CE
RoHS

HSY SERIES

ULTRA LOW PHASE NOISE RF SYNTHESIZER

USER MANUAL
JUNE 2022

Holzworth

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ATTENTION
HOT SURFACES

Steady state operating conditions can result in surface temperatures that exceed 60C and the unit will be hot to the touch. This is normal operation.

The HSY9000 Series Synthesizer is a fanless chassis designs. Internal conductive heat dissipation assists with measurement repeatability and accuracy while eliminating microphonics caused by chassis cooling fans.

When installing the unit into populated communications racks it is recommended that rack cooling fans be used to eliminate thermal run away, which may result in measurement errors and/or system warnings.

ATTENTION
HOT SURFACES

Table of Contents

1.0 INTRODUCTION

Thank you for purchasing a Holzworth Instrumentation HSY Series Multi-Channel RF Synthesizer module. The combination of Holzworth's proprietary YIG based, multi-loop synthesizer architecture and the multi-channel integration provides the user with unique product performance advantages which are currently only available from Holzworth Instrumentation Inc.

This User's Manual is a quick reference guide for use with the Holzworth HSY Series Multi-Channel RF Synthesizer products. Refer to section 5 for specific configuration details with regards to the HSY Series hardware.

2.0 CERTIFICATIONS and EXEMPTIONS

2.1 CE CERTIFICATION

Holzworth multi-channel synthesizer products comply by test and design, with the essential requirements and other relevant provisions of the *EMC Directive*: 2004/108/EC, and the *Electrical equipment for measurement, control and laboratory use EMC requirements* (test standard): EN 61326-1: 2006*;* as set forth by the Council of the European Union.

2.2 RoHS COMPLIANCE

Holzworth multi-channel synthesizer products are in compliance with Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the *Restriction and use of Certain Hazardous Substances in Electrical and Electronic Equipment* (RoHS Directive).

3.0 PRODUCT WARRANTY

Holzworth HSY Series synthesizers come with a 3 year 100% product warranty covering manufacturing defects. All product repairs and maintenance must be performed by Holzworth Instrumentation Inc. Holzworth reserves the right to invalidate the warranty for any products that have been tampered with or subjected to improper use. If the unit becomes damaged, please contact Holzworth Instruments or your local representative for an RMA Number & instructions prior to returning the unit for repair.

4.0 CALIBRATION NOTICE

Holzworth calibrates each channel for output frequency accuracy and output amplitude accuracy. The factory calibration is valid for 1 year from the original calibration date. Holzworth provides calibration services for applicable Holzworth products. Contact sales@holzworth.com with model number and serial number for a calibration service quotation. Holzworth also makes the calibration routine and equipment list available to customers who have the capability to perform on site calibration. Contact support@holzworth.com for more information.

5.0 HSY SERIES CONFIGURATION GUIDE

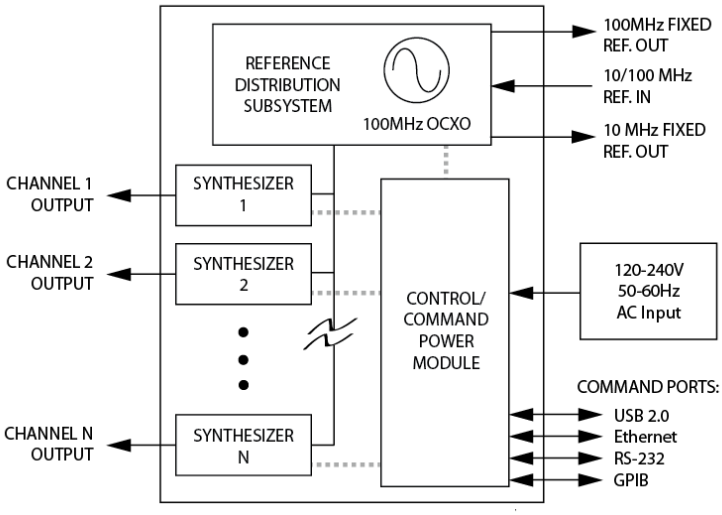
5.1 CONFIGURATION SUMMARY

The Holzworth HSY Series multi-channel platform is designed to achieve optimal channel-to-channel stability across all integrated channel synthiesizers via a conductively cooled, fan-less enclosure. Specific attention is paid to phase coherency between the independely controllable channels. Internal channels offer better than -110 dB of channel-channel isolation.

The HSY Series is a unique platform allowing the user to specify custom configurations for a COTS product. Units are loaded with anywhere from 1 to 4 channels (up to 6GHz). The HSY Series provides industry leading phase noise and spectral purity performance, as well as exceptionally high output power dynamic range from +20 to -110 dBm.

Each RF output is driven by a separate, internally loaded synthesizer module. Up to 4 independently tunable synthesizers can be specified per 1U chassis allowing for the highest integrated channel density available in its class.

Holzworth HSY Series synthesizers offer the performance benefits of a proprietary YIG based, multi-loop architecture with a centralized reference distribution subsystem, which maintains a tight phase coherent relationship across all integrated channels.



Different from traditional PLL based synthesizers, Holzworth's proprietary multi-loop architecture creates precisely synthesized signals that exhibit both instantaneous and long term stability. Temperature variations between the channels remain the only contribution to drift. The thermally optimized, fan-less chassis was specifically developed for maintaining the lowest possible channel-to-channel thermal gradients.

Holzworth multi-channel designs are integrated into precision applications that include ATE systems integration, particle accelerator, timing clocks, satellite position tracking and more.

5.2 HARDWARE CONFIGURATION

The HSY Series synthesizer platform is a user defined platform. The configuration is setup at the Holzworth factory based on the configuration defined by the end user. Three primary categories define the final configuration of a unit.

5.2.1 NUMBER OF CHANNELS

The HSY part number signifies the number of independent channels available in the unit. The current revision of the design is revision A. A four channel unit is defined as an HSY9004A.

No. Channels	1	2	3	4
Part Number	HSY9001A	HSY9002A	HSY9003A	HSY9004A

NOTE: Amplitude accuracy may vary when operated outside of channel operating temperature specified in section 6.3. Internal channel temperature should be monitored using the ":TEMP?" command (see Appendix A). External cooling is recommended to regulate internal temperature depending on ambient operating conditions and number of integrated channels.

5.2.2 LOADED CHANNEL FREQUENCIES

The channel frequencies are defined at the time of a product purchase order. To identify what channel frequencies are loaded, refer to the “Loaded Options” designator scribed into the front panel of the instrument (at the left side of the power switch).

