



MX 9400 DGPS RECEIVER

**INSTALLATION
AND
MAINTENANCE MANUAL**

Prepared by

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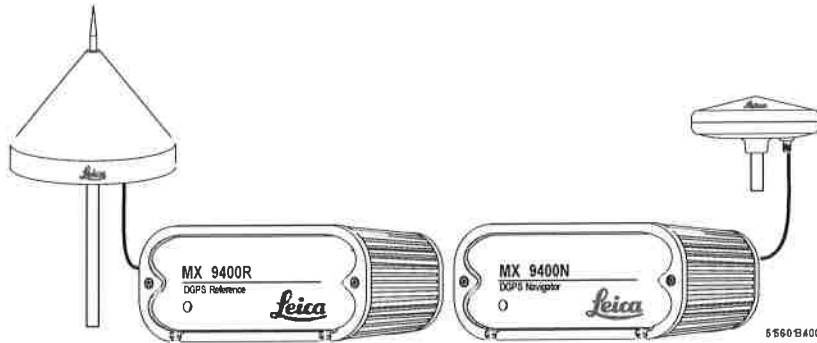
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ABOUT THIS MANUAL

Congratulations on your purchase of a Leica MX 9400N DGPS Navigator, MX 9401N DGPS Navigator, MX 9400R DGPS Reference Station or MX 9401R DGPS Reference Station. These receivers represent the finest in DGPS technology today.



This manual provides all the information you will need to install and test your Leica DGPS receiver for proper operation. This manual applies to both the MX 9400 and MX 9401 DGPS receivers. In addition to step-by-step procedures, you will find valuable information on problems to avoid and how best to ensure trouble-free operation.

The instructions in this manual follow the order in which you are likely to use them. However, we suggest, that you read this manual through before proceeding with the installation. This will help you to understand the installation requirements and avoid potential problems.

At the back of this manual, you will find two tear-out sheets: one is a Problem Report Sheet; the other, a Reader Comment Sheet. On the inside back cover is a Limited Warranty Statement and Service Request Information. If you would like more in-depth information about Leica DGPS products, refer to the referenced documents which follow.

Thank you.

IMPORTANT NOTICE

The stated policy of the US Government is to degrade accuracy for non-military use to within 100 meters RMS. The Leica DGPS receivers provide increased accuracy when differential correction is available.

REFERENCED DOCUMENTS:

- Leica MX 9400 Navigator Operator's Manual, P/N 10137: Describes how to connect and operate the Leica Navigator using the Leica developed Control and Display (CDU) program.
- Leica MX 9400 Reference Station Operator's Manual, P/N 10138: Describes how to connect and operate the Leica Reference Station using the Leica developed Control and Display (CDU) program.
- Leica MX 12 Channel Technical Reference Manual, P/N 10139: Contains information for programming the Leica DGPS Navigators and Reference Stations.
- NMEA-0183 Specification: Defines the hardware and software requirements for marine equipment interfaces.
- EIA RS-232C Specification: Defines the hardware and software requirements for an RS-232 data interface.
- EIA RS-422 Specification: Defines the hardware and software requirements for an RS-422 data interface.

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UNPACKING YOUR DGPS NAVIGATOR

Perform the following three steps and verify the packaged items against those listed in Table 1.

1. Remove the contents from the packing container.
2. Save the packing container. You may need it for storage or return shipment.
3. Inspect each item for in-transit damage. If you notice evidence of damage, inform both the shipping carrier and Leica (see the back side of the manual cover).

Table 1. System Parts

Description	Part Number
Console Assembly, MX 9400N	10096
Console Assembly, MX 9400R	10097
Weatherproof Console Assembly, MX 9401N	10164
Weatherproof Console Assembly, MX 9401R	10165
GPS Antenna Assembly, Navigation (Discus)	10146
GPS Antenna Assembly, Survey (Choke Ring)	10147
MX 9400 Antenna Cable Assembly, 15 meter (Belden 9310)	10148
MX 9401 Antenna Cable Assembly, 15 meter (Belden 9310)	10149
GPS Antenna Cable Assembly, Extension, 15 meter option; (Belden 9310)	10150
Power Cable Assembly (MX 9400 Only)	10252
Multi-Port Interface Cable Assembly	10135
CDU Program Diskette (3.5 inch, High Density, MS-DOS)	10086
Leica MX 9400 DGPS Receiver Installation and Service Manual	10136
Leica 12 Channel Technical Reference Manual	10139
Leica MX 9400 Navigator Operator's Manual (Shipped with MX 9400N/9401N)	10137
Leica MX 9400 Reference Station Operator's Manual (Shipped with MX 9400R/9401R)	10138

INSTALLATION PREPARATION

Installing your DGPS receiver is easy, however, you do have important details to think about. If you plan the installation carefully, you will save time, effort, and materials. More importantly, your receiver will operate with fewer problems and better efficiency. If this is your first GPS installation, we suggest you allow six to eight hours for installation and test.

Here are the most important items to consider before and during installation. These are described in more detail further in this manual.

Antenna

- proper length and routing of cable.
- safe distance from high-power antennas and transmitters.
- appropriate height and mounting surface, providing a 360 degree view of the horizon.

Receiver

- safe distance to navigating compass, equipment sensitive to small magnetic fields, or equipment emitting strong RF or magnetic fields.
- physical and visual accessibility for operator monitoring and peripheral interfaces.
- physical environment.

Interface

- do you need special cables?
- will you need an RS-422 to RS-232 converter?

Power

- cabling.
- dc power source.

Now that you know what the issues are, let's begin your installation. Table 2 lists the few tools needed.

Table 2. Tools and Materials for Installation and Maintenance

Tool or Material	Purpose
No. 1 Phillips Screwdriver	Installing and Removing Receiver Mounting Screws
Electric Drill with No. 27(9/64-inch) Bit	Mounting Receiver Housing
Volt-ohmmeter	Verifying Antenna Voltage and Resistance
3/16-inch Socket Wrench	Installing and Removing MULTI-PORT Interface Hex Standoffs.
7/64-inch Allen Wrench	Chassis Assembly and Disassembly
5/16-inch Deep Socket or Open End Wrench	Installing and Removing Antenna Hex Nut on Rear Panel
Standard Screwdriver	Installing and Removing Interface Cable Screws

INSTALLING THE ANTENNA

Installing the antenna is the most crucial part of the system installation. How and where you install your antenna, with its cabling and integral preamplifier, can greatly affect its sensing efficiency. Figure 1 shows you both good and bad installation sites for the navigator antenna.

Keep the following guidelines in mind for an ideal site. Try to install the antenna where it has a clear view of the sky whether on land, sea, or air.

