA8<SP>1↵ Read channel 1 when footswitch on input 8 activated.

Note: The HSU-128 will not send any response to this command until the footswitch specified is activated. While the HSU-128 is waiting for the footswitch to be activated, any other command may be sent, which will disarm the footswitch.

When the footswitch is activated, the following is sent by the HSU-128:
@00 001 +0.00235↵ Response