

Model 7000-001

EMCenter™

Modular RF Platform

User Manual



 **ETS-LINDGREN™**
An ESCO Technologies Company

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Notes, Cautions, and Warnings

	Note: Denotes helpful information intended to provide tips for better use of the product.
CAUTION	Caution: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.
WARNING	Warning: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.



See *Laser Safety* on page 19 for detailed laser safety precautions and operational features.



See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.

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1.0 Introduction

For flexible configuration of an EMC test facility and fully-automated testing, the **ETS-Lindgren EMCenter™ Modular RF Platform** provides space for seven plug-in cards in a 3U, 19-inch rack mount enclosure. The EMCenter can also be used as a desktop unit.



The seven slots can contain a user-defined combination of these ETS-Lindgren cards: EMSwitch™, EMPower™, EMControl™, and EMSense™. When installed, each card is automatically recognized, initialized, and ready for use. For more information on the cards, see *EMCenter Plug-In Cards (Optional)* on page 8. Additionally, an IEEE interface card is available.

The EMCenter is configured and controlled using the 7-in widescreen color thin-film transistor (TFT) touchscreen on the front panel. Additionally, the EMCenter may be controlled from a computer using these software products:

- ETS-Lindgren TILE!™ (Totally Integrated Laboratory Environment)
- ETS-Lindgren EMQuest™ Data Acquisition and Analysis Software
- Other test automation software

The EMCenter contains a Vortex-embedded main processor to control all cards and to interface with the user and/or an external computer. The operating system is Linux-based, providing a stable operating environment, fast startup time, and high performance. All embedded software is stored in flash, making it easy to upgrade to new versions and future functionality.

EMCenter Plug-In Cards (Optional)



EMCenter plug-in cards are optional components. For part number information, see *Replacement and Optional Parts* on page 15. To place an order, please contact ETS-Lindgren.

EMSWITCH RF SWITCH PLUG-IN CARD

EMSwitch is a general purpose multi-channel switch matrix used to switch the RF path of equipment for RF measurement applications, including immunity, emissions, and wireless measurements. EMSwitch is available with two SPDT coaxial relays, four SPDT coaxial relays, or two SP6T coaxial relays; a 40 GHz option is also available. EMSwitch cards switch RF signals from DC–18 GHz, with powers up to 240 W.



Model 7001-001

Model 7001-003

Model 7001-002

(not all models shown)

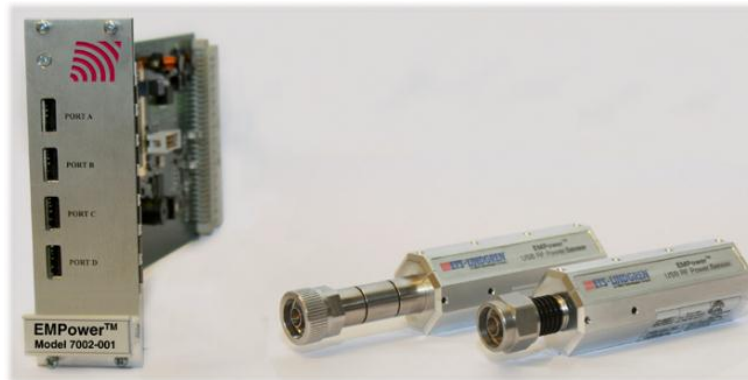
EMPOWER PLUG-IN CARD AND EMPOWER SENSORS

The EMPower Meter Plug-in Card occupies one slot in the EMCenter and includes four USB ports, accommodating any combination of up to four EMPower USB RF Power Sensors.

Two versions of the EMPower sensors are available:

- **Model 7002-002 and Model 7002-004:** Support RMS measurements for CW signals.
- **Model 7002-003 and Model 7002-005:** Measure RF bursts as short as a few microseconds.

The 7002-002 and 7002-003 sensors cover the 9 kHz to 6 GHz range, and the 7002-004 and 7002-005 sensors cover the 80 MHz to 18 GHz.



EMCONTROL POSITIONER CONTROL PLUG-IN CARD

EMControl is a versatile positioner controller which enables you to synchronize the simultaneous movements of up to two ETS-Lindgren positioning devices (for example, towers or turntables) and the on/off operation of an additional auxiliary device, such as a LISN or EUT.



EMSENSE EMF PROBE PLUG-IN CARD

The EMSense card provides an interface for ETS-Lindgren battery-powered EMC field probes. Each EMSense card can support one probe.