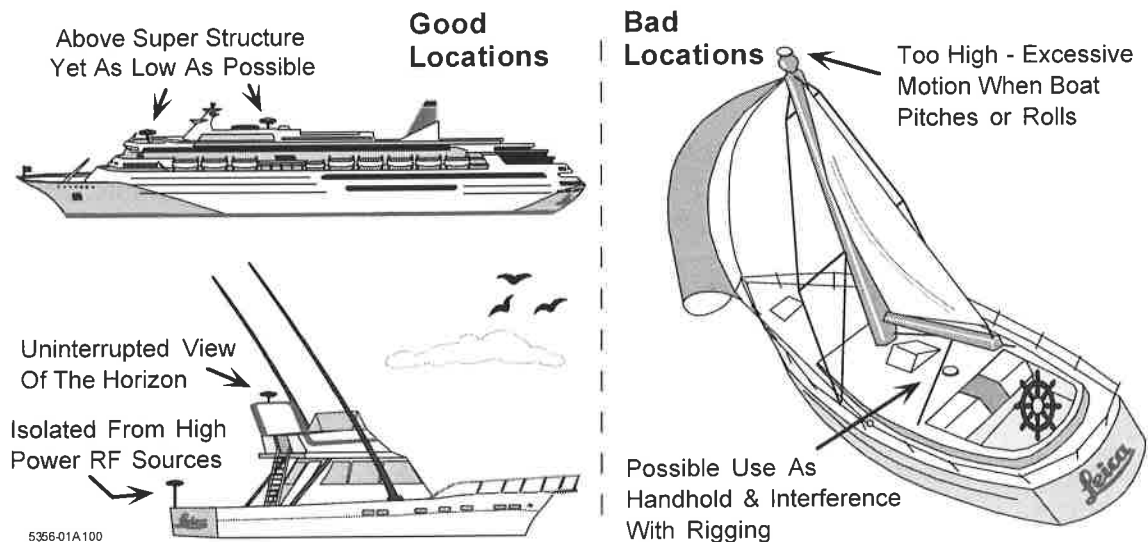


Figure 1. Navigator Antenna Mounting Location Recommendations

Easy Access to Maintenance

Locate the antenna for easy access and maintenance. Stay safely away from interfering high-power energy sources like radar and other transmitting radio antennas. Locate the antenna at least ten feet (about three meters) away from and out of the transmitting beam of high-power transmitters.

Avoiding Vertical Obstructions

You should not install the antenna closer than 15 feet (about 4.5 meters) to any large vertical obstruction. The objective is for the GPS antenna to see the horizon freely through 360 degrees and 5 to 90 degrees above the horizon. Be sure that you have the base of the antenna at least three (3) feet (about 1 meter) above any large, metallic, horizontal surface.

NOTE: *Small diameter obstructions, such as masts, booms, and kingpins do not seriously degrade signal reception, but such objects must not eclipse more than a few degrees of any given bearing.*

SYSTEM INSTALLATION

Cable Lengths

Standard lengths of Belden 9310 coaxial antenna cable are 15 meters (about 50 feet). If you need a longer cable length than the installation kit provides, you can extend the cable up to a total length of 30 meters, with additional Belden 9310 coaxial cable connected by an RF through line connector (bullet). If you need additional cable, order Leica part number 10149, 15 meter Cable Extension Kit. For cable lengths between 100 and 200 feet (30 to 60 meters), an in-line RF amplifier is required. Order Leica part number PA6817C, Cable Line Amplifier (does not include coaxial cable). Longer cable lengths are possible with special low loss cables. Contact Leica for assistance if your installation requires more than 200 feet (60 meters) of cable.

Avoiding EMI Effects

Try to route the coaxial cable between the antenna and the receiver connector directly; direct paths reduce electromagnetic interference (EMI) effects. When doing this, avoid running the cable close to high-power lines, such as radar or radio-transmitter lines.

If you must cross antenna cables, do so at 90 degrees, so that magnetic fields are not coupled.

Finally, consider EMI effects related to antenna cable length; longer lengths can increase EMI effects.

Mounting the Antenna

The antenna is designed to be mounted to a threaded one inch by 14 thread per inch (1-14 UNC) pole mount.

PROCEDURE FOR NAVIGATOR ANTENNA INSTALLATION

1. Identify the ideal site to install the Navigator antenna, based on the following considerations:
 - a) Locate the antenna as far as you can from high-power transmitters, and 15 feet (about 4.5 meters) or more and below an INMARSAT / SATCOM communications antenna.
 - b) Avoid emitted radiation from antenna sets.
 - c) Situate the antenna:
 - so that personnel won't use it as a handle or a leaning post (otherwise, post a CAUTION sign).
 - to be free from crashing waves during heavy seas.
 - just aft of midship, above the superstructure and as low as possible.
 - d) Ensure that moving objects won't damage the antenna.
 - e) Space multiple GPS antennas at least six feet (two meters) from each other.

- Attach the antenna to a rail or pole using a standard antenna mount, or other appropriate hardware, as shown in Figure 2.

Both antennas utilize a 1 inch by 14 threads per inch pole mount.

The Choke Ring antenna can also use a 3/4 inch standard pipe thread pole mount.

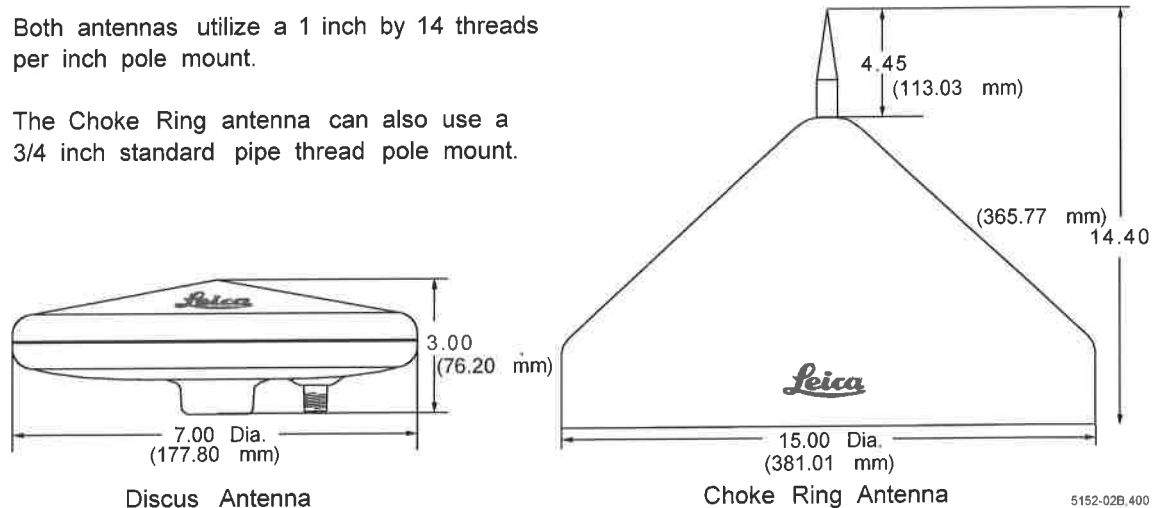


Figure 2. Navigator and Reference Antenna Mounting and Dimensions

- Connect the TNC connector end (larger of the connectors) of the coaxial cable to the antenna.
- Route the cable as directly as you can from the antenna, bring the end of the cable to the receiver installation site.

