Safety rules to using his device

Safety Regulations

1. Do not touch any part of high voltage circuit or make any unnecessary high voltage measurements. Do not remove the top or bottom covers of this unit unless you are a qualified service person. Remove the power from this unit before removing the top and bottom covers.

2. When servicing this unit, the work area should be free from any electrical hazards. The floor and workbench where the unit is operated should be insulated and free from any exposed high voltage conductors. Remove any source of water or other conductive liquids in the working area.

3. Connect this unit only to a 3-prong AC outlet, which conforms to electrical safety, codes. Do not use any adapters to connect this unit to an AC receptacle.

4. Before operating or servicing this instrument, read the instruction manual and fully understand the operating procedures. If you are servicing the unit, check the circuit you are testing for high voltage.

5. Do not use this device in a room alone; be sure there are other people in the vicinity of your work area in case of an emergency arises. Have emergency telephone numbers posted in the work area in case a quick response is necessary.
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   1.2. How to set the address of the equipment............................................ 1  
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1. General Introduction

This section describes how to remotely control all instrument functions and how to download and upload waveform data using either the RS-232C or GPIB interface. It is necessary to read the section on how to set the GPIB address or RS232 parameters on the Bench top if you have already installed a GPIB card and the required software on your computer. Included are an overview of remote control, a complete tabulation and explanation of control commands.

1.1. **To set GPIB address**

Each device on the GPIB (IEEE-488.2) interface must have a unique address. You can set the address of the equipment to any value between 0 and 30.

1.2. **How to set the address of the equipment**

1.2.1. **Procedure**

1) Press the Menu button.
2) Select the Equip mode to display the equipment setup mode.
3) Press Edit button to display “the movement cursor (<)”.
4) Move “the movement cursor (<)” to GPIB address setup field.
5) Press button to change the “(<) movement mode” to “(◄) correction mode”.
6) Select the address by turning the rotary dial. (0-30).
7) Press F5 button to exit.

1.3. **Before sending commands**

Whether you use RS-232C or GPIB as the communication interface to the equipment, you should examine the following.

1.3.1. **For RS-232C**

1) Check the cable connection.
   Make sure the proper end (PC or Instrument) of the cable supplied is connected to the respective ends.

   PC-to-PC COM port
   Instrument to RS-232 connector

2) Setup the PC Port.
   Select a COM port on the PC. Make sure that the baud rate and other interface parameters are set to the same parameters as the equipment.

1.3.2. **For GPIB**

1) Check the cable connection.
2) Set up the GPIB board on the PC to a proper setting.
3) Make sure that the GPIB address set on the PC matches the equipment address.
2. **RS232C Overview**

2.1. **Introduction**
RS-232 is an industry-standard method of sending data back and forth between two pieces of equipment. With the equipment, a computer can remotely control the instrument, download waveform data and upload waveform data. This overview explains the interface requirements, instrument setup, how to verify communications.

2.2. **Interface Requirements**
All IBM (or IBM compatible) personal computers (PCs) should be equipped with at least one serial interface port. It may be either a 9-pin DB-9 or a 25-pin DB-25 connector. An 8-foot 9-pin cable is included with the instrument. Most any software, which defines communication protocols, may be used. This includes the programming languages Quick Basic, GW Basic, Visual Basic, Quick C, Turbo C and Turbo C++. Communications programs such as ProComm, a “shareware” version, are also usually acceptable.

2.3. **RS232C Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud Rate</td>
<td>9600, 4800, 2400, 1200 (option)</td>
</tr>
<tr>
<td>DATA LENGTH</td>
<td>8 BIT</td>
</tr>
<tr>
<td>START BIT</td>
<td>1 BIT</td>
</tr>
<tr>
<td>STOP BIT</td>
<td>1 BIT</td>
</tr>
<tr>
<td>PARITY BIT</td>
<td>NONE</td>
</tr>
</tbody>
</table>
3. RS232C Communication

3.1. Hardware and Software requirement:
1) IBM PC/XT/AT (8088, 80286, 80386, 80486) or Compatible Computer.
2) Microsoft Windows VER 3.1 or Windows 95, 98
3) Serial Port for Connection with Instrument.

