



HSX9100A-Series Low Phase Noise Multi-Channel RF Synthesizers



User Manual 1.16

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1 Introduction

Thank you for purchasing a Maury Microwave Multi-Channel RF Synthesizer. The combination of Maury's proprietary non-PLL synthesizer architecture and the multi-channel integration provides the user with unique product performance advantages which are currently only available from Maury Microwave Inc.

This User's Manual is a generic, quick reference guide for use with the Maury Microwave HSX9100A Series Multi-Channel RF Synthesizer products. Refer to section 5 for specific configuration details regarding the HSX9100A Series hardware.

2 Safety and Certifications

The following safety and certifications apply to Maury's Multi-Channel RF Synthesizer products.

2.1 SAFETY

Maury Microwave multi-channel synthesizer products comply by test and design, with the essential requirements and other relevant provisions of IEC 61010-1:2010, IEC 61010-1:2010/AMD1:2016. Testing was performed by TUV Rheinland of North America, Inc., following CB Scheme.

2.2 ELECTROMAGNETIC COMPATIBILITY (EMC)

Maury Microwave multi-channel synthesizer products comply by test and design, with the essential requirements and other relevant provisions of CISPR 11:2024, EN55011:2016, A1:2017, A2:201, A11:2020, ICES-003 Issue 8, FCC Part 15 B:2025, IEC 61326-1:2020, EN IEC 61326-1:2021. Testing was performed by TUV Rheinland of North America, Inc.

2.3 CE CERTIFICATION

Maury Microwave 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. As such, Maury Microwave multi-channel synthesizer products comply with RoHS (Directive 2011/65/EU).

3 Warranty

Please see Maury Microwave's warranty policy on www.maurymw.com. To avoid delays or rejection, please contact Maury Microwave at support@maurymw.com for remote diagnostics, and if required, a return material authorization (RMA) number and instructions, prior to returning any equipment.

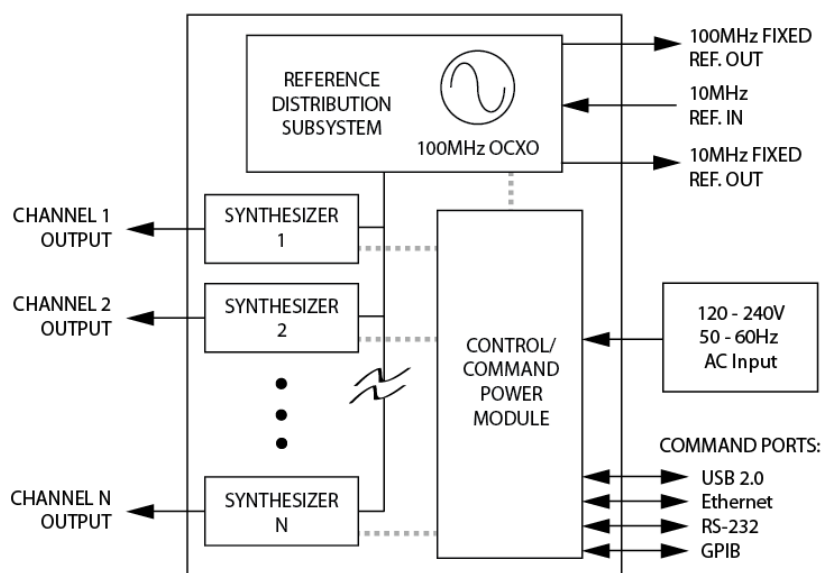
4 Calibration

Maury Microwave calibrates each channel for frequency, amplitude and phase accuracy. The factory calibration is valid for 1 year from the original calibration date. Maury Microwave provides calibration services for applicable products. Please contact sales@maurymw.com with model number and serial number for a calibration service quotation.

5 HSX9100A Configuration Guide

5.1 CONFIGURATION SUMMARY

The HSX9100A is a unique platform allowing the user to specify custom configurations for a COTS product. Units are loaded with up to 4 broadband channels, with additional flexibility to specify each channel's frequency limits and performance options. The result is a high performance, multi-channel synthesizer that is tailored to an application with an optimal price point.



The HSX9100A offers the benefits of a proprietary multi-loop-based synthesis architecture. Coupling the multi-loop architecture with a centralized reference distribution subsystem enables truly phase coherent independently settable channels. Different from traditional PLL based synthesizers, Maury's proprietary multi-loop architecture creates precisely synthesized signals that exhibit both instantaneous and long-term stability.

HSX9100A 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 HSX9100A Series synthesizer platform is a user defined platform. Three primary categories define the final configuration of a unit: the number of channels, loaded channel frequencies, and loaded options/accessories.

5.2.1 Number of Channels (Chassis)

The HSX9100A part number signifies the number of independent channels available in the unit, as follows:

No. Channels	1	2	3	4
Part Number	HSX9101A	HSX9102A	HSX9103A	HSX9104A

5.2.2 Broadband Channels Frequencies

The option model number (OPT-XX) indicates the channel frequency as follows:

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 Available Accessories

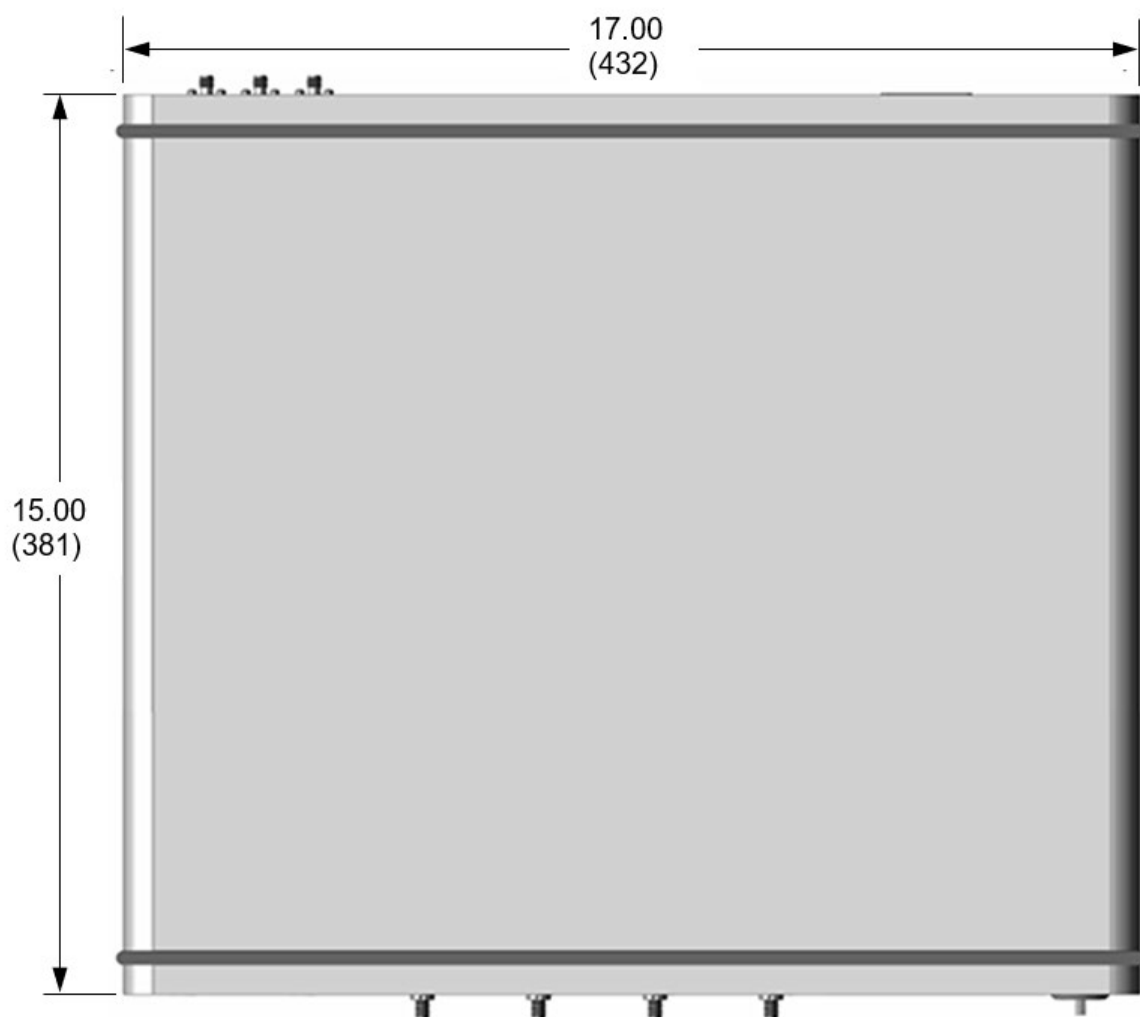
The following accessories are external to the HSX9100A and can be ordered separately.

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 HSX9100A 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). Mechanical dimensions are listed in inches (and millimeters).

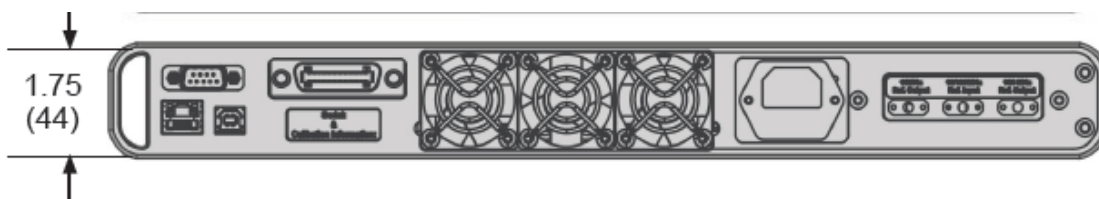
TOP



FRONT



REAR



6 Specifications

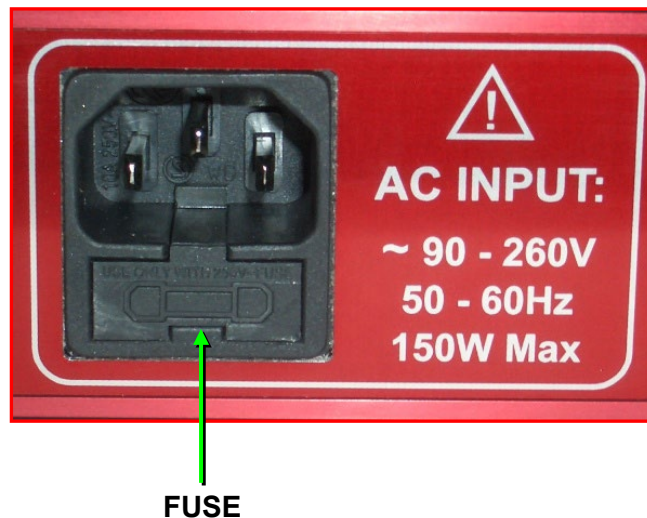
Please refer to the HSX9100A Series data sheet available on www.maurymw.com for the most up-to-date electrical, mechanical and environmental specifications

7 Installation

Prior to use of an HSX9100A Series Multi-Channel Synthesizer users will need to be set up with the basic hardware and software.

7.1 HARDWARE INSTALLATION

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 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. A fuse is in the service tray on the power cord receptacle (rear panel). A spare fuse is provided inside the service tray.

