The **GS-232A** provide digital control of most models of Yaesu antenna rotators from the serial port of an external personal computer.

The **GS-232A** contains its own microprocessor with ROM and RAM (memory), and a 10-bit analog-to-digital (A-D) converter. The 3-wire async serial line can be configured for serial data rates from 150 to 9600 baud. The **GS-232A** has a DB-9 “male” connector for connection to the (RS-232C) COM port of your computer. Purchase or construct a “straight” type serial cable, ensuring it has the correct gender and number of pins for connection to your system.

Firmware on the **GS-232A** supports either direct keyboard control, or commands from programs written specifically to support it (software is not supplied by Yaesu). In addition to reading and setting antenna angle and rotation speed, the firmware includes clocked positioning routines to automatically step the antenna through up to 3800 angles at programmable intervals, such as for tracking band openings or satellites (with an elevation rotator).

Please read this manual carefully to install the **GS-232A**. If also installing a **G-400**, **G-500A** or **G-550** with the **GX-500** Automatic Control Adapter, follow the procedures in the **GX-500** manual before installing the **GS-232A**.


**G-400 Azimuth Rotator and G-500A/G-550 Elevation Rotator requires one GX-500 Automatic Control Adapter each.**
**GENERAL**

- **Power Requirements**: DC 12 V, 110 mA
- **Case Size**: 110 (W) x 21 (H) x 138 (D) mm
- **Weight (approx.)**: 380 g

**Semiconductors**
- **Microprocessor**: HD6303XP
- **ROM**: 27C64
- **RAM**: 6264
- **A/D Converter**: HD46508PA (10 bits)
- **Serial Comms**: 3-wire Async. DCE
  - RS-232C voltage levels,
  - 150 to 9600 baud, 8 data bits,
  - 1 stop bit, no parity, no handshake

**CONNECTOR PINOUTS**

**Serial I/O:**
- 9-pin DB-9 connector (**RS-232C** connector)
  - Pin 2 - Tx Data
  - Pin 3 - Rx Data
  - Pin 5 - Signal Ground

**Rotator Control:**
- 5-pin connector (**EL** connector)
  - Pin 1 - UP switch (open collector)
  - Pin 2 - DOWN switch (open collector)
  - Pin 3 - analog output (0.5 - 4.5 V, four steps)
  - Pin 4 - analog input (0-5V elevation)
  - Pin 5 - analog ground

- 5-pin connector (**AZ** connector)
  - Pin 1 - RIGHT switch (open collector)
  - Pin 2 - LEFT switch (open collector)
  - Pin 3 - analog output (0.5 - 4.5 V, four steps)
  - Pin 4 - analog input (0-5V azimuth)
  - Pin 5 - analog ground
### Supplied Accessories

- Control cable for the Azimuth Rotator*1 .................. 1 pc
  (“5-pin” ↔ “Min-DIN” cable)
- Control cable for the Az/El Rotator*2 .................. 1 pc
  (“Dual 5-pin” ↔ “DIN” cable)
- DC cable w/coaxial plug ........................................ 1 pc
- Hook & loop fasteners (for mounting) .............. 1 pc

*1: G-5400B-G-5600B/G-5500
*2: G-800DXA/G-1000DXA/G-2800DXA &
    G-800DXC/G-1000DXC/G-2800DXC

### Available Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GX-500</td>
<td>Control Adapter (GS-232A version) (Check with your dealer)</td>
</tr>
<tr>
<td>C-1000</td>
<td>Connection Cable (for SDX series Azimuth Rotator)</td>
</tr>
<tr>
<td>NC-72B/C/F/U</td>
<td>AC Adapter</td>
</tr>
</tbody>
</table>

*3: “B” suffix is for use with 117 VAC,
    “C” suffix is for use with 220-240 VAC,
    “F” suffix is for use with 220 VAC, or
    “U” suffix is for use with 230 VAC
During installation, a personal computer with a serial port and terminal software is required to calibrate trimmers on the Controller and on the Control Interface. Any simple interactive terminal program can be used - it only has to transmit keystrokes as typed, and display characters received from the **GS-232A**.

