



# MultiChannel Driver Software Programming Guide

## Overview:

The MultiChannel Driver allows remote control and monitoring via either an Ethernet or USB connection. Once a connection is made to the driver using one of these interfaces, all command and control is the same regardless of which interface is used.

## USB Interface:

In order for Windows to recognize the MultiChannel Driver USB port the USB driver must first be installed, after which the MultiChannel Driver appears as an additional COM port on the computer. Currently Windows XP, Vista, 7, and 8 are supported. Windows 7 requires the extra step listed below; Windows 8 requires additional steps which can be found in the following application note:

<http://www.spectronixinc.com/Downloads/Installing%20Under%20Windows%208.pdf>

1. Copy the file "cdc\_NTXPV764.inf" from the supplied CD to the hard drive.
2. Plug the MultiChannel Driver into a free USB port. When the hardware installation wizard asks for the driver location, browse to the "cdc\_NTXPVista.inf" file on the hard drive.
3. After the driver has been installed right click "my computer" and select "properties". In the properties window select the "hardware" tab. Click on "device manager" and expand the "Ports (COM & LPT)" item. Locate the "Spectronix, Inc." entry and note the assigned COM number, (ie "COM4"). This is the COM port that the software will use to communicate with the MultiChannel Driver.

Note, on some operating systems such as Window 7, manual USB driver installation may be necessary. If the hardware installation wizard fails, go to "My Computer" > "Properties" > "Hardware" > "Device Manager", and find the "Spectronix" or "SERIAL DEMO" entry under "Other Devices" and select "Update Driver". At this point you will be able to browse to the location of the driver.

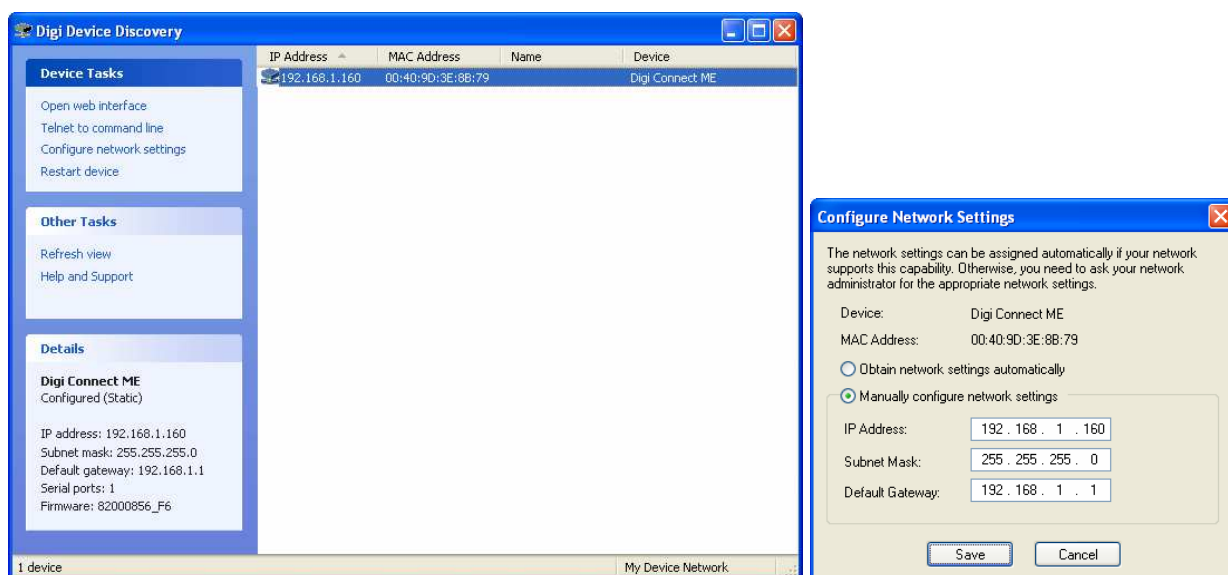
## Ethernet Interface:

The MultiChannel Driver communicates using TCP/IP on port number 2101 and is shipped with a default IP address of 192.168.1.160.

### Changing the IP Address

The Digi Device Discovery utility allows the user to retrieve and change the MultiChannel Driver IP address. The installation program "40002265\_G.exe" can be found on the Spectronix or Digi web sites.

After installing the utility, disable Windows Firewall and any other virus or firewall programs and start the program. The program will report the IP and MAC addresses of all compatible devices on the network. Right click on the device and select "Configure Network Settings" to change the network settings.



### Updating the Firmware:

It is possible for the user to update the MultiChannel Driver firmware over the Ethernet port using the Spectronix Bootloader application which can be found on the included CD or downloaded from the Spectronix web site. With the unit powered off press and hold the recessed programming button while turning on the main power switch, the controller's chassis LED will turn solid green. Follow the bootloader user's manual for instructions on loading the firmware. During programming the LED will rapidly flash.