CAUTION

Be sure you don't crimp the cable with the tiedowns. Also, don't exceed the bend radius of 1 inch (25 mm). It will alter the electrical characteristics of the cable.

- Attach the SMA connector to the Navigator.

SYSTEM INSTALLATION

PROCEDURE FOR REFERENCE STATION ANTENNA INSTALLATION

1. Identify the ideal surveyed site to install the Reference Station antenna, based on the following considerations:
 - a) Locate the antenna at a precisely surveyed site, and as far as you can from high-power transmitters.

CAUTION

Any error in either the physical location or user-entered coordinates of the Reference Station antenna will directly affect the calculated pseudorange correction accuracy.

Phase center location for both antennas is at the exact center of the antenna as viewed from the top.

The phase center height is given below.

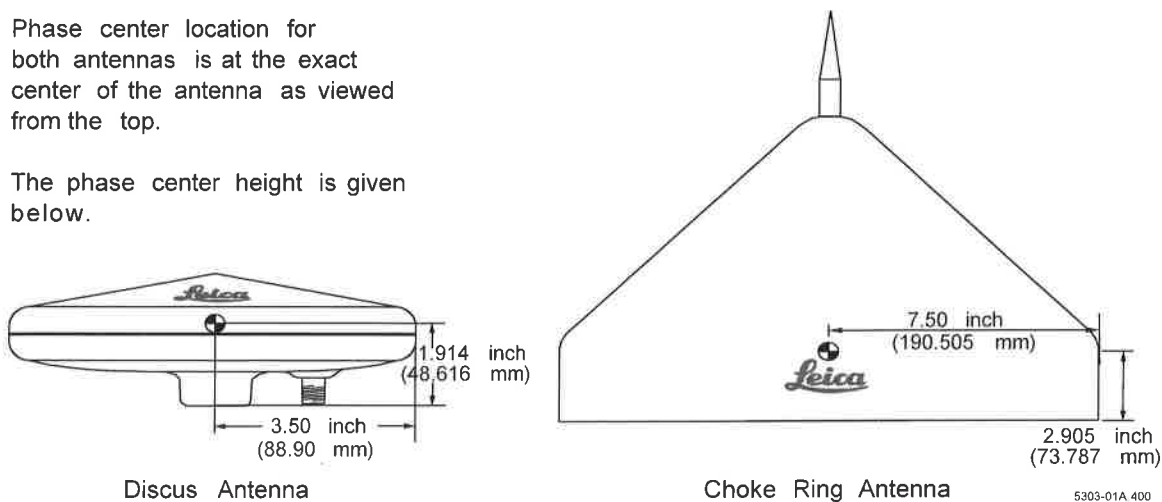


Figure 3. Discus and Choke Ring Antenna Phase Centers

- b) Avoid emitted radiation from antenna sets.
 - c) Situate the antenna:
 - so that personnel won't use it as a handle or a leaning post (otherwise, post a CAUTION sign).
 - to be free from skyline obstructions.
 - in a fixed (non-moveable) mount at least 3 feet (1 meter) above metal platforms.
2. Attach the antenna to the pole using a standard one inch by 14 thread per inch (1-14 UNC) pole mount or a 3/4 inch standard pipe thread. Dimensions of the choke ring antenna are given in Figure 2.
 3. Connect the TNC connector end (large connector) of the coaxial cable to the antenna.

4. Route the cable as directly as you can from the antenna, bring the end of the cable to the receiver installation site.

CAUTION

Be sure you don't crimp the cable with the tiedowns. Also, don't exceed the bend radius of 1 inch (25 mm). It will alter the electrical characteristics of the cable.

5. Attach the SMA connector to the Reference Station.

INSTALLING THE RECEIVER

Because of its compact size and light weight, you have lots of flexibility in how and where you install your Leica MX 9400 Receiver. An adjustable mounting platform lets you mount the unit in any orientation, even on the overhead.

You will want to choose both a physically safe environment and an electromagnetically safe environment.

Choosing a Safe Physical Environment

Locate an installation site away from excessive heat sources, such as heating vents or equipment heat exhausts. Also avoid sites (examples would be port holes/windows and hatches that open to the outside) where the flow of humid salt air might corrode internal components.

Allowing for Proper Distances

Give some thought to the location of the unit. You may wish to visually monitor the multi-color status indicator (red, yellow and green LED) on the front panel while working with other equipment. If you intend to monitor the receiver with a personal computer, you'll want to view the screen while at a particular location. A careful choice of receiver location will minimize cable lengths between components. For Navigators, you'll also want to allow a safe distance (minimum of two meters) from the receiver to the navigation compass to minimize compass deviation.

Allowing Access to Rear Panel

You will want access to the ANTENNA input connector, the 1 PPS output connector (perhaps), the event connector, and the MULTI-PORT Interface dB 25S connector (Figures 4 & 5).

NOTE: *The 1 PPS (1 pulse per second) output connector provides an optional timing source; the 1-second timing pulses are accompanied by an ASCII message giving you the precise time of each pulse.*

When installing, leave 5 inches (about 13 centimeters) or more of clearance behind the back panel of the unit. You will need that much room for dressing the cables and getting at the rear panel parts.

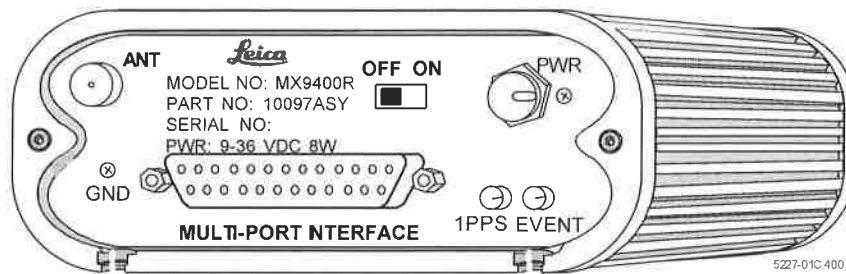


Figure 4. Rear Panel of the MX 9400 Receiver

MX 9401 Rear Panel

The MX 9401 Receiver has a different rear panel than the MX 9400. The connectors used are sealed. The antenna connector is a TNC. The rear panel of the MX 9401 is illustrated in Figure 5.

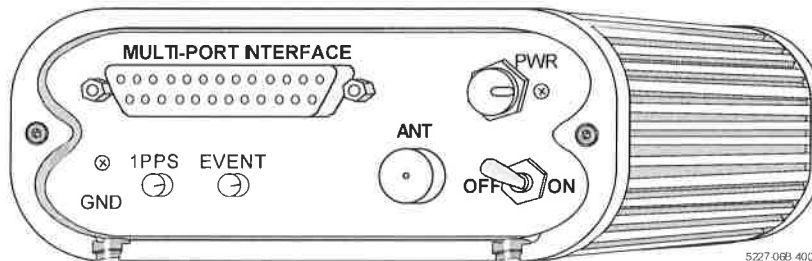


Figure 5. Rear Panel of the MX 9401 Receiver

Power and Memory Backup

Your receiver requires a minimum of 10 VDC and a maximum of 32 VDC. It requires an average of 320 milliamps at 15 VDC (average: 7.5 watts; maximum: 10 watts).