**POWER & CONTROL CONNECTIONS**

**DXA or DXC Series Azimuth Rotator**

- Connect the supplied DC cable to a source of 12 VDC. The red lead connects to the Positive (+) DC terminal, and the black lead connects to the Negative (–) DC terminal. The **GS-232A** requires 110 mA. The supplied cable has a 500-mA fast-blow fuse. Use only the same type fuse for replacement.

- Plug the coaxial power connector into the **DC 12V** jack on the **GS-232A** rear panel.

- Connect the supplied Control cable ("5-pin" → "Mini-DIN") between the **EXT CONTROL** connector on the rotator’s controller and **AZ** connector on the rear panel of the **GS-232A** (Figure 1).

---

**Figure 1**

DXA or DXC series Azimuth Rotator

To DC 12V Power Source

To Serial port of the computer
**Power & Control Connections**

**G-5400B/-5600B Az-El Rotator**

- Connect the supplied DC cable to a source of 12 VDC. The red lead connects to the Positive (+) DC terminal, and the black lead connects to the Negative (−) DC terminal. The GS-232A requires 110 mA. The supplied cable has a 500-mA fast-blow fuse. Use only the same type fuse for replacement.
- Plug the coaxial power connector into the DC 12V jack on the GS-232A rear panel.
- Connect the supplied Control cable (“Dual 5-pin” ↔ “DIN”) between the rotator’s controller and GS-232A. Be careful to match the “AZ” and “EL” labels on the cable with the same labels on the rear panel of the GS-232A (Figure 2).

**G-400/G-500 or G-400/G-550 & pair of GX-500**

- Connect the supplied DC cable to a source of 12 VDC. The red lead connects to the Positive (+) DC terminal, and the black lead connects to the Negative (−) DC terminal. The GS-232A requires 110 mA. The supplied cable has a 500-mA fast-blow fuse. Use only the same type fuse for replacement.
- Plug the coaxial power connector into the DC 12V jack on the GS-232A rear panel.
- Connect the 5-pin to 5-pin cable (supplied with the GX-500; requires two sets) between the GX-500(s) and GS-232A (Figure 3).
**POWER & CONTROL CONNECTIONS**

**SDX Series Azimuth Rotator**

- Prepare the optional **C-1000** Connection Cable.
- Remove the Top cover from the controller.
- Connect the 8-pin connector of the **C-1000** Connection cable to the exposed 8-pin connector located the rear left corner in the controller.
- Route the 5-pin connector of the **C-1000** Connection cable through out the rubber grommet on the rear panel of the controller, and connect it to the **AZ** connector on the rear panel of the **GS-232A** (Figure 4).
- Replace the Top Cover.

- Connect the supplied DC cable to a source of 12 VDC. The red lead connects to the Positive (+) DC terminal, and the black lead connects to the Negative (–) DC terminal. The **GS-232A** requires 110 mA. The supplied cable has a 500-mA fast-blow fuse. Use only the same type fuse for replacement.
- Plug the coaxial power connector into the **DC 12V** jack on the **GS-232A** rear panel.

---

**Figure 4**

Diagram showing connections and components.

**To DC 12V Power Source**

**To Serial port of the computer**

**Optional C-1000 Connection Cable**

**Output Grommet for C-1000 Connection Cable**

**SDX series Azimuth Rotator**

**Exposed 8-pin Connector (Inside of the Controller)**
With the computer switched off, connect the RS-232C cable to the serial port of the computer, then connect the other end of your serial cable to the RS-232C connector on the rear panel of the **GS-232A**. Only three wires are used for serial control, so there is no hardware handshaking.

If you are using a **G-400** Azimuth Rotator, or **G-5400B/G-5600B** Az-El Rotator, set the **GS-232A**’s DIP switch (switch 5) to “OFF” position, to disable the 450° rotate operation. If you are using other rotators (except the **G-400/G-5400B** and **G-5600B**), the **GS-232A**’s DIP switch (switch 5) is still “ON.”

Select the desired data baud rate with the DIP switch bank on the **GS-232A**’s bottom case.

The Control Interface serial data format uses 8 data bits, no parity, and one stop bit, with no handshaking. Turn on the computer, controller, and **GS-232A**, and set up your terminal program for this format and your selected data rate on the serial port to be used for rotator control.

