

MicroMax[®] GPS80 Interrupter

Installation and Configuration Guide

AMERICAN INNOVATIONS, LTD.

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Installation and Configuration Guide**

©American Innovations, Ltd.
<http://www.aiworldwide.com/>
12211 Technology Blvd • Austin, TX 78727
Phone: 512-249-3400 • Fax: 512-249-3444

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Chapter 1

Getting Started

Introduction

The MicroMax[®] GPS80 Interrupter is a programmable, GPS current interrupter. The information in this guide is intended for authorized service personnel who plan to install and configure the interrupter for service using the MicroMax GPS80 Interrupter Programmer software.

GPS80 Interrupter Overview

Rectifier interruption in the cathodic protection industry requires an accurate on-board clock with minimal drift to ensure synchronization between multiple interrupters over extended periods of time.

Traditionally, quartz crystal clocks are used but with the availability of GPS technology, the use of GPS receivers to ensure a highly accurate clock with zero drift has become the standard.

The GPS80 interrupter is a GPS synchronized current interrupter that is ideal for any interruption task. The device measures 5.5 inches x 3.5 inches x 1.25 inches and includes standard connections for 12V power, antenna, switch control, programming interface, and interruption activation/deactivation. It is an ideal solution for portable or permanent installation applications. See the figure on the next page for an example of the GPS80 interrupter.



Figure 1. GPS80 Interrupter

You can use the GPS80 interrupter in any of the following configurations:

- As a stand-alone portable interrupter that is small enough to fit inside any rectifier. It is capable of controlling almost any relay requiring a 0V/12VDC control signal.
- As a permanently installed interrupter inside a rectifier either as a retrofit or for OEM applications. The GPS80 interrupter can be activated manually or via a telemetry application.
- Packaged in a weatherproof portable case with backup batteries and with an optional built-in 60A mechanical relay.
- Interfaced with the Bullhorn® ICP (a satellite remote monitoring unit) for remote activation of an interruption cycle and alarm via e-mail or cell phone if interruption fails. The ICP is available as a robust, portable field unit or as a permanently installed unit.

The GPS80 interrupter includes the following features:

- GPS receiver and on-board clock that is updated every 15 seconds.
- On-board CPU with algorithm to achieve synchronization between multiple units.
- Fully programmable in 0.1 second increments (up to 99.9 seconds) for any on/off cycle combination.
- Four user-defined interruption cycles stored in memory.
- Digital inputs and outputs allowing control and status verification.
- Serial communications port for programming and monitoring.
- Signal output to operate almost any relay with 12VDC control.

You can use the GPS80 interrupter as a stand-alone portable device or as a permanently installed device. The supplied DB15 programming selection key (also called dongle key) allows you to activate any of the four interruption cycles. Alternatively, the interrupter can also be controlled and monitored by most systems that provide at least one discrete output.

The GPS80 interrupter is provided with 4 discrete inputs (used to select any one of 4 interrupter programs) and discrete outputs that indicate program, operation, power, and GPS satellite status. Up to 4 interrupter programs are simultaneously present on the GPS80 interrupter. Depending on the capabilities of the third party equipment, any one of these 4 programs can be activated.

The MicroMax Programmer is a Windows-based, configuration software that allows you to create an interrupter configuration file and then download the file to the GPS80 interrupter. You can configure interruption cycles using any combination of time intervals between 0.1 seconds and 99.9 seconds for Off and On cycles. The MicroMax Programmer also allows you to configure the GPS80 interrupter with a variety of switches and synchronization configurations; open and closed switch configurations are both supported. Every setting and parameter is saved in the configuration file for download to the GPS80 interrupter or later retrieval.

Synchronization configuration allows the GPS80 interrupter to operate with almost any other brand of GPS synchronized interrupter or logger. The GPS80 interrupter can be configured to accommodate other brands of interrupters using non-standard configurations. Based on the number of GPS satellites seen and the quality of view, synchronization triggering accuracy is specified to within 1 μ s with any other MicroMax interrupter.

Mercury Relay Customer Advisory

This advisory is intended to notify American Innovations (AI) customers of the manufacturer's published limitations on mercury relays.

Customers primarily purchase relays from AI for use with the MicroMax[®] family of current interrupters. MicroMax interrupters provide great programming flexibility to enable customers to use a wide variety of interruption cycles.