CAUTION

For reliable operation, you must provide DC power to the Leica receiver within the 10 to 32 VDC range. Never apply voltages outside this range.

The Leica receiver power supply does provide over-voltage protection. Another safeguard is an internal thermal circuit breaker protecting the unit from electrical surges (you may have need to reset it; see *Resetting the Solid State Fuse* under *Maintenance*).

In addition, an internal lithium battery gives you backup power protection for random access memory (RAM) for three to five years typically.

PROCEDURE

1. Choose the best site for mounting the unit.

NOTE: *The MX 9400 Receivers are shorter than the MX 9401 Receivers. Make sure the dimensions used for mounting are correct before drilling holes.*

2. Install the unit using the template provided. Refer to Figures 6, 7 and Table 2.
3. Connect the interface cable to the MULTI-PORT Interface connector. Tighten the connector screws with a slot screwdriver.
4. Connect a ground wire to the GND stud. Connect the ground wire at the other end to the electrical *earth* ground (the user supplies this variable length ground wire not smaller than 14 Awg.; no more than 1 meter - about 3 feet - in length). This wire helps dissipate EMI signals to reduce interference in the DGPS receiver and other equipment.
5. Connect the unit power cable to a DC power source.

CAUTION

Be sure you connect the positive lead of the power input cable (identified by the white strip) to the positive terminal of the DC power supply source. You can verify the polarity of the cable by checking for continuity between the outer ring of the connector and the negative (-) power lead.