### Baud Setting DIP Switches

<table>
<thead>
<tr>
<th>Baud</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>ON</td>
</tr>
<tr>
<td>9600</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>
**DXA/DXC/SDX Series Azimuth Rotator**

### Azimuth Offset Null
- Before calibrate the Rotator, check to see that the GS-232A’s DIP switch (switch 5) must be “ON” position.
- From the Controller panel, set the Rotator fully counter-clockwise (set to 0°).
- Press [O] → [+] (the letter “oh”, and “ENTER”) on the computer keyboard to activate the azimuth calibration routine. The computer display should show \( AZaaaa = bbbb \) returned from the Interface Board, where \( aaaa \) and \( bbbb \) are four-digit numbers padded at the left with zeroes.
- Adjust the \( AZ \) trimmer (located on the bottom case of the GS-232A) while watching the computer display, until the four-digit numbers \( aaaa \) and \( bbbb \) are the same (the precise values are not important).
- Turn off the GS-232A’s POWER switch to exit the azimuth calibration routine, then turn on the GS-232A’s POWER switch again.

### Azimuth A-D Calibration
- From the Controller panel, set the Rotator fully clockwise (to the right).
- Press [F] → [+] (“F” and “ENTER”) on the computer keyboard to activate the Control Interface’s azimuth A-D converter calibration routine. The computer’s display should show +\( aaaa \), where \( aaaa \) is a four-digit number which indicates the azimuth heading in degrees.
- Adjust the \( OUT\ VOL\ ADJ \) potentiometer on Controller rear panel so as to get a reading of “0450” on the computer’s display. This reading (“450 degrees”) corresponds to the actual beam heading you established when you pointed the azimuth rotator to the East.
- Turn off the GS-232A’s POWER switch to exit the azimuth A-D converter calibration routine, then turn on the GS-232A’s POWER switch again.

---

**Important Note!**

If your controller’s indicator needle starts from the point except 0° (North) (such as the default setting of the USA version), align the starting point of the controller’s indicator needle to 0° (North) before calibration.

When finish the calibration, set the controller’s indicator needle to the desired point. Refer to the rotator’s user manual for details regarding the indicator needle alignment.
Azimuth Offset Null
☐ Before calibrating the Rotator, check to see that the GS-232A’s DIP switch (switch 5) is set to the “OFF” position.
☐ From the Controller panel, set the Rotator fully counterclockwise (set to 180°).
☐ Press [0] → [.] (the letter “oh”, and “ENTER”) on the computer keyboard to activate the azimuth calibration routine. The computer display should show Azaaaa = bbbb returned from the Interface Board, where aaaa and bbbb are four-digit numbers padded at the left with zeroes.
☐ Adjust the AZ trimmer (located on the bottom case of the GS-232A) while watching the computer display, until the four-digit numbers aaaa and bbbb are the same (the precise values are not important).
☐ Turn off the GS-232A’s POWER switch to exit the azimuth calibration routine, then turn on the GS-232A’s POWER switch again.

Azimuth A-D Calibration
☐ From the Controller panel, set the Rotator fully clockwise (to the right).
☐ Press [F] → [.] (“F” and “ENTER”) on the computer keyboard to activate the Control Interface’s azimuth A-D converter calibration routine. The computer’s display should show +aaaa, where aaaa is a four-digit number which indicates the azimuth heading in degrees.
☐ Adjust the FULL SCALE ADJ on the GX-500 so as to get a reading of “0180” on the computer’s display. This reading (“180 degrees”) corresponds to the actual beam heading you established when you pointed the azimuth rotator to the South (the fully clockwise setting).
☐ Turn off the GS-232A’s POWER switch to exit the azimuth A-D converter calibration routine, then turn on the GS-232A’s POWER switch again to turn it back on.
Azimuth Offset Null

- Before calibrating the Rotator, check to see that the GS-232A’s DIP switch (switch 5) is set to the “OFF” position.
- From the Controller panel, set the Azimuth Rotator fully counter-clockwise (set to 180°).
- Press [0] → [L] (the letter “oh”, and “ENTER”) on the computer keyboard to activate the azimuth calibration routine. The computer display should show AZaaaa = bbbb returned from the Interface Board, where aaaa and bbbb are four-digit numbers padded at the left with zeroes.
- Adjust the AZ trimmer (located on the bottom case of the GS-232A) while watching the computer display, until the four-digit numbers aaaa and bbbb are the same (the precise values are not important).
- Turn off the GS-232A’s POWER switch to exit the azimuth calibration routine, then turn on the GS-232A’s POWER switch again.