Frequency Range	Number of Channels per Frequency Range			
	1x	2x	3x	4x
10MHz - 6GHz	OPT-106	OPT-206	OPT-306	OPT-406
10MHz - 12GHz	OPT-112	OPT-212	OPT-312	OPT-412
10MHz – 24GHz	OPT-120	OPT-220	OPT-320	OPT-420
10MHz - 40GHz	OPT-140	OPT-240	n/a	n/a

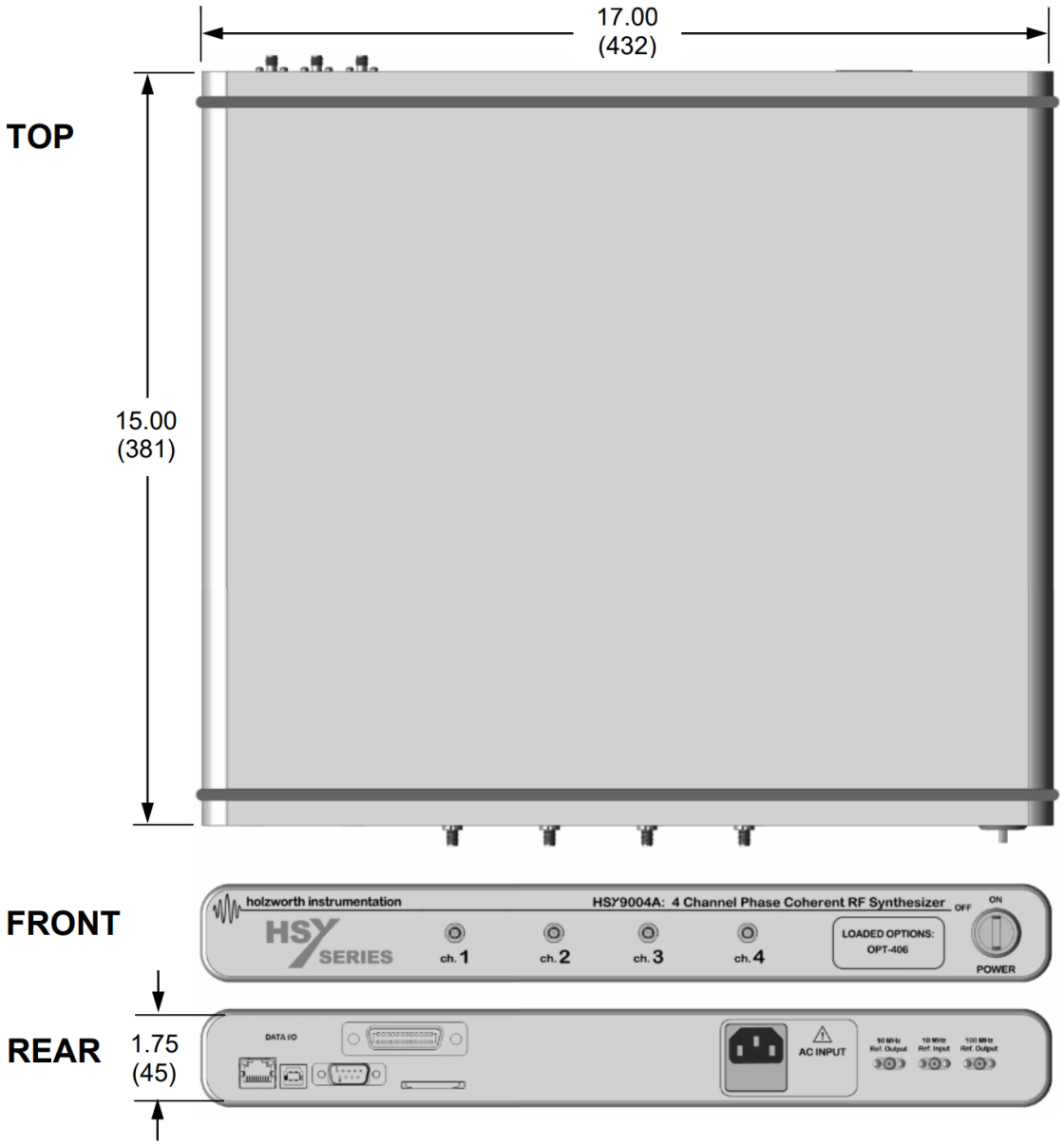
5.2.3 LOADED OPTIONS & AVAILABLE ACCESSORIES

Additional factory loaded options are also defined in the “Loaded Options” designator on the front panel. These options further customize the HSY Series to an application and are loaded at the factory when the unit is initially built. Accessories are external to the HSY platform and can be ordered separately.

TYPE	Part Number	Description
ACCESSORY	RACK-1U	19" Rack Mount Bracket Kit, 90° Rear Brackets
ACCESSORY	RACK2-1U	19" Rack Mount Bracket Kit, Straight Rear Brackets

5.3 MECHANICAL CONFIGURATION

The HSY Series comes in a 1U high, rack mountable chassis. The example shown is of a 4 channel unit (front panel configuration may vary). A universal rack mount bracket kit is an available accessory (Part No.: RACK-1U or RACK2-1U). Mechanical dimensions are listed in inches (and millimeters).



5.4 ENVIRONMENTAL SPECIFICATIONS[1]

Environmental specifications are based on component margins, thermal verification testing and current draw tests. Production unit performance is not verified over temperature.

PARAMETER	MIN	TYPICAL	MAX	COMMENTS
Operating Temperature	0 C		+55 C	
Temperature Monitor Range	-40 C		+85 C	
Channel Operating Temperature*	+35 C	+40 C	+45 C	Amplitude accuracy valid range
AC Power Supply	100 V_{AC}		240 V_{AC}	50 – 60Hz
Power Consumption Chassis Channel (per)		 5 W 17 W		
Warm-Up Time		10 min	20 min	20 C (ambient temp. dependent)

[1] Specifications are subject to change per the discretion of Holzworth Instrumentation, Inc

***NOTE:** Amplitude accuracy may vary when operated outside of channel operating temperature specified in section 6.3. Internal channel temperature should be monitored using the ":TEMP?" command (see Appendix A). External cooling is recommended to regulate internal temperature depending on ambient operating conditions and number of integrated channels.

DESCRIPTION	SPECIFICATION (by design)
Operating Environment Humidity Altitude Vibration	 RH 20% to 80% at wet bulb temp. <29C (non-condensing) 0 to 2,000m (0 to 6,561 feet) 0.21 G-rms maximum, 5Hz to 500Hz
Storage (Non-Operating) Temperature Humidity Altitude Altitude Vibration	 -10C to + 60C RH 20% to 80% at wet bulb temp. <40C (non-condensing) 0 to 4,572m (0 to 15,000 feet) 0.5 G-rms maximum, 5Hz to 500Hz

6.0 HARDWARE/SOFTWARE INSTALLATION

This section outlines the basic installation requirements and procedures for the HSY Series Multi-Channel Synthesizer application GUI and the hardware either via USB or Ethernet.

First, the application GUI software must be installed. The GUI software is contained on the thumb drive that was included with the synthesizer module. If the thumb drive was lost another can be emailed or the software can be downloaded after contacting Holzworth support via email at: support@holzworth.com or by phone at +1.303.325.3473 (option 2).

