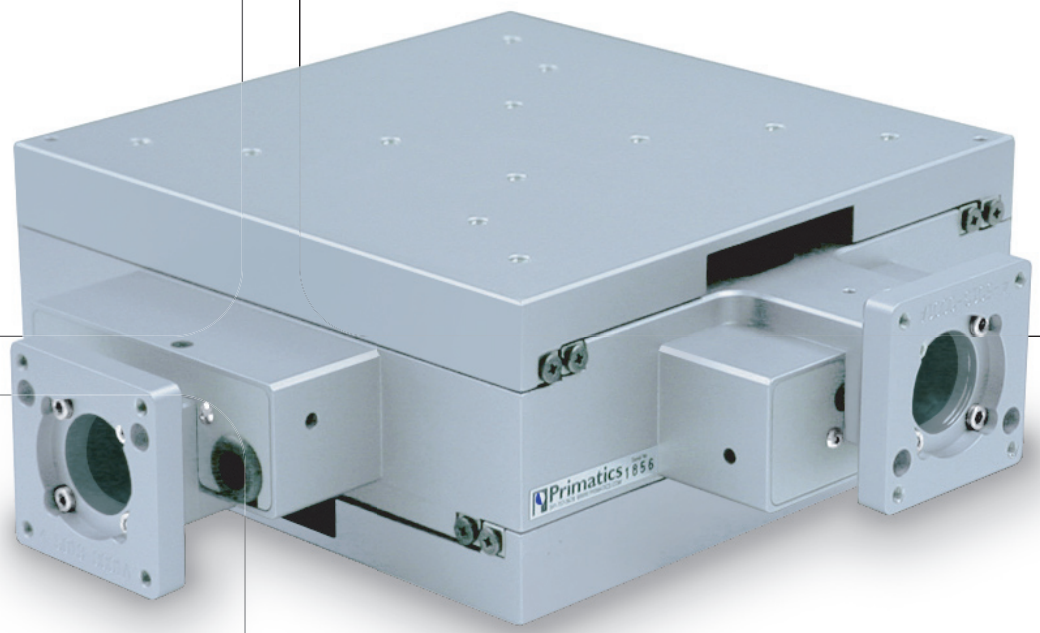
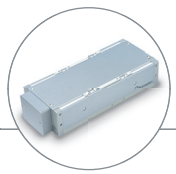
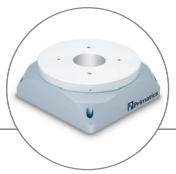
PXY88
SERIES



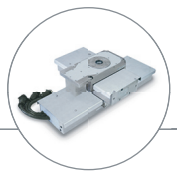
Reference & Maintenance Manual

Primatics


Linear Positioning


Rotary Positioning


Motion Controls


Engineered Solutions

32114 Mallard Ave.
PO Box 409
Tangent, OR 97389-0409
U.S.A.

Phone: [541] 791-9678
Fax: [541] 791-9410
Toll Free: [888] 754-3111
Web: www.primatics.com
E-mail: info@primatics.com

PXY88 Manual
Revision Information

Publication Date	Notes
Jan 2002	
March 2003	Changed recommended grease from Lithium #2 to NSK Clean room grease
April 2005	Updated look & formatting

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For Specifications, Dimensioned Drawings and additional information, refer to the PXY88 Datasheet available from our website at www.primatics.com.

1) Overview

This user guide is designed to help you install and maintain your PXY88 Series linear positioning stage application. Follow these steps to ensure correct stage installation and maximum stage life:

Step 1 Review this entire user manual. Become familiar with all installation procedures prior to integrating your system.

Step 2 Review the safety summary to develop an understanding of standard safety practices when installing and operating automated equipment.

Step 3 Familiarize yourself with the conventions summary.

Step 4 Review installation procedures. For best results, follow these procedures carefully.

Step 5 Once you successfully complete all the installation procedures, you will be ready to install and operate your stage.

Step 6 Review preventive maintenance section for proper lubrication schedule.