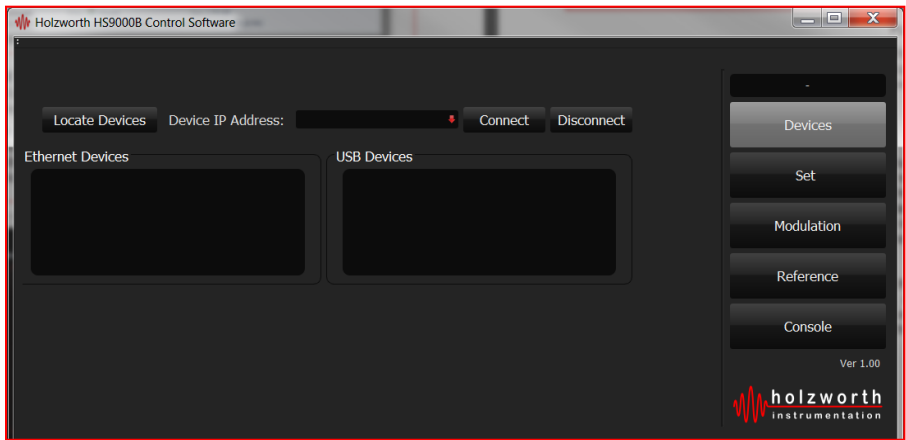
7.2 APPLICATION GUI

The HSX9100A GUI can be run on any Windows PC; no software installation is required. The application GUI is contained on the USB drive that was included with the synthesizer or can be downloaded from www.maurymw.com

8 HSX9100A Communication

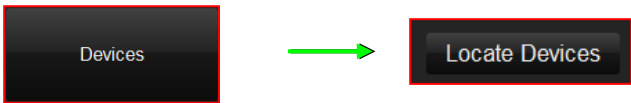
The application GUI can be used to control the HSX9100A via Ethernet or USB communication. Custom, user created applications can be used to control the HSX9100A via Ethernet, USB, RS-232, or GPIB

communication. This section covers Ethernet and USB control with the GUI, where connections are established in the Devices menu (shown below).

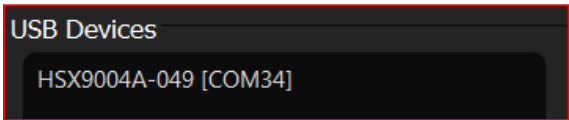


8.1 USB, RS-232, AND GPIB COMMUNICATION

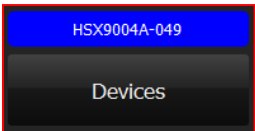
With the HSX9100A USB and RS-232 communication are handled similarly in Windows. USB communication requires FTDI drivers. The drivers should install automatically when the instrument is connected. Click the Devices button on the right side of the GUI, followed by the Locate Devices button in the menu:



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



Identify the instrument by serial # 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:



To create a custom USB software interface or application, the user must determine the COM port the instrument is using. The COM port associated with the USB connection to the HSX9100A can be identified by using the application GUI as shown above or via the Windows Device Manager.

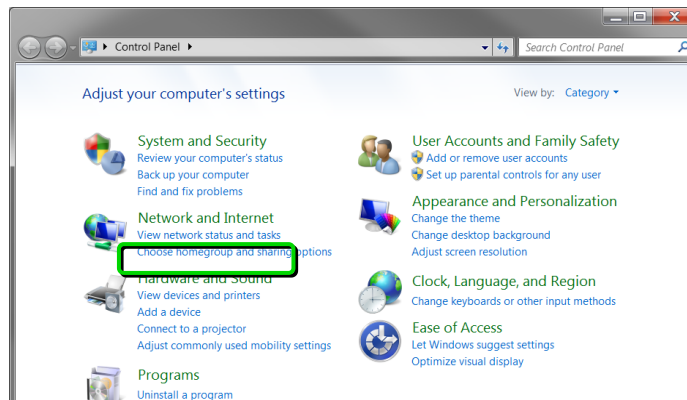
8.1.1 USB Communication Troubleshooting

Follow the steps below to determine the COM port via Windows Device Manager.

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

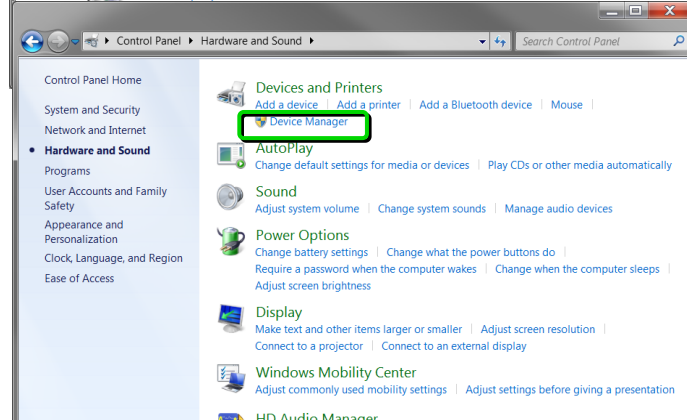
STEP ONE

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



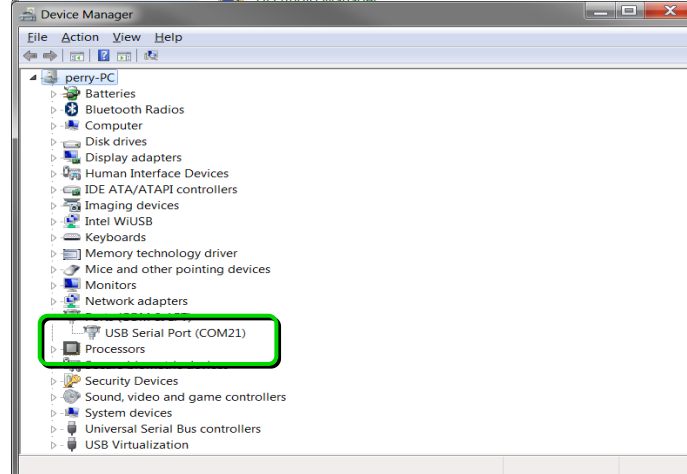
STEP TWO

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



STEP THREE

Under Ports (COM & LPT) locate COM port associated with the HA7062C (identified as "USB Serial Port")