6.1 APPLICATION GUI OPERATION

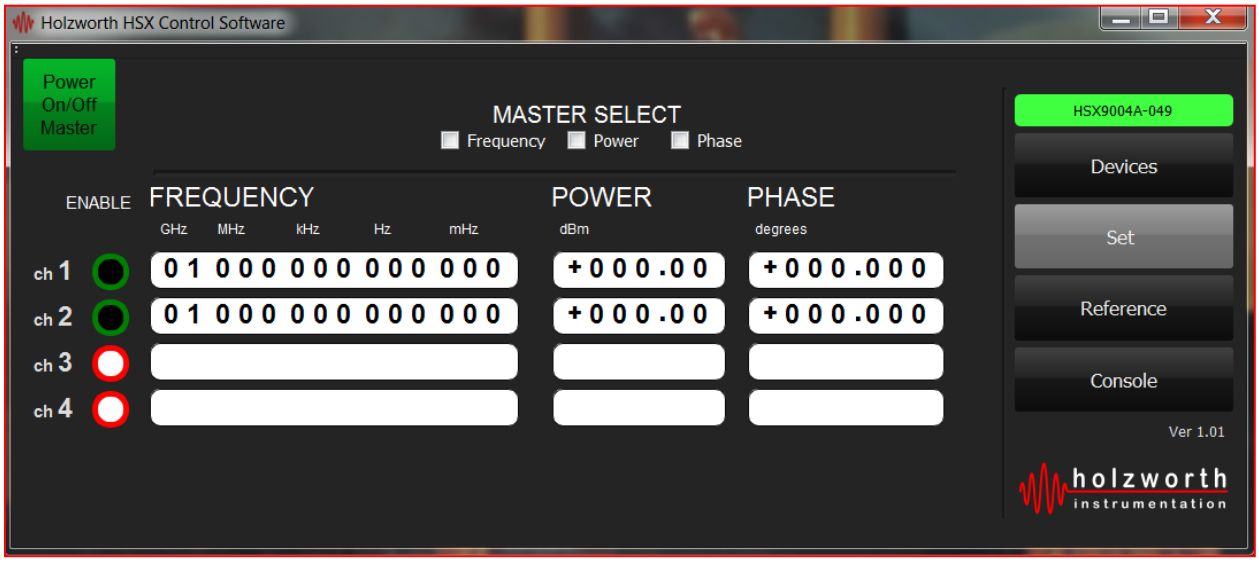
The Holzworth HSX/HSY Series GUI can be run on any Windows PC. There is no installation required. Simply double click the executable file to launch the GUI. The latest version can be downloaded by navigating to the URL below:

https://www.holzworth.com/resource-library/software/hsx-series

NOTE: The Holzworth GUI can only be used to communicate with the instrument via USB or Ethernet.

The Holzworth HSY Series Software can be used to change frequency, power, and phase settings for individual channels as well as toggle each channel output on or off. The RF output of each channel can be toggled using the circular buttons to the right of each channel indicator. By default, the output power of all channels is set to "Off."

Click the REFERENCE button at the right of the GUI window set the instrument to utilize an external 10MHz or 100MHz reference. By default it will use the on-board 100MHz OCXO.



6.1.2 KEYBOARD AND MOUSE FUNCTIONS

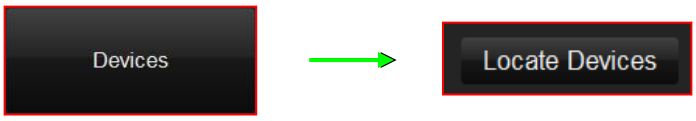
As a virtual instrument, the PC keyboard and mouse functions are intuitively integrated for ease of operation.

KEY	FUNCTION
Tab	used to move the Highlighted Field indicator from left to right
Left/Right Arrows	used to move the Highlighted Field both left and right
Up/Down Arrows	used to increase/decrease the value of the Highlighted Field
Number Keys	used to directly enter value into active field

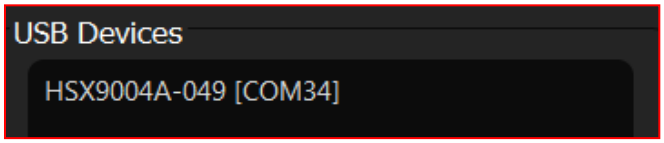
6.2 USB, RS-232, AND GPIB COMMUNICATION

With the HSY9000 USB and RS-232 communication are handled similarly in Windows. USB communication requires FTDI drivers. Windows should install these drivers automatically when the instrument is connected to the computer via USB. If the instrument is not recognized, Windows may need to install updated USB drivers. These are also included on the thumb drive that ships with the instrument.

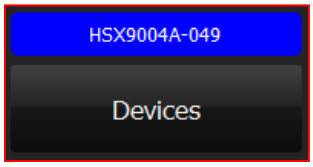
Click the **Devices** button on the right side of the GUI, followed by the **Locate Devices** button in the menu:



The software will then scan for instruments connected via USB. It will display USB devices as shown below:



Identify the instrument by either serial # or COM port and select it. If the connection is successful the window above 'Devices' will turn blue to indicate a USB connection, and it will display the instrument serial number:



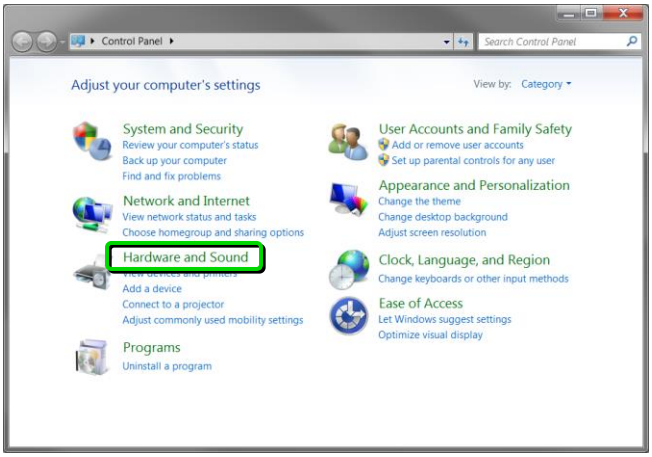
In order to create a custom USB software interface or application to control Holzworth Synthesizers, the user must determine the COM port the instrument is using. The COM port associated with the USB connection to the HSY9000 can be identified by using the application GUI as shown above or via the Windows Device Manager.