6. Connect the antenna cable to the ANTENNA input connector (refer to Figures 4 & 5).

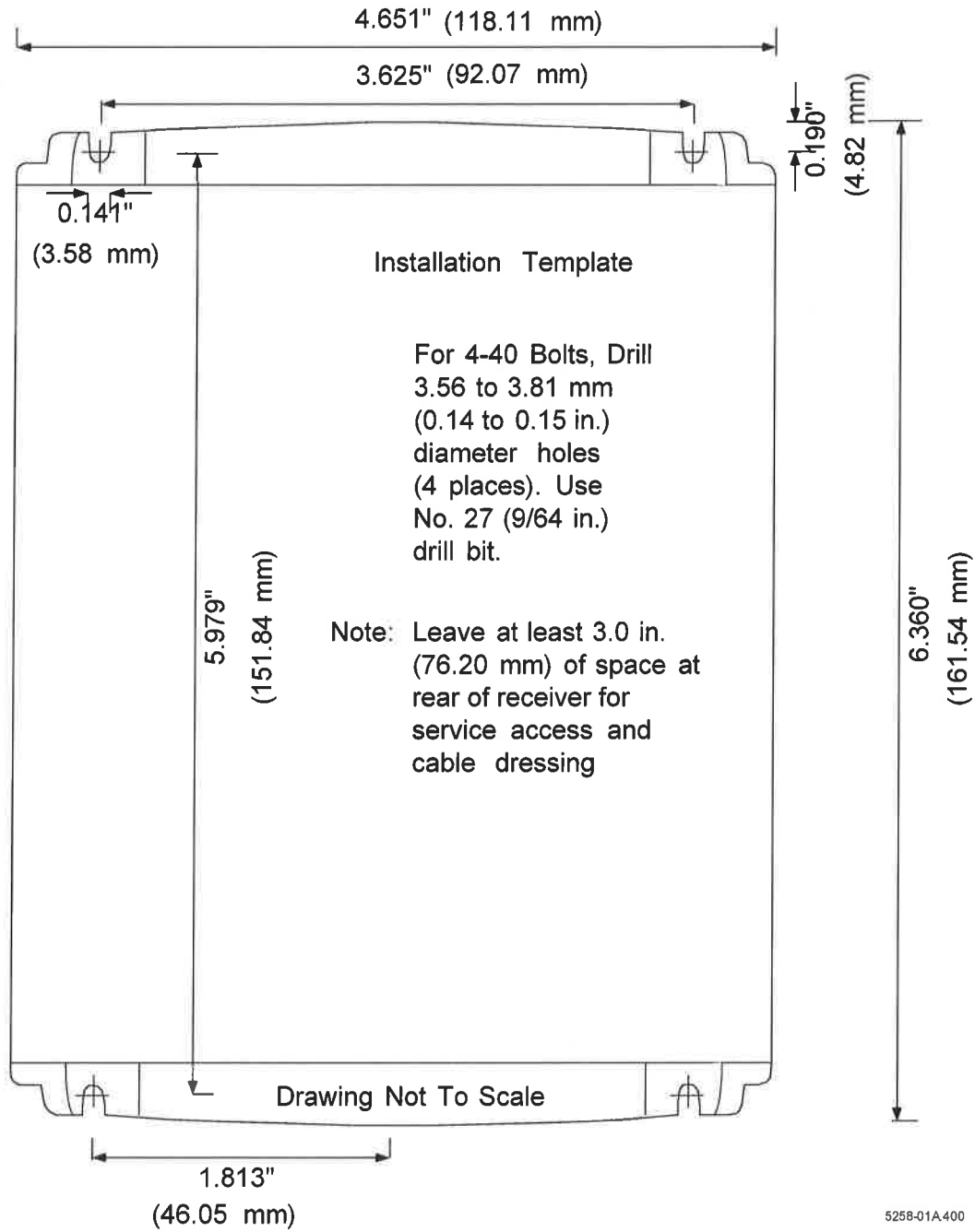


Figure 6. MX 9400 Installation Template

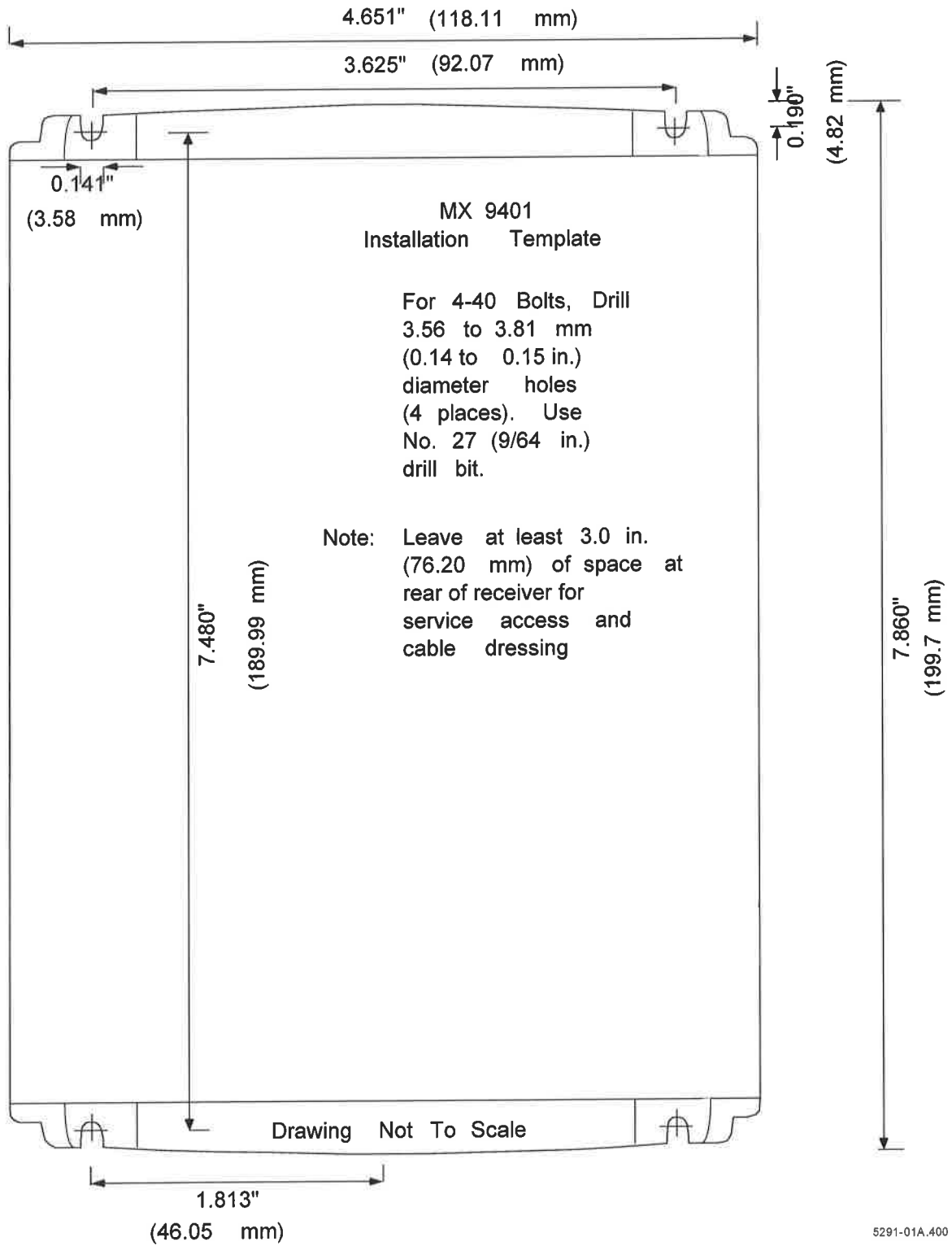


Figure 7. MX 9401 Installation Template

SYSTEM INSTALLATION

CONNECTING THE RECEIVER TO EXTERNAL EQUIPMENT

External equipment connects to the MULTI-PORT Interface connector on the rear panel of the receiver unit (see Figures 4 & 5). The interface consists of four Input/Output (I/O) serial ports; three RS-232 ports and one RS-422 port. IBM compatible (MS-DOS based) software controls the communications. Figure 8 depicts the MULTI-PORT Interface connector pin assignments. If you are logging data with a personal computer (PC) on the RS-422 port (4), you will need the optional RS-422 to RS-232 data converter kit, P/N 10236. You determine the exact use of the individual I/O ports by your needs and choice of associated equipment. You may, for example, use the Leica Navigator to navigate as a stand-alone unit or as a component in an integrated system.

Standard Port Uses

Ports 1, 2, and 3 are RS-232 ports; port 4 is a RS-422 port. Port 1 is fixed as the Control Port. All ports are factory set to 9600 baud. Below are their default functions:

- Port 1 - RS-232, Operational control and data messages (9600 baud default) [input/output]
- Port 2 - RS-232, Measurement (Raw data) [output]
- Port 3 - RS-232, RTCM SC-104 or Proprietary DGPS Corrections (MX 41R, MX 51R & MX 52R) [input for navigators/output for reference stations/beacon modulator control/navigator beacon receiver control]
- Port 4 - RS-422, Equipment/NMEA [input/output]

All ports have selectable baud rates ranging from 300 to 38,400 baud. Table 4 details port functions of both data and electrical interfaces.

Table 3. Electrical Interfaces and Data Formats

ELECTRICAL INTERFACES				
	PORT 1	PORT 2	PORT 3	PORT 4
IN	RS-232	RS-232	RS-232	RS-422
OUT	RS-232	RS-232	RS-232	RS-422
DATA FORMATS				
	PORT 1	PORT 2	PORT 3	PORT 4
IN	CONTROL MESSAGES	NOT ACTIVE	DGPS I/O	NMEA-0183 EQUIPMENT
OUT	CONTROL MESSAGES	MEASUREMENT RAW DATA	DGPS I/O	NMEA-0183 EQUIPMENT

1PPS Output

8 - 9.5 VDC; 50 Ohm; 25 μ sec pulse; 25 nsec rise time.

Event Input

Contact closure, TTL compatible, minimum pulse width 300 nsec.

