

GPS ANTENNA with MC100 INSTALLATION GUIDE



GPS Antenna Installation Guide

NATIONAL TIME AND SIGNAL CORPORATION

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1.0 INTRODUCTION

The Global Positioning Satellite (GPS) antenna for the MC100 master clock keeps the MC100's time accurate. A network of at least 24 satellites is presently orbiting the Earth, and continuously sending time and position information. The GPS antenna reads the information from the satellites that are in view and uses that information to compute the time and the position of the antenna. The MC100 reads the time information from the antenna via packets sent on wires from the antenna. The MC100 also supplies +24VDC power to the antenna.

2.0 OPERATION

2.1 Enable GPS and select the time zone:

With the date and time displayed

1. Press the SETUP key (EXIT BUTTON).
2. Press the RIGHT ARROW key twice to move the cursor to the CLK selection.
3. Press ENTER.
4. The screen to select daylight savings mode (Dsav), 12 or 24 hour clock (12/24), and 50 or 60 Hertz AC cycles (50/60) should appear. If any of these selections need to be changed, use the RIGHT arrow key to move to the selection, and the DOWN ARROW key to change the selection.
5. When all selections displayed are correct, press ENTER.
6. The "Timebase" screen should appear. If you want to enable GPS, repeatedly press the DOWN ARROW key until GPS is shown.
7. Press ENTER.
8. The "Offset from GMT:" screen should appear. Use the RIGHT ARROW and LEFT ARROW keys to move the cursor. Use the DOWN ARROW key to toggle the sign. Use the number keys to enter the numeric values or DOWN ARROW to decrement the numeric values. Use the CLEAR key to set the sign to plus and all the digits to zero. GMT is the **Greenwich Mean Time**, which is the time in Greenwich England. The "Offset from GMT" is how many hours and minutes to add or subtract from the Greenwich time to get your local time when not in Daylight Savings (-05:00:00 for United States EST). When Daylight Savings becomes active, it will add an hour to this time.
9. Press ENTER.

2.2 GPS Automatic time updates:

When the antenna sends time information to the MC100, the MC100's clock is updated each hour at the 40th minute (i.e. xx:40, where xx denotes any hour). The month, date, and year are not updated from the GPS antenna, however, the day of the week is updated by the GPS unit. The operator must enter the date manually in the SET DATE/TIME menu.

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2.3 Number of satellites display:

When GPS is enabled, the date and time screen shows the number of satellites that the antenna has in view. It is displayed as a one character numeric digit between the date and the schedule name (or to the right of the day of the week). If more than nine satellites are visible, the digit 9 is displayed. If no satellite information has been received from the GPS during the last automatic correction attempt, a question mark is displayed. Note that when first powered up, a question mark is displayed until an automatic correction attempt is made at xx:40. This correction process may be started immediately if the VIEW GPS STATUS menu is used as described below.

2.4 GPS Status Menu:

There exists a GPS STATUS menu selection that will help verify the GPS communication during the installation process. The number of satellites communicating with the GPS unit will be continuously updated to aid in antenna mounting location and direction. The time on the MC100 will also be updated if sufficient satellites are communicating (3 or more) without having to wait until the xx:40 automatic correction.

To enter the GPS Status menu,

1. Press the SETUP button (EXIT Key)
2. Move the cursor under TST using the arrow keys.
3. Press ENTER.
4. Press the DOWN ARROW until 'VIEW GPS STATUS' is displayed.
5. Press ENTER.

The display will also show the number of bad communication packets received from the GPS unit. For example, the top line of the display will show 'GPS Stat 004/001'. The '004' represents the peak percentage of bad packets ever received while the '001' represents the instantaneous percentage of bad communications packets. This provides the installer a 'feel' of the quality of the installation. Bad communication could be caused by the length of the communication line, quality of the cable (capacitance and/or gauge of wire), or routing of the cable near noise sources (motors, lighting ballast, transformers etc.) To reset the peak value, press the CLEAR key.

The bottom line of the display will show one of the following GPS Statuses:

7 GPS OK!: This message shows that the GPS unit is communicating properly and is currently receiving from seven satellites. Your number of satellites may be between 3 and 9.

0 No Time Data: This message shows that the GPS unit is communicating properly, but the number of satellites is insufficient to receive time data. The number of satellites may be between 0 and 2. The antenna must be redirected or relocated for better reception. Upon initial installation, this may be displayed for up to 15 minutes while the GPS unit acquires its new geographical location from the satellites.