6.2.1 IDENTIFY INSTRUMENT COM PORT & USB TROUBLESHOOTING

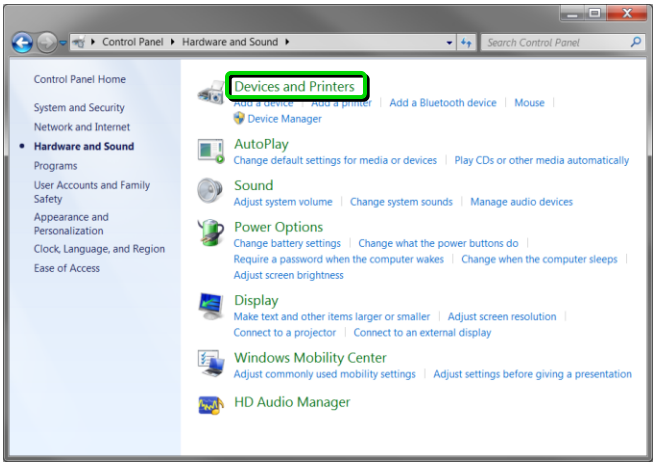
To identify the instrument COM port using Windows Device Manager follow the steps below:

1. Open the Windows Device Manager and check for the synthesizer in the 'Ports (COM & LPT)' category.

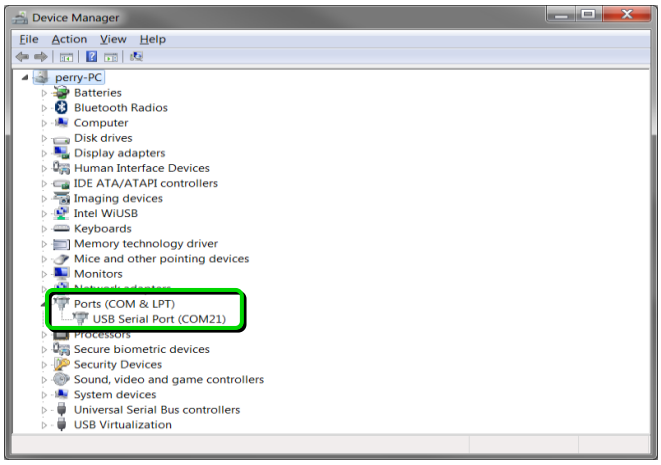
STEP ONE
Open the Windows Control panel from the start menu. Click on "Hardware and Sound"



STEP TWO
Under "Devices and Printers," select **Device Manager**



STEP THREE
Under Ports (COM & LPT) locate COM port associated with the HSY9000 (identified as "USB Serial Port")



2. If the instrument is not present in Device Manager or in the Holzworth application GUI please unplug the USB cable and power cycle the synthesizer. Wait 5-10 seconds for the synthesizer to initialize an re-insert the USB cable. Click **Locate Devices.**

3. If the synthesizer is still not detected download the device drivers may need to be manually installed. Download and extract the executable using the link below. Run the executable to ensure the proper device drivers are installed.

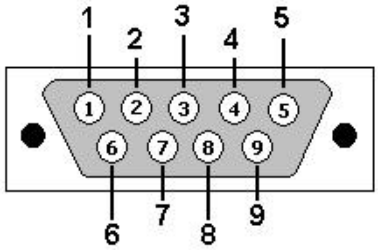
Device drivers:
http://www.holzworth.com/software/Synthesizers/HSX/Installation/CDM21228_Setup.zip

After the executable has finished installing the drivers repeat troubleshooting Step 1.

4. Attempt to make a connection through a 'USB hub' if available. Upon connecting through a hub it may be necessary to repeat troubleshooting Step 1.

5. Contact Holzworth Support for further assistance.

RS-232 HARDWARE SPECIFICATIONS



1. Connector: DB9 Male Shrouded.
2. Logic Level: ±5V
3. Baud Rate: 115200 FIXED.
4. Bit Structure: 8 Data Bits, 1 Stop Bit, No Parity, No Flow Control
5. Carriage Return: Carriage return (ASCII Code 13)
6. Pinout**:**

PIN	Label	PIN	Label	PIN	Label
1	N/C	**4**	N/C	**7**	N/C
2	**TX (Response Output)**	**5**	**GND**	**8**	N/C
3	**RX (Instruction Input)**	**6**	N/C	**9**	N/C

6.2.2 GPIB COMMUNICATION

The Holzworth HSY9000 is GPIB capable. GPIB configuration commands are listed in Appendix A.

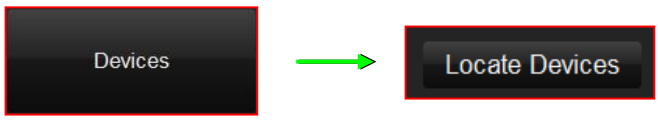
6.3 ETHERNET COMMUNICATION

Ethernet communication can be established with the HSY9000 by connecting the instrument to a local area network or directly to a PC. Locating the instrument is handled differently depending on the method of connection and DHCP settings that have been assigned. By default, the HSY9000 is set to utilize DHCP when connected over a network.

6.3.1 LAN CONNECTION

Communication with the HSY9000 over a LAN connection defaults to the use of DHCP. The instrument can be addressed by using either the network assigned IP address or by using the instrument serial (ex. "HSY9000-123") and the **TCP port (9760)**. Use the Holzworth Ethernet Finder software to locate and modify IP address settings on the instrument.

To search for devices, click the **Devices** button and then click **Locate Devices** in the sub menu.

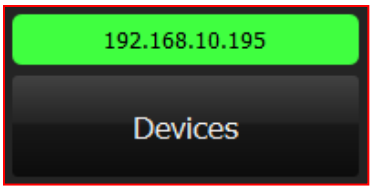


The software will then scan for instruments connected via Ethernet and via serial port. It will display Ethernet devices as shown below:

Identify the instrument by serial # or IP address and click to connect. If the connection is successful the window above 'Devices' will turn green (Ethernet) and display the instrument serial number:

Users can also enter the instruments IP address manually to connect. Enter the IP address into the 'Device IP Address' field and then press the **Connect** button.

If the connection is successful the window above 'Devices' will turn green and display the IP address.



6.3.2 DIRECT PC CONNECTION (DHCP MODE)

When the HSY9000 is connected directly to a PC and it is set to DHCP, the instrument's default IP address is:

169.254.117.11

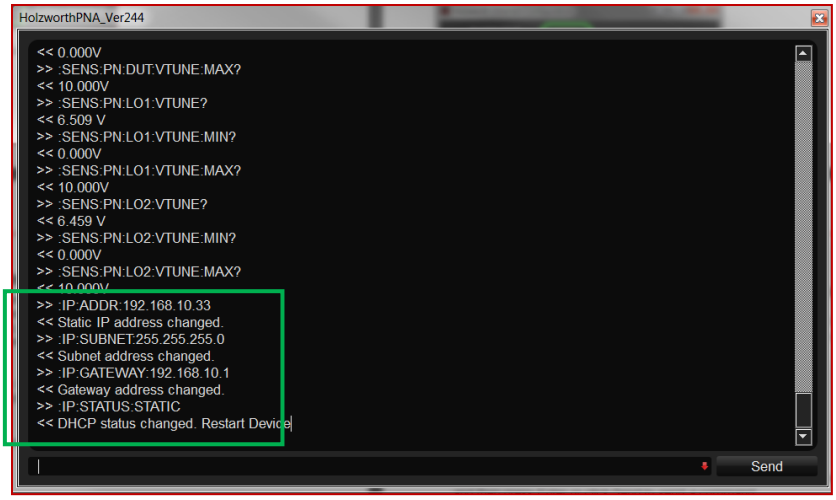
This IP address can be used to establish communication with the HSY9000 when connected directly.

6.3.3 ASSIGNING A STATIC IP ADDRESS

The most efficient way to assign the instrument a static IP address is to use the Console in the Holzworth GUI. The Console can be used to send the commands from Appendix B which are used to change the instrument from DHCP to Static, set the static IP, *etc.* Users must first establish a USB connection or a direct Ethernet connection as referenced in section **8.2** and **8.3.2**, respectively.