Azimuth A-D Calibration

- From the Controller panel, set the Azimuth Rotator fully clockwise (to the right).
- Press [F] → [L] (“F” and “ENTER”) on the computer keyboard to activate the Control Interface’s azimuth A-D converter calibration routine. The computer’s display should show +aaaa, where aaaa is a four-digit number which indicates the azimuth heading in degrees.
- Adjust the OUT VOL ADJ potentiometer on the “AZMUTH” (left) side of the Controller rear panel so as to get a reading of “0180” on the computer’s display. This reading (“180 degrees”) corresponds to the actual beam heading you established when you pointed the azimuth rotator to the South.
- Turn off the GS-232A’s POWER switch to exit the azimuth A-D converter calibration routine, then turn on the GS-232A’s POWER switch again.
Elevation Offset Null

- From the Controller panel, set the Elevation Rotator to the “left” horizon (down, set to 0°).
- Press [O2] → [J] (the letter “oh,” “2,” and “ENTER”) on the computer keyboard to activate the elevation calibration routine. The computer will return $\text{AZ} = \text{bbbb}$, as in the previous procedure, $\text{EL} = \text{dddd}$ to the right, where $\text{cccc}$ and $\text{dddd}$ are four-digit numbers padded at the left with zeroes.
- Adjust the EL trimmer (located on the bottom case of the GS-232A), so as to make the numbers $\text{cccc}$ and $\text{dddd}$ are the same (again, the actual values are unimportant).
- Turn off the GS-232A’s POWER switch to exit the elevation calibration routine, then turn on the GS-232A’s POWER switch again to turn it back on.

Elevation A-D Calibration

- From the Controller panel, set the Elevation Rotator to full scale (180°: “right” horizon).
- Press [F2] → [J] (F, 2, and ENTER) on the computer keyboard to activate the Control Interface’s elevation A-D converter calibration routine. The computer will display $\text{aaaa} + \text{eeee}$, where $\text{eeee}$ is a four-digit number which indicates the elevation heading in degrees. For the purposes of this alignment, you may ignore the (azimuth) $\text{aaaa}$ numbers.
- Adjust the OUT VOL ADJ potentiometer on the “ELEVATION” (right) side of the Controller rear panel so as to get a reading of “0180” on the computer’s display. This reading (“180 degrees”) corresponds to the actual beam heading you established when you pointed the elevation rotator to the 180° position.
- Turn off the GS-232A’s POWER switch to exit the elevation A-D converter calibration routine, then turn on the GS-232A’s POWER switch again to turn it back on.
Azimuth Offset Null
☐ Before calibrating the Rotator, check to see that the GS-232A’s DIP switch (switch 5) is set to the “ON” position.
☐ From the Controller panel, set the Rotator fully counterclockwise (set to 0°).
☐ Press [0] → [.] (the letter “oh”, and “ENTER”) on the computer keyboard to activate the azimuth calibration routine. The computer display should show 𝑎𝑎𝑎𝑎 = 𝑏𝑏𝑏𝑏 returned from the Interface Board, where 𝑎𝑎𝑎𝑎 and 𝑏𝑏𝑏𝑏 are four-digit numbers padded at the left with zeroes.
☐ Adjust the 𝐴𝐙 trimmer (located on the bottom case of the GS-232A) while watching the computer display, until the four-digit numbers 𝑎𝑎𝑎𝑎 and 𝑏𝑏𝑏𝑏 are the same (the precise values are not important).
☐ Turn off the GS-232A’s POWER switch to exit the azimuth calibration routine, then turn on the GS-232A’s POWER switch again.