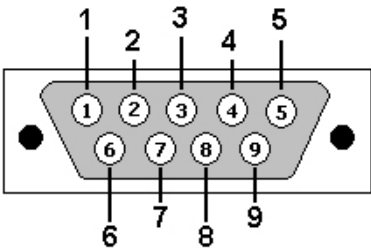
2. If the instrument is not present in Device Manager or in the application GUI please unplug the USB cable and power cycle the synthesizer. Wait 5-10 seconds for the synthesizer to initialize and re-insert the USB cable. Click Locate Devices.

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. 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 Maury Microwave Support at support@maurynw.com for further assistance.

8.1.2 RS-232 Hardware Specifications

Connector: DB9 Male Shrouded.
Logic Level: $\pm 5V$
Baud Rate: 115200 FIXED.
Bit Structure: 8 Data Bits, 1 Stop Bit, No Parity, No Flow Control
Carriage Return: Carriage return (ASCII Code 13)
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

8.1.3 GPIB Communication

HSX9100A synthesizers are GPIB capable. GPIB configuration commands are listed in Appendix A.

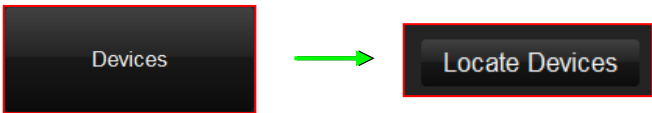
8.2 ETHERNET COMMUNICATION

Ethernet communication can be established with the HSX9100A 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 HSX9100A is set to utilize DHCP when connected over a network.

8.2.1 LAN Connection

Communication with the HSX9100A 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. "HSX9100A-123") and the TCP port (9760).

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

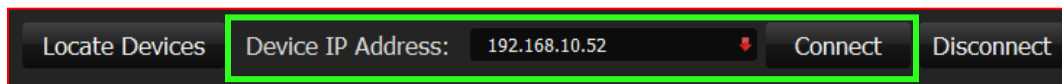


The software will then scan for instruments connected via Ethernet and via serial port. It will display Ethernet devices as shown below:

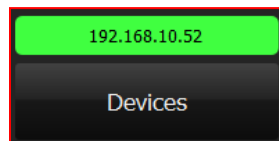


Identify the instrument by serial # or IP address and click to connect. If the connection is successful, the window above 'Devices' will turn green (Ethernet) and display the instrument serial number:

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.



8.2.2 DHCP

When the HSX9100A is connected to a network with a DHCP server, the network settings will be auto assigned by the servers configuration.

If the HSX9100A is connected *directly* to a PC or to a network with no DHCP server, the instrument's default IP address will be 169.254.117.11

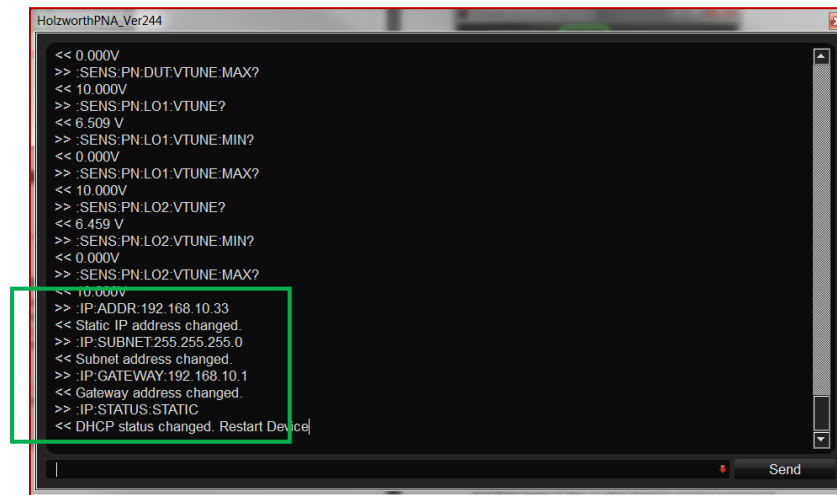
8.2.3 Assigning a Static IP Address

The most efficient way to assign the instrument a static IP address is to use the Console in the GUI. The Console can be used to send the commands from Appendix A 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 sections 8.1 and 8.2.1, respectively.