### Commands:

The MultiChannel Driver uses ASCII data to communicate with a host computer; the tables below list the individual commands, parameters, and responses from the MultiChannel Driver.

#### Notes:

1. All communication is initiated by the host.
2. Commands are not case sensitive.
3. A space or equal sign should be inserted between the command and any parameters.
4. All commands should be terminated with a <CR> <LF>.
5. Responses with data are initiated with <0x00> and terminated with <CR> <LF> <0xFF>.
6. Responses with no data return a single 0xFF confirmation. The confirmation only indicates only that the command was received.

Get Unit Information and driver status	
Command:	Example / Parameters:
"?"	( none )
Response:	Example / Parameters:
Start of message	<0x00>
Command echo	?,

Unit name	100432A,
Firmware Rev	000.000,
Logic Rev	001
Slot number*	CR / LF 00, (00:15)
Logic Rev*	01
Termination	CR / LF <0xFF>
Notes:	<p>*If a driver card is present, the message reports the slot number and logic revision. If the driver card is not present no slot / rev is reported.</p> <p>?, 100432A, 000.000, 001  00, 01  01, 01  02, 01  03, 01  04, 01  05, 01  06, 01  07, 01  08, 01  09, 01  10, 01  11, 01  12, 01  13, 01  14, 01  15, 01</p>

Get the chassis status and settings	
Command:	Example / Parameters:
<b>"Status"</b>	<b>(none)</b>
Response:	Example / Parameters:
Start of message	<0x00>
Command echo	<b>Status,</b>
Controller fault	0, (0=normal, 1=fault)
Trigger source	i, (i=internal, e=external)
Trigger Duty Cycle	10, (10% or 50%)
Period Multiplier	5, (See "SetPeriod" command below)
Reference source	i (i=internal, e=external)
RF Blanking	0 (0=normal, 1=RF blanking on) (added in V 1.2)
Over Temp Limit	64, (°C)
Over Power Limit	0794, (mW)
Channel number*	CR / LF 00, (0:31)

Fault*	0, (0=normal, 1=fault)
RF on/off*	1, (0=off, 1on)
Input Source*	e, (i=internal, e=external)
Modulation Source*	0, (0=off, d=direct trigger, r=RAM table)
Gain*	13, (0:23)
DDS Frequency*	200000000, (Hz)
DDS Phase*	180, (0:359°)
DDS Amplitude*	02950 (0:16383)
Termination	CR / LF <0xFF>
Notes:	<p>*If a driver card is present, the message reports the channel number and settings. If the driver card is not present no information reported.</p> <pre>Status, 1, i, i, 064, 0794 00, 1, 0, i, 0, 13, 200000000, 000, 02950 01, 1, 0, i, 0, 13, 200000000, 000, 02700 02, 1, 0, i, 0, 13, 200000000, 000, 02750 03, 1, 0, i, 0, 13, 200000000, 000, 02750 04, 1, 0, i, 0, 13, 200000000, 000, 02750 05, 1, 0, i, 0, 13, 200000000, 000, 02750 06, 1, 0, i, 0, 13, 200000000, 000, 02750 07, 1, 0, i, 0, 13, 200000000, 000, 02750 08, 1, 0, i, 0, 13, 200000000, 000, 02700 09, 1, 0, i, 0, 13, 200000000, 000, 02750 10, 1, 0, i, 0, 13, 200000000, 000, 02750 11, 1, 0, i, 0, 13, 200000000, 000, 02750 12, 1, 0, i, 0, 13, 200000000, 000, 02750 13, 1, 0, i, 0, 13, 200000000, 000, 02750 14, 1, 0, i, 0, 13, 200000000, 000, 02775 15, 1, 0, i, 0, 13, 200000000, 000, 02750 16, 1, 0, i, 0, 13, 200000000, 000, 02750 17, 1, 0, i, 0, 13, 200000000, 000, 02800 18, 1, 0, i, 0, 13, 200000000, 000, 02800 19, 1, 0, i, 0, 13, 200000000, 000, 02800 20, 1, 0, i, 0, 13, 200000000, 000, 02750 21, 1, 0, i, 0, 13, 200000000, 000, 02750 22, 1, 0, i, 0, 13, 200000000, 000, 02800 23, 1, 0, i, 0, 13, 200000000, 000, 02800 24, 1, 0, i, 0, 13, 200000000, 000, 02800 25, 1, 0, i, 0, 13, 200000000, 000, 02750 26, 1, 0, i, 0, 13, 200000000, 000, 02750 27, 1, 0, i, 0, 13, 200000000, 000, 02700 28, 1, 0, i, 0, 13, 200000000, 000, 02800 29, 1, 0, i, 0, 13, 200000000, 000, 02750 30, 1, 0, i, 0, 13, 200000000, 000, 02700 31, 1, 0, i, 0, 13, 200000000, 000, 02725</pre>