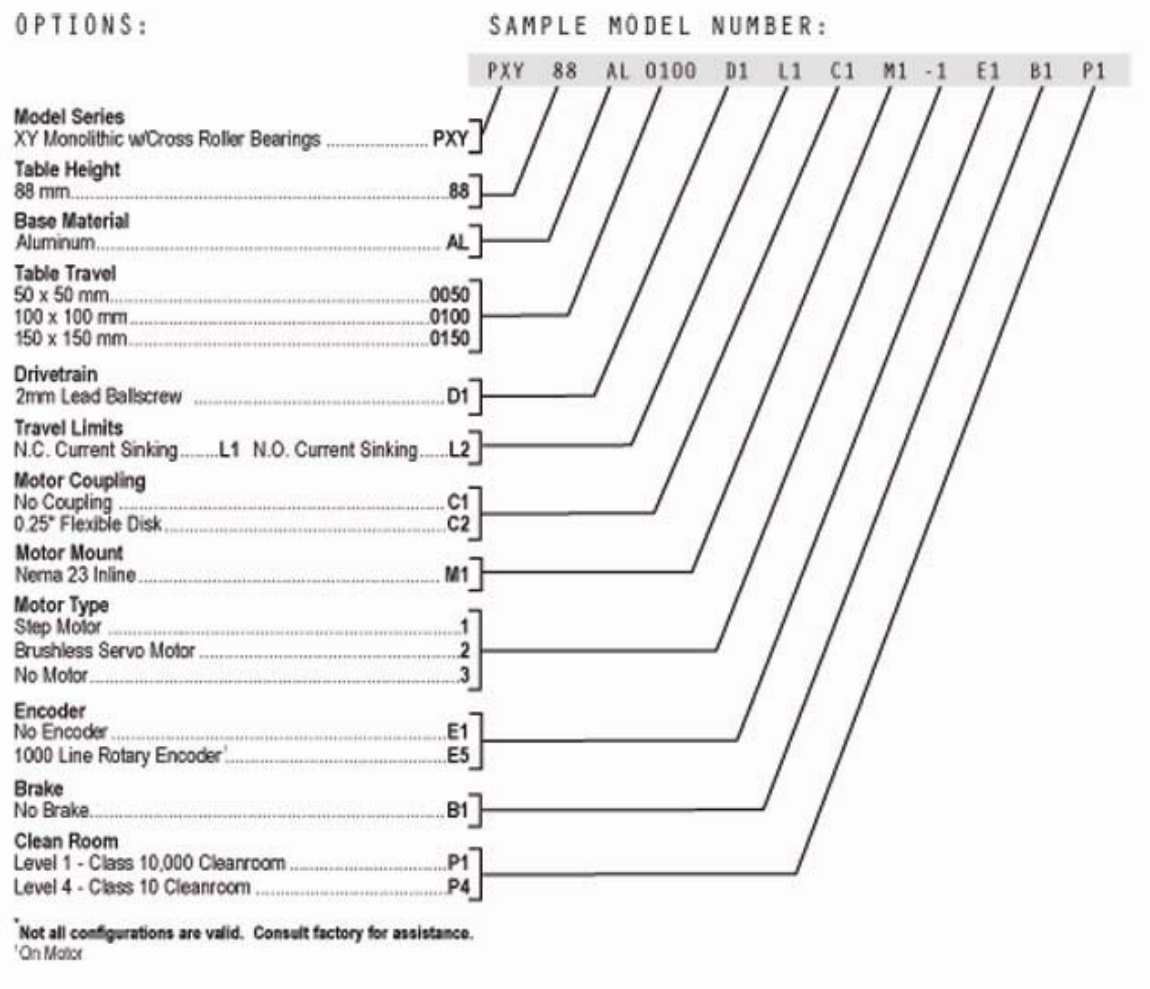
2) Introduction – About the PXY88

The PXY88 positioning stage is a monolithic, 2 axis mechanism designed for precision movement. It incorporates precision cross roller bearings for stiffness, smoothness and high load capacity and is driven with a preloaded 2mm lead precision ground ballscrew selected specifically for accuracy, repeatability, thrust, speed and life. The preloaded ballscrew nut provides high accuracy and repeatability.

Many customers choose the Primatics Motion Drive Chassis (MDC) to power PXY88 stages. The MDC is a modular system that packages motor drivers, encoder interfaces, power supplies and safety systems into a single chassis. It acts as an intermediary between a Galil Optima, National Instruments 7344 or Delta Tau PMAC II motion control cards and a Primatics positioning stage. Pre-wired high-flex cables are available to allow a convenient connection from the stage to the MDC chassis. The MDC drive chassis interfaces 3rd party controllers via a removable interconnect module. These interconnect modules conform to each manufacturers interconnect cable, and internally route all the command and I/O signals.