EMGEN RF SIGNAL GENERATOR PLUG-IN CARD

The EMGen card is a modular signal generator with AM and pulse modulation, covering a frequency range of 9 kHz to 6 GHz. EMGen is designed for EMC testing, and quickly and accurately performs EMC tests without the need for an external modulation source.



Standard Configuration

- EMCenter Modular RF Platform
- Cables: RS-232, USB, power
- Interlock plug
- Mains lead
- 19-inch mounting brackets

ETS-Lindgren Product Information Bulletin

See the ETS-Lindgren *Product Information Bulletin* included with your shipment for the following:

- Warranty information
- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS-Lindgren calibration service
- ETS-Lindgren contact information

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2.0 Maintenance

CAUTION

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.



Maintenance of the EMCenter is limited to external components such as cables or connectors.

Clean the exterior of the cabinet using a damp cloth and mild cleaner. Always unplug the unit before cleaning.

To prevent electrical shock, do not remove cover.

Warranty may be void if the housing is opened.

If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

Maintenance of Fiber Optics

Fiber optic connectors and cables can be damaged from airborne particles, humidity and moisture, oils from the human body, and debris from the connectors they plug into. Always handle connectors and cables with care, using the following guidelines.



Before performing any maintenance, disconnect the fiber optic cables from the unit and turn off power.

When disconnecting fiber optic cables, apply the included dust caps to the ends to maintain their integrity.

Before connecting fiber optic cables, clean the connector tips and in-line connectors.

Before attaching in-line connectors, clean them with moisture-free compressed air.

Failure to perform these tasks may result in damage to the fiber optic connectors or cables.

Replacement and Optional Parts



ETS-Lindgren may substitute a similar part or new part number with the same functionality for another part/part number. Contact ETS-Lindgren for questions about part numbers and ordering parts.

Following are the part numbers for ordering replacement or optional parts for the EMCenter™ Modular RF Platform.

Part Description	Part Number
EMCenter Modular RF Platform	<ul style="list-style-type: none"> • 7000-001: 7-slot EMCenter Modular RF Platform • 7000-002: IEEE Interface Card for 7-slot EMCenter Modular RF Platform
EMSwitch RF Switch Plug-in Card	<ul style="list-style-type: none"> • 7001-001: EMSwitch RF Switch Plug-in Card 2xSPDT • 7001-002: EMSwitch RF Switch Plug-in Card 4xSPDT • 7001-003: EMSwitch RF Switch Plug-in Card 2xSP6T
EMSwitch Remote Relay	<ul style="list-style-type: none"> • 7001-004: EMSwitch External Remote Relay
EMPower Meter Plug-in Card	<ul style="list-style-type: none"> • 7002-001: EMPower Power Meter Plug-in Card
EMPower USB RF Power Sensor	<ul style="list-style-type: none"> • 7002-002: EMPower 6 GHz RF Powerhead, USB • 7002-003: EMPower 6 GHz Burst/Pulse Powerhead, USB • 7002-004: EMPower 18 GHz RF Powerhead, USB • 7002-005: EMPower 18 GHz Burst/Pulse Powerhead, USB

Part Description	Part Number
EMControl Positioner Control Plug-in Card	7006-001: EMControl Positioner Control Plug-in Card
EMSense EMF Probe Plug-in Card	7007-001: EMSense EMF Probe Plug-in Card, Battery
TILE!™ (Totally Integrated Laboratory Environment)	Contact ETS-Lindgren for ordering information
EMQuest™ Data Acquisition and Analysis Software	Contact ETS-Lindgren for ordering information

Service Procedures

For the steps to return a system or system component to ETS-Lindgren for service, see the *Product Information Bulletin* included with your shipment.

3.0 Specifications

Performance Specifications

Slots:	7 modular card slots
Display:	<ul style="list-style-type: none">• TFT with touchscreen• 7.0-in WVGA (800 x 480)
Processor:	800 MHz Vortex 860x CPU
Memory:	256 MB DDR2 RAM, 512 MB Flash
Operating System:	Linux
Configuration:	Desktop or 19-in rack mountable

Physical Specifications

Height:	3U: 132 mm (5.2 in)
Width:	447 mm (17.6 in)
Depth:	350 mm (13.8 in)
Controller Weight (approximate):	7 kg (15.4 lb)

Environmental Specifications

Temperature Range:	0°C to 40°C (32°F to 104°F)
Relative Humidity:	10% to 90% (non-condensing)