AI supplies mercury relays from a variety of respected and reliable vendors including MDI and American Electronic Components (AEC). These manufacturers publish expected relay lives of 3 to 6 million cycles depending upon the type of relay selected. AEC, the manufacturer of Durakool relays, indicates that relay life will be significantly shortened at rates exceeding 1,500 cycles per hour. MDI recommends no more than 900 cycles per hour. Depending upon the interruption cycle chosen by the customer, it is possible to exceed the manufacturer's recommendation resulting in a likely reduction of service life.

As an example, customers who elect to use mercury relays to interrupt at 1 cycle per second will generate 3600 cycles per hour. Customers should consult the manufacturer's documentation to select the appropriate relay for the application. Durakool information can be accessed via the Internet at the web address below:

<http://www.aecensors.com/>

In the Durakool documentation, two situations are explained that may impact the current carrying capacity of the relay: 1) cycle rate and 2) voltage values. The sizing tables indicate a methodology for determining the maximum amperage that can be carried depending upon the cycle rate. An additional de-rating table for mercury relays is provided for those instances where voltage in excess of 48 VDC is being interrupted. When selecting relays, customers should be aware of both of these de-rating tables to choose the best relay for the application.

To avoid depolarization of the CP system, the mercury relays that AI sells are of the normally closed variety. It is possible that a normally closed relay will fail at the end of its life in the open position due to a malfunction of the spring mechanism which drives the plunger/contacts into a normally closed position. If this occurs, a depolarization situation would result. AI has the following two recommendations:

- Customers using mercury relays should consider periodic replacement of these relays based upon engineering estimated life via a preventive maintenance program to reduce the likelihood of an open circuit failure.

–OR–

- If fast cycle operation is common, AI recommends a solid state relay for maximum life and reliability.

Although the MicroMax interrupter is capable of being programmed for faster interruption cycles, AI recommends that customers not exceed 900 cycles per hour (or a cycle time of less than four seconds) and will not warranty devices that are utilized in this manner. AI adds a serial number to relays that are supplied to enable the tracking of the shipment date. The approximate age of the relay may be used to assist AI in return material response, failure analysis, and warranty claims. AI will also consult manufacturers to help determine failure cause and advise customers that warranties may not be honored if AI or the manufacturer deems that the mercury relay is used outside of recommended parameters.

If you have questions or need additional information, please contact AI Technical Support.

Using the GPS80 as a Stand-alone Interrupter

The GPS80 interrupter is designed for permanent installation inside a rectifier (with or without remote monitoring) or for use as a portable field device. The GPS80 is not waterproof and because of its small size, should always be left inside the rectifier cabinet.

The provided 110V power adapter supplies 12V DC power to the GPS80 interrupter. GPS synchronization is achieved with the provided GPS antenna. The GPS80 interrupter is pre-programmed with four interrupter programs. For more information about interruption settings and factory default settings, refer to pages 11 and 12.

All GPS80 interrupter functions are monitored with 8 LEDs visible on the front panel of the device. (Refer to Table 1.) You can activate interrupter programs 1, 2, 3, or 4 by plugging the provided selection key (dongle key) in the DB15 port on the GPS80 interrupter and then setting the DIP switch on the selection key to 1, 2, 3, or 4. To connect the external relay, plug the male banana plugs on the switch control cable in the female jacks on the GPS80. See Figure 1 on page 2 for location of connectors.

Table 1. GPS80 Interrupter Status LEDs

LED Name	LED Description
System	Blinks in synchronization with PPS signal (precise positioning service signal) obtained from GPS constellation.
Program 1	Blink: Calculating or standby (see Notes). Solid: Program 1 activated.
Program 2	Blink: Calculating or standby (see Notes). Solid: Program 2 activated.
Program 3	Blink: Calculating or standby (see Notes). Solid: Program 3 activated.
Program 4	Blink: Calculating, standby, or always “off” program (see Notes). Solid: Program 4 activated.
GPS	Lights when sufficient satellites are visible for accurate clock update.
Power	Lit when power is on, not lit when power is off.
Oper	Lit when output is 12V.

Notes:

Calculating:The period from activation of the program by the user until the unit is ready to start the first “on” or “off” part of the interruption cycle.

Standby: When an interruption program is selected, but the current time is outside the times set for the interruption (daily schedule). For example, interruption is set to run from 06:00 to 18:00 (6pm) every day but it is currently 21:00 (9pm).