Relay Busy...: This message shows that the MC100 is currently busy activating relay outputs on one or more circuits. They may be aborted by momentarily sliding the manual circuit switches to the OFF position. Otherwise, the status will be updated when the relays are finished.

? Waiting...: This message shows that there is no communication between the MC100 and GPS unit. Double check the wire connections, or the GPS unit may have been damaged.

3.0 GPS Antenna mounting:

The GPS antenna needs to be mounted on the exterior of a building on the wall or roof away from any sources of electrical noise (air conditioner condensers, etc.). It also may operate inside a building if the

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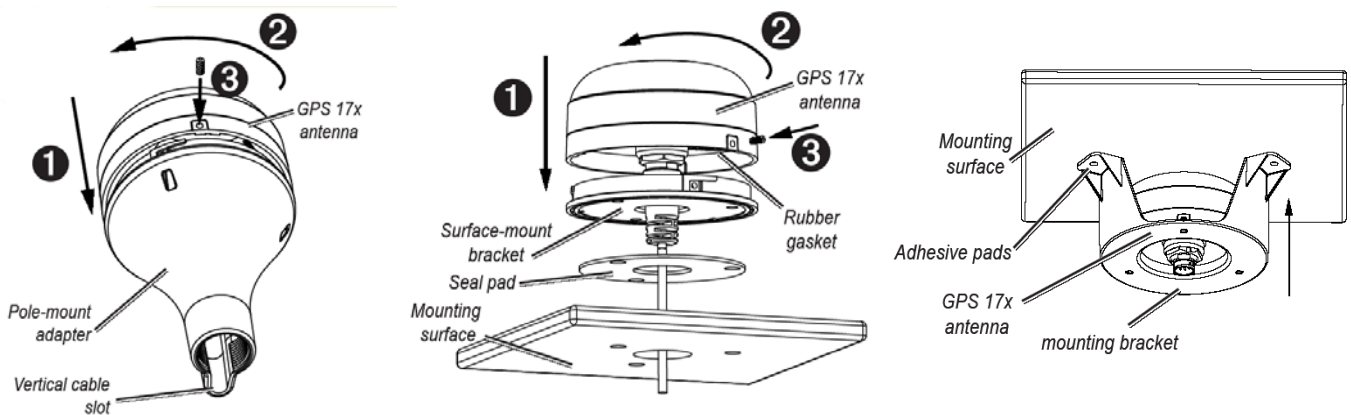
signal is not blocked by metal. The GPS unit may be mounted to the interior of a window using the optional window bracket.

For outdoor installations, the higher the GPS unit is mounted, the more likely it is to be hit by lightning, so mounting on an exterior wall is preferred. Since most of the satellites orbit near the equator, mounting on a southern facing wall in the northern hemisphere (northern wall in the southern hemisphere) is preferred. Use the "GPS Status" display to ensure a signal is being received before selecting the permanent location for the GPS antenna. A good signal requires that at least 3 satellites.

The cable from the MC100 to the GPS antenna should be kept as short as possible (less than 300 feet). If longer cables are needed, converters may be required to switch the RS232 signals of the antenna and MC100 to RS422 and back to RS232. Try to run the cable away from any source of noise (motors, florescent lights, welders, neon lights, air conditioners, etc.). If noise cannot be avoided, use shielded cable (less than 150 feet) and be sure to connect the shield wire to chassis ground to block as much noise as possible. Also, make sure the shield is contiguous and attached to the shield of the cable supplied with the GPS unit.

Temporary mounting of the GPS antenna may be necessary to test for satellite reception at the desired location.

The GPS unit comes standard with 1" pole mount adapter. The unit will attach to the 1" pole with 14 TPI threads. NOTE – the unit will not mount to coarse 1" pipe threads. Alternately, the unit may be mounted to the cover of a four-square weatherproof box. This box may be mounted to the roof or wall of the building making necessary weather tight seals around wire entry.