Power Specifications

Supply Voltage:	115/230 VAC
Power Consumption:	<ul style="list-style-type: none">• Standby: < 1.0 W• Empty: 33 W• Max load: 200 W
Fuses:	2 A T

Interface and Cable Specifications

Interfaces:	<ul style="list-style-type: none">• RS-232• USB• Ethernet• IEEE-488 (optional)
Connectors:	<ul style="list-style-type: none">• IEC Inlet• Sub D-9• USB-A 2.0 (2)• USB-B 1.1• IEEE-488 (optional)• Ethernet• Interlock
Cables:	<ul style="list-style-type: none">• RS-232• IEC power cord
Interlock:	External interlock and interlocked laser outputs

4.0 Laser Safety

CAUTION

For additional safety information see the ETS-Lindgren *Product Information Bulletin* included with your shipment.

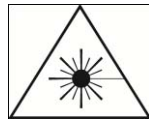
Safety Precautions

WARNING

LASER RADIATION
AVOID EXPOSURE TO BEAM
CLASS 3B LASER PRODUCT
WAVELENGTH 808 nm
OPTICAL POWER 0.5 W

WARNING

Never look into any of the fiber optic connectors. The laser emits an infrared beam that is invisible to the naked eye. Direct or even reflected light will cause permanent eye damage.



INVISIBLE LASER RADIATION: Do not stare into beam or view directly with optical instruments.
Avoid eye or skin exposure to direct or scattered radiation.

Some EMCenter™ Modular RF Platform plug-in cards use a high power laser to supply energy to a remote (floating) measuring device. The wavelength of these lasers is approximately 808 nm. These lasers are high-power, infrared lasers and invisible to the human eye. Please read the documentation and safety instructions provided in the separate manual for the specific card.

Exposure to any laser radiation during normal operation is not likely because the EMCenter uses only fiber-coupled lasers. However, for the safety of all employees, please comply with the following rules:

- When the EMCenter is not in use, power off the unit.
- The remote interlock connection should be connected to an emergency master disconnect and in series with the room door or fixture interlocks.
- Connect all fiber cables and install protective covers before switching on the system. Protective covers are identified by the following label:



- Do not attempt to turn on the EMCenter if the fiber optic cables show any sign of damage.

Safety Features

To make the EMCenter as safe as possible, the primary safety system of each plug-in card is designed to work standalone, without any intervention from the EMCenter. Apart from this, the EMCenter has its own safety interlock system, which is connected in series with the interlock system of every installed card. Additionally, the following safety measures are implemented:

- The EMCenter is equipped with a remote interlock system. For example, this interlock system would prevent inadvertent laser radiation by preventing someone from entering a shielded room and stepping on a fiber.
- To prevent accidental activation of the laser, an Acknowledge button will appear directly after the Laser Start button is pressed. The laser will start only if this button is pressed within a four-second timeframe.
- A visual Laser On indicator warns the operator of laser activity. The Laser On LED on the front panel of EMCenter indicates that at least one laser is active.

5.0 EMCenter Controls and Connectors

CAUTION

Never disconnect the fiber optic cables when one of the lasers is active.



See *Manual Control of the EMCenter* on page 27 for information on using the touchscreen controls.

Front Panel



STATUS INDICATORS

There are four status indicators on the front panel of the EMCenter™ Modular RF Platform:

- **Interlock**—Illuminates if the external interlock is open, or if one of the plug-in card interlocks encounters an interlock error.
- **Laser On**—Illuminates if at least one of the lasers in one of the cards is active.
- **Standby**—Illuminates when the EMCenter is in standby mode.
- **Power On**—Illuminates when the EMCenter is turned on.

Back Panel



- **Slots 1 through 7**—Allow you to install a combination of ETS-Lindgren plug-in cards: EMSwitch™, EMPower™, EMControl™, and EMSense™. For more information on the cards, see *EMCenter Plug-In Cards (Optional)* on page 8.
- **Slot 8**—Dedicated to the processor card for the embedded Linux computer. The processor card also provides these connectors:

RS-232	Serial interface bus to interface with a computer. Use a straight (pin-for-pin) cable with sub-D9 connectors. The baud rate is 57k6, with no parity, 8 bits and 1 stop bit.
IEEE-488/GPIB (optional)	IEEE-488 interface card to interface with a computer.
LAN	Local Area Network connection used to update the operating system and application software on the EMCenter.
USB	<ul style="list-style-type: none"> • USB-A: USB device connection for a pointing device or keyboard. • USB-B: The EMCenter can act as a USB device when connected to a computer.

