EMCenter™ Modular RF Platform

Models 7000-0XX

Product Manual

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Revision Record

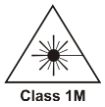
MANUAL, EMCENTER | Part #399342, Rev. H

Revision	Description	Date
A	Initial Release	JUL, 2013
B	Updated EMCenter models	JUN, 2014
C	Updated USB Driver installation instructions	NOV, 2016
D	Updated specifications	APR, 2018
E	Removed incorrect warranty info	SEP, 2020
F	Discontinued products removed. Inserted correct interface options.	APR, 2022
G	Updated format; Added Commands and Errors	SEP, 2022
H	Updated format; Added Commands and Errors	FEB, 2024

Safety Information

High Voltage: Indicates presence of hazardous voltage. Unsafe practice could result in severe personal injury or death.

Protective Earth Ground (Safety Ground): Indicates protective earth terminal. You should provide uninterruptible safety earth ground from the main power source to the product input wiring terminals, power cord, or supplied power cord set.



Laser Warning: Denotes a laser (class 1M) is part of the operating system of the device.

Waste Electrical and Electronic Equipment (WEEE) Directive: (European Union) At end of useful life, this product should be deposited at an appropriate waste disposal facility for recycling and disposal. Do not dispose of with household waste.

Notes, Cautions, and Warnings

Note: Denotes helpful information intended to provide tips for better use of the product.

CAUTION: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.

WARNING: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.

Table of Contents

Introduction

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

The slots can contain a user-defined combination of these ETS-Lindgren cards: EMSwitch™, EMPower™, EMGen™, 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) section.

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.

Standard Configuration

Standard configuration may vary by EMCenter model; contact ETS-Lindgren for additional information.

- EMCenter Modular RF Platform
- Cables: Power
- Interlock plug
- Mains lead
- 19-inch mounting brackets

EMCenter Platform Models

The EMCenter is available in the following configurations:

- **Model 7000-001**: 7-slot EMCenter Modular RF Platform
- **Model 7000-010:** 7-slot EMCenter Modular RF Platform with GPIB
- **Model 7000-004:** 2-slot EMCenter Modular RF Platform
- **Model 7000-011:** 2-slot EMCenter Modular RF Platform with GPIB
- **Model 7000-012:** 1-slot EMCenter Modular RF Platform without screen
- **Model 7000-013**: 8-slot EMCenter Modular RF Platform without screen

7-Slot and 2-Slot

The 7-slot and 2-slot systems are both 3U high and are standard delivered as a desktop model. They fit within a 19” rack mount enclosure when using the 19” brackets that are supplied.

The main difference between these two models is the amount of slots. The 7-slot has nine slots and the 2-slot Lite has four. Each model has a number of free slots (for custom selectable plug-in cards) and two dedicated slots to standard components. The slots are numbered from left to right (when looking at the back panel).

The dedicated slots are used for the embedded Linux computer (CPU plug-in cards) and power supply plug-in cards. These plug-in cards cannot be placed in any other slot. The power supply plug-in card also has a connection for an external interlock. The processor plug-in card has several interfaces to control the EMCenter such as Ethernet and GPIB (optional).

Both models are controlled by the user through the touchscreen on the front panel or by remote control through a computer.

1-Slot

The Single Slot (1-slot) EMCenter provides space for one plug-in card in a table top enclosure. The touchscreen local controls are not included to minimize the cost in this model.

The plug-in card is inserted in the front of the 1-slot EMCenter and can act as a USB device on your computer. A virtual COM-port will appear after installation of the USB driver. Use port settings: 115200,8,N,1 for this port.

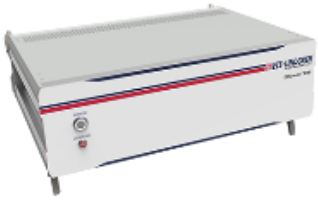
The back panel of the 1-slot contains all the cable connections. The power switch and DC-input can be found on this panel. The 1-slot is powered by an external 12V/2A mains AC/DC adapter, which is delivered (as standard) with the system.

Two communication ports are located at the middle of the back panel:

- One (Holaday compatible) serial port with settings: 9600,7,Odd,1
- One USB-B connector.

The interlock connector and a push button to start the LASER are located at the top of the back panel. (Use of the LASER button is only applicable when used with an EMSense 10 sensor.)