Optionally, a Primatics positioning stage can be used with many third party controller and amplifier systems. In this case, a pigtailed cable is available to simplify the connection between the PXY88 stage and controls.

3) Model Configuration



4) Personal Safety

Please review before installing your positioning stage

Observe common industrial safety practices when installing and operating automated equipment.

- Have power connections made by qualified personnel.
- Keep fingers and other items out of any opening in the stage while it is in operation since injury or damage may result.
- Provide a safe access route and adequate room for servicing.
- Perform the recommended periodic maintenance described in this document.
- Verify that the work envelope is free of obstructions before the positioning stage is powered.
- Insure that you have the feedback wired properly to the controller before applying power to the positioning stage. Improper feedback connections can cause a motor run-away condition that has the potential to damage the stage and injure an operator.
- Only trained operators of the positioning stage should be allowed near the work environment.
- If so equipped, identify emergency stop circuits and actuators in the workcell.
- Note the places in the workcell where pinch points occur, and provide adequate safety clearance or safety curtain.
- Never operate the motor in a location that could be splashed by water, exposed to corrosive or flammable gases or is near combustible substances since this may cause an electric shock, fire or malfunction.
- Never touch the motor, driver, or peripheral devices when the power is on or immediately after the power is turned off. The high temperature of these parts may cause burns.

5) Conventions

5.1) Direction of Motion

The positive direction of motion is defined as a motion away from the motor end of a stage. If an optional encoder is present, a positive direction of motion also signifies the encoder count is increasing. All cables and connectors are located at the motor end of the stage. The reverse limit switch is located on the motor end and the forward limit switch is located on the opposite end of the stage. Figure 5-1 illustrates this convention.

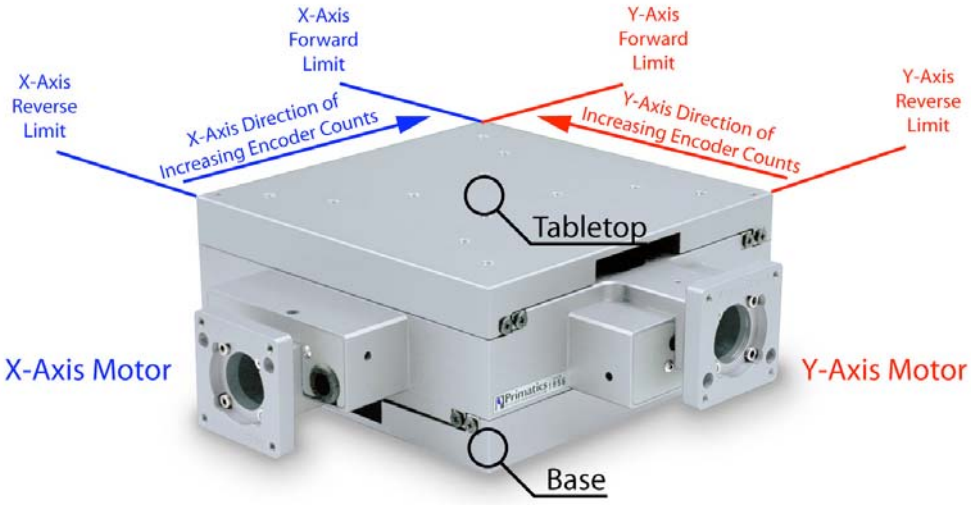


Figure 5-1: Positive direction convention

5.2) Units of Measure

Primatics uses the metric system for all specifications and dimensions. All linear dimensions are specified in millimeters. Accuracy, repeatability, resolution, flatness and straightness for the PXY is specified in microns. Load capacity is specified in kilograms and moment capacity is given in Newton-meters. All torque specifications are given in Newton-meters. Thrust specifications are given in Newtons.