- **Slot 9**—Dedicated to the power supply card. The power supply card also provides a connection for an external interlock.

Interlock	<p>Safety interlock connection that provides two floating contacts which require shorting for the EMCenter to operate.</p> <p>Use the supplied connector (6.3 mm 1/4-in stereo jack) to wire to the emergency switch of your site. Connect the tip and middle pin.</p>
Mains Inlet	<p>Used to connect to the mains power to the EMCenter.</p> <p>This IEC inlet holds a primary fuse. Always use the correct fuse when replacing the fuse.</p> <p>The main power switch is also located on the IEC inlet.</p>

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6.0 Installation

CAUTION

Before connecting any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.



If you plan to operate the EMCenter manually, software installation is not required.

The EMCenter™ Modular RF Platform may be controlled from a computer using these software products:

- ETS-Lindgren TILE!™ (Totally Integrated Laboratory Environment)
- ETS-Lindgren EMQuest™ Data Acquisition and Analysis Software

Plug-In Card Installation

CAUTION

Leave an empty slot or space 1U in height beneath the EMCenter to allow sufficient cooling through the bottom air inlets of the cabinet.

1. Install each plug-in card per the detailed installation steps provided in the separate manual for the specific card.
2. See *Power On* on page 28 and follow the instructions to turn on the EMCenter.

The EMCenter is now ready for use. You can control all cards through the touchscreen. See page 27 for information on using the EMCenter touchscreen.

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7.0 Manual Control of the EMCenter

CAUTION

Before placing into operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

CAUTION

Prior to operation, verify that the mains voltage is within the operating range of the equipment.



Common Control Buttons

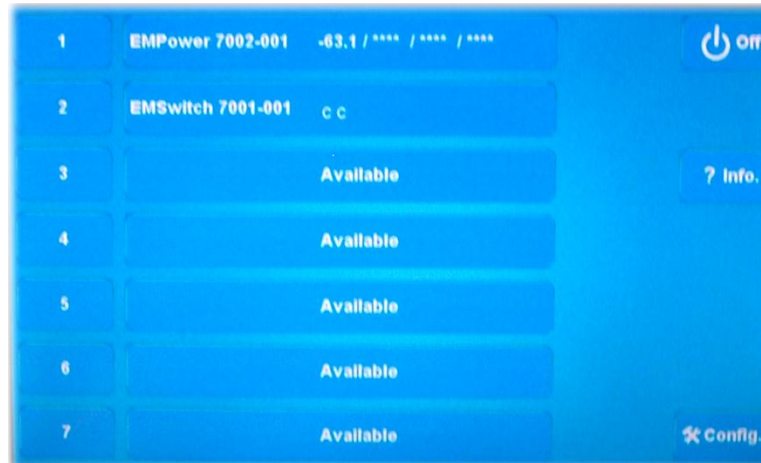
The following control buttons are common to most EMCenter™ Modular RF Platform screens (if relevant to the particular screen):

- **Home**—Press to display the Home screen. See page 31 for information on the Home screen.
- **Back**—Press to display the previous screen.
- **Info**—Press to display the Information screen. See page 30 for more information.
- **Config**—Press to display the Configuration screen. See page 33 for more information on the Configuration screen.
- **Off**—Press to power off the EMCenter. See page 28 for the steps to power on and power off.

Powering On and Off

POWER ON

1. Plug the power cord from the mains inlet on the back panel of the EMCenter into a power outlet.
2. Plug the interlock jack into the interlock connector on the back panel of the EMCenter.
3. Turn the power switch located on the back panel of the EMCenter to the on position.
4. Touch anywhere on the EMCenter screen. It will take approximately 20 seconds to boot. The Information screen will flash, and then the Home screen will display.



Sample EMCenter Home Screen

POWER OFF

1. Press the **Off** button located on the EMCenter screen.



2. Press **OK** to switch off the system.

The standby light located on the front panel of the EMCenter will flash, and then will illuminate steadily.



When the EMCenter is in standby mode, touch the screen anywhere to reboot.

3. Turn the power switch located on the back panel of the EMCenter to the off position.
4. Remove the power cord from the power connector on the back panel of the EMCenter.
5. Remove the interlock jack from the interlock connector on the back panel of the EMCenter.

Information Screen

Press **Info** to display the Information screen.