3.2. RS232C Cable Pin Connection

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Computer</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-sub 9-Pin Male</td>
<td>D-sub 9-pin Female</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

3.3. Installation of Supplied Software
1) Insert the supplied diskette into the Drive A. (or B).
2) Select File from the Program Manager screen, and then select Run.
3) Type A:\(or B:\) Setup.exe. Then ENTER.
4) If you are using Windows 95/98 click the mouse on MY computer ICON, then Floppy Drive A icon. When the menu is displayed click on SETUP.EXE.
5) Monitor Program will be installed and create a directory named “Model No,” automatically in Hard Disk.

3.4. Communication with PC
1) Start the program by clicking the mouse on the icon.
2) Click on the **SetUp** button to open the setup dialog. Then select appropriate Serial Port and Baud Rate and click on the **OK** button
3) Click on the S TIME button and type in the appropriate sampling time.
4) Click the “START” button with mouse to start the program.

Start: Starts the program.
Stop: Stops the program.
4. GPIB (IEEE-488.2) Overview

4.1. Introduction
The instrument conforms to the Institute of Electrical and Electronics Engineers (IEEE) Standard 488.2-1992. The specific implementation of IEEE-488.1 includes the following functions and subsets:

<table>
<thead>
<tr>
<th>Interface Function</th>
<th>Subset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Handshake</td>
<td>SH1</td>
</tr>
<tr>
<td>Acceptor Handshake</td>
<td>AH1</td>
</tr>
<tr>
<td>Talker</td>
<td>T6</td>
</tr>
<tr>
<td>Listener</td>
<td>L4</td>
</tr>
<tr>
<td>Service Request</td>
<td>SR1</td>
</tr>
<tr>
<td>Remote Local</td>
<td>RL1</td>
</tr>
<tr>
<td>Parallel Poll</td>
<td>PP0</td>
</tr>
<tr>
<td>Device Clear</td>
<td>DC1</td>
</tr>
<tr>
<td>Device Trigger</td>
<td>DT1</td>
</tr>
<tr>
<td>Controller</td>
<td>C0</td>
</tr>
<tr>
<td>Electrical Interface</td>
<td>E1</td>
</tr>
</tbody>
</table>

To facilitate programming, a brief overview of the IEEE-488.2 Standard (as it specifically applies to the instrument) is provided.

For a more detailed discussion of these topics, a copy of IEEE Standard 488.2-1992 may be obtained from:

The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th street, New York, NY 10017
5. GPIB Port

Standard IEEE-488.2 connector for connecting multiple devices to the GPIB interface.

*Note
The total cable length should be less than 25m (80ft) and the maximum number of device connections (including controller) is 15.

5.1. GPIB Example
Figure below is an example of connecting multiple devices to the GPIB port.

5.2. GPIB cable PIN number and signal

<table>
<thead>
<tr>
<th>Pin number</th>
<th>IEEE Standard</th>
<th>Pin number</th>
<th>IEEE Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DIO 1</td>
<td>13</td>
<td>DIO 5</td>
</tr>
<tr>
<td>2</td>
<td>DIO 2</td>
<td>14</td>
<td>DIO 6</td>
</tr>
<tr>
<td>3</td>
<td>DIO 3</td>
<td>15</td>
<td>DIO 7</td>
</tr>
<tr>
<td>4</td>
<td>DIO 4</td>
<td>16</td>
<td>DIO 8</td>
</tr>
<tr>
<td>5</td>
<td>EOI</td>
<td>17</td>
<td>REN</td>
</tr>
<tr>
<td>6</td>
<td>DAV</td>
<td>18</td>
<td>GND (6)</td>
</tr>
<tr>
<td>7</td>
<td>NRFD</td>
<td>19</td>
<td>GND (7)</td>
</tr>
<tr>
<td>8</td>
<td>NDAC</td>
<td>20</td>
<td>GND (8)</td>
</tr>
<tr>
<td>9</td>
<td>IFC</td>
<td>21</td>
<td>GND (9)</td>
</tr>
<tr>
<td>10</td>
<td>SRQ</td>
<td>22</td>
<td>GND (10)</td>
</tr>
<tr>
<td>11</td>
<td>ATN</td>
<td>23</td>
<td>GND (11)</td>
</tr>
<tr>
<td>12</td>
<td>Shield</td>
<td>24</td>
<td>Logic GND</td>
</tr>
</tbody>
</table>
6. Status and Event Registers