Powering Up the GPS80 Interrupter

Complete the following steps:

1. Plug the 110V adapter in a 110V electrical outlet. Plug the other end of the adapter (DC plug) in the jack marked **12V DC** on the GPS80 interrupter. See Figure 1 on page 2 for location of the jack.

When power is applied to the GPS80 interrupter, the green LED labeled **Power** illuminates.

2. Plug the GPS antenna in the jack labeled **GPS** on the GPS80 interrupter. Place the antenna where it has a clear, unobstructed view of the sky.

After approximately 30 seconds, the amber **System** LED begins flashing. If the LED is not flashing, leave power on for 15 minutes. If after 15 minutes the LED does not begin flashing, recycle power to the GPS80 interrupter. If the **System** LED does not begin flashing at this point, please contact Technical Support for assistance.

3. After the GPS80 interrupter locates the GPS satellites to update its clock, the amber **GPS** LED illuminates. This process may take a few minutes and only occurs after the **System** LED has begun flashing.

Installing the Relay

Complete the following steps:

1. Before you begin, make sure to observe all safety precautions during the relay installation.

NOTE: For important information about mercury relays, refer to the section entitled *Mercury Relay Customer Advisory* on page 4.

2. The GPS80 interrupter operates almost any relay requiring a 0V/12VDC control signal. If a mercury relay is used, make sure the relay is oriented upright with the cylindrical body of the relay in a vertical position. The label on the relay should face up so that the lettering is readable.

NOTE: If the relay is normally open (**NO**) or normally closed (**NC**), refer to Chapter 2, *Configuration* on page 15 for information about how to set up the GPS80 interrupter for either a normally open or normally closed relay.

3. Connect the relay switch to the red and black female banana connectors labeled **Switch** on the GPS80 interrupter. Make sure the polarity is correct. See Figure 1 on page 2 for location of the connectors.

NOTE: The solid state NC relay requires a minimum switching load of 24V AC.

4. Turn **On** power to the rectifier and then power-up the GPS80 interrupter.
5. Verify that the process described in the previous section occurred (*Powering Up the GPS80 Interrupter* on page 7). After the **GPS** LED illuminates, you can start the interruption cycle.

Starting an Interruption Cycle

Complete the following steps to start interrupter program 1, 2, 3, or 4:

1. Insert the selection key in the DB15 port on the GPS80 interrupter. See Figure 1 on page 2 for location of the port.
2. Slide the corresponding DIP switch (1, 2, 3, or 4, respectively) to the left (on).

For example, to start program 1, slide DIP switch 1 to the left.

The green LED for the corresponding interrupter program begins flashing. This indicates the GPS80 interrupter is calculating the exact point that it can start the interruption cycle. As soon as the interruption cycle begins, the green LED remains lit and then the amber LED labeled **Oper** illuminates when the 12V control signal is applied to the switch. The amber **Oper** LED turns off when 0V is applied to the switch.

3. To stop the interrupter program, slide the DIP switch to the right (off) or remove the selection key (dongle key).

Using the GPS80 with a Third Party Device

This section explains how to use the GPS80 interrupter with a third-party control instrument such as a remote terminal unit (RTU). For successful operation, the GPS80 interrupter requires the following input/output configuration:

- 12V power supply
- One digital control channel (to activate/deactivate programs)
- Rectifier switch (any 12V controlled switch)
- GPS antenna

The GPS80 interrupter includes the features listed below. Also refer to the next table (Table 2) and Figure 1 on page 2.

- Supports 4 control channels for selecting a specific interrupter program. Also supports open-collector configuration and level-control.
- Program 4 can be configured as “Always off” in support of turning the rectifier off for an extended period of time.
- Status channels support 4 programmable interruption cycles. They also support power, GPS satellite, and interrupter output status.
- LEDs are provided for all status channels.
- All control and status channels are accessible using the DB15 connector on the GPS80 interrupter.
- GPS antenna connects to the GPS80 interrupter using a MCX connector.
- The GPS80 interrupter is programmed and monitored using a banana plug that connects in the jack provided on the side or bottom of the interrupter.

Table 2. GPS80 Interrupter Technical Specifications

Description	Typical	Min.	Max.
Supply Voltage	12V	10V	15V

Table 2. GPS80 Interrupter Technical Specifications

Description	Typical	Min.	Max.
Current consumption, excludes current consumed by external switch	100 mA		
Current supply to switch at 12V, dependent on 12V source capacity			500mA
Open collector configuration (All status channels, Operation, and 3D Fix)			25V 100mA
Physical Size (height, length, width)	1.34in. x 5.5in. x 3.66in. (34mm x 140mm x 93mm)		

Information in the next table identifies the pin configuration of the DB15 connector (input for program selection key).