Once a connection has been established, the Console can be launched by clicking the Console button which is shown in the GUI Overview section, section **8.1.** Now users can begin sending the ASCII commands from Appendix B. The commands should be sent in the order shown in the list and the Console screenshot below.

1. Send the command to change the static IP address.
    - :IP:ADDR:<value>
2. Send the command to change the subnet address.
    - :IP:SUBNET:<value>
3. Send the command to change the gateway if necessary.
    - :IP:GATEWAY:<value>
4. Send the command to change from DHCP to Static.
    - :IP:STATUS:STATIC
5. Power cycle the instrument when prompted.



When the instrument fully powers back on (5-10 second power up) it will come up with the static IP settings and can be connected to the LAN.

6.4 TROUBLESHOOTING ETHERNET CONNECTIONS

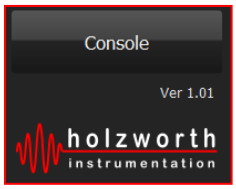
Prior to proceeding below press CTRL+ALT+DEL to open Windows Task Manager. Click the Processes tab. Ensure that there is only one instance of the application GUI open. If there are more than one, end each Holzworth process, re-launch the GUI, and attempt to establish a connection.

6.4.1 ETHERNET CONFIGURATION VIA USB & APPLICATION GUI

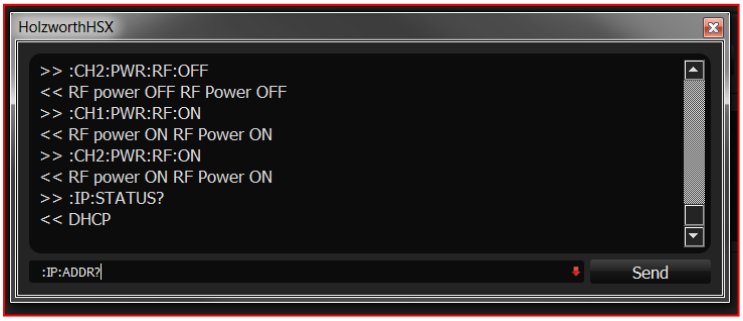
1. If the synthesizer is not discovered by the application GUI there may be static Ethernet settings that conflict with the current network configuration. USB communication may be used to reset the synthesizer to DHCP or re-configure the static network settings.

2. Establish a USB connection with the synthesizer as shown in section **8.1.**

3. Launch the **Console** window using the button at the bottom right of the GUI. The **Console** can be used to send ASCII commands to change static network settings or change from static mode to DHCP and vice versa.



4. Refer to Appendix B for Ethernet configuration commands. Type commands into the text field and then press Enter or click Send to send a command.



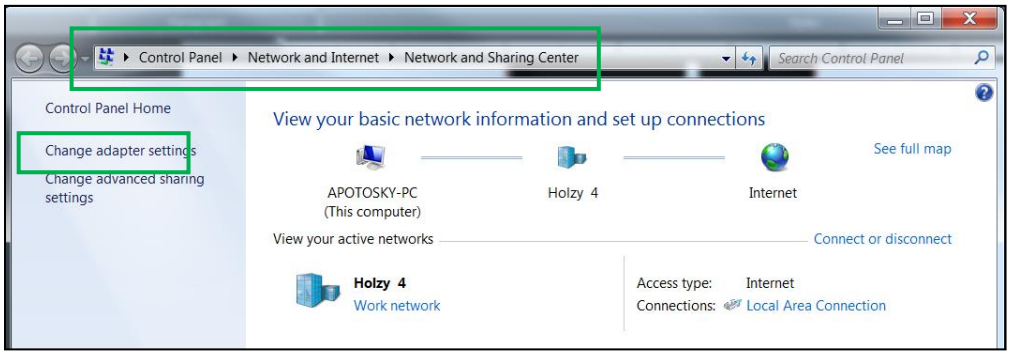
5. Begin by querying with the :IP:STATUS? command. Change status and/or re-configure the static network settings as necessary.

6. Power cycle the HSY9000 if prompted. Any status change from DHCP to Static or vice versa will require a power cycle.

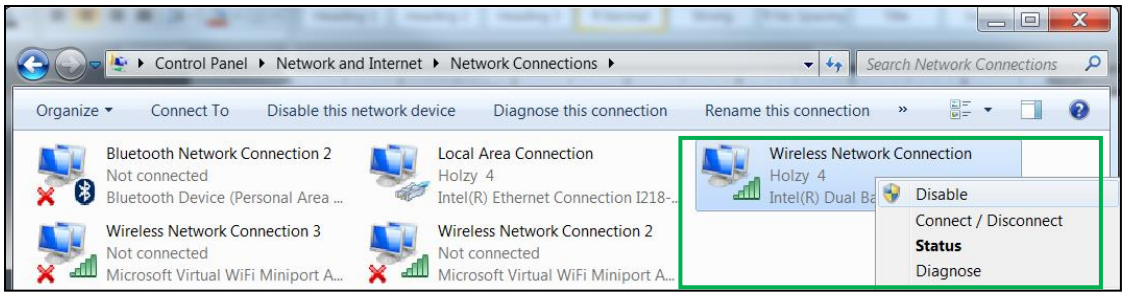
6.4.2 MISCELLANEOUS ETHERNET TROUBLESHOOTING

1. Ensure that the Holzworth software application is allowed through the firewall. Additionally, ensure that anti-virus software is not blocking communication.

2. Using Windows Control Panel, disable Wi-Fi and any other hard-wired network connections. Launch the Control Panel and proceed to Network and Internet, the Network and Sharing Center. Click Change Adapter Settings.



3. In the Change Adapter Settings window right click on any network connections that are not required for communication with the HSY9000 and select Disable.