8-Slot



The EMCenter EM8 Modular Test System forms the heart of many different EMC and RF test systems. The EMCenter has the ability to store up to eight (8) instrument plug-in cards, which can all be controlled and used simultaneously. The 1 GBIT LAN interface, providing some of the fastest acquisition in the industry, makes the EMCenter EM8 the ideal hardware platform for applications requiring multiple channels and fast measurements, like Automotive mode-stir (reverberation chamber) testing or switching applications.

Read the manual **1788365 EM8** for more information on the EMCenter EM8.

EMCenter Plug-In Cards (Optional)

EMSwitch RF Switch Plug-In Card

The EMSwitch cards (Models 7001-xxx) use 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; 40 GHz and 67 GHz options are also available. EMSwitch cards switch RF signals from DC–18 GHz, with powers up to 240 W.

Read the manual ***399343 EMSwitch*** for more information on the differences between the various EMSwitch cards.

EMPower Meter Plug-In Card and Sensors

The EMPower card (Model 7002-001) occupies one slot in the EMCenter and includes four USB ports, accommodating any combination of up to four EMPower USB RF Power Sensors.

The following EMPower sensors are available:

- **Model 7002-002** — Support RMS measurements for CW signals and covers the 9 kHz to 6 GHz range.
- **Model 7002-003** — Measure RF bursts as short as a few microseconds and covers the 9 kHz to 6 GHz range.
- **Model 7002-004** — Support RMS measurements for CW signals and covers the 80 MHz to 18 GHz range.
- **Model 7002-005** — Measure RF bursts as short as a few microsecond and covers the 80 MHz to 18 GHz range.
- **Model 7002-006:** Burst mode, Fully Compliant with ETSI 300 328 and 301 893, while covering a range of 10 MHz to 6 GHz.
- **Model 7002-009** — True RMS Power Meter for measurements of (non)-sinusoidal signals and covers the range 4 kHz to 6 GHz. This advanced feature eliminates the need for additional signal processing or waveform assumptions, making it a versatile device for a wide range of applications.

Read the manual ***399345 EMPower*** or ***1679937 EMPower-006*** for more information on the functionality of the EMPower card and the differences between the various EMPower sensors.

EMGen RF Signal Generator

ETS-Lindgren's EMGen RF Signal Generator offers users a convenient and economical solution for signal generation.

The EMGen Module is designed to fit into the EMCenter Modular Test System and provides the user with a signal generator that can be used in different modes across the 4 kHz to 6 GHz frequency range.

Read the manual ***1741904 EMGen-003*** for more information on the functionality of the EMGen card.

EMControl Positioner Control Plug-In Card

The EMControl (Model 7006-001) is a versatile positioner controller that 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.

Read the manual ***399348 EMControl*** for more information on the functionality of the EMControl card.

EMSense 10 EMF Probe Plug-In Card

The EMSense 10 card provides an interface for ETS-Lindgren Laser-powered electric field probes. Each EMSense 10 card can support one EMSense 10 probe.

Read the manual ***1720585 EMSense 10_40*** for more information on the functionality of the EMSense 10 card and sensors.

ETS-Lindgren Product Information Bulletin

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

- 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

Operation

Installation

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

WARNING: Always unplug the unit before starting maintenance to prevent electrical shock. Maintenance includes removal of the plug-in cards or the top panel.

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.

Changing Plug-In Cards

Note: Due to the width of some cards, two consecutive empty slots are required for installation. The card will use the track of the first of the two slots.

1. **Before installing and inserting a new plug-in card make sure that the EMCenter is turned OFF and disconnect the AC Mains power cord.**

2. Determine in which empty slot of the EMCenter you want to install the Plug-in Card. Looking at the back of the EMCenter, the slots are numbered 1 through 7 from left to right.

3. Remove the blank panel from the slot by removing the two screws at the top of the blank panel and the two screws at the bottom. Be careful not to lose the screws.

4. Carefully insert the card into the slot of the EMCenter. Position the plug-in card into the slot and slowly push it, using the lower part of the plug-in card. When it reached the end of the rail, gently push and lock the plug-in card into the backplane socket.