Table 3. DB15 Pin Configuration

Pin	Description
1	Power on Indication (Hi impedance output)
2	Satellite OK
3	Output confirming Program 4
4	Output confirming Program 2
5	Auxiliary output (not used)
6	Auxiliary output (not used)
7	Input 3 (activate program 3)
8	Input 1 (activate program 1)
9	Output monitor (indicates 12V/0V of interrupter output connector)
10	GND
11	Output confirming Program 3
12	Output confirming Program 1
13	NU
14	Input 4 (activate program 4)
15	Input 2 (activate program 2)

NOTE: Interruption cycles can be initiated manually by shorting pin 10 (GND) to the relevant input pin (pin 8, 15, 7, or 14 for interrupter programs 1, 2, 3 or 4, respectively). Interruption starts after the interrupter has completed calculations for synchronization, which takes a few seconds.

Interruption Settings

A number of options are available when setting interruption parameters. Refer to the following table for a description of available options.

Table 4. Interruption Options

Parameter	Possible Settings
On Time	<ul style="list-style-type: none"> ■ 0.1 – 99.9 seconds ■ Increments of 100 milliseconds
Off Time	<ul style="list-style-type: none"> ■ 0.1 – 99.9 seconds ■ Increments of 100 milliseconds
Scheduling	<ul style="list-style-type: none"> ■ Start immediately, never stop ■ Daily, set between start and stop times ■ Between two dates, daily between start and stop times
Synchronization	<ul style="list-style-type: none"> ■ On/Off ■ Off/On
Output Level (to support various switches)	<ul style="list-style-type: none"> ■ Low level (0V) is ON (for normally closed switch) ■ High level (12V) is ON (for normally open switch)
Time Zone	GMT –12 to GMT +12

GPS80 Interrupter Default Settings

The next table identifies factory default settings for the GPS80 interrupter. If you are a third party user, default settings may have been changed by your provider.

All interruption parameters are configurable using the MicroMax GPS80 Interrupter Programmer software provided on the CD in the installation kit. The software allows you to monitor the device and change interruption settings. For more information about the software, refer to Chapter 2, *Configuration* on page 15.

Table 5. GPS80 Interrupter Factory Default Settings

Setting	Description
Time Zone	GMT

Table 5. GPS80 Interrupter Factory Default Settings

Setting	Description
On/Off Interruption for Programs 1 – 4	<p>On/Off times listed below are in seconds:</p> <ul style="list-style-type: none"> ■ Program 1: 9.0 / 3.0 ■ Program 2: 12.0 / 3.0 ■ Program 3: 4.0 / 1.0 ■ Program 4: Output always high (12V) (Used in advanced remote control operations to control rectifier output.)
Start Time	Immediate
Stop Time	Never
Output Parameters	<ul style="list-style-type: none"> ■ Synchronization: Off/On ■ Low Output: On

Contacting Technical Support

If you need assistance with the GPS80 interrupter, please contact American Innovations (AI) Technical Support in any of the following ways:

Telephone: 512-249-3400
800-229-3404

Email: bhtechservices@aiworldwide.com

Mail: American Innovations, Ltd.
ATTN. Technical Support
12211 Technology Blvd.
Austin, TX 78727

Fax: 512-249-3444



Chapter 2 Configuration

Introduction

This chapter explains how to install and use the MicroMax Programmer software. You can use the software to monitor the MicroMax GPS80 interrupter or change interruption settings for Programs 1 through 4.

The MicroMax Programmer is a Windows-based, configuration software that allows you to create an interrupter configuration file and then download the file to the MicroMax GPS80 interrupter. You can configure interruption cycles using any combination of time intervals between 0.1 seconds and 99.9 seconds for Off and On cycles. The MicroMax Programmer also allows you to configure the MicroMax GPS80 interrupter with a variety of switches and synchronization configurations; open and closed switch configurations are both supported. Every setting and parameter is saved in the configuration file for download to the MicroMax GPS80 interrupter or for later retrieval.

Installing the MicroMax Programmer

Complete the following steps to install the MicroMax Programmer software on a computer running Microsoft Windows 98 or higher:

1. Insert the BATtools USB drive into an available USB port on your computer.
2. Open the BATtools folder and double-click on the executable file *BatTools.SuiteInstaller.exe*.
3. Follow the prompts to install the software. Unless specified otherwise, the software installs on your hard drive in the following location: C:\Program Files\MicroMax.