The following table gives some common conversions into English units:

Metric Unit	**English Unit**
1 Kilogram equals	0.0685 slug*
1 micron equals	0.0000394 inch
1 millimeter equals	0.0394 inch
1 Newton-meter equals	8.85 in-lbs
1 Newton equals	0.2248 lbs

*1 Kg has a weight of 2.205 lb when g = 9.8 m / s^2

6) Installation Preparations

This section outlines installation environments. Unfavorable installation conditions may cause electric shock, fire, or breakdown. Certain breakdown situations or malfunctions in particular may lead to serious injury or other consequences. Assure that the unit is used under the following installation conditions:

- Indoors, free from being splashed by water
- No corrosive or inflammable gases present
- Well ventilated place, minimum level of dust or waste
- An environmental temperature range between 0-40°C, and humidity between 20-80% RH (location with no condensation) Note - These values show the range in which operation can be carried out safely, but not the environmental range in which stages accuracy can be guaranteed. Stage accuracy can be guaranteed at 20°C +/- 1°C.
- Location should not be affected by electrical noise.
- Location should be where inspection and cleaning can be performed without difficulty.

6.1) Heat and Humidity

All positioning stages are assembled and tested at 20°C. Any stage calibrations are also performed at 20°C. For optimum accuracy the ambient temperature should be maintained at 20°C. Deviations from this nominal temperature may result in degraded accuracy performance.

Ballscrew driven stages are also susceptible to thermal expansion effects. The ballscrew nut can create a localized thermal gradient if driven at high speeds. Airflow through the stage can help minimize ballnut heating.

6.2) Contamination

Applications in dirty or dusty environments require the electrical, optical and mechanical components to be protected. The PXY88 series is intended for clean environments free from small particulates and fluids.

Airflow through a stage must be filtered and dry. The filtration system should reject particles larger than 2 microns. Air pressures between 60-100 psi are sufficient for convection cooling. A typical air source can be made suitable with the addition of an inline desiccant dryer and filter/regulator assembly. Humidity should be less than 85% and there should be no condensation in the environment the stage is used in.

6.3) Electrical Noise

Electrical noise is the corruption of signals carried over low voltage wires. Encoder signals can be corrupted resulting in spurious encoder counts thus causing the stage to drift. Grounding, shielding, and spatial separation are all countermeasures to reduce the influences of electrical noise on performance. You can minimize the potential for electrical noise by observing the following installation precautions:

- Physically separate low voltage conductors from those carrying high voltage.
- Ensure that all components are properly grounded.
- Ensure that all wiring is properly shielded.

7) Installing the PXY88 Positioning Stage

7.1) Tools you will need

The PXY88 linear positioning stage uses M5x18mm (minimum) socket head cap screws in the base plate mounting as well as the carriage plate.

7.2) Unpacking

Carefully remove the stage from its shipping crate and inspect it for evidence of shipping damage. Report any damage immediately to your authorized dealer.

Improper handling of the stage may degrade its performance. Follow these guidelines when handling and mounting your stage.

1) Do not drop the stage onto its mounting surface. Place the stage gently on the mounting surface. Impact loads can cause high spots on mounting surfaces, misalignment of drive components and warping of the base.
2) Do not drill holes into the stage. If additional holes are necessary, contact your local distributor.
3) Lift the stage by its base structure only. Do not lift by the motor drive assembly.
4) Stage disassembly and alteration, unless specified otherwise, may void warranty.

7.3) Mounting surface preparation

The characteristics of the surface the positioning stage is mounted to will have a large effect on system performance. An accurate and flat positioning stage will conform to the shape of its mounting surface, therefore a flat mounting surface is required. In the absence of a sufficiently flat surface, a three point mounting scheme can be utilized to rely on the inherent flatness of the stage. This technique can introduce negative dynamic effects in moment load applications because a large portion of the stage base is not in contact with the mounting surface. The flatness and straightness specifications can be affected under large loads. For best results in maintaining stage specifications we suggest the following:

1) Use a laboratory Grade AA granite surface plate
2) Before mounting stage, inspect for burrs or dings on the stage mounting surfaces
3) Clean all mounting surfaces with acetone

In the absence of a granite surface plate, we recommend a base plate made of the same material as the base of the stage. A mounting surface constructed out of a material different from the stage base material can introduce warping in the stage in the presence of a thermal gradient. The surface flatness should match the requirements of the application; a good starting point is to have the mounting surface flat to less than 5-8µm.

7.4) Mounting the PXY88

The PXY88 has four mounting holes that can be accessed by moving the X-Axis to its forward and reverse limits. Figure 7-1 shows the location of these mounting holes.