5. Secure the card by tightening the four previous screws using a Pozi type screwdriver head PZ1.

6. Plug the interlock into the connector on the back of the EMCenter.

7. **If applicable**: Connect the desired device(s) to the correct plug-in card.

8. **Optional**: Connect the EMCenter to a computer using Ethernet or GPIB.

9. Re-connect the AC mains power cord and turn ON the EMCenter. It can now be started by tapping the touch screen. The EMCenter will automatically detect the newly installed card.

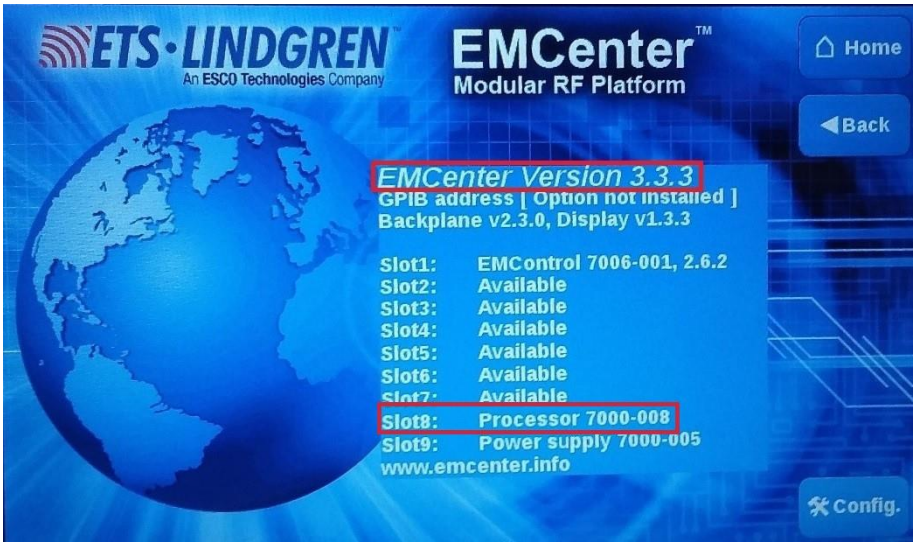
10. The card installation is complete and the EMCenter is now ready for use. You can control all cards through the touchscreen or sending remote commands.

Updating Software

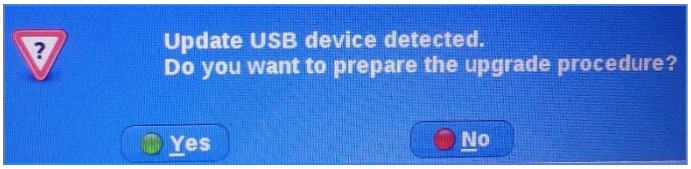
The following section gives a brief set of instructions for updating the EMCenter firmware. For more information, use for the *EMCenter Firmware Update Manual* located on the ETS software portal https://support.ets-lindgren.com/.

Note: Incremental updates were introduced to allow selective updating of the EMCenter cards and system. The updates use the same USB installers for both X86 and ARM, but the version numbers will be different as X86 is now in long-term support. The X86 version will remain at v3.3.X, as new functionality will not be added.

NOTE: The last main system update before the incremental system is called the GOLD version. **You must have at least the gold version on your EMCenter or the incremental updates will not work.** The GOLD version for X86 is v3.3.0 and ARM is v3.3.3.



1. Before starting, check on the info page of the EMCenter for the processor type, and if the EMCenter version is GOLD or higher you can use an incremental USB installer with latest update.
    - The GOLD version for X86 is v3.3.0 and ARM is v3.3.3.
        - STD (X86) = 7000-006
        - GPIB (X86) = 7000-007
        - STD (ARM) = 7000-008
        - GPIB (ARM) = 7000-009
2. Turn ON the EMCenter and wait until it gets to the main screen.
3. Plug in the USB stick with the incremental installer on it. The following box will appear when the USB is detected; click YES to prepare the download.



4. Once you have downloaded the incremental update, you may remove the USB.
5. REBOOT, as sometimes the new incremental update does not appear available until the power cycles completely.