<b>Read the current measurements</b>	
Command:	Example / Parameters:

<b>"Meas"</b>	<b>(none)</b>
Response:	Example / Parameters:
Start of message	<0x00>
Command echo	<b>Meas ,</b>
Controller fault	<b>0 , (0=normal, 1=fault)</b>
Cell Temperature A	<b>0459 , (°C*10: 0:9999)</b>
Cell Temperature B	<b>0413 , (°C*10: 0:9999)</b>
Channel number*	<b>CR / LF 00 , (0:31)</b>
Fault*	<b>0 , (0=normal, 1=fault)</b>
RF Power*	<b>0500 , (power in mW)</b>
Temperature*	<b>045 , (driver temperature °C)</b>
Termination	<b>CR / LF &lt;0xFF&gt;</b>
Notes:	<p>If the Cell temperature is equal to 255, the thermistor is either open, shorted, or the temperature is negative.</p> <pre> Meas , 1 , 255 , 255 00 , 0 , 0000 , 041 , 01 , 0 , 0000 , 040 , 02 , 0 , 0000 , 042 , 03 , 0 , 0000 , 042 , 04 , 0 , 0000 , 041 , 05 , 0 , 0000 , 040 , 06 , 0 , 0000 , 044 , 07 , 0 , 0000 , 043 , 08 , 0 , 0000 , 043 , 09 , 0 , 0000 , 041 , 10 , 0 , 0000 , 044 , 11 , 0 , 0000 , 044 , 12 , 0 , 0000 , 044 , 13 , 0 , 0000 , 044 , 14 , 0 , 0000 , 041 , 15 , 0 , 0000 , 045 , 16 , 0 , 0000 , 043 , 17 , 0 , 0000 , 042 , 18 , 0 , 0000 , 044 , 19 , 0 , 0000 , 042 , 20 , 0 , 0000 , 043 , 21 , 0 , 0000 , 041 , 22 , 0 , 0000 , 046 , 23 , 0 , 0000 , 046 , 24 , 0 , 0000 , 045 , 25 , 0 , 0000 , 044 , 26 , 0 , 0000 , 042 , 27 , 0 , 0000 , 041 , 28 , 0 , 0000 , 042 , 29 , 0 , 0000 , 043 , 30 , 0 , 0000 , 045 , 31 , 0 , 0000 , 038 , </pre>

Calibrate the power meter of a channel	
Command:	Example / Parameters:
<b>"CalPower"</b>	<b>"12"</b> ( <i>mW, set to 0 to disable</i> )
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	Assumes the output power level is set to 500mW

Set the overpower limit	
Command:	Example / Parameters:
<b>"SetOverPower"</b>	<b>"1100"</b> ( <i>mW, set to 0 to disable</i> )
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	The example sets the over power limit to 1.1W for all channels. Setting the overpower limit to zero disables the auto shutdown function – useful for calibrating the channels.

Set the overpower limit	
Command:	Example / Parameters:
<b>"SetOverTemp"</b>	<b>"55"</b> ( <i>°C</i> )
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	The example sets the over temp limit to 55°C. On over limit the controller flags an error.

Set the master reference source	
Command:	Example / Parameters:
<b>"SetRef"</b>	<b>"i"</b> ( <i>internal</i> ) or <b>"e"</b> ( <i>external</i> )
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	

Sets or clears the global RF blanking signal	
Command:	Example / Parameters:
<b>"Blank"</b>	<b>"0"</b> ( <i>no blanking</i> )

	"1" (force RF blanking)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	Channel RF states are retained during blanking and are reported on the GUI. The front panel LEDs reflect the RF state.

Enables the global trigger	
Command:	Example / Parameters:
"EnTrig"	"1" (enabled) or "0" (disabled)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	This command is useful for synchronizing the RAM based modulation look up channels.

Set the trigger source	
Command:	Example / Parameters:
"SetTrig"	"i" (internal) or "e" (external)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	

Set the internal trigger period (multiplier)	
Command:	Example / Parameters:
"SetPeriod"	"3" (0:7 = multiply base period by 2 <sup>0</sup> to 2 <sup>7</sup> )
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	The base period is set at 312.5uS. The maximum period is 40mS. The default power on is 312.5uS*2 <sup>5</sup> = 10mS

Set the internal duty cycle	
Command:	Example / Parameters:
"SetDuty"	"10" (10 or 50%)
Response:	Example / Parameters:

Confirmation	<0xFF>
Notes:	The default power on is 10%

Clear a fault on one of the channels	
Command:	Example / Parameters:
"ClearFault"	"12" (channel number 0:31, "all")
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	Clears a latched fault in one channel if the condition is no longer causing the fault. "all" can be used to clear all channels.