Azimuth A-D Calibration
☐ From the Controller panel, set the Azimuth Rotator fully clockwise (to the right).
☐ Press [F] → [.] (F and ENTER) on the computer keyboard to activate the Control Interface’s azimuth A-D converter calibration routine. The computer’s display should show +𝑎𝑎𝑎𝑎, where 𝑎𝑎𝑎𝑎 is a four-digit number which indicates the azimuth heading in degrees.
☐ Adjust the OUT VOL ADJ potentiometer on the “AZI-MUTH” (left) side of the Controller rear panel so as to get a reading of “0450” on the computer’s display. This reading (“0450: 360 degrees + 90 degrees”) corresponds to the actual beam heading you established when you pointed the azimuth rotator fully clockwise.
☐ Turn off the GS-232A’s POWER switch to exit the azimuth A-D converter calibration routine, then turn on the GS-232A’s POWER switch again.
G-5500 Az-El Rotator

Elevation Offset Null

- From the Controller panel, set the Elevation Rotator to the “left” horizon (down, set to 0°).
- Press [O2] → [±] (the letter “oh,” “2,” and “ENTER”) on the computer keyboard to activate the elevation calibration routine. The computer will return AZaaaa = bbbb, plus ELcccc = dddd to the right, where cccc and dddd are four-digit numbers padded at the left with zeroes.
- Adjust the EL trimmer (located on the bottom case of the GS-232A), so as to make the numbers cccc and dddd are the same (again, the actual values are unimportant).
- Turn off the GS-232A’s POWER switch to exit the elevation calibration routine, then turn on the GS-232A’s POWER switch again to turn it back on.

Elevation A-D Calibration

- From the Controller panel, set the Elevation Rotator to full scal (180°: “right” horizon).
- Press [F2] → [±] (F, 2, and ENTER) on the computer keyboard to activate the Control Interface’s elevation A-D converter calibration routine. The computer will display +aaaa+eeee, where eeee is a four-digit number which indicates the elevation heading in degrees. For the purposes of this alignment, you may ignore the (azimuth) aaaa numbers.
- Adjust the OUT VOL ADJ potentiometer on the “ELevation” (right) side of the Controller rear panel so as to get a reading of “0180” on the computer’s display. This reading (“180 degrees”) corresponds to the actual beam heading you established when you pointed the elevation rotator to the 180° position.
- Turn off the GS-232A’s POWER switch to exit the elevation A-D converter calibration routine, then turn on the GS-232A’s POWER switch again to turn it back on.
Elevation Offset Null

- From the Controller panel, set the Elevation Rotator to the “left” horizon (down, set to 0°).
- Press [O2] → [→] (the letter “oh,” “2,” and “Enter”) on the computer keyboard to activate the elevation calibration routine. The computer will return \( AZ_{aaaa} = bbbb \), as in the previous procedure, plus \( EL_{cccc} = dddd \) to the right, where \( cccc \) and \( dddd \) are four-digit numbers padded at the left with zeroes.
- Adjust the EL trimmer (located on the bottom case of the GS-232A), so as to make the numbers \( cccc \) and \( dddd \) are the same (again, the actual values are unimportant).
- Turn off the GS-232A’s POWER switch to exit the elevation calibration routine, then turn on the GS-232A’s POWER switch again to turn it back on.

Elevation A-D Calibration

- From the Controller panel, set the Elevation Rotator to full scale (180°: “right” horizon).
- Press [F2] → [→] (F, 2, and Enter) on the computer keyboard to activate the Control Interface’s elevation A-D converter calibration routine. The computer will display \(+aaaa+eeee\), where \( eeee \) is a four-digit number which indicates the elevation heading in degrees. For the purposes of this alignment, you may ignore the (azimuth) \( aaaa \) numbers.
- Adjust the OUT VOL ADJ potentiometer on the GX-500 so as to get a reading of “0180” on the computer’s display. This reading (“180 degrees”) corresponds to the actual beam heading you established when you pointed the elevation rotator to the 180° position.
- Turn off the GS-232A’s POWER switch to exit the elevation A-D converter calibration routine, then turn on the GS-232A’s POWER switch again to turn it back on.
If you wish, you can mount the **GS-232A** on top of your Rotator Controller using the two supplied hook-and-loop fastener strips. Just remove the backing from one side of each strip, and press into place on the bottom of the **GS-232A**. Then remove the backing from the other side, and press the **GS-232A** into place on the Controller.