Once a connection has been established, launch the Console. Now users can begin sending the ASCII commands from Appendix A. 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.
 - a. :IP:ADDR:<value>
2. Send the command to change the subnet address.
 - a. :IP:SUBNET:<value>
3. Send the command to change the gateway if necessary.
 - a. :IP:GATEWAY:<value>
4. Send the command to change from DHCP to Static.
 - a. :IP:STATUS:STATIC

5. Power cycle the instrument when prompted.



```
<< 0.000V
>> :SENS:PN:DUT:VTUNE:MAX?
<< 10.000V
>> :SENS:PN:L01:VTUNE?
<< 6.509 V
>> :SENS:PN:L01:VTUNE:MIN?
<< 0.000V
>> :SENS:PN:L01:VTUNE:MAX?
<< 10.000V
>> :SENS:PN:L02:VTUNE?
<< 6.459 V
>> :SENS:PN:L02:VTUNE:MIN?
<< 0.000V
>> :SENS:PN:L02:VTUNE:MAX?
<< 10.000V
>> :IP:ADDR:192.168.10.33
<< Static IP address changed.
>> :IP:SUBNET:255.255.255.0
<< Subnet address changed.
>> :IP:GATEWAY:192.168.10.1
<< Gateway address changed.
>> :IP:STATUS:STATIC
<< DHCP status changed. Restart Device
```

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

8.2.4 Troubleshooting Ethernet Connections

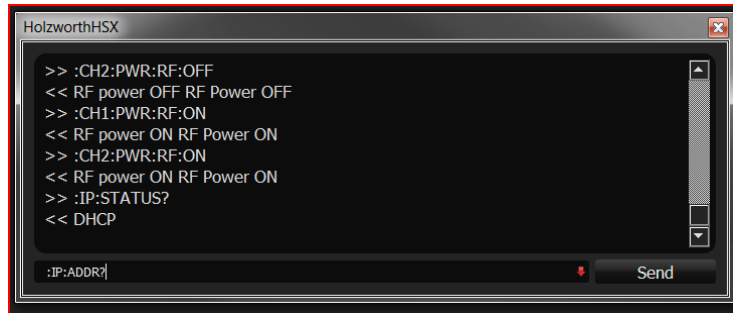
Prior to proceeding below press CTRL+ALT+DEL to open Windows Task Manager. Click the Processes tab. Ensure that there is only one instance of the application GUI open. If there is more than one, end each process, re-launch the GUI, and attempt to establish a connection.

8.2.4.1 Ethernet Reset via USB & Console Window

1. If the synthesizer is not discovered by the application GUI there may be static TCP/IP settings that conflict with the current network configuration. If the static settings are unknown, 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 A for the Ethernet configuration commands. Type commands into the text field and then press Enter or click Send to send a command.



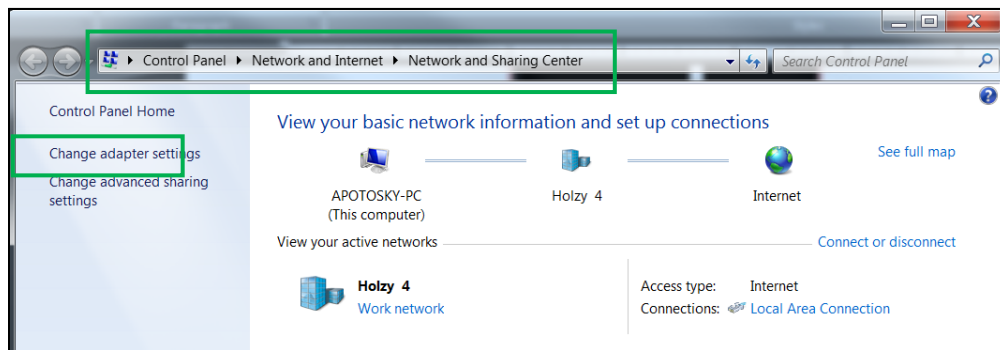
5. Begin by querying with the :IP:STATUS? command. Change status and/or re-configure the static network settings as necessary.

6. Power cycle the HSX9100A if prompted. Any status change from DHCP to Static or vice versa will require a power cycle.

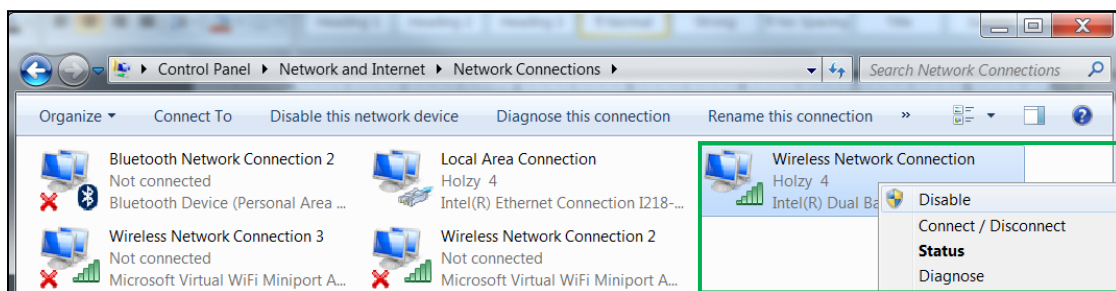
8.2.4.2 Miscellaneous Ethernet Troubleshooting

1. Ensure that the Maury Microwave 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.

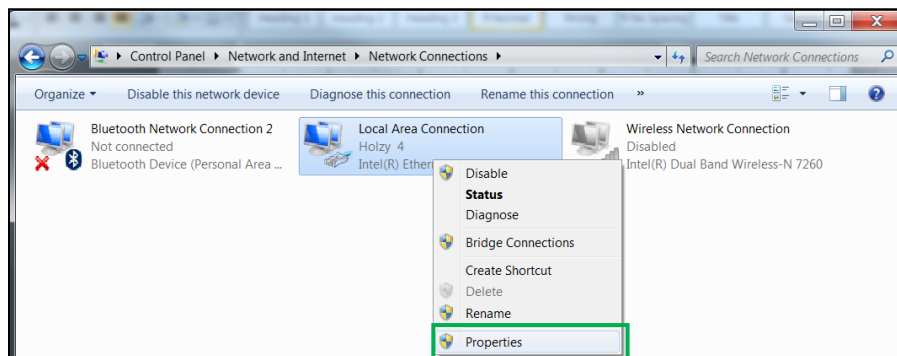


3. In the Change Adapter Settings window right click on any network connections that are not required for communication with the HSX9100A and select Disable.