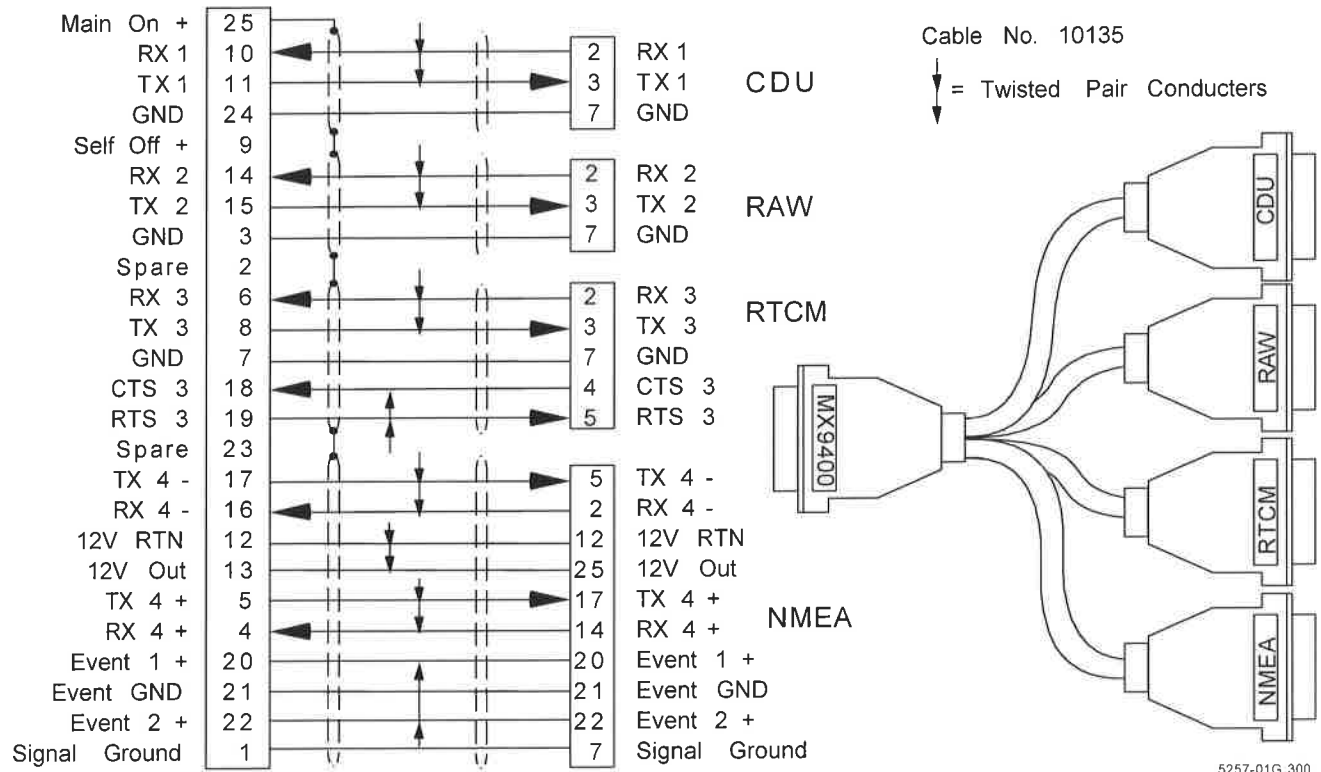


Figure 8. MULTI-PORT Interface Connector Pin Assignments

INITIAL POWER-ON CONDITIONS

When you turn on the receiver, the PC CDU display unit may indicate "Sats Visible 0, used 0" (where the number of satellites is a number from 1 to 12). Elevation and azimuth values will also be zero. This indicates that no almanac is present and is the correct display until the receiver has acquired an almanac from a satellite.

After the initial power-up, the receiver begins to collect a new almanac. This process takes at least 12 minutes from the time the first satellite is tracked. This means that the receiver typically requires a total of 15 to 20 minutes, from the time it's turned on, to complete its collection of an almanac.

When the almanac has been acquired, the receiver stops tracking satellites briefly, while it conducts a search of collected data and compiles a table of satellite rise time predictions. The receiver is able to navigate (or calculate corrections) while making these calculations.

SYSTEM INSTALLATION

Your receiver will probably have already acquired an almanac. You can verify this by glancing at the lower right corner of the menu that first appears on the PC CDU screen. If the number beside "Sats Visible" is not zero then you already have an almanac. The internal battery has preserved this information in memory from the time the unit was shipped from the factory.

If you have an almanac in your receiver, the unit will navigate (or calculate corrections) within 1 or 2 minutes of power up. Because the position shown on the screen maybe in Torrance, California, the initial displayed position may be wrong when using the navigator.

Continue below with TEST PROCEDURE and then refer to one of the "Leica MX 9400 Operator's Manuals" for a detailed description of the PC CDU program.

TEST PROCEDURE

When the installation is complete, perform the following steps to ensure proper operation of the unit:

1. Turn on the controlling device (Personal computer or other device.)
2. Set the OFF/ON switch (receiver rear panel) to the ON position.
3. Monitor the status indicator light (three color LED on the front panel of the receiver). The normal startup sequence is as follows:
 - RED: Indicates power on.
 - YELLOW: Passed self-test, attempting to acquire satellites.
 - GREEN (flashing): Tracking one or more satellites, but not yet navigating (or computing corrections).
 - GREEN: Receiver is navigating (or computing corrections).

During normal operation the receiver cycles between yellow (not tracking), flashing green (some tracking), and green (navigating/computing corrections). Changes occur as the number and geometry of tracked satellites vary.

The sequence above is for a receiver that has been turned on for the first time, or after its memory has been erased. If your receiver has an almanac, the four items described above may happen so quickly that some of them may not be noticed.

This concludes the System Installation portion of this manual. If the receiver appears to be functioning correctly, and if you are using a PC as a Control Display Unit, you will want to refer to the additional manual that was shipped with the receiver. See "Leica MX 9400 Operator's Manual".

RESETTING THE SOLID STATE FUSE

The solid state fuse (thermal circuit breaker) is located in the power input housing on the RF/power supply Circuit Card Assembly (CCA). To reset it, remove the power cord from the rear panel receptacle and replace it after 10 seconds. If the problem persists, or recurs repeatedly, remove power from the equipment and obtain service from your authorized Leica dealer.

TROUBLESHOOTING

The receiver front panel LED (sometimes referred to as a traffic light) not only indicates operational status, but can also aid you in identifying common problems. Use Table 4 to identify common problems and possible remedies.

Table 4. Troubleshooting Table

Status Indicators	Probable Cause	Recommended Action
OFF	Circuit breaker tripped or no power to unit.	<ol style="list-style-type: none"> 1. Reset circuit breaker by toggling power switch ON/OFF positions. 2. Remove the power cord from the rear panel receptacle and replace it after 10 seconds.
YELLOW	Not tracking satellites.	<ol style="list-style-type: none"> 3. Check for proper antenna connection. 4. Verify clear visibility to skyline. 5. See below.
FLASHING GREEN	Tracking satellites but not navigating or computing corrections.	<ol style="list-style-type: none"> 1. If in Search-the-Sky, wait for additional satellites to be acquired. 2. Check operator-entered elevation limit. 3. Check operator-entered DOP limit.

DISASSEMBLY AND ASSEMBLY

Tools Required
#1 Or Smaller Phillips Screwdriver
5/16" Deep Socket Driver Or Open End Wrench
1/4" Socket Driver Or Open End Wrench
7/64" Allen Wrench

Disassembly

CAUTION

The MX9400, like all complex micro-electronic devices, contains circuits that are sensitive to Electrostatic Discharge (ESD) damage. Precautions should be followed to avoid exposing the circuit boards to static electricity from the person handling them or the environment. Whenever feasible, service should be performed at an ESD safe workstation and the operator should wear an ESD wrist-strap or similar grounding device. The circuit boards should always be transported or stored in electrostatic barrier bags.