NOTE: BATtools can also be downloaded from the Asset Tracker website (www.bullhornsys.com). Under the **Help** menu, click the link to **Support Files for Download** and then select **BATtools**. Once you have saved the file to your computer, extract all files and then double-click *BatTools.SuiteInstaller.exe* to install the software and support files.

Using the MicroMax Programmer

Complete the following steps to begin using the MicroMax Programmer software:

1. Connect the MicroMax GPS80 interrupter to your computer using the provided interface cable. Connect the other end of the cable in an available COM port on your computer.
2. Start the software by clicking the MicroMax Programmer icon.

A window similar to the following example displays.

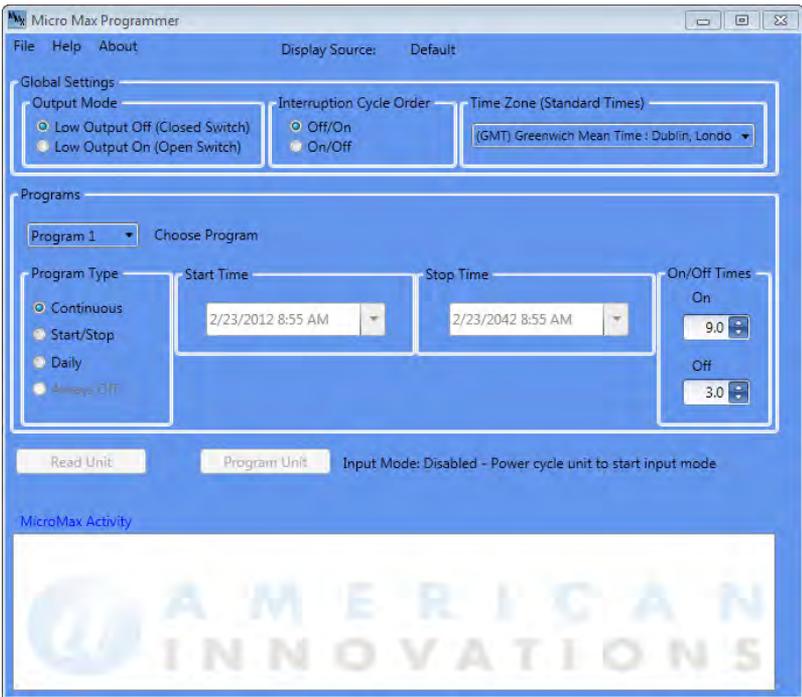


Figure 1. MicroMax GPS80 Interrupter Programmer

3. By default, the MicroMax Programmer uses COM 1 and 9600 baud rate for communication with the GPS80 interrupter. If the GPS80 interrupter is connected to a COM port other than COM 1, complete the following steps:
 - a. Click **File > Options** to display the **Options** window shown in Figure 2.

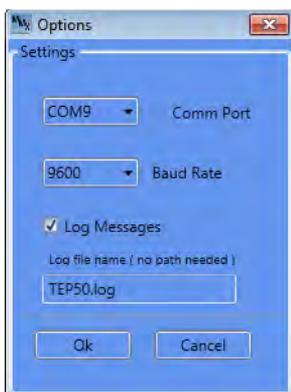


Figure 2. Settings Options

- b. To choose a different COM port, click the arrow in the **Comm Port** list box and then select an option from the list. Valid choices include COM 1 through COM 18.

Normal hardware COM ports are COM 1 through COM 4. USB converters or other soft COM ports are numbered COM 5 or higher.

- c. To choose a different baud rate, click the arrow in the **Baud Rate** list box and then select an option from the list.
- d. By default, the MicroMax Programmer logs all messages that display in the **MicroMax Activity** pane in a text file on your computer in the MyDocuments folder.

Because this file is typically used for troubleshooting purposes, it's recommended that you not change the **Log Messages** default setting. However, if you do not want to log messages, click the **Log Messages** check box to remove the check mark.

- e. To change the name of the log file, type a name for the file in the text box below **Log file name (no path needed)**.
 - f. Click **OK** to save changes and close the **Options** window.
4. Complete **one** of the following steps:
 - a. If you only plan to monitor the MicroMax GPS80 interrupter, turn **On** the device.