After installation and calibration, the Control Interface can accept commands entered directly from the keyboard, or from a program written specifically to support it (not supplied by Yaesu). For brief summaries of the commands recognized by the Control Interface, press `[H] → [\_]` for a list of azimuth commands, or `[H2] → [\_]` for elevations commands. Keep in mind that all commands require that the **ENTER** key be pressed after the command letter (or “**0D**h” be sent by a control program), although we will not repeat this when discussing the commands. Also note that any command letter may be sent in either upper or lower case. The info screens shown on the next page will be returned by the Control Interface.

Most commands have two versions: one for azimuth, and one for elevation. Commands are not echoed by the Control Interface, but a carriage return character (“**0D**h”) is returned after every command, and also a line feed character (“**0Ah**”) if the command invoked returned data. Invalid commands cause “? >” to be returned and the input buffer cleared. Note that all angles are in degrees, beginning with zero at the most counterclockwise azimuth (or horizontal elevation). Angles sent to the Control Interface must be 3 digits long (left-zero-padded), and angles returned will, in some cases, be 4 digits long with a leading “+0.”
In the following command descriptions, the elevation version of each command, where there is one, is shown in parentheses (but don’t type the parentheses). Remember that elevation commands require the G-5400B, G-5600B or G-5500 Az/El Rotators, or the GX-500 adapter and the G-500 or G-550 Elevation Rotator.

0 (02)
Offset calibration for internal AZ (EL) trimmer potentiometer: preset rotator manually fully counter-clockwise, send command, and adjust trimmer on Control Interface until returned values are equal. Turn off the GS-232A’s POWER switch to store settings.

H (H2)
Returns list of commands (see page 19).

F (F2)
Full Scale Calibration: preset rotator manually to full scale, send command, adjust OUT VOL ADJ trimmer on rear of controller (or GX-500 elevation adapter) until the returned data is “+0180” or “+0450” (“+0nnn+0180” for elevation). Turn off the GS-232A’s POWER switch to save new settings.

R (U)
Start turning the rotator to the right (up)

L (D)
Start turning the rotator to the left (down).

A (E)
Stop azimuth (elevation) rotation.

S
Stop: cancel current command before completion.

C (B)
Return current azimuth (elevation) angle in the form “+0nnn” degrees.

C2
Return azimuth and elevation (“+0aaa+0eee”, where aaa = azimuth, eee = elevation).

Xn
Select azimuth rotator turning speed, where n = 1 (slowest) to 4 (fastest). This command can be issued during rotation, and takes effect immediately. There is no equivalent for elevation.
**Command List**

**Maaa**
Turn to **aaa** degrees azimuth, where **aaa** is three digits between “000” and “360 or 450: vary according to controller type.” Rotation starts.

**Msss aaa bbb ccc**
This command, together with the **[T]** command, provides automatic, timed tracking of moving objects or propagation by the Control Interface itself. This command stores the time value **sss** seconds to wait between stepping from azimuth **aaa** to **bbb**, and then to **ccc**, etc. (from “2” to as many as “3800” angles may be stored with one command).

Note that this command is completely different than the **[T]** command with only one parameter: when multiple parameters are present, the first one is interpreted by the Control Interface as the rotation interval **sss**, not an angle. Valid ranges are “001” to “999” for **sss**, and “000” to “360 or 450: vary according to controller type” for the angles. When this command is sent, the parameters are stored in the Control Interface’s RAM, and the rotator turns to angle **aaa** and waits for a subsequent **[T]** command to begin the actual stepping. All numbers must be 3 digits, space-separated. Stored values remain in effect until another **[M]** command is issued (this may have no parameters, in which case the “? >” error prompt is returned, but memories are still cleared), or until the controller is turned off or by toggling the **GS-232A** off and on.

**T**
See the **[M]** (above) and the **[W]** (below) command. Start automatic stepping routine (both azimuth and eievation): turn rotator to next sequentially memorized azimuth (or az-el pair, for the **[W]** command), wait **sss** seconds, and turn to next angle (or pair), etc. This command works only if a long-form **[M]** or **[W]** has been issued since power-up or the last reset.

**N**
Return serial number of currently selected memorized point **[nnnn]**, and total number of memorized points **[mmmm]**, in the form +**nnnn**+**mmmm**. Must be proceeded by either a long-form **[M]** or **[W]**, and a **T** command. Used only during stepping (see **[T]** command).