There are four required status or event registers. They are:

1) Standard Event Status Enable (ESE) Register
2) Standard Event Status (ESR) Register
3) Service Request Enable (SRE) Register
4) Status Byte (STB)

The following diagram shows how the registers are related to each other. These registers indicate device status, and allow the programmer to specify which device events will enable a service request.
7. Command Set or Query message terminator

7.1. Common command

Commands can be divided into two major categories: common commands and instrument specific commands. Instrument specific commands are detailed in next section. Common commands are defined by the standard, and, among other things, are used to manage status registers and synchronization. The following is a list of common commands as implemented in the instrument:

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>*CLS</td>
<td>Clear Status</td>
</tr>
<tr>
<td>*ESE (GPIB ONLY)</td>
<td>Standard Event Status Enable</td>
</tr>
<tr>
<td>*ESE?</td>
<td>Standard Event Status Enable Query</td>
</tr>
<tr>
<td>*ESR?</td>
<td>Standard Event Status Register Query</td>
</tr>
<tr>
<td>*IDN?</td>
<td>Identification Query</td>
</tr>
<tr>
<td>*OPC</td>
<td>Operation Complete</td>
</tr>
<tr>
<td>*OPC?</td>
<td>Operation Complete Query</td>
</tr>
<tr>
<td>*RST</td>
<td>Reset</td>
</tr>
<tr>
<td>*SRE (GPIB ONLY)</td>
<td>Service Request Enable</td>
</tr>
<tr>
<td>*SRE?</td>
<td>Service Request Enable Query</td>
</tr>
<tr>
<td>*STB?</td>
<td>Status Byte Query</td>
</tr>
<tr>
<td>*TRG</td>
<td>Trigger Command</td>
</tr>
<tr>
<td>*TST?</td>
<td>Self-Test Query</td>
</tr>
<tr>
<td>*WAI</td>
<td>Wait-to-Continue</td>
</tr>
<tr>
<td>*OPT?</td>
<td>System Option Query</td>
</tr>
</tbody>
</table>

7.2. Verification of Communication

After the PC and the instrument have been connected together and programmed for compatible interface parameters, the interface should be tested for proper operation. To test the interface, type the following:

*IDN?

The instrument should identify itself with the following:

**Model NO,V.x.xx**

(x.xx represents the current firmware revision number.)
7.3. **Command set (RS232 & GPIB)**

<table>
<thead>
<tr>
<th>Command</th>
<th>Limits</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td></td>
</tr>
<tr>
<td>*CLS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*ESE (GPIB only)</td>
<td>0</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>*ESE?</td>
<td>0</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>*ESR?</td>
<td>0</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>*SRE?</td>
<td>0</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>*SRE?</td>
<td>0</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>*SRE?</td>
<td>0</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>*IDN?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*RST</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*TRG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*TST?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*WAI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*SRE?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*OPC?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*OPT?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.4. **Query message terminator**

In order for the device to recognize the end of a command or query message, a special terminator is required.

**CR LF**  
CR represents carriage return and is an ASCII code **0D** (CHR$(13) for basic),  
LF represents line feed and is an ASCII code **0A** (CHR$(10) for basic).

**Command Execution examples**

Example 1. To set Function to FREQ A and Gate time to 1S for the C3100  
You would send the following program message:  

```
F 0 ; G 10 CR LF
```

Example 2. How to get the response from a query message  
If you send a query message below  

```
MD ? CR LF
```

You would get the response below from a query message.  

```
- 1 9 . 9 9 9 9 CR LF
```
# 8. Commands Set for Products