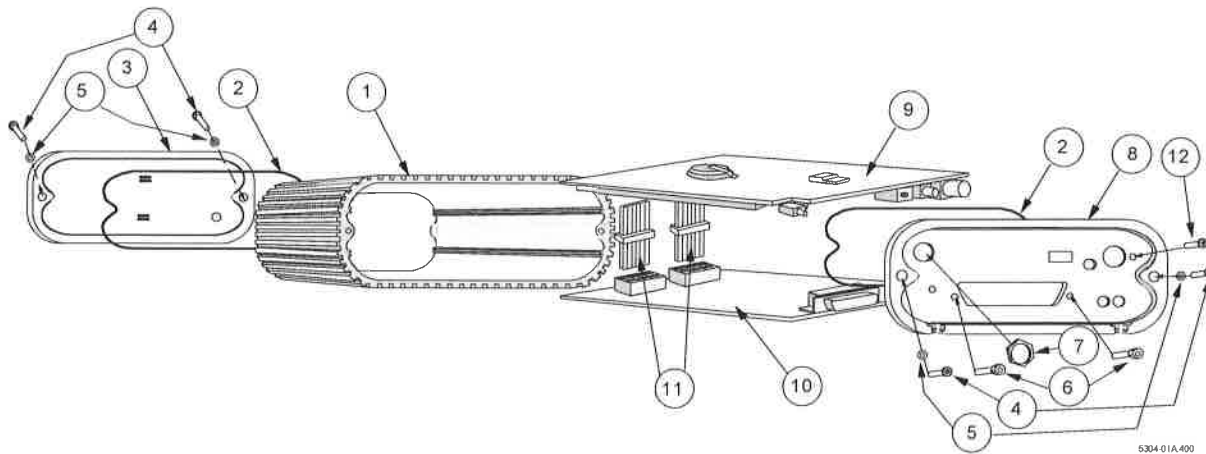


Figure 9. Exploded View Of The MX 9400

1. The board set may be pulled out by removing the rear panel (8). It is not necessary to remove the front panel (3).
2. Use the 5/16' driver to remove the retaining nut and lock washer (7) from the antenna SMA receptacle.
3. Use the small Phillips screwdriver to remove the screw and washers (12) from the power receptacle.
4. Use the 1/4" driver to remove the two mounting posts (6) from the Multi-port Interface connector.

CAUTION

Once the Rear Panel is freed, the circuit boards are no longer restrained and may fall out of the chassis if turned on end.

5. Use the 7/64" Allen wrench to remove the two Rear Panel retaining screws and washers (4).
6. Remove the Rear Panel (8), being careful not to lose the sealing gasket (2).
7. Slide out the two circuit boards (9) and (10) together.
8. To separate the two circuit boards, hold them by the edges and pull them apart at the interconnection (11). Save the interconnection headers (11).

Assembly

Re-assembly is accomplished by reversing the steps in the Disassembly Section. When installing the Rear Panel (8), be careful that the Gasket (2) is properly installed in the groove in the Rear Panel. Align the processor card LED with the front panel access hole.

SOFTWARE DOWNLOAD PROCEDURE

New software releases for your MX 9400 are easily installed in your unit using a Leica developed download program (DNLD). The install procedure is described below.

New MX 9400 software versions will be made available on high density diskettes (3.5 inch). If required, the diskette will also contain the appropriate password(s) required for installation. Should you need to upgrade multiple units, a number of files containing individual passwords for each unit will also be stored on the floppy diskette. Each password is unique to a specific receiver. Passwords are only required for paid upgrades. A password is not required to install a maintenance release.

The security system in the MX 9400 never disables a working unit. All security blocks are verified and cleared before a receiver's software or features are changed. If the required passwords are not found on the program disk, the download utility will identify the unit's *Security Identification Number, Product Type, and Software Version*, and you will be prompted to enter a unique password. Please record this information and contact Leica to receive the appropriate passwords.

Using the Download Utility

The download program defaults to COMM Port 1 and assumes that the installation files are located in the directory that contains DNLD.EXE. If you would like to change this setup, please follow the instructions under the *Download Utility Options* section.

1. Attach the connector labeled 'Control Port' to COMM Port 1 of the PC.
2. Power on the receiver.
3. Insert the floppy diskette into drive A of the PC. Type *A:DNLD* to begin the installation process.
4. After the password has been verified, the serial number, product identification and current software version are displayed. At this point, the new software will be installed into the receiver. The approximate time for software installation is about 5 minutes, but may vary depending on the hardware configuration of your computer.
5. When the installation process is complete, the receiver will be reset to factory defaults and will automatically enter *Search-the-sky* mode. *Note that the factory default is 9600 baud on all ports.*

Download Utility Options

The DNLD utility can be customized by using the slash '/', which indicates that an option follows. An option or multiple options can be input on the same line. You can run the download utility, DNLD, followed by a question mark '?' or '/h' to produce the help screen as shown:

A:DNLD /? or A:DNLD /H

The following screen will be displayed on the terminal:

```

dnld /?
Run string Syntax:
DNLD [opt1 [[opt2] ... [optN]]]
Optional switches:
/Apass      where 'pass' is the password for the specific receiver
             to permit the software upgrade.
/Cc         where 'c' is the PC comm port (1-4) for the download process
/Dname      where 'name' is the file name or path of the upgrade file.
             The default is A:\
/Fpass:cmd  where 'pass' is the password for the specific receiver
             to permit the feature upgrade.
             'cmd' is the feature upgrade command.
/H          to get this help note.
/Pt         where 't' is the unit product type to be loaded.
             The default is the product type currently in the unit.
/Rrate      where 'rate' is the maximum baud rate to be used during
             the load process. The default is 115.2k baud.
/Vv         where 'v' is the desired version to be installed.
             The default is the newest version located.

```

Each option and its use is defined below. Both upper and lower case characters are accepted. When an option requires additional input, it follows immediately after the option identifier *without any spaces in between*.

/A This option is used to identify the software upgrade password specific to the receiver being upgraded. Software installation cannot occur without the proper password. Software provided by Leica on floppy diskette will contain the proper password(s) for the unit(s) being upgraded. This option would be used, for example, if the new software version was retrieved from the bulletin board. In this scenario, a floppy diskette containing the proper password was not provided. The user will be required to provide the password to the download utility as a command line option.

Example: A:\DNLD /Apassword

/C This option enables the user to select a different COMM port on the PC rather than the default. This is useful when the MX 9400 Control Port is connected to any port other than COMM 1.

Example: A:\DNLD /C3

Install the upgrade using COMM 3 to communicate with the MX 9400.

/D This option identifies the file name or the path where the software upgrade (Hex file) is located. This option is only required if the hex file is not located in the same directory as DNLD.EXE.

Example: A:/DNLD /DC:\9400\9400.HEX

MAINTENANCE

/F This option identifies the feature enable password specific to the receiver. This password is different from that in option **/A** above. This password is used to enable a feature that is already present in the unit, but which has not yet been activated. Each option will have a command unique to the specific receiver. Leica will provide you with the feature password and the feature selection identification. You will enter this information as follows:

Example: `A:\DNLD /Fpassword:feature_selection`

/H This option displays the help list.

Example: `A:\DNLD /H`

/M This option specifies the maximum baud rate used by the download utility. The download utility defaults to downloading the new software at the highest baud rate acceptable at the MX 9400. This option is used by slower PC's which cannot communicate at higher baud rates, or when problems are encountered during the installation process. Supported baud rates are 9600, 19200, 38400, and 57600. *Note: this option is normally not required.*

Example: `A:\DNLD /M9600`

/P This option specifies the product type to install. This overwrites the currently loaded software, provided that the proper password to enable this action is used.

Example: `A:\DNLD /P9400N`

/R This option specifies the current baud rate at the MX 9400. *Note: this option is normally not required.*

Example: `A:\DNLD /R9600`

/V This option specifies which software version to install. This option is used when many versions are located in the same directory, and the newest version is NOT the version being installed in the unit, and the file name was not specified by the ID option.