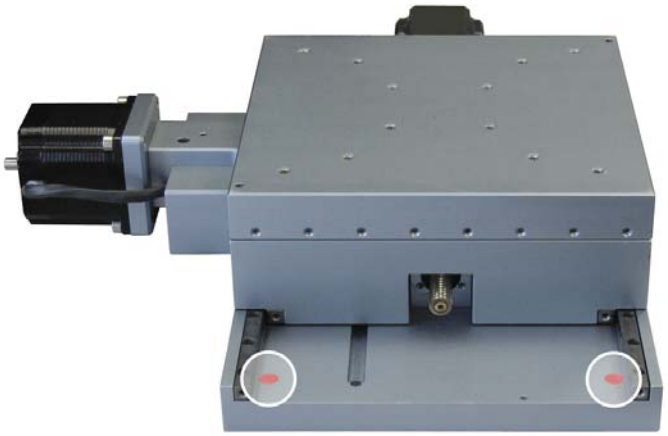


Figure 7-1: Mounting Hole Locations

7.5) Electrical Connections

Electrical connections to the stages are dependent on the type of motor option in use. Three motor options are available: No motor, Step Motor, Step Motor with encoder. The electrical connections are different for each option

Ensure that the power cables for the X (bottom) and Y (top) axes are properly routed to minimize stress on the cables and secured so that the cables do not get pinched by the cycling axes.

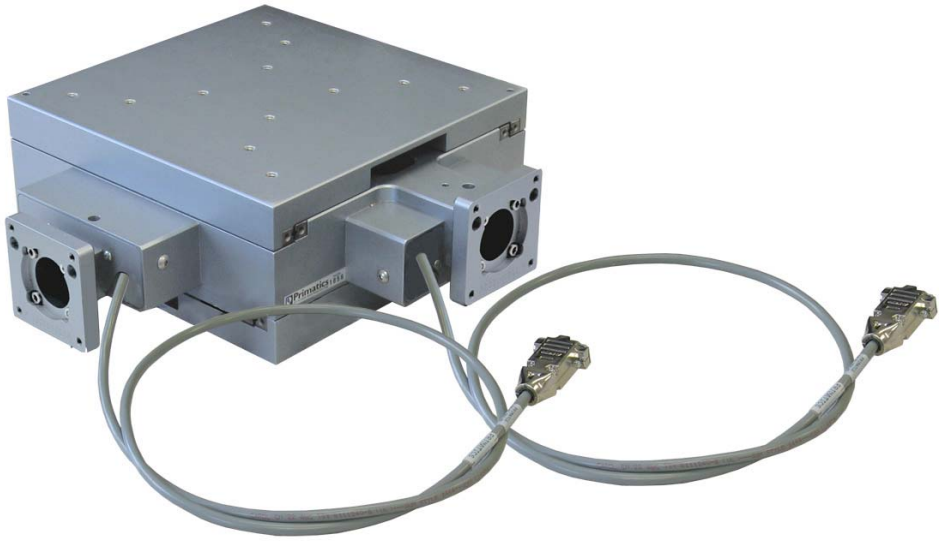
Various extension and pigtail cables are available for each option. Contact the factory for more information.

7.5.1) No Motor Option

When a motor is not supplied with the PXY88 stage, a single 9 position DSub connector is mounted near the motor mounting surface on each axis. This connector is described in Table 7-1 below.

Table 7-1 No Motor Option - Signals Connector (Limits, Home)
DSub 9 position with pins.

Pin	Function
1	Limit V+ (5 to 24VDC)
2	DCCOM (Power Supply & Signal Common)
3	Forward Limit Sensor (N.C. to DCCOM) (Open circuit upon forward limit violation)
4	Reverse Limit Sensor (N.C. to DCCOM) (Open circuit upon reverse limit violation)
5	Home (Reserved, N.C.)
6	Not Used
7	Not Used
8	Not Used
9	Not Used



7.5.2) Step Motor Option

When step motors are supplied with the PXY88 stage, each axis is terminated with 750mm length of flexible cable with a 19 position circular connector. Table 7-2 of this connector is below.