## 8.1. C3100 Commands

### 8.1.1. Command Set

<table>
<thead>
<tr>
<th>Command set Name</th>
<th>Command</th>
<th>Format</th>
<th>Command description (Variables)</th>
</tr>
</thead>
</table>
| **Function**     | F       | F0     | F0=FREQ A  
F1=FREQ B  
F2=FREQ C  
F3=A→B  
F4=TOT.A  
F5=A/B  
F6=A-B  
F7=DTY.A  
F8=RPM A |
|                  |         | F?     | Function query |
| **Gate Time**    | G       | G0     | G0=50mS  
G1=100mS  
G2=200mS  
G3=300mS  
G4=400mS  
G5=500mS  
G6=600mS  
G7=700mS  
G8=800mS  
G9=900mS  
G10=1S  
G11=2S  
G12=3S  
G13=4S  
G14=5S  
G15=6S  
G16=7S  
G17=8S  
G18=9S  
G19=10S |
|                  |         | G?     | Gate time query |
| **Trigger level**| TA      | TA0    | -99~+99  
TA? | Trigger level query |
|                  | TB      |         | |
| **Slope**        | SA      | SA0    | 0 (+), 1 (-)  
SA? | Slope query |
|                  | SB      |         | |
| **Coupling**     | CA      | CA0    | 0 (DC), 1 (AC)  
CA? | Coupling query |
|                  | CB      |         | |
| **Attenuator**   | AA      | AA0    | 0(*1), 1 (*10)  
AA? | Attenuator query |
|                  | AB      |         | |
| **Low pass Filter** | LA     | LA0    | 0 (NOR), 1 (LPF)  
LA? | Low pass filter query |
|                  | LB      |         | |
| **Request Measurement** | RM | RM? | Request for measurement data |
| **Go to local (RS232C Only)** | GTL | GTL | Remote disable |
8.1.2. Command Features

The following examples will illustrate the specific features of the instrument remote programming commands using RS-232 or GPIB. All commands are executed immediately.

**Function** Command Execution examples

Example 1:
To set **FREQ A**
You would send the following program message:
\[ \Rightarrow F0 \]

Example 2:
To set **FREQ B**
You would send the following program message:
\[ \Rightarrow F1 \]

**Trigger** Command Execution examples

Example 1:
To set **Trigger level A 30**
You would send the following program message:
\[ \Rightarrow TA30 \]

Example 2:
To set **Trigger level B 30**
You would send the following program message:
\[ \Rightarrow TB30 \]

8.1.3. More in one line

It is allowed to combine multiple commands and/or queries with their respective data into one single line. To combine multiple commands and queries with their respective data, a separator must be used. The semicolon (;) is used as a separator between commands and/or queries. This separator is officially called a “program message unit separator”. The followings are the examples to combine multiple commands and/or queries.

Example 1:
To set **Func A, Trigger level A 30**
You would send the following program message:
\[ \Rightarrow F0;TA30 \]

Example 2:
To set **Func A, trigger level B, Slope A+**
You would send the following program message:
\[ \Rightarrow F0;TB30;SA0 \]
### 8.2. B4100 and B4200 Commands

#### 8.2.1. Command set

<table>
<thead>
<tr>
<th>Command set Name</th>
<th>Command</th>
<th>Format</th>
<th>Command description (Variables)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td>FUN</td>
<td>FUN0</td>
<td>FUN0=DCV&lt;br&gt;FUN1=ACV&lt;br&gt;FUN2=OHM&lt;br&gt;FUN3=BEEP&lt;br&gt;FUN4=DIODE&lt;br&gt;FUN5=FRQ&lt;br&gt;FUN6=DCuA&lt;br&gt;FUN7=DCmA&lt;br&gt;FUN8=DCA&lt;br&gt;FUN9=ACuA&lt;br&gt;FUN10=ACmA&lt;br&gt;FUN11=ACA</td>
</tr>
<tr>
<td>Range</td>
<td>RGE</td>
<td>RGE0</td>
<td>Each function has respective ranges. (Refer to Range description)</td>
</tr>
<tr>
<td>Hold</td>
<td>HLD</td>
<td>HLD0</td>
<td>HLD0=NOR&lt;br&gt;HLD1=HOLD</td>
</tr>
<tr>
<td>Measurement Data</td>
<td>MD</td>
<td>MD?</td>
<td>Measurement data query</td>
</tr>
<tr>
<td>Go to local (RS232C Only)</td>
<td>GTL</td>
<td>GTL</td>
<td>Remote Disable</td>
</tr>
</tbody>
</table>
### 8.2.2. Range description (Range Command Set)