Fiber Optic Maintenance

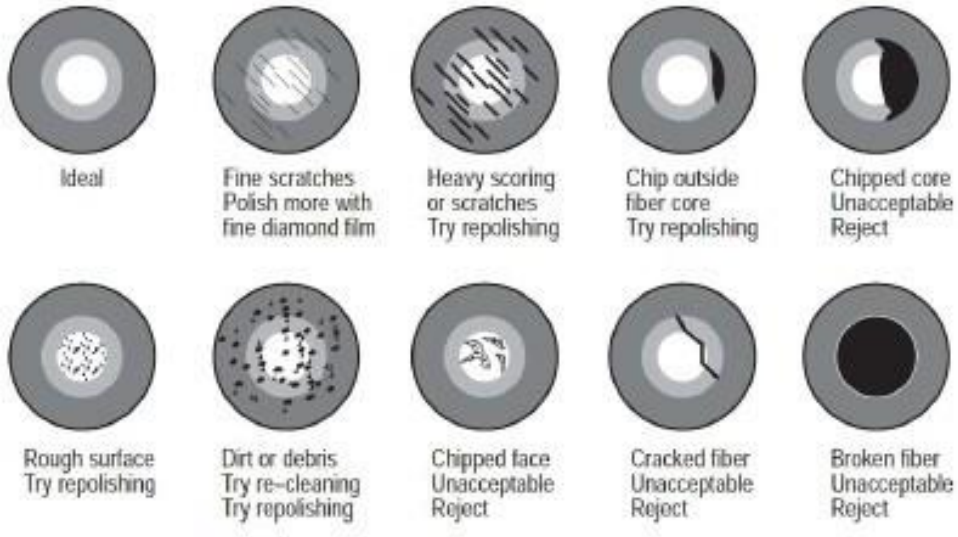
Fiber optic connectors and cables can be damaged from airborne particles, humidity and moisture, oils from the human body, and debris from the connectors they plug into. Always handle connectors and cables with care, using the following guidelines.

CAUTION: Before performing any maintenance, disconnect 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.**

Fiber Conditions

Use the examples and instructions in the following figure as a guideline for further fiber maintenance. If you have doubts about the condition of the fiber optic cables, please contact your local reseller or ETS-Lindgren for assistance and/or advice.



Laser Safety

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

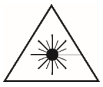
Safety Precautions

LASER RADIATION AVOID EXPOSURE TO BEAM CLASS 3B LASER PRODUCT

- **WAVELENGTH 808 nm**
- **OPTICAL POWER 0.5 W**

CAUTION: 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.

Interlock Usage

The EMCenter modular test and measurement system provides in several interlock systems. A common system interlock and local interlocks. These local interlocks can be found on some of the plug-in cards. This section describes how these interlock are intended to be used and describes the behavior of the different plug-in cards to the interlock.

Systems Interlock

Each EMCenter is equipped with a system interlock, provided on a 6,3mm (1/4”) stereo jack socket. This socket is located on the power supply plug-in card. Two floating contacts, one on the middle pin and one on the tip of the plug, require shorting for normal operation of the system. The interlock plug can be connected to a switch on the entrance of the test chamber.

Each EMCenter is equipped with a system interlock, provided on a 6,3mm (1/4”) stereo jack socket. This socket is located on the power supply plug-in card. Two floating contacts, one on the middle pin and one on the tip of the plug, require shorting for normal operation of the system.

The interlock plug can also be connected to a switch on the entrance of the test chamber. Opening the middle pin and tip of the interlock plug will engage the interlock system and lights the “INTERLOCK”- indication on the front panel.

Interlock Behaviors

The behavior of plug-in cards to the interlock is different for models. Safety is provided by hardware for mandatory systems, without the intervention of software. The following table clarifies the behavior of the plug-in cards:

Plug-in Card Modules	Action when the system interlock is engaged	Requirements

EMSwitch (all models)	None	Switch card with SPDT SMA or k-type relays are equipped with a local interlock system.
EMPower 7001-001	None	All power meters connected to this card remain powered.
EMGen 7003-001	RF output is switched off	This is done by software. **Note**: Supported by Versions 2.4.8 or higher.
EMLink 7004-001	Laser(s) are switched off	
EMControl 7006-001	All motion is stopped	By powering down the optical devices on the card. J1 on the PCB must be left open.
EMSense 7007-001	None	The probe connected to this card remains operational.
EMSense 7007-002	Laser(s) are switched off	J1 on the PCB must be left open.
EMField 7008-100	DC supply is switched off	

Local Interlock – Switch Card

Switch cards with 2 or 4 SPDT SMA or k-type relays are equipped with a local interlock system. The floating contacts of this local interlock are provided on a 3-way Binder connector on the panel of the switch card. For normal operation, the middle pin and one of the outer pins need to be shortened.