–OR–

- b. If you plan to configure new interrupter program files, configure program files first before turning on the MicroMax GPS80 interrupter. (There is only a window of 15 seconds during which time you can download interrupter program files or read data from the MicroMax GPS80 interrupter.)

NOTE: Before programming the MicroMax GPS80 interrupter, ensure that all programs on the DB15 Programming Selection Key (dongle key) are switched off (move DIP switches to the right).

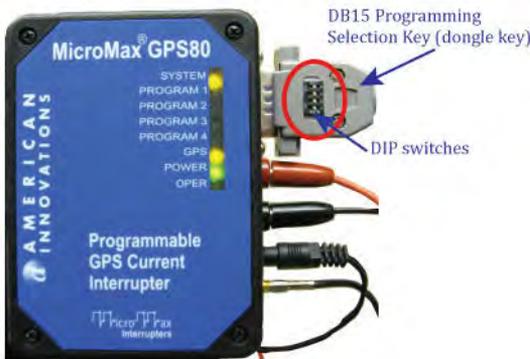


Figure 3. DB15 Programming Selection Key

The MicroMax GPS80 interrupter is ready for programming when a message similar to the following example displays in the **MicroMax Activity** pane.

```
Power up ENV60 ver 1.1p.  
EEProm test .... succesfull.  
Set GPS options and wait for GPS time..  
Send soft reset to GPS....  
Fix=0; Sats=0; GPS code=0xFF; Ant=A; Bat=B;  
Delay 15 secs to allow ENV25 setup.
```

Only at this point can programming parameters be downloaded.

Figure 4. Startup Message

If you are monitoring the MicroMax GPS80 interrupter, also refer to the section entitled *Monitoring the MicroMax GPS80 Interrupter* on page 22 for examples of other messages that display in the **MicroMax Activity** pane.

Changing Global Settings

1. Review the following general settings information in the **Global Settings** section (Figure 5) as needed:
 - **Output Mode:** Output parameters are set to accommodate various current switch configurations and to enable synchronization with other interrupters. The output can also be changed to reflect ON as 12V (High) or 0V (Low).

As a general guideline, when a normally open switch is used, the setting should be “Low Output Off”. When a normally closed switch is used, the setting should be “Low Output On”.
 - **Interruption Cycle Order:** The interruption cycle can be set to **Off/On** or **On/Off**. The setting indicates which part of the interruption cycle is executed first on the synchronization event. The default setting is **Off/On**.
 - **Time Zone (Standard Times):** The time zone can be set by selecting from the list of options. All time zones are in standard time. The MicroMax Programmer does not allow for Daylight Savings Time. If you want to use Daylight Savings, set the zone to the zone that is just ahead of your zone.

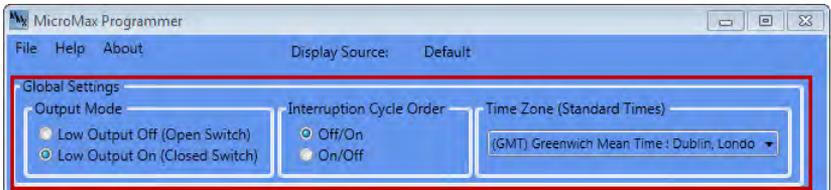


Figure 5. Global Settings

Creating Programs

1. To create a new interrupter program, click the arrow next to **Choose Program** and select a program number from the list (Figure 6).

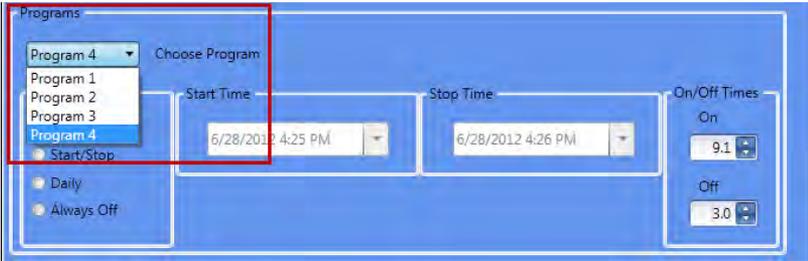


Figure 6. Programs

Figure 7, below, shows an example of the **Program 4** setting options. Currently, the GPS80 interrupter only supports the interrupter options. The **Program 1** through **Program 3** options only include Continuous, Start/Stop, and Daily Program types. Each program type includes interrupter options applicable to the program function. For example, Start/Stop includes a date in the Start Time and Stop Time options, but the Daily program type only displays time for the Start Time and Stop Time options. Also, the Continuous type only uses the On/Off Times option, whereas the Always Off type (only available in **Program 4**) does not allow for any options.