<table>
<thead>
<tr>
<th>Range Name (Function)</th>
<th>Command</th>
<th>Format</th>
<th>Command Description (Variables)</th>
</tr>
</thead>
</table>
| DCV (FUN0)            | RGE     | RGE0   | RGE0=2V  
RGE1=20V  
RGE2=200V  
RGE3=1000V  
RGEA=AUTO (A is capital) |
|                       |         | RGE?   | Range query                      |
| ACV (FUN1)            | RGE     | RGE0   | RGE0=2V  
RGE1=20V  
RGE2=200V  
RGE3=1000V  
RGEA=AUTO (A is capital) |
|                       |         | RGE?   | Range query                      |
| OHM (FUN2)            | RGE     | RGE0   | RGE0=200Ω  
RGE1=2kΩ  
RGE2=20kΩ  
RGE3=200kΩ  
RGE4=2MΩ  
RGE5=20MΩ  
RGEA=AUTO (A is capital) |
|                       |         | RGE?   | Range query                      |
| BEEP (FUN3)           | RGE     | RGE0   | RGE0=2kΩ |
| DIODE (FUN4)          | RGE     | RGE0   | RGE0=2V |
| FRQ (FUN5)            | RGE     | RGE0   | RGE0=200Hz  
RGE1=2kHz  
RGE2=20kHz  
RGE3=200kHz  
RGE4=2MHz  
RGEA=AUTO (A is capital) |
|                       |         | RGE?   | Range query                      |
| DCuA (FUN6)           | RGE     | RGE0   | RGE0=200uA |
| DCmA (FUN7)           | RGE     | RGE0   | RGE0=200mA |
| DCA (FUN8)            | RGE     | RGE0   | RGE0=10A |
| ACuA (FUN9)           | RGE     | RGE0   | RGE0=200uA |
| ACmA (FUN10)          | RGE     | RGE0   | RGE0=200mA |
| ACA (FUN11)           | RGE     | RGE0   | RGE0=10A |
8.2.3. Command Features

The following examples will illustrate the specific features of the instrument remote programming commands using RS-232 or GPIB. All commands are executed immediately.

**FUN Command Execution examples**

Example 1:
To set DCV
You would send the following program message:
→ FUN0

Example 2:
To set FRQ
You would send the following program message:
→ FUN5

**HLD Command Execution examples**

Example 1:
To freeze the screen
You would send the following program message:
→ HLD1

Example 2:
To resume your measurement
You would send the following program message:
→ HLD0

8.2.4. More in one line

It is allowed to combine multiple commands and/or queries with their respective data into one single line. To combine multiple commands and queries with their respective data, a separator must be used. The semicolon (;) is used as a separator between commands and/or queries. This separator is officially called a "program message unit separator". The followings are the examples to combine multiple commands and/or queries.

Example 1:
To set DCV, 20V
You would send the following program message:
→ FUN0;RGE1

Example 2:
To set OHM, AUTO
You would send the following program message:
→ FUN2;RGEA
### 8.3. G5100 Commands