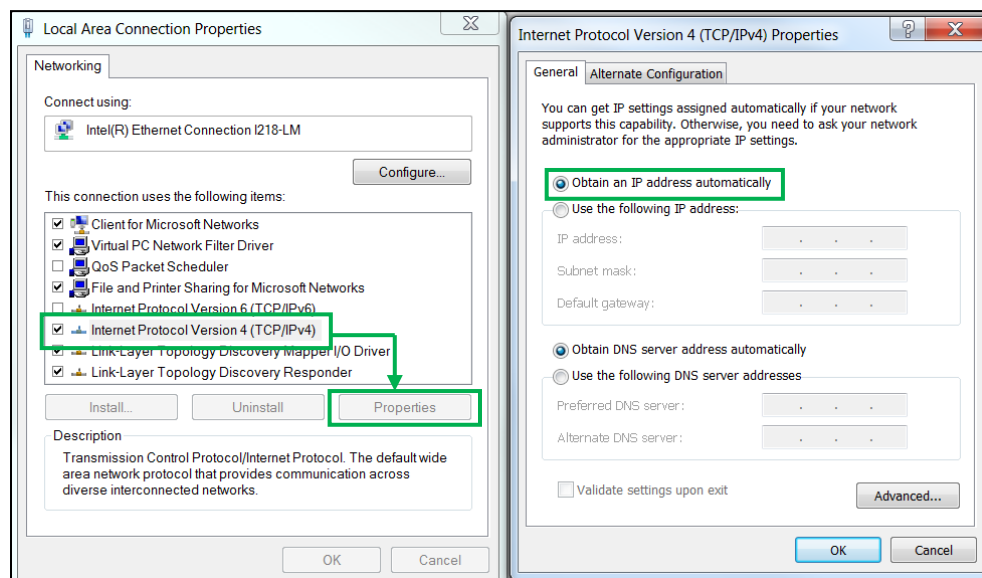


4. Close and re-launch the application GUI. Attempt to establish a connection with the HSX9100A.

5. If connection remains unsuccessful, reset the PC network adapter 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.

7. Close and re-launch the application GUI. Attempt to establish a connection to the HSX9100A.

8. For further assistance please contact Maury Microwave Support at support@maurymw.com

9. Application GUI Operation

The GUI can be launched by double-clicking the executable (.exe) file provided. There is no installation required.

9.1 "SET" MENU

Master Output Power
Power control over all synthesizer channels
Red: Power is OFF
Green: Power is ON

Master Select
Designates ch1 as master for Frequency, Power, and/or Phase offset over all enabled channels

Selected Device
Displays active source with serial number

Device Locator Menu
Displays all Maury Microwave Sources connected to the PC

Channel Enable
Toggle each individual channel on/off

Set Frequency
Adjust CW frequency to mHz resolution

Set Power
Adjust output power

Set Phase Offset
Adjust phase offset from ZERO to 360deg

SET Mode (shown)
View settings for CW Freq., Output Pwr., Phase Offset and channel activation