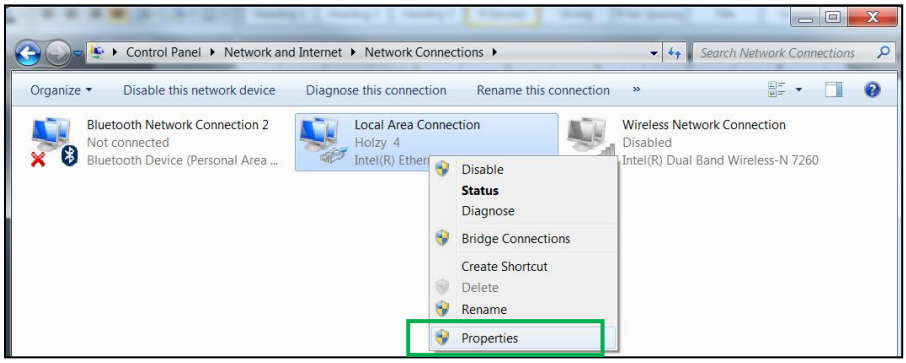


4. Close and re-launch the application GUI. Attempt to establish a connection with the HSY9000.

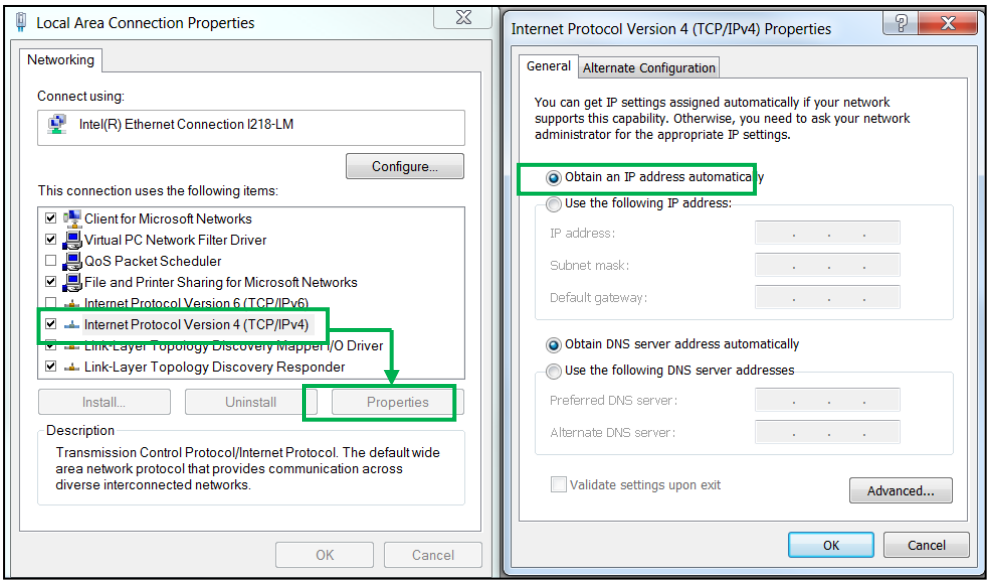
5. If connection remains unsuccessful, reset the PC network adapter in use to DHCP ('Obtain IP address automatically') and reset the synthesizer to DHCP using either method in the previous two sections.

6. Make a direct Ethernet connection from the PC to the synthesizer bypassing any routers or network switches.

7. Right click the network adapter the synthesizer is connected to and click Properties.



8. In Properties, left-click "Internet Protocol Version 4 (TCP/IPv4)", the Properties button highlighted below will become available. Click the button and the window on the right will open. Set to 'Obtain an IP address automatically'.



With a direct Ethernet connection between the PC and synthesizer both will default to network settings that will allow communication.

The synthesizer IP address will default to 169.254.117.11 and the subnet address will default to 255.255.0.0.

The PC IP address will default to 169.254.xxx.xxx and the subnet address will default to 255.255.0.0.

9. Close and re-launch the application GUI. Attempt to establish a connection to the HSY9000.

10. For further assistance please contact Holzworth Support.

7.0 HARDWARE

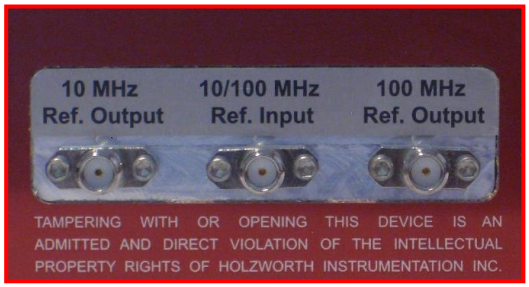
The HSY Series Multi-Channel RF Synthesizers are CW work horses. They are designed to do a very good job of providing highly stable, phase coherent signals with pure spectrums and highly accurate output power amplitude control.

7.1 RF OUTPUT

The RF Output ports are labeled and positioned sequentially from left to right on the front panel of the instrument. The RF Output ports are protected against reflected power with a maximum damage threshold of 25V_{DC} (+10dBm or 10mW).

7.2 REFERENCE INPUT / OUTPUTS

The reference input and output ports are located on the right side of the rear panel.



NOTE that the internal reference distribution subsystem must be manually set for the type of reference being used. The factory default setting is for the *internal* reference (free running). Users can change the reference setting using the Application GUI or by sending ASCII commands.

7.2.1 10/100 MHz EXTERNAL REFERENCE

When a 10MHz or 100MHz External Reference signal is applied and External 10MHz or External 100MHz is selected in software, the system enables a 20Hz digital PLL which phase locks the internal OCXO to the external reference signal. The internal OCXO remains operating in both scenarios to maintain optimal phase noise levels at >20Hz offset. The performance of the synthesized channel output signals as well as the fixed 10MHz and 100MHz Reference Output signals are based on the 10 or 100MHz external reference for offsets of <20Hz; performance is based on the integrity of the 100MHz internal OCXO at offsets of >20Hz.

This architecture is often used in laboratories and systems as a cleanup loop for 10MHz Rubidium, Cesium, GPS disciplined, *etc*. references; as it provides an optimal reference signal for the internal channels as well as both the 10MHz and 100MHz reference outputs.

7.2.3 REFERENCE OUTPUT

Holzworth multi-channel synthesizer modules supply very clean 10MHz and 100MHz Reference Outputs under all operating conditions.

An outline of the reference input vs. output configuration is captured as follows:

Reference Input	Internal 100MHz OCXO	100MHz Reference Out	10MHz Reference Out
None (free running)	ACTIVE	Matches Internal 100MHz OCXO	Divided from internal 100MHz OCXO.
10MHz Signal applied	ACTIVE	Based on: Internal 100MHz OCXO (>20Hz OS) External 10MHz (<20Hz OS)	Divided from: Internal 100MHz OCXO (>20Hz OS) External 10MHz (<20Hz OS)
100MHz Signal applied	ACTIVE	Based on: Internal 100MHz OCXO (>20Hz OS) External 100MHz (<20Hz OS)	Divided from: Internal 100MHz OCXO (>20Hz OS) External 100MHz (<20Hz OS)

7.2.4 ATTENUATOR MODE

NOTE: The following information applies to OPT-n03 (3GHz) and OPT-n06 (6GHz) channels only.

Holzworth HSY synthesizer channels are equipped with an attenuator module to allow for very high dynamic range. There are four different modes the attenuator can be operated in depending on the requirements of the application. Table 1 below describes each attenuator mode and Table 2 indicates which power levels are available in each attenuator state. The attenuator mode can be configured by sending the commands from the power settings section of Appendix A.