#### 8.3.1. Command set

<table>
<thead>
<tr>
<th>Command set Name</th>
<th>Command</th>
<th>Format</th>
<th>Command description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waveform</strong></td>
<td>WFM</td>
<td>WFM0</td>
<td>WFM0=SINE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WFM1</td>
<td>WFM1=TRI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WFM2</td>
<td>WFM2=SQUARE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WMF?</td>
<td>WAVEFORM query</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>OUT</td>
<td>OUT0</td>
<td>OUT0= OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OUT1</td>
<td>OUT1= ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OUT?</td>
<td>OUTPUT query</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>FRQ</td>
<td>FRQ1Hz</td>
<td>Frequency=1Hz~15.00MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FRQ?</td>
<td>Frequency query</td>
</tr>
<tr>
<td><strong>Amplitude</strong></td>
<td>AMP</td>
<td>AMP0</td>
<td>Amplitude=0~999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AMP?</td>
<td>Amplitude query</td>
</tr>
<tr>
<td><strong>Offset</strong></td>
<td>OFS</td>
<td>OFS0</td>
<td>Offset=-999~+999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFS?</td>
<td>Offset query</td>
</tr>
<tr>
<td><strong>Attenuator</strong></td>
<td>ATN</td>
<td>ATN0</td>
<td>ATN0=OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ATN1</td>
<td>ATN1=ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ATN?</td>
<td>Attenuator query</td>
</tr>
<tr>
<td><strong>Symmetry</strong></td>
<td>SYM</td>
<td>SYM0</td>
<td>Symmetry=0~99.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SYM?</td>
<td>Symmetry query</td>
</tr>
<tr>
<td><strong>Sweep</strong></td>
<td>SWP</td>
<td>SWP0</td>
<td>SWP0=OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SWP1</td>
<td>SWP1=ON</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SWP?</td>
<td>Sweep query</td>
</tr>
<tr>
<td></td>
<td>SWR</td>
<td>SWR0.05</td>
<td>Sweep rate =0.05~9.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Sweep rate step: 0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SWR?</td>
<td>Sweep rate query</td>
</tr>
<tr>
<td></td>
<td>SWW</td>
<td>SWW0</td>
<td>Sweep width=0~99</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SWW?</td>
<td>Sweep width query</td>
</tr>
<tr>
<td><strong>Go to local</strong></td>
<td>GTL</td>
<td>GTL</td>
<td>Remote disable</td>
</tr>
</tbody>
</table>

*Go to local (RS232C Only)*
8.3.2. Command Features
The following examples will illustrate the specific features of the instrument remote programming commands using RS-232 or GPIB. All commands are executed immediately.

**WFM Command Execution examples**
- **Example 1:**
  To set *SINE* waveform
  You would send the following program message:
  \[ \text{WFM0} \]

- **Example 2:**
  To set *TRI* waveform
  You would send the following program message:
  \[ \text{WFM1} \]

**FRQ Command Execution examples**
- **Example 1:**
  To set 1kHz
  You would send the following program message:
  \[ \text{FRQ1kHz} \]

- **Example 2:**
  To set 10kHz
  You would send the following program message:
  \[ \text{FRQ10kHz} \]

**Note:**
* When you enter FRQ1.5kHz, the instrument generates 1.500kHz automatically.
* When you enter FRQ1.5MHz, the instrument generates 1.500MHz automatically.

8.3.3. More in one line
It is allowed to combine multiple commands and/or queries with their respective data into one single line. To combine multiple commands and queries with their respective data, a separator must be used. The semicolon (;) is used as a separator between commands and/or queries. This separator is officially called a "program message unit separator". The followings are the examples to combine multiple commands and/or queries.

- **Example 1:**
  To generate sine waveform, 1kHz
  You would send the following program message:
  \[ \text{WFM0;FRQ1kHz} \]

- **Example 2:**
  To generate sine waveform, 1kHz, Amplitude 50
  You would send the following program message:
  \[ \text{WFM0;FRQ1kHz;AMP50} \]
### 8.4. P6100 Commands