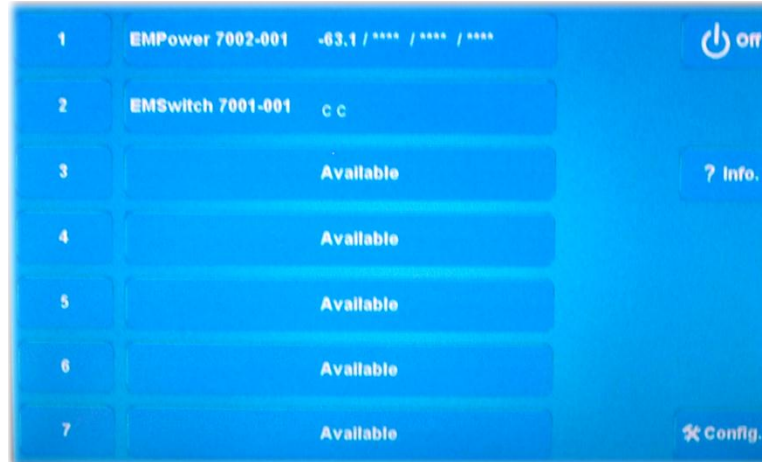
Sample Information Screen

The Information screen displays after the EMCenter is powered on. It provides the following information:

- Software version
- Configured IEEE address (if installed)
- Plug-in card installed in each slot

Home Screen

Press **Home** to display the Home screen.



Sample Home Screen

CARD SLOT NUMBERS



Looking at the back of the EMCenter, the card slots are numbered 1 to 7 from left to right.

The numbers 1 to 7 on the left side indicate the card slot numbers of the EMCenter. In this example, the following cards are installed:

- **Slot 1:** EMPower™
- **Slot 2:** EMSwitch™

No cards are installed in slots 3–7.

STATUS BOX

A status box for each slot displays to the right of the slot number. The box displays an overview of the main parameters for each installed card. This can be the actual field strength for a field probe or the positions of the different switches in case of an EMSwitch™ plug-in card. If no card is installed in a slot, the Status box will display **Available**.

To display or change the data and configuration parameters of a card, press the Status box for that card.

CONTROL BUTTONS

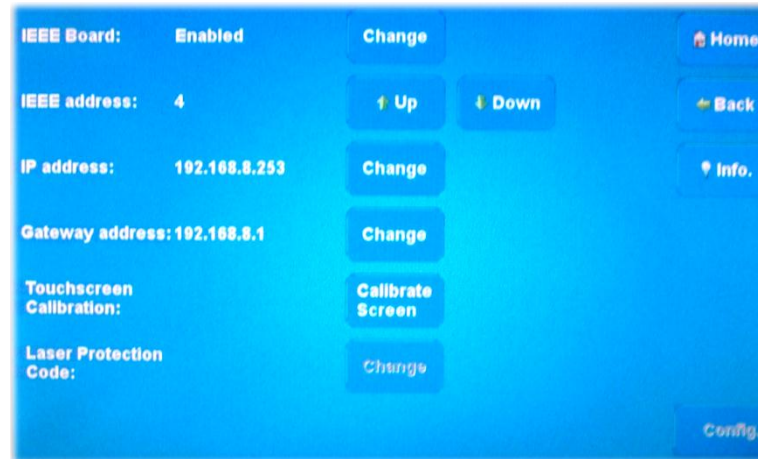
Depending on the card installed, relevant control buttons will appear. These buttons are used to start the card or to control the status of the card. See the separate manual for the specific card for more information. For a description of common control buttons, see page 27.

LOCAL MODE

Local control is disabled once the EMCenter has been operated by remote. To regain local control, press **Go to local** in the bottom right of the Home screen. (Option is available when the EMCenter is connected to a computer.)

Configuration Screen

Press **Config** to display the Configuration screen. The IEEE address of the EMCenter can be changed here.



Sample Configuration Screen

- **IEEE Board**—Press **Change** to enable or disable the board (if installed).
- **IEEE Address**—Press **Up** or **Down** to change the address (if installed).
- **IP Address**—Press **Change** to set a new address.
- **Gateway Address**—Press **Change** to set a new address.
- **Touchscreen Calibration**—Press **Calibrate Screen** and follow the on-screen instructions.
- **Laser Protection Code**—Press **Change** to enter or change a code.

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8.0 Remote Control of the EMCenter



To control a device installed in the EMCenter from a remote computer, the IEEE address of the EMCenter must be set correctly.