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4.0 SETUP

1. Temporarily mount the GPS antenna in the desired location. It may have to be relocated if its placement does not provide sufficient view of the satellites in your area. Wire the GPS antenna to MC100 per table below (see Bulletin C-393 for installation details): **All unused wires must be insulated from each other.**

| Terminal Designation | GPS-19x Wire | GPS-17x Wire | GPS-17 Wire | GPS-36 Wire | MC100 connection (factory) |
|----------------------|---------------------|---------------------|---------------|-------------|----------------------------|
| TxD | Gray | Gray | White | White | K2-3(R) |
| RxD | White | White | Blue | Blue | K2-1(T) |
| 24VDC | Red | Red | Red | Red | K3-2(+24VDC REG) |
| Gnd | Black, Wht/Orn, Orn | Black, Wht/Orn, Orn | Black, Yellow | Black | K3-3(GND) |
| | | | | | K2-2 to K2-4(RTS to CTS) |

2. Place all manual slide switches to the OFF position.
3. Power up MC100.
4. If there is no ‘?’ displayed next to the date on the display, the GPS timebase must be enabled. Follow the steps in the Enable GPS section above.
5. Use the MC100 SET DATE/TIME menu and set the proper date. The time setting may be left incorrect to verify the GPS operation at step 10.
6. Satellite display number to the right of the date display on the main screen should show “?”.
7. Use the GPS STATUS menu to verify GPS to MC100 communication. See GPS STATUS MENU section above.
8. Verify that communication exists between the MC100 and GPS unit. The display should show either “No Time Data” or “GPS OK”. If it displays “Waiting...” then verify the communication connections.
9. If the status “No Time Data” exists, it may be necessary to wait up to 15 minutes for the GPS unit to acquire the satellite positions. If this status persists, relocation or redirection of the antenna is required.
10. If the status “GPS OK” exists, wait for 10 seconds, then press ENTER.
11. The time should change to the correct time.
12. The satellite display number should show 3 or more satellites.
13. Mount the GPS antenna in the permanent location.
14. Automatic correction of the MC100 time will occur every hour at xx:40 (fortieth minute each hour). At these times the satellite count display will also be updated.
15. If there are no outdoor clock movements in this installation, All manual slide switches may be returned to the AUTO position.
16. Setup clock and auxiliary circuits as described in the MC100 User’s Manual.

Additional Steps for use with National Time outdoor movements (2MR, 3MR, HMR, 4MR.. etc. Series)

At this time, the MC100 LCD display should be at the correct time. Verify the proper circuits are programmed for NATSCO x10, or NATSCO 11MR (for 11MR series only). Refer to MC100WP user’s manual.

Case 1: Initial installation, all clock movement(s) hands are at 12:00 (Alternately Case 2 could be used but the correction would not occur for 40 minutes)

1. Slide all clock circuit manual switches to AUTO. Take note of the time displayed on the MC100.
2. Momentarily slide the first clock circuit switch to RESET.
3. When the ENTER CORRECTION AMOUNT menu is displayed, enter the time that was noted in step 1 in the format HHMMSS. (i.e. 2:34:00 would be entered as 023400)

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4. Press ENTER.
5. Momentarily slide the next clock circuit switch to RESET.
6. Enter the same time for the correction amount as step 3.
7. Press ENTER.
8. Repeat steps 5,6 and 7 for remaining clock circuits.
9. The clock movements will advance at 10 times speed to the correct time and resume normal time keeping.

Case 2: All clocks show the same, but incorrect, time.

1. Slide all clock circuit switches to AUTO.
2. Enter the SET DATE/TIME menu by pressing the DOWN ARROW.
3. Set the time on the MC100 incorrectly to reflect the time shown on the clock movements.
4. The clocks will continue to run at normal speed until the MC100 time gets to the next xx:40. At this time, the GPS unit will correct the time on the MC100 and advance the clock movements at 10 times speed to the correct time.

Case 3: All clocks show different incorrect times.

1. Slide all clock switches to AUTO.
2. Momentarily slide the first clock circuit switch to RESET.
3. Calculate the difference between the real time and the time shown on the first clock. (i.e. if the real time is 11:20 and the clock movement shows 3:10, enter 081000 (8:10:00))
4. Press ENTER. The clock will begin advancing at 10 times speed to the correct time.
5. Repeat steps 2 through 4 for remaining clock circuits.

5.0 REVISIONS

| Revision Number | Originator | Date | Comments |
|-----------------|------------|----------|--|
| 1 | A. B. | 07/13/00 | Original Draft |
| 2 | M. B. | 01/23/01 | Added Bulletin Number;removed sec 4 |
| 3 | M. B. | 06/18/02 | Updated for Software v1.41I and higher |
| 4 | M. B. | 04/14/04 | Added GPS Status bad packet display |
| 5 | M. B. | 11/09/07 | Added Support for GPS-17 |
| 6 | M. B. | 07/15/09 | Added Support for GPS-17x |
| 7 | S. B. | 07/20/09 | Updated GPS-17x wire colors |
| 8 | M.B. | 04/29/14 | Added GPS-19x wiring |