Configures the RF channel	
Command:	Example / Parameters:
"SetRF"	"12" (channel number 0:31)
	"e" (source: "e"=external, "i"=internal, "0"=off)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	

Turns on/off modulation	
Command:	Example / Parameters:
"SetMod"	"12" (channel number 0:31)
	"R" ("0"=off, "D"=direct trigger, "R"=RAM table)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	

Sets the RF channel gain (effects both external and internal sources)	
Command:	Example / Parameters:
"SetGain"	"12" (channel number 0:31)
	"16" (gain level 0:23)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	Each gain step is approximately 1dB



Sets the DDS channel frequency	
Command:	Example / Parameters:
"SetFreq"	"12" (channel number 0:31)
	"200000000" (frequency in Hz)
	"858993459" (optional frequency tuning word)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	Due to math precision rounding, the resultant frequency can be off up to 0.02ppm if the frequency tuning word (FTW) is calculated automatically (FTW omitted). For greater precision the FTW can be specified manually using the formula:  FTW = freq * 2 <sup>32</sup> / 1E9

Sets the DDS channel phase	
Command:	Example / Parameters:
"SetPhase"	"12" (channel number 0:31)
	"180" (phase 0:360°)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	The above example sets the phase of channel 12 to 180°

Sets the DDS channel amplitude	
Command:	Example / Parameters:
"SetAmp"	"12" (channel number 0:31)
	"16383" (amplitude 0: 16383)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	

Reset the RAM table counters	
Command:	Example / Parameters:
"RAMCntRs"	(none)
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	

Load the RAM based look up table into the selected channel	
Command:	Example / Parameters:
"LoadTable"	"12" (channel number 0:31)
	<CR/LF>
Table Data	<3F58b801> (2 to 4096 ASCII coded Hex characters, must be an even number)
End of Data Set Marker	<0xFF>
Response:	Example / Parameters:
Confirmation	<0xFF>
Notes:	Up to 16,384 samples can be loaded. Samples are read out MSB of first byte to LSB of last byte. Data must be loaded in 8bit intervals (2 characters); data not on 8 bit boundaries will be truncated.

Hardware Level Commands:

Reads the DDS hardware	
Command:	Example / Parameters:
"ReadDDS"	"12" (channel number 0:31)
	"1E" (register number – hex format)
Response:	Example / Parameters:
Start of message	<0x00>
Command echo	"readdds"
Upper 32 bits	"08B50000" (register data – hex format)
Lower 32 bits	"858993459" (register data – hex format)
Termination	CR / LF <0xFF>
Notes:	

Writes to the DDS hardware	
Command:	Example / Parameters:
"WriteDDS"	"12" (channel number 0:31)
	"1E" (register number – hex format)
	"180d0f9b" (upper 32 bits – must be 8 characters)
	"33333333" (lower 32 bits – must be 8 characters)
Response:	Example / Parameters:

Confirmation	<0xFF>
Notes:	

Configuration Commands:

Flash the FPGA image to NV memory	
Command:	Parameters:
"flash"	"l" (local-controller) or "r" (remote-driver)
Response:	Parameters:
Start of message	<0x00>
Command echo	"Flash" (sent when ready to accept data)
Termination	CR / LF <0xFF>
Notes:	Stores the FPGA logic image (*.bin) in the on-board FLASH memory. This image is uploaded to the FPGA upon start-up.

Force configuration of the FPGA from internal memory	
Command:	Parameters:
"config"	"l" (internal) or "r" (external)
Response:	Parameters:
Confirmation	<0xFF>
Notes:	Configures the FPGA logic image from on-board FLASH memory. During flashing the Chassis LED will flash green and the driver will not respond to commands; the "?" can be used to determine when flashing is complete.

**Revision Log:**

Revision	Date	Comments
1.2	12/7/2017	<ul style="list-style-type: none"><li>• Added status for RF blanking</li></ul>
1.1	11/2/2017	<ul style="list-style-type: none"><li>• Added RAM modulation capability</li></ul>
1.0	5/31/2017	<ul style="list-style-type: none"><li>• Increased temperature resolution to 1 decimal point</li><li>• Added SetDuty and SetPeriod commands along with associated fields in the status response</li></ul>
0.3	2/9/2017	<ul style="list-style-type: none"><li>• Added 0xFF as responses to all commands</li></ul>
0.2	2/2/2017	<ul style="list-style-type: none"><li>• Added the ability to update FPGA logic via Ethernet</li></ul>
0.1	1/5/2017	<ul style="list-style-type: none"><li>• Updated cell thermistor SH parameters</li><li>• Added the ability to disable over temperature fault</li><li>• Added auto-port finder</li></ul>
0.0	12/1/2016	<ul style="list-style-type: none"><li>• Initial release</li></ul>