Console
Open Console window to view or send ASCII commands

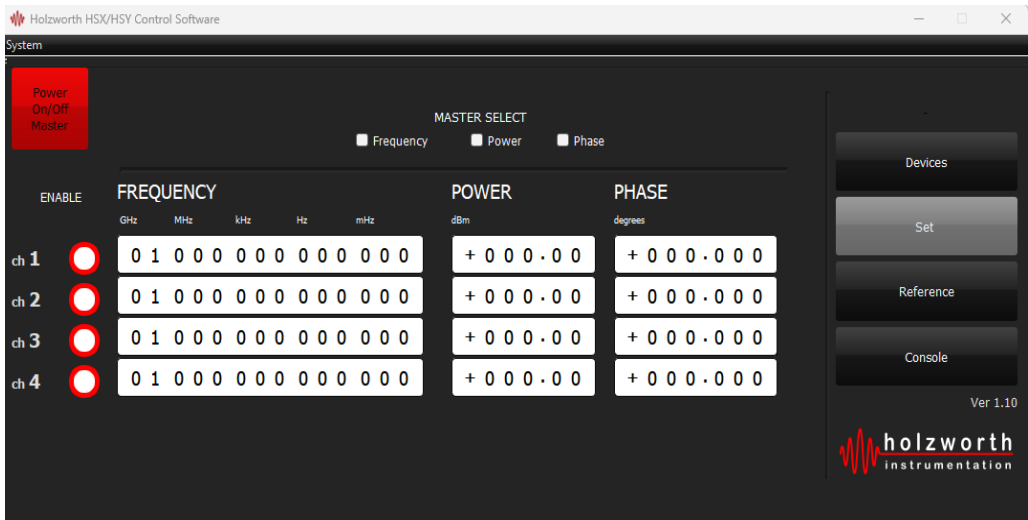
9.1.1 Keyboard Functions

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

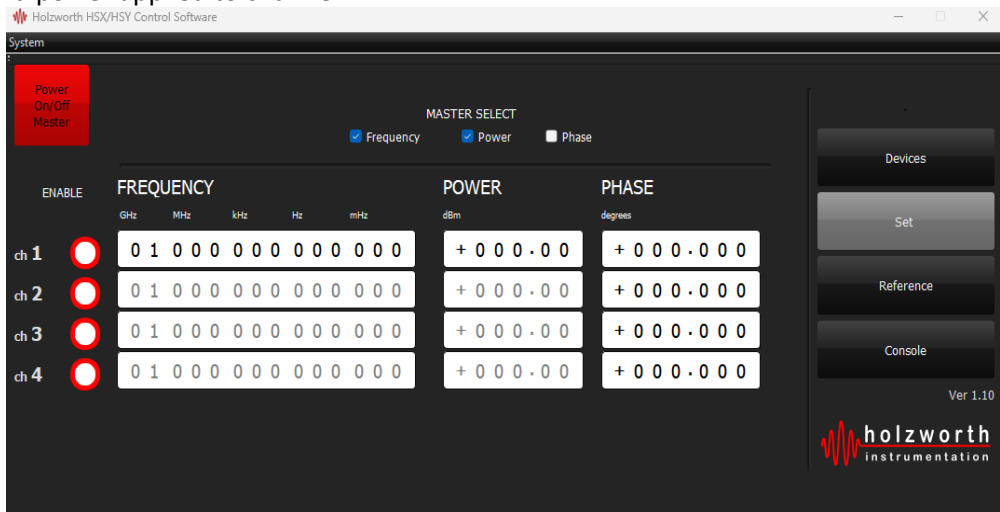
9.1.2 Channel Enable Function

The channel enable function allows the user to select which channels are operating. By toggling the radio button next to the channel number, a user can independently turn each channel on or off. The example below shows Channel 2 enabled and Channel 1 disabled.



9.1.3 Master Select Function

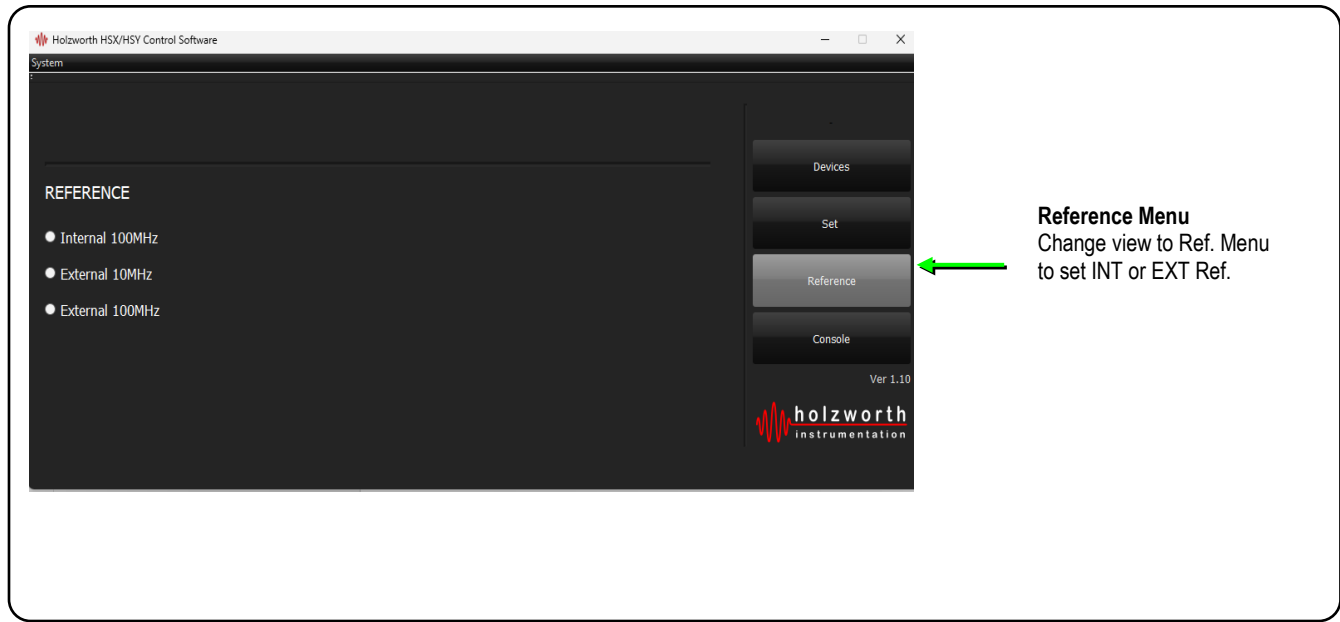
The Master Select function allows the user to select channel 1 as being the master control for any enabled channel. Under this flexible function, channel 1 will always be enabled. The user can select any combination of Frequency, Power and/or Phase Offset to be controlled via the master (channel 1). The example below shows the Master Select enabled for frequency and power, with the result being channel 1 frequency and power applied to channel 2.



NOTE that the GUI does not specifically identify each channel frequency range, but the frequency limits of each loaded channel is auto detected and hard set for each channel. In the case of operating a synthesizer equipped with less than 8 channels, only channels 1 though N will be displayed for control, the remaining channel slots will not be available.

9.2 REFERENCE MENU

The reference menu allows user to configure the synthesizer to utilize its internal 100MHz OCXO reference or either an external 10MHz or 100MHz reference.