All commands for plug-in cards must have a two-character prefix:

- **First character:** Identifies the type of card.
- **Second character:** Provides the device number of the card.



Terminate each command with a carriage return (CR).

First Character: Identifier

The following table provides the first character or identifier for the EMCenter™ Modular RF Platform cards.

Plug-in Card	Identifier	Description
7004-004	P	Dual Laser Power Supply Card
7001-00 <i>n</i>	S	EMSwitch Card (All)
7004-00 <i>n</i>	L	<Future use>
7003-00 <i>n</i>	G	<Future use>
7002-001	X	EMPower Meter Plug-in Card
7002-00 <i>n</i>	W	EMPower Sensor (All)
7006-001		EMControl Positioner Control Plug-in Card
7007-001		EMSense EMF Probe Plug-in Card, Battery

Second Character: Device ID Number

Each card in the EMCenter is assigned a unique device ID number that is the same as the slot number; all commands for plug-in cards must be preceded by the numbered slot where the card is installed. Additionally, if the card provides a multiple port, like EMPower, the port number must also precede the command. A carriage return (CR) must terminate each command.



Looking at the back of the EMCenter, the card slots are numbered 1 to 7 from left to right.

For example, if the EMCenter was installed with the following cards, you would configure the device drivers of the external software with the device ID numbers shown in the table.

Card Slot Number =Device ID Number	Port Number	Plug-in Card Type
1		EMSwitch
2		EMLink
3		EMPower
3	A	EMPower
3	B	EMPower
3	C	EMPower
4	D	EMPower
5		EMSense
6		Empty
7		Empty
8		Processor
9		Power Supply

If a card slot supports more than one device, the device ID is the slot number, followed by the port number of that card slot. For example, using the previous table:

- To access the second EMPower in slot 3: Use device ID number **3B**.
- To access the EMLink in slot 2: Use device ID number **2**.

Command Examples

EXAMPLE 1: REQUEST DEVICE IDENTIFICATION

To request the identifier of the EMSwitch card in slot 1:

```
1 : *IDN?
```

EXAMPLE 2: REQUEST AN E-FIELD READING

To request an E-field reading from the EMSense card in slot 4

```
4 : D2
```

EXAMPLE 3: REQUEST A POWER VALUE

To request a power value from the EMPower sensor connected to port B of the card in slot 3:

```
3B : POWER?
```

Command Set and Error Codes

Following are the general commands and error codes for the EMCenter. For device-specific commands, see the separate manual for each card.

COMMAND SET

Command Message	Description
*IDN?	Request the identification of the EMCenter Response: ETS-Lindgren EMCenter version x.x.xx
STATUS?	Request the status of the EMCenter; reply is device-specific
LOCAL	Return to local mode
REBOOT SYSTEM	Reboot the EMCenter

ERROR CODES

Error Code	Description
ERROR 1	Internal buffer overflow
ERROR 2	Command too long
ERROR 3	Invalid command
ERROR 4	Command too short
ERROR 5	Invalid parameter
ERROR 6	Parameter too high
ERROR 7	Parameter too low
ERROR 8	Hardware failure
ERROR 9	Reserved
ERROR 10	Reserved
ERROR 20	Unknown device type
ERROR 21	Unknown device number

Error Code	Description
ERROR 22	No reply from device
ERROR 23	No such device
ERROR 100	EMSense probe not connected; laser off
ERROR 101	EMSense probe busy zeroing

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Appendix A: Warranty



See the *Product Information Bulletin* included with your shipment for the complete ETS-Lindgren warranty for your EMCenter.

DURATION OF WARRANTIES FOR EMCENTER

All product warranties, except the warranty of title, and all remedies for warranty failures are limited to three years.

Product Warranted	Duration of Warranty Period
EMCenter™ Modular RF Platform	3 Years

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Appendix B: EC Declaration of Conformity

ETS-Lindgren Inc. declares these products to be in conformity with the following standards, following the provisions of EMC-Directive 2004/108/EC and Low Voltage Directive 2006/95/EC:

EMCenter Modular RF Platform

- Emission:** EN 61326-1:2006, Class A
Electrical equipment for measurement, control, and laboratory use.
Note: Conducted emission complies with Class B (household equipment).
- Immunity:** EN 61326-1:2006, Industrial level, performance criteria A
Electrical equipment for measurement, control, and laboratory use.
- Safety:** EN 61010-1:2010
Safety requirements for electrical equipment for measurement, control, and laboratory use

Technical Construction Files are available upon request.