#### 8.4.1. Command set

<table>
<thead>
<tr>
<th>Command set Name</th>
<th>Command</th>
<th>Format</th>
<th>Command description (Variables)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Output</td>
<td>P</td>
<td>PON</td>
<td>ON = Positive on (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OOF = Positive off (0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PON?</td>
<td>Positive output query</td>
</tr>
<tr>
<td>Positive voltage</td>
<td>PV</td>
<td>PV0</td>
<td>V0 = Positive voltage PV0~29.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PV?</td>
<td>Positive voltage query</td>
</tr>
<tr>
<td>Positive Ampere</td>
<td>PA</td>
<td>PA1</td>
<td>A1 = Positive ampere PA0~2.999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PA?</td>
<td>Positive ampere query</td>
</tr>
<tr>
<td>Negative Output</td>
<td>N</td>
<td>NON</td>
<td>N0 = Negative on (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NON?</td>
<td>Negative output query</td>
</tr>
<tr>
<td>Negative Voltage</td>
<td>NV</td>
<td>NV0</td>
<td>V0 = Negative voltage NV0~29.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NV?</td>
<td>Negative voltage query</td>
</tr>
<tr>
<td>Negative Ampere</td>
<td>NA</td>
<td>NA1</td>
<td>A1 = Negative ampere NA0~2.999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NA?</td>
<td>Negative ampere query</td>
</tr>
<tr>
<td>Fixation output</td>
<td>F</td>
<td>FON</td>
<td>ON = fixation on (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FON?</td>
<td>Fixation query</td>
</tr>
<tr>
<td>Fixed current</td>
<td>FA</td>
<td>FA1</td>
<td>A1 = Fixed current FA0~1.999</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FA?</td>
<td>Fixed current query</td>
</tr>
<tr>
<td>Tracking</td>
<td>T</td>
<td>TON</td>
<td>ON = Tracking on (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TON?</td>
<td>Tracking query</td>
</tr>
<tr>
<td>Go to local (RS232C only)</td>
<td>GTL</td>
<td>GTL</td>
<td>GTL Remote disable</td>
</tr>
</tbody>
</table>
8.4.2. **Command Features**
The following examples will illustrate the specific features of the instrument remote programming commands using RS-232 or GPIB. All commands are executed immediately.

**PV Command Execution examples**
Example 1:
To set +10.00V
You would send the following program message:
> PV10

Example 2:
To set +15.00V
You would send the following program message:
> PV15

**PA Command Execution examples**
Example 1:
To set 1.000A
You would send the following program message:
> PA1

Example 2:
To set 2.000A
You would send the following program message:
> PA2

8.4.3. **More in one line**
It is allowed to combine multiple commands and/or queries with their respective data into one single line. To combine multiple commands and queries with their respective data, a separator must be used. The semicolon (;) is used as a separator between commands and/or queries. This separator is officially called a "program message unit separator". The followings are the examples to combine multiple commands and/or queries.

Example 1:
To set **10V**, tracking on.
You would send the following program message:
> PV10;TON

Example 2:
To set **Positive output off, Negative voltage 5V, Negative current 1.0A**
You would send the following program message:
> POF;NV5;NA1.0
9. Installing and Removing the IEEE-488.2 Interface

[Figure GP-01] Disassembly
[Figure GP-02] IEEE-488.2(GPIB) Module Assembly

[Figure GP-03] Assembly Layout
9.1. **Installing the IEEE-488.2 Interface**

Use the following procedure to install the IEEE-488.2 Interface Option.

1) Make sure the meter is turned off and unplugged from the power outlet.
2) Remove the four mounting screws on the bottom of case. (See Figure GP-01)
3) Remove the two screws and the retainer plate on the rear panel. (See Figure GP-03)
4) Remove the two bolt of GPIB Connector at IEEE-488.2 MODULE. (See Figure GP-02)
5) The head of GPIB in IEEE-488.2 MODULE slips into the hole of GPIB in the rear panel of the meter. (See Figure GP-03)
6) Secure the rear of the IEEE-488.2 MODULE with the bolt of GPIB Connector.
7) Connect the 7-line cable to the Main PCB Assembly. (See Figure GP-03)
   The cable fits in only one socket and in only one direction. Make sure the cables lock firmly in place.
8) Reinstall the meter case so it seats properly in the front panel and secure the case with the flathead Phillips screw in the bottom.

9.2. **Removing the IEEE-488.2 Interface**

The following instructions can be used for access and servicing an IEEE-488.2 Interface Option that is already installed in a Seintek bench top series.

1) Make sure the meter is turned off and unplugged from the power outlet.
2) Remove the four mounting screws on the bottom of case. (See Figure GP-01)
3) Using needle nose pliers, disconnect the 7-line cable at the Main PCB Assembly. (See Figure GP-03)
4) Remove the two bolt of GPIB Connector on the rear panel. (See Figure GP-03)
5) Install the two screws and the retainer plate on the rear panel. (See Figure GP-03)
6) Reinstall the meter case so it seats properly in the front panel and secure the case with the flathead Phillips screw in the bottom.