Figure 7. Program Type and Options

2. Review the following information to create a new interruption program:
 - **Program Type:** Choose one of the following program types to determine the type of interruption:
 - ▶ **Continuous:** Never stops. The only option available is On/Off Times.
 - ▶ **Start/Stop:** The start and stop date/time options you choose determine when the interruption program begins

and stops running. The interruption program runs every day during the date and time period you choose using the controls in the **Start Time** and **Stop Time** group boxes.

- ▶ **Daily:** The interruption program runs every day during the time period you choose using the controls in the **Start Time** and **Stop Time** group boxes.
- ▶ **Always Off:** This option is only available for **Program 4**. This option sets the interrupter output so that the switch connected to it is off when this program is selected.
- **Start Time and Stop Time:** These settings are only available for the **Start/Stop** or **Daily** program types. Sets the time to start the interruption. For Start/Stop programs, select a date and time from the drop-down menu (Figure 8). For Daily programs, click on the hour, minute, or second that is currently displayed and then click the up or down arrow to change the time (Figure 9).

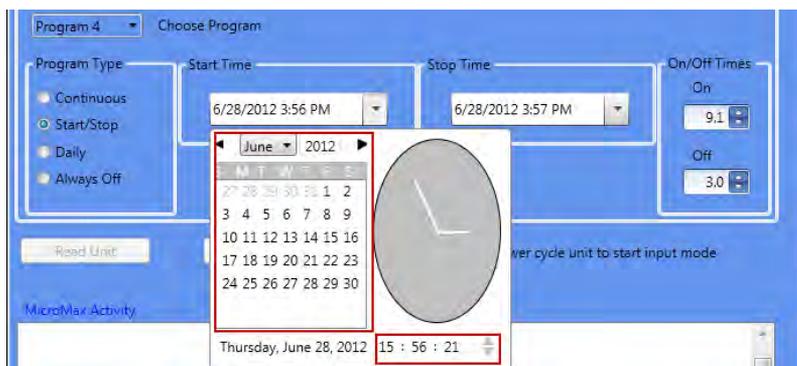


Figure 8. Changing Start or Stop Date and Times (Start/Stop Program)



Figure 9. Changing Start or Stop Times (Daily Program)

- **On/Off Times:** This option cycles power on and off based on a time interval you choose. Click the arrows to increase or decrease time. You can also type a number in the box.
3. When you finish creating the program file, click **File > Save Settings to File**.

Sending Programs to the MicroMax GPS80

NOTE: Before programming the MicroMax GPS80 interrupter, ensure that all programs on the DB15 Programming Selection Key (dongle key) are switched off (move DIP switches to the right). See Figure 3 on page 18 for more information.

1. If the GPS80 is powered **on**, turn off the unit and then power on the unit.
2. Click the **Program Unit** button to download the program file to the GPS80 interrupter or other type of current interrupter.

There is only a window of 15 seconds during which time you can download interrupter program files or read data from the GPS80 interrupter. See Figure 4 on page 18 for more details.

Monitoring the MicroMax GPS80 Interrupter

This section includes examples of messages that display in the **MicroMax Activity** pane while using the MicroMax Programmer to monitor the status of the GPS80 interrupter.

NOTE: The MicroMax GPS80 interrupter must be connected to a COM port on your computer with the MicroMax Programmer running in order to see unit activity in the pane.

```
Standby; select input for interruption.
Standby, 11:41:51; 09/05/03;
Standby, 11:41:52; 09/05/03;
Standby, 11:41:53; 09/05/03;
Standby, 11:41:54; 09/05/03;
Standby, 11:41:55; 09/05/03;
Standby, 11:41:56; 09/05/03;
Standby, 11:41:57; 09/05/03;
Standby, 11:41:58; 09/05/03;
Standby, 11:41:59; 09/05/03;
Standby, 11:42:00; 09/05/03;
Standby, 11:42:01; 09/05/03;
```