The meaning of a “point” in this command following an **[M]** command is only an azimuth angle, so in this case **nnnn** and **mmmm** can range up to “3800” (the limit of available RAM in the Control Interface). However, when elevation is involved, a “point” following a **[W]** command is represented by both an azimuth and an elevation angle, in which case **nnnn** and **mmmm** can range up to only “1900,” since each “point” is a pair of angles.
Elevation Control Commands

These commands are only for az-el operation. Note that an azimuth angle must always be supplied when changing elevation, and that a setting point consists of a pair of angles.

W aaa eee

Turn to aaa degrees azimuth and eee degrees elevation, where aaa is three digits between “000” and “360” or 450: vary according to controller type,” and eee is three digits between “000” and “180.” Rotators respond immediately.

W sss aaa eee aaa sss ...

This command is similar to the [M] command: the first parameter is a time interval, and succeeding parameters are angles. With this command, however, angles are in azimuth-elevation pairs, each pair representing one antenna location. At most “1900” pairs can be sent and stored in the Control Interface. As with the other commands, the time interval range is limited to “001” to “999” (seconds), azimuth to “000” to “360” or 450: vary according to controller type,” and elevation to “000” to “180.”

When this command is sent, the rotators turn to the first aaa azimuth parameter and the first eee elevation parameter, and wait for a subsequent [T] command to begin the actual stepping (to the next azimuth-elevation pair). Stored values remain in effect until another [W] command is issued (this may have no parameters, in which case the “? >” error prompt is returned, but memories are still cleared), or until the controller is turned off or by toggling the GS-232A off and on.
### COMMAND LIST

**Returned by [H] Command:**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Clockwise Rotation</td>
</tr>
<tr>
<td>L</td>
<td>Counter Clockwise Rotation</td>
</tr>
<tr>
<td>A</td>
<td>CW/CCW Rotation Stop</td>
</tr>
<tr>
<td>C</td>
<td>Antenna Direction Value</td>
</tr>
<tr>
<td>M</td>
<td>Antenna Direction Setting. M XXX</td>
</tr>
<tr>
<td>T</td>
<td>Time Interval Direction Setting. MTTT XXX XXX XXX ---</td>
</tr>
<tr>
<td>N</td>
<td>Start Command in the time interval direction setting mode.</td>
</tr>
<tr>
<td>X1</td>
<td>Total number of setting angles in &quot;M&quot; mode and traced number of all datas (setting angles)</td>
</tr>
<tr>
<td>X2</td>
<td>Rotation Speed 1 (Horizontal) Low</td>
</tr>
<tr>
<td>X3</td>
<td>Rotation Speed 2 (Horizontal) Middle 1</td>
</tr>
<tr>
<td>X4</td>
<td>Rotation Speed 3 (Horizontal) Middle 2</td>
</tr>
<tr>
<td>X5</td>
<td>Rotation Speed 4 (Horizontal) High</td>
</tr>
<tr>
<td>S</td>
<td>All Stop</td>
</tr>
<tr>
<td>O</td>
<td>Offset Calibration</td>
</tr>
<tr>
<td>F</td>
<td>Full Scale Calibration</td>
</tr>
</tbody>
</table>

**Returned by [H2] Command:**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>U</td>
<td>UP Direction Rotation</td>
</tr>
<tr>
<td>D</td>
<td>DOWN Direction Rotation</td>
</tr>
<tr>
<td>E</td>
<td>UP/DOWN Direction Rotation Stop</td>
</tr>
<tr>
<td>C2</td>
<td>Antenna Direction Value</td>
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<tr>
<td>W</td>
<td>Antenna Direction Setting. W XXX YYY</td>
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<tr>
<td>T</td>
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<td>N</td>
<td>Start Command in the time interval direction setting mode.</td>
</tr>
<tr>
<td>X1</td>
<td>Total number of setting angle in &quot;W&quot; mode and traced number of all datas (setting angles)</td>
</tr>
<tr>
<td>S</td>
<td>All Stop</td>
</tr>
<tr>
<td>O2</td>
<td>Offset Calibration</td>
</tr>
<tr>
<td>F2</td>
<td>Full Scale Calibration</td>
</tr>
<tr>
<td>B</td>
<td>Elevation Antenna Direction Value</td>
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