Attenuator Mode	Description
AUTO	Synthesizer adjusts attenuator automatically
HIGH	Attenuator set to 0dB state. Valid for power levels +5dBm to +20dBm
NORMAL	Attenuator sets from 10dB to 120dB. Valid for all power levels +5dBm and below. 0dB (high power) state disabled
FIX	Attenuator state fixed to whichever state it is currently in (e.g. if the synthesizer is in the 10dB attenuator state and the FIX command is sent, it will remain in the 10dB state and not allow power levels outside of this state)

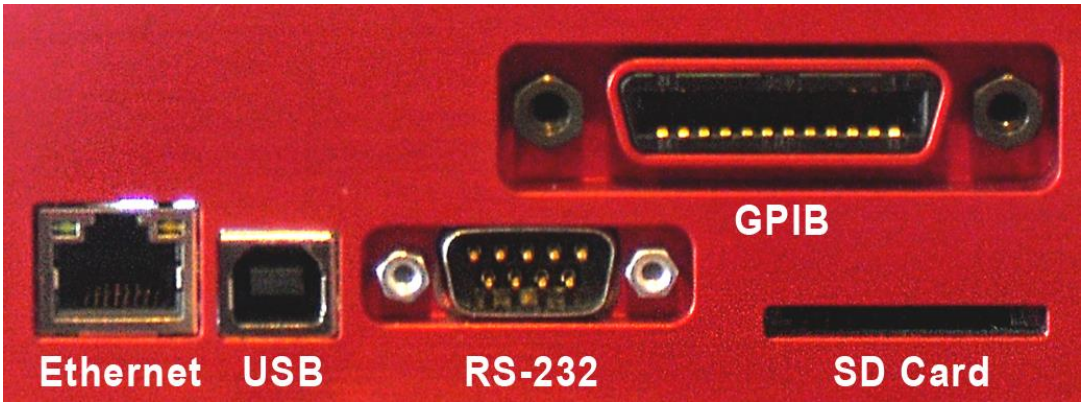
Attenuator State	Power Level
120dB	≤ -105.00dBm
110dB	≤ -95.00dBm
100dB	≤ -85.00dBm
90dB	≤ -75.00dBm
80dB	≤ -65.00dBm
70dB	≤ -55.00dBm
60dB	≤ -45.00dBm
50dB	≤ -35.00dBm
40dB	≤ -25.00dBm
30dB	≤ -15.00dBm
20dB	≤ -5.00dBm
10dB	≤ +5.00dBm
0dB	> +5.00dBm

7.3 HARDWARE INPUT/OUTPUT CONFIGURATION

The HSY Series ships standard with region-specific AC power cord as well as the cables necessary for USB and Ethernet communication with the instrument.

REAR PANEL

DESCRIPTION	SPECIFICATION
Reference Output Port	
Connector Type	SMA, 50ohm
Output Frequency	10/100MHz ±10Hz
Output Level	+5dBm ±2dBm
Output Waveform	Sinusoid
Reference Input Port	
Connector Type	SMA, 50ohm
Input Frequency	10MHz ±10Hz
Input Level	0dBm to +15dBm (Sinusoid or Square)
AC Power Input	
Connector Type	IEC 320-C13
AC Input Rating	100-240V_{AC}, 47-63Hz. Specify country at time of order.
Data I/O Interface	
Connectivity	USB B-Type (virtual comm. port), Ethernet, RS-232, GPIB
Storage	SD Card Reader (currently inactive)



HSY Series Communication Ports

7.3.1 AC POWER SUPPLY

Prior to initializing the synthesizer, connect the power cord to an active AC power supply. The instrument is shipped with the appropriate power cord for the final destination country/region. The master power switch located at the right side of the front panel is equipped with a blue indicator light which illuminates when the AC power is active.

NOTE: If the power light is not illuminated while the front panel switch is in the "ON" position, verify that there is power at the AC outlet/supply and that the fuse has not blown. Fuse is located in the service tray on the power cord receptacle (rear panel). A spare fuse is provided inside the service tray.

8.0 CONTACT INFORMATION

Contact Holzworth directly for product support. A list of US Sales Representatives and non-US Distribution partners are listed on the Holzworth website.

Holzworth Instrumentation Sales Support

Phone: +1.303.325.3473 (option 1)

Email: sales@holzworth.com

Holzworth Instrumentation Technical Support

Phone: +1.303.325.3473 (option 2)

Email: support@holzworth.com

www.HOLZWORTH.com

APPENDIX A: ASCII Control of HSY Synthesizer

The following commands can be used to modify settings on the individual synthesizer channels of the HSY Series.

NOTE: For the following commands, n stands for the channel number.

HSY SERIES PROGRAMMING COMMANDS

FREQUENCY SETTINGS

COMMAND	:CHn:FREQ:<value><suffix>
DESCRIPTION	Set Channel Output Frequency
RANGE	10MHz - 6GHz (0.001Hz Resolution)
EXAMPLE	:CH2:FREQ:2105MHz
RESPONSE	3 Loop1 Locked, Loop2 Locked; N=2 2105.000000000 MHz Frequency Set

COMMAND	:CHn:FREQ?
DESCRIPTION	Query Channel Output Frequency Setting
EXAMPLE	:CH2:FREQ?
RESPONSE	2105.000000000 MHz

COMMAND	:CHn:FREQ:MIN?
DESCRIPTION	Query Minimum Channel Output Frequency
EXAMPLE	:CH2:FREQ:MIN?
RESPONSE	9.77 MHz

COMMAND	:CHn:FREQ:MAX?
DESCRIPTION	Query Maximum Channel Output Frequency
EXAMPLE	:CH2:FREQ:MAX?
RESPONSE	6001.00 MHz

POWER SETTINGS

COMMAND	:CHn:PWR:<value>dBm
DESCRIPTION	Set Channel Output Power
RANGE	(See table 6.2 of HSY User's Manual)
EXAMPLE	:CH2:PWR:15dBm
RESPONSE	15.00 dBm Power Set

COMMAND	:CHn:PWR?
DESCRIPTION	Query Channel Output Power Setting
EXAMPLE	:CH2:PWR?
RESPONSE	15.00

COMMAND	:CHn:PWR:RF:<value>
DESCRIPTION	Set Channel RF Output ON/OFF
RANGE	ON <or> OFF
EXAMPLE	:CH2:PWR:RF:OFF
RESPONSE	RF power OFF RF Power OFF

COMMAND	:CHn:PWR:RF?
DESCRIPTION	Query Channel RF Output Status
EXAMPLE	:CH2:PWR:RF?
RESPONSE	"OFF" or “ON"

COMMAND	:CHn:PWR:MODE:<value>
DESCRIPTION	Sets attenuator mode
VALUE	AUTO, HIGH, NORMAL, FIX
EXAMPLE	:CH2:PWR:MODE:AUTO
RESPONSE	Power Mode Set to Auto
EXAMPLE	:CH2:PWR:MODE:HIGH
RESPONSE	Power Mode Set to High Power, Attenuator = 0dB
EXAMPLE	:CH2:PWR:MODE:NORMAL
RESPONSE	Power Mode Set to Normal, disable High Power
EXAMPLE	:CH2:PWR:MODE:FIX
RESPONSE	Power Mode Set to FIXED, Attenuator set to XdB

NOTE: X = value corresponding to current set power level per the table in section 7.2.4

PHASE SETTINGS

COMMAND	:CHn:PHASE:<value>
DESCRIPTION	Set Channel Output Phase Offset
RANGE	(See table 6.1 of HSY User's Manual)
EXAMPLE	:CH2:PHASE:120
RESPONSE	119.97136688 degree actual

COMMAND	:CHn:PHASE?
DESCRIPTION	Query Channel Output Phase Offset Setting
EXAMPLE	:CH2:PHASE?
RESPONSE	120.00000000 degrees