9.3. **Performance Testing**

Use the performance test program in Table GP-01 to verify operation of the IEEE-488.2 Interface.
This program is written for use with the Seintek Instrument Controller and its interpreted BASIC language. The program may be adapted to the language of any IEEE-488.2 controller.
This performance test communicates to a meter that has been configured for IEEE-488.2 operation at address 0.

Lines 160 and 170 initialize the IEEE-488.2 bus and send a selective device clear to the meter.
A multiple byte command is sent to the meter (by line 190) to clear the meter status. Another command sequence (including a query) is sent to the meter by line 210; the meter asserts Service Request (SRQ) to signal that a response is available. Lines 530 through 560 first poll the meter for status, then input the response from the meter. Lines 230 through 270 test for proper operation and print the results.
140 IA% = 0% ! instrument IEEE address
150 S% = -1% ! initialize spl response
160 TERM ! terminate input only on EOI
170 INIT PORT 0 ! initialize IEEE-488.2 bus
180 CLEAR @IA% ! selective device clear
190 PRINT @IA%,”*cls” ! clear instrument status
200 ON SRQ GOTO 530 ! enable SRQ interrupt
210 PRINT @IA%,”*cls;*sre 16;*idn?” ! SRQ on Message Available
220 WAIT 500% FOR SRQ ! allow time to execute commands
230 IF S% >= 0% THEN 260
240 PRINT “Instrument failed to generate a Service Request”
250 STOP
260 PRINT ”Serial Poll =”;S%;“(should be 80).”
270 PRINT ”Identification Query Response = “;R$
280 STOP
500 !
510 ! Service Request interrupt
520 !
530 S% = SPL(IA%) ! get instrument serial poll status
540 IF S% AND 16% THEN 550 ELSE 560
550 INPUT LINE @IA%,R$ ! if MAV set get the response
560 RESUME 230 ! end of SRQ interrupt
999 END

[Table GP-01] IEEE-488 Interface Performance Test

9.4. List of Replaceable Parts

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Parts Code</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>U2</td>
<td>10278F0058GC</td>
<td>IC,Micom,UPD78F0058GC-8BT</td>
<td>1</td>
</tr>
<tr>
<td>U1</td>
<td>19275ALS1600</td>
<td>IC,T.I 75ALS160 SOP</td>
<td>1</td>
</tr>
<tr>
<td>U3</td>
<td>19275ALS1610</td>
<td>IC,T.I 75ALS161 SOP</td>
<td>1</td>
</tr>
<tr>
<td>R1</td>
<td>202ECJ1K0000</td>
<td>CHIP RES,2012 1kohm (102) 5%</td>
<td>1</td>
</tr>
<tr>
<td>C1,C6,C7</td>
<td>301EFK104000</td>
<td>CER CAP,2012 Y5V 50V 104(0.1uF)</td>
<td>3</td>
</tr>
<tr>
<td>C3,C4</td>
<td>301EFK20P000</td>
<td>CER CAP,2012 COG 50V 200(20pF)</td>
<td>2</td>
</tr>
<tr>
<td>C2,C5</td>
<td>306HTA475000</td>
<td>CHIP TANTAL CAP,4.7uF/16V A case</td>
<td>2</td>
</tr>
<tr>
<td>X1</td>
<td>3414M1943041</td>
<td>CRYSTAL,4.194314MHz,SMD,20pF</td>
<td>1</td>
</tr>
<tr>
<td>J2</td>
<td>50224PC00000</td>
<td>Connector,Centronic, 24P,Right Angle</td>
<td>1</td>
</tr>
<tr>
<td>J1</td>
<td>5317P5264000</td>
<td>Harness MOLEX-5264 to 51088-7PIN</td>
<td>1</td>
</tr>
<tr>
<td>J1</td>
<td>703799000000</td>
<td>PCB for GPIB CARD</td>
<td>1</td>
</tr>
<tr>
<td>J1</td>
<td>844BOSSGPIB0</td>
<td>BOSS, 7X14 ,Connector Hex</td>
<td>2</td>
</tr>
</tbody>
</table>

[Table GP-02] IEEE-488 Part List
10. MEMO