Example: `A:\DNLD /V1.02`

Problems During Software Installation

The most common problem during installation is a missing or incorrect password. If the download utility cannot find the correct password, then an error message is displayed identifying the unit *Security Identification Number*, *Product Type*, and *Software Version*. You will be prompted to enter the correct password. Please record this information and contact Leica to receive the appropriate password(s). Follow the steps in the *Download Utility Options* section to execute the download process while providing the password(s) manually on the command line option.

LEICA MX 9400 RECEIVER SPECIFICATIONS

General Operating Characteristics	
Navigator Operating Modes	3 Dimensional navigation Altitude hold (3 satellites visible) Automatic cold start (no time or position input required) Altitude aided
Position Update Rate:	Twice per second (2 Hz Maximum)
Time To First Fix:	1 minute (typical), with almanac in memory
Accuracy	Position: 30 cm RMS Velocity: .05 m/s RMS
Self-Test Coverage	Antenna, antenna cable, digital sections of the circuit card assemblies, and analog section of the RF/power supply CCA
Remote Control Sources	MS-DOS PC with control software, provisions for remote ON/OFF control.

Signal Input	
Receiver Type:	Continuous Tracking. L ₁ Frequency, C/A, 12-channel (independent)
Receiver Sensitivity:	-143 dBm Costas threshold
Navigator Antenna Type:	Low profile with ground plane (Discus)
Navigator Antenna Cable (Beldon 9310): Impedance Maximum Loss Limit	50 OHMS 13 dB at L ₁
Reference Station Antenna Type:	GPS Antenna with Choke Ring
Reference Station Antenna Cable (Beldon 9310): Impedance Maximum loss limit	50 OHMS 13 dB at L ₁

Electrical Interfaces	
Input: Port 1, 2 and 3 Port 4	RS-232 RS-422
Output: Port 1, 2 and 3 Port 4	RS-232 RS-422
Baud Rate:	300 to 38400 baud all ports, selectable
Output Data:	Position, speed vector (COG, SOG, Vn, Ve) GPS status, navigation data, time
Data Formats:	NMEA-0183 - proprietary; RTCM 104; ASCII

Physical Data - MX 9400 DGPS Receiver	
Dimensions: Height Width Depth	48 millimeters (1.9 inches) 118 millimeters (4.7 inches) 164 millimeters (6.4 inches)
Weight:	1.5 kilograms (3 pounds)

Physical Data - MX 9401 DGPS Receiver	
Dimensions: Height Width Depth	48 millimeters (1.9 inches) 118 millimeters (4.7 inches) 208 millimeters (8.2 inches)
Weight:	1.8 kilograms (3.5 pounds)

Physical Data - Low Profile (Discus) Navigation Antenna	
Dimensions: Height Diameter	76 millimeters (3 inches) 178 millimeters (7 inches)
Weight (with cable):	0.9 Kilograms (2 pounds)
Cable Length:	15 meters (50 feet)

Physical Data - Choke Ring Survey Antenna	
Dimensions:	
Height	381 millimeters (15 inches)
Diameter	366 millimeters (14.4 inches)
Weight (with cable):	1.8 Kilograms (4 pounds)
Cable Length:	15 meters (50 feet)

Environmental Data	
Temperature Range	
Operational	
Receiver:	-20° to +55°C (0° to +122°F)
Antenna:	-40° to +75°C (-40° to +160°F)
Storage	
Receiver:	-40° to +85°C (-40° to +185°F)
Antenna:	-40° to +85°C (-40° to +185°F)
Humidity	
MX 9400 Receiver:	95% non-condensing
MX 9401 Receiver:	100%
Antenna:	100%

Power Data	
Power Input Requirements:	10-32 Vdc, 6 watts nominal
Power Output: (to connected device on Multiport Interface)	12 Vdc \pm 5%, 60 milliamps maximum
Grounding:	Chassis isolated from signal ground.

8

HOW ARE WE DOING?

PLEASE HELP US TO HELP YOU AND OUR OTHER VALUED CUSTOMERS BY

sending us your evaluation of this manual. We need to know such things as:

- Is the manual complete, or do you need more (or less) information?
- Can you find the information you need easily?
- Is the information easy to understand, or could we be clearer?
- Are there any errors and, if so, where and what are they?

Be sure to reference the title and identification number of this manual:

Leica MX9400 DGPS Receiver Installation and Service Manual, P/N 10136

and include your name, address and telephone number. We look forward to finding out how we can improve our information services.

All of your comments and suggestions become the property of Leica.
Please send them to:

Leica Inc.
Navigation and Positioning Division
23868 Hawthorne Blvd.
Torrance, California 90505
FAX: 310-791-6108

or write your comments on the READER COMMENT SHEET on the next page and mail it to us.



READER COMMENT SHEET

Leica MX 9400 DGPS Receiver Installation and Service Manual	10136	September 1996
Manual Title	Manual Number	Issue Date

Leica welcomes your evaluation of this manual. Please note errors, suggest additions, or make general comments below. Use extra pages if you like. All comments and suggestions become the property of Leica.

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Thank you.

YOUR NAME: _____

ADDRESS: _____

PHONE: () _____

FOLD ON BROKEN LINE AS SHOWN ON OTHER SIDE OF PAGE AND SEAL WITH TAPE.

Paste
Stamp
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Leica Inc.
Navigation and Positioning Division
23868 Hawthorne Blvd.
Torrance, California 90505

PROBLEM REPORT

Describe Problem (How long have you had this problem and is it repeatable).	Part and Serial No. _____ _____
What is connected to the control port (normally port 1)?	UTC Time/Date of Problem.
What is connected to the raw data port (2)?	LAT/LON
Do you have high-power transmitting equipment, such as radar or SSB radios? What are the signal strengths of satellites under track?	Indicate GDOP, HDOP, and VDOP, if available. 1. _____ 2. _____ 3. _____
Are you using Leica PC control software for control of peripherals? If Yes, what version? _____	Show problem state of LED. Red _____ Green _____ Yellow _____
Are you recording the raw data to disk?	Have you reset the system? Yes _____ No _____ Did it help? Yes _____ No _____
When and where can you be reached? Time and Days: _____ Address: _____ _____	Telephone Number _____ Fax Number _____
Your name, title and company.	_____

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Navigation and Positioning Division
23868 Hawthorne Blvd.
Torrance, California 90505

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Refer to the "Standard Condition of Sale" on your Order acknowledgment or Invoice.

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CONTACT LEICA FOR THE LOCATION OF YOUR NEAREST AUTHORIZED SERVICE REPRESENTATIVE.

Leica Inc.
Navigation and Positioning Division
23868 Hawthorne Blvd.
Torrance, California 90505

ATTN: FIELD SERVICE

PHONE: (310) 791-5300

FAX: (310) 791-6108

YOU WILL NEED TO KNOW YOUR UNIT'S MODEL AND SERIAL NUMBER WHEN CONTACTING LEICA FOR SERVICE. RECORD THE SERIAL NUMBER BELOW.

SERIAL NUMBER: _____