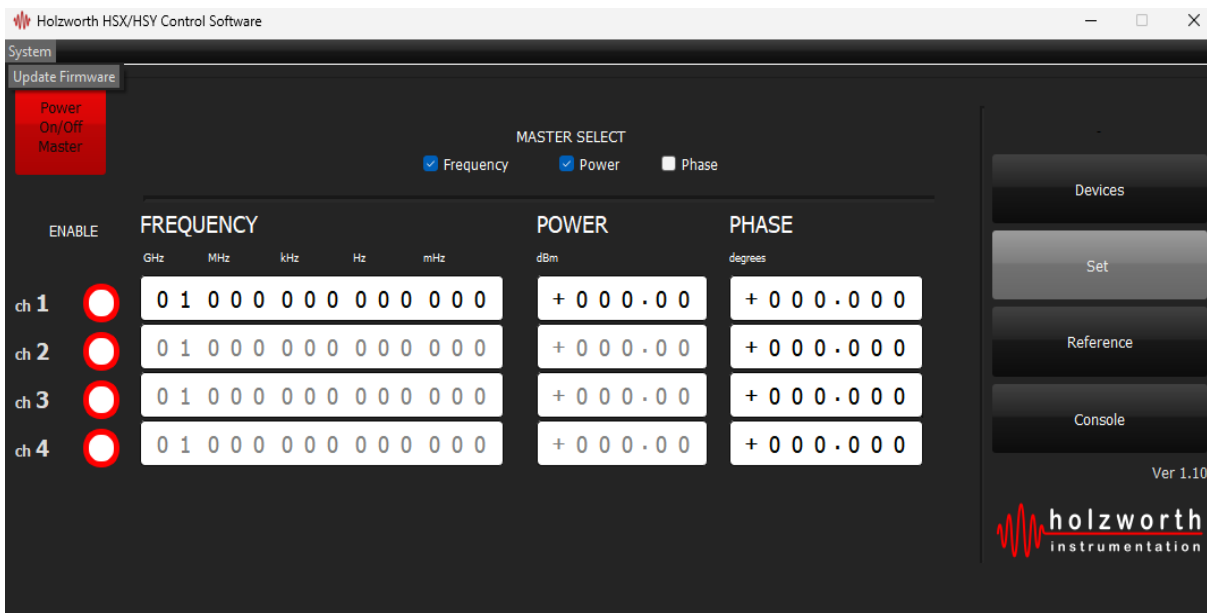
9.2.1 Setting OPT-REFX Frequency

If the HSX9100A is equipped with OPT-REFX, the radio button for 'External 100MHz' will change to a text field that allows users to manually type in the external reference frequency. As previously noted, the REFX reference frequency may be any 100kHz increment in the range of 5MHz to 160MHz

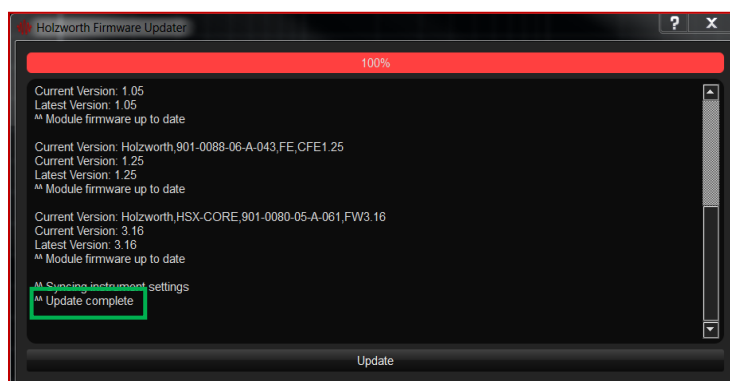
9.4 FIRMWARE UPDATES

HSX9100A firmware can be updated via a USB connection by following the instructions below. Updates are performed using the GUI.

1. Ensure the PC is connected to the internet in order to download the latest software and to check for firmware updates. Download the latest software and extract all files from the .zip file. Double click the .exe file to launch the application GUI.
2. Establish a USB connection with the analyzer as shown in section 7.1.
3. Click the System button in the top left corner of the GUI. Select Update Firmware. The firmware updater window will now open. Click the Update button.



4. Do not turn off, unplug, or disconnect USB from the analyzer/PC while updates are in progress. When the progress bar reaches 100% and the updater window displays "Update complete" close the updater window.



10 Hardware

The HSX9100A Synthesizers are CW work horses. They are designed to do an excellent job of providing highly stable, phase coherent signals with pure spectrums and highly accurate output power amplitude control.

10.1 RF OUTPUTS

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).

10.2 REFERENCE INPUTS/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 (internal, external 10/100MHz, or OPT-REFX frequency). The factory default setting is for internal reference (free running).



10.2.1 10/100MHz 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.

10.2.2 Reference Output Summary

Maury Microwave 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)

10.3 ATTENUATOR MODE

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

HSX9100A 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 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	$\leq -105.00\text{dBm}$
110dB	$\leq -95.00\text{dBm}$
100dB	$\leq -85.00\text{dBm}$
90dB	$\leq -75.00\text{dBm}$
80dB	$\leq -65.00\text{dBm}$
70dB	$\leq -55.00\text{dBm}$
60dB	$\leq -45.00\text{dBm}$
50dB	$\leq -35.00\text{dBm}$
40dB	$\leq -25.00\text{dBm}$
30dB	$\leq -15.00\text{dBm}$
20dB	$\leq -5.00\text{dBm}$
10dB	$\leq +5.00\text{dBm}$
0dB	$> +5.00\text{dBm}$

Appendix A: Programming Commands

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

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

HSX 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 HSX 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 10.3

PHASE SETTINGS

COMMAND	:CHn:PHASE:<value>
DESCRIPTION	Set Channel Output Phase Offset
RANGE	(See table 6.1 of HSX 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	:HSX:DIAG:MIN:START
DESCRIPTION	Start mini diagnostics routine
EXAMPLE	:HSX:DIAG:MIN:START
RESPONSE	Diagnostics started
COMMAND	:HSX:DIAG:DONE?
DESCRIPTION	Query Status of Diagnostics routine
EXAMPLE	:HSX:DIAG:DONE?
RESPONSE	"Diagnostics running" or "Failed" or "Passed"
COMMAND	:HSX:DIAG:ERROR?
DESCRIPTION	Output errors from Diagnostics routine
EXAMPLE	:HSX: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, HSX9104A, #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.