Table 7-2: Step Motor Option - Signals Connector
Circular Connector, Size 16, 19 position, panel mount, with pins

Pin	Function
A	Motor A+
B	Not Used
C	Motor A-
D	Motor B-
E	Limit V+ (5 to 24VDC)
F	DCCOM
G	Forward Limit Sensor (N.C. to DCCOM) (Open circuit upon forward limit violation)
H	Reverse Limit Sensor (N.C. to DCCOM) (Open circuit upon reverse limit violation)
J	Not Used
K	Not Used
L	Not Used
M	Signal Cable Shield
P	Not Used
R	Motor Shield
S	Home (Reserved, N.C.)
T	Temp Sensor (Not Used, Connected to DCCOM)
U	Not Used
V	Not Used

7.5.3) Step Motor with Encoder Option

When step motors with encoders are supplied with the PXY88 stage, each axis is terminated with 750mm length of flexible cable with a 28 position circular connector. Table 7-3 of this connector is below.

Table 7-3: Step Motor with Encoder Option - Signals Connector
Circular Connector, Size 20, 28 position, panel mount, with pins

Pin	Function
A	Motor A+
B	Motor B+
C	Motor B-
D	<Key>
E	Encoder 5V
F	Encoder A+
G	Encoder A-
H	Encoder B+
J	Encoder B-
K	Encoder Shield
L	Limit Sensor Power (5 to 24VDC)
M	DCCOM
N	Home (Reserved, N.C.)
P	Not Used
R	Not Used
S	Signal Shield
T	Motor A-
U	Not Used
V	Encoder Common
W	Encoder Index +
X	Encoder Index -
Y	Forward Limit Sensor (N.C. to DCCOM) (Open circuit upon forward limit violation)
Z	Reverse Limit Sensor (N.C. to DCCOM) (Open circuit upon reverse limit violation)
a	Motor Shield
b	Not Used
c	Not Used
d	Temp Sensor (Not Used, Connected to DCCOM)
e	Not Used

7.6) Limit Options:

The Limit switches are ordered in either the Normally Closed (L1) or Normally Open (L2) configuration

L1: When the carriage is in the normal operating range of travel, both limit switches are closed. When the carriage encounters a limit the switch opens. The switch will close again when the carriage is moved away from the switch.

L2: When the carriage is in the normal operating range of travel, both limit switches are open. When the carriage encounters a limit the switch closes. The switch will open again when the carriage is moved away from the switch.

7.7) Limit Switch Adjustment

The limit switches have been preset at the factory and cannot be adjusted.

7.8) Recommended System Test

Before attaching a load or applying power to your stage, verify the encoder (if available) and limit switches are working properly. Move the stage carriage by hand in the positive direction and verify the encoder count is increasing. Runaway conditions caused by mis-wired encoders can result in stage damage and personal injury. Move the carriage to each end of travel to ensure limit switches are working properly. When closing the position loop for the first time, set the torque limit of your controller to a low value, and use conservative tuning gains. Once the control loop is working properly, payloads can be added to the stage carriage.

8) Preventive Maintenance

Performing preventive maintenance procedures on your stage will extend its life and improve its long-term performance.

8.1) Lubrication

Use clean room grease to lubricate the ballscrew and linear guide components. We recommend NSK grease part #GRS LG2. For low duty cycle applications, it is recommended that the ballscrew and linear guides are re-greased every six months. High duty cycle applications may require more frequent re-lubrication. Lubrication intervals depend on duty cycle, load and ambient conditions. Inspection of the drivetrain elements may be required to determine the proper lubrication interval. Primatics offers a grease kit that has all the necessary hardware to re-lubricate the ballscrew and linear bearings.

After power has been disconnected from both axes of the stage, a light film of grease can be smeared along the length of the ballscrew. A light film can be applied the linear bearings when the stage is at one extreme end of travel. Cycle the stage back and forth to distribute the grease and wipe off any excess.

9) Troubleshooting & Service

9.1) Troubleshooting Help

For further assistance contact the factory:
M-F 8AM to 5PM Pacific Time

Phone:	[541] 791-9678
Fax:	[541] 791-9410
Toll Free:	[888] 754-3111
Web:	www.primatics.com
E-mail:	service@primatics.com

9.2) Service

Should your device require factory service, contact the factory for a Return Materials Authorization (RMA). When inquiring about an RMA please have the following information available:

- Your contact information (name, phone, email, address)
- Unit Serial Number (see Figure 9-1)
- Symptom of problem
- History of troubleshooting steps already taken

Figure 9-1: Unit Serial Number Location