Figure 10. Interrupter in Standby Mode Message (No Program Running)

```
Standby, Input delay; 07:37:33;
Standby, Input delay; 07:37:34;
Standby, Input delay; 07:37:35;
Interruption started; Load parameters; Program # 1;
Program 1; ontime = 001.0; offtime = 001.0;
Low output On; Program type - Continuous
Time = 07:37:36; SyncTime = 07:37:38;
Start interruption;
13:37:32; 07:37:37; 07:37:38; 00 ← Begins calculating.
13:37:37v 07:37:25; 07:37:38; 13
13:37:37; 07:37:26; 07:37:38; 13
13:37:37; 07:37:27; 07:37:38; 13
13:37:37; 07:37:28; 07:37:38; 13
13:37:37; 07:37:29; 07:37:38; 13
13:37:42; 07:37:30; 07:37:38; 13
13:37:42; 07:37:31; 07:37:38; 13
13:37:42; 07:37:32; 07:37:38; 13
13:37:42; 07:37:33; 07:37:38; 13
13:37:42; 07:37:34; 07:37:38; 13
13:37:47; 07:37:35; 07:37:38; 13
13:37:47; 07:37:36; 07:37:38; 13
13:37:47; 07:37:37; 07:37:38; 13
GPS=07:37:38; Sync=07:37:42; 0368 ← Interruption starts here.
GPS=07:37:42; Sync=07:37:46; 0261
```

Figure 11. Interrupter Program 1 Starting and Running



Appendix A DB15 Interface

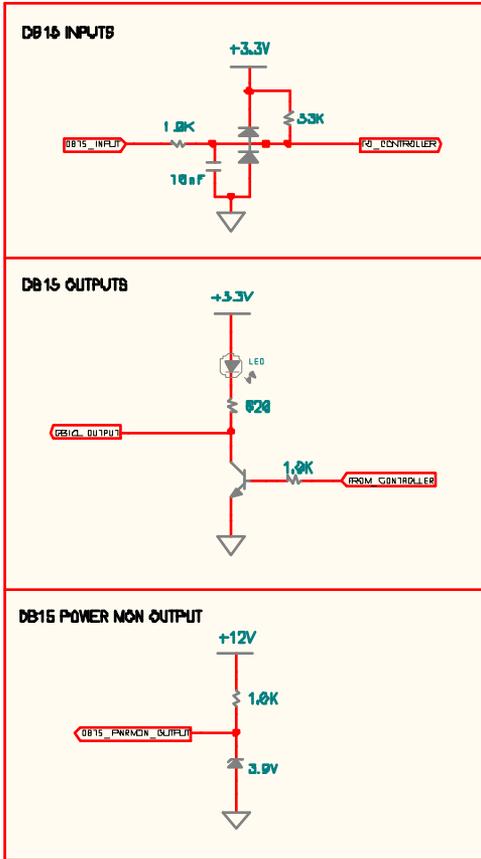
The following table identifies pin function for the MicroMax GPS80 DB15 interface. The equivalent circuit diagrams are pictured in the second section. If you have questions or need additional information, contact Technical Support at bhtechservices@aiworldwide.com.

Table 1. DB15 Pin Function

DB15 pin	Function	Circuit Equivalent	Comment
1	Power Monitor	Power Mon Output	Power on indication, ~4V when 12V is present
9	Output Monitor	DB15 Outputs	Interruption signal mon, low = 12V at output, hi = 0V at output
2	3D Fix	DB15 Outputs	Satellite OK indication, low = OK.
10	Ground		
3	Out 4	DB15 Outputs	Output confirming Program 4, low = prog 4 operating
11	Out 3	DB15 Outputs	Output confirming Program 3, low = prog 3 operating
4	Out 2	DB15 Outputs	Output confirming Program 2, low = prog 2 operating
12	Out 1	DB15 Outputs	Output confirming Program 1, low = prog 1 operating
5	not used	DB15 Outputs	auxiliary output, not used
13	not used	DB15 Inputs	not used
6	not used		auxiliary input, not used
14	Input 4	DB15 Inputs	Input 4, activate program 4, low = prog 4 selected
7	Input 3	DB15 Inputs	Input 3, activate program 3, low = prog 3 selected
15	Input 2	DB15 Inputs	Input 2, activate program 2, low = prog 2 selected
8	Input 1	DB15 Inputs	Input 1, activate program 1, low = prog 1 selected

Only select one program input (Input 1-4) at a time. Open collector / drain or NO contacts can be used to control Input 1-4.

Equivalent Circuits





Appendix B Regulatory Notices

The following FCC requirements are met by the product(s) described in this guide.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.



<http://www.aiworldwide.com/>
12211 Technology Blvd. • Austin, TX 78727
Phone 512-249-3400 • Fax 512-249-3444
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