COMMAND	:CHn:PHASE:MAX?
DESCRIPTION	Query Channel Maximum Phase Offset Setting for Current Output Frequency
EXAMPLE	:CH2:PHASE:MAX?
RESPONSE	719.96002200 degrees

COMMAND	:CHn:PHASE:RES?
DESCRIPTION	Query Channel Maximum Phase Offset Resolution Setting for Current Output Frequency
EXAMPLE	:CH2:PHASE:RES?
RESPONSE	0.04394287 degrees

DIAGNOSTICS & TEMPERATURE

COMMAND	:HSY:DIAG:MIN:START
DESCRIPTION	Start mini diagnostics routine
EXAMPLE	:HSY:DIAG:MIN:START
RESPONSE	Diagnostics started

COMMAND	:HSY:DIAG:DONE?
DESCRIPTION	Query Status of Diagnostics routine
EXAMPLE	:HSY:DIAG:DONE?
RESPONSE	"Diagnostics running" or "Failed" or "Passed"

COMMAND	:HSY:DIAG:ERROR?
DESCRIPTION	Output errors from Diagnostics routine
EXAMPLE	:HSY:DIAG:ERROR?
RESPONSE	Empty string or the list of errors encountered

COMMAND	:TEMP?
DESCRIPTION	Query instrument average internal temperature
EXAMPLE	:TEMP?
RESPONSE	40.21

COMMAND	:CHn:TEMP?
DESCRIPTION	Query specific channel temperature (n = Ch #)
EXAMPLE	:CH3:TEMP?
RESPONSE	40.11

REFERENCE SETTINGS

COMMAND	:REF:EXT:10MHz
DESCRIPTION	Set reference to external 10MHz
EXAMPLE	:REF:EXT:10MHz
RESPONSE	Reference Set to 10MHz External, PLL Enabled

COMMAND	:REF:INT:100MHz
DESCRIPTION	Set reference to internal 100MHz
EXAMPLE	:REF:INT:100MHz
RESPONSE	Reference Set to 100MHz Internal, PLL Disabled

COMMAND	:REF:STATUS?
DESCRIPTION	Query status of the reference
EXAMPLE	:REF:STATUS?
RESPONSE	“Internal 100MHz” or “External 10MHz”

COMMAND	:REF:PLL?
DESCRIPTION	Query status of the PLL
EXAMPLE	:REF:PLL?
RESPONSE	“1 PLL Locked, 0 errors” or “0 PLL Unlocked, Insufficient RF Power, 'x' errors” or “0 PLL Disabled”

COMMUNICATION SETTINGS – General

COMMAND	*IDN?
DESCRIPTION	Query device information
EXAMPLE	*IDN?
RESPONSE	Holzworth Instrumentation, HSY9004A, #041, Ver:2.13

COMMAND	:COMM:RESPOND:<value>
DESCRIPTION	Set Ethernet, USB, and RS-232 response status
RANGE	ON <or> OFF
EXAMPLE	:COMM:RESPOND:ON
RESPONSE	Respond to every command

COMMAND	:COMM:RESPOND?
DESCRIPTION	Query Ethernet, USB, and RS-232 response status
EXAMPLE	:COMM:RESPOND?
RESPONSE	"Respond to every command" or "Respond only to queries"

COMMAND	*RST
DESCRIPTION	Device Reset
EXAMPLE	*RST
RESPONSE	Reset Performed

COMMAND	:DIAG:INFO:BOARDS?
DESCRIPTION	Query board information
EXAMPLE	:DIAG:INFO:BOARDS?
RESPONSE	“COM:901-0084-08-A-005/FW2.03,REF:901-0091-01-A-002/FW1.01,CH1:901-0080-05-B-132/FW3.15/901-0081-10-A-002/FW4.06”

COMMUNICATION SETTINGS - Ethernet Configuration

COMMAND	:IP:STATUS:<value>
DESCRIPTION	Toggle Instrument Static/Dynamic IP Address
RANGE	Static <or> DHCP
EXAMPLE	:IP:STATUS:STATIC
RESPONSE	DHCP status changed. Restart Device

COMMAND	:IP:STATUS?
DESCRIPTION	Query Instrument IP Address Setting
EXAMPLE	:IP:STATUS?
RESPONSE	"Static IP Address" or "DHCP"

COMMAND	:IP:ADDR:<value>
DESCRIPTION	Set Instrument Static IP Address
EXAMPLE	:IP:ADDR:192.168.10.38
RESPONSE	Static IP address changed.

COMMAND	:IP:ADDR?
DESCRIPTION	Query Instrument Static IP Address
EXAMPLE	:IP:ADDR?
RESPONSE	192.168.010.038

COMMAND	:IP:GATEWAY:<value>
DESCRIPTION	Set Instrument Gateway Address
EXAMPLE	:IP:GATEWAY:255.255.255.255
RESPONSE	Gateway address changed

COMMAND	:IP:GATEWAY?
DESCRIPTION	Query Instrument Gateway Address
EXAMPLE	IP:GATEWAY?
RESPONSE	255.255.255.255

COMMAND	:IP:SUBNET:<value>
DESCRIPTION	Set Instrument Subnet Address
EXAMPLE	:IP:SUBNET:255.255.255.255
RESPONSE	Subnet address changed

COMMAND	:IP:SUBNET?
DESCRIPTION	Query Instrument Subnet Address
EXAMPLE	:IP:SUBNET?
RESPONSE	255.255.255.255

COMMUNICATION SETTINGS - GPIB Configuration

COMMAND	:GPIB:ADDR:<value>
DESCRIPTION	Set Instrument GPIB Address
RANGE	0-30
EXAMPLE	:GPIB:ADDR:5
RESPONSE	GPIB Address: 5

COMMAND	:GPIB:ADDR?
DESCRIPTION	Query Instrument GPIB Address
EXAMPLE	:GPIB:ADDR?
RESPONSE	GPIB Address: 5

COMMAND	:GPIB:EOIWLC:<value>
DESCRIPTION	Set Instrument GPIB EOI with last character
RANGE	ON <or> OFF
EXAMPLE	:GPIB:EOIWLC:ON
RESPONSE	EOI with last character enabled

COMMAND	:GPIB:EOIWLC?
DESCRIPTION	Query Instrument GPIB EOI with last character
EXAMPLE	:GPIB:EOIWLC?
RESPONSE	“EOI with last character disabled” or “EOI with last character enabled”

COMMAND	:GPIB:RESPOND:<value>
DESCRIPTION	Set Instrument GPIB to always return a response
RANGE	ON <or> OFF
EXAMPLE	:GPIB:RESPOND:ON
RESPONSE	"GPIB responds with every command" or "GPIB only responds to queries"

COMMAND	:GPIB:RESPOND?
DESCRIPTION	Query Instrument GPIB respond
EXAMPLE	:GPIB:RESPOND?
RESPONSE	GPIB only responds to queries or GPIB responds with every command

Setting :GPIB:RESPOND:ON will ensure every command receives a response over GPIB. The default factory setting is :GPIB:RESPOND:OFF, which ensures only query commands receive a response.

USER NOTES

holzworth instrumentation

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