This local interlock connection can be connected to the contact (for example a magnetic switch) on the door of the shielding room. By adding a relay (operated by this local interlock) between the signal source and the amplifier, the signal will be switched off as soon as the door of the shielding room is opened.

A dip switch on the PCB of the plug-in card determines which relays are operated by the local interlock system of the switch card. By default only relay 1 is set to be operated by the local interlock (yellow switch for REL 1 is in the left position), but this can be any combination of the relays present on the card.

By moving the corresponding DIP switch to the left position, the interlock for the corresponding relay is enabled. Printed in the silkscreen is a table that describes which DIP switch has to be used for which relay output.

Please note that the outputs REL 1 to 4 are used for SPDT relays and the outputs REL 5 and 6 are used for SP6T relays.

Manual Control

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

CAUTION: Before placing into operation, follow the information provided in Safety Information on page v.

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

Powering ON/OFF

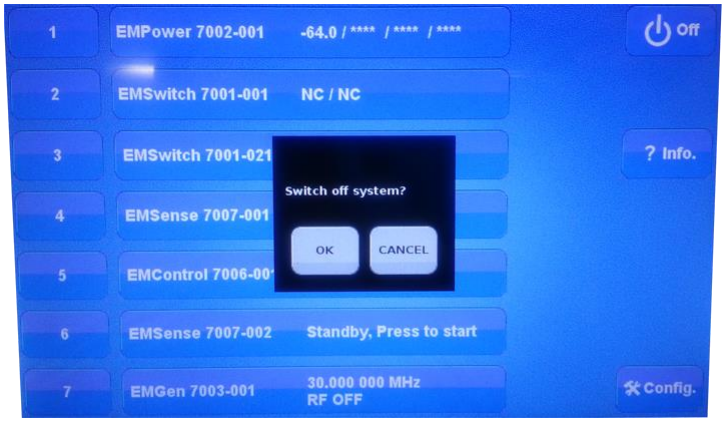
Power ON

Note: Verify all cards are installed correctly in the EMCenter.

1. Plug the power cord from the mains inlet on the back panel of the EMCenter™ Modular RF Platform 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 touchscreen. It will take approximately 20 seconds to boot. The Information screen will flash, and then the Home screen will display.

Power OFF

1. Press the Off button located on the EMCenter screen in the top right corner.



2. Press OK to switch off the system.

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

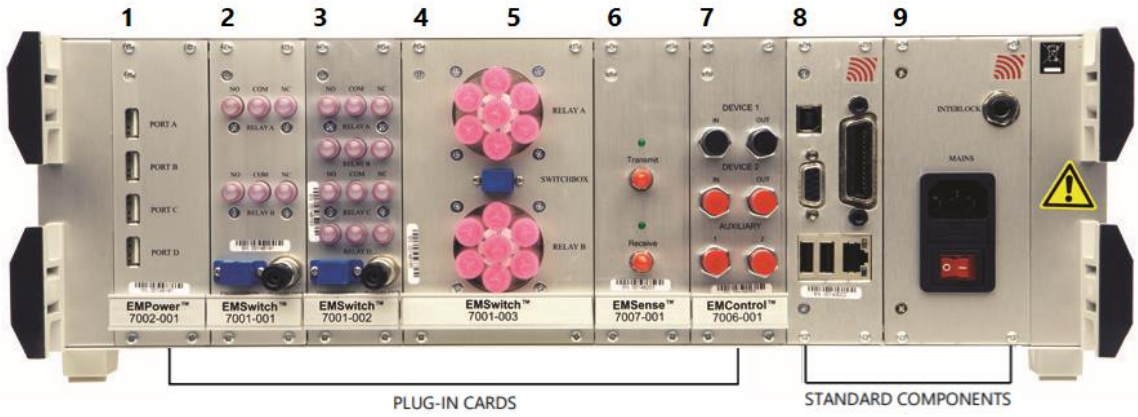
Note: When the EMCenter is in standby mode, touch the screen anywhere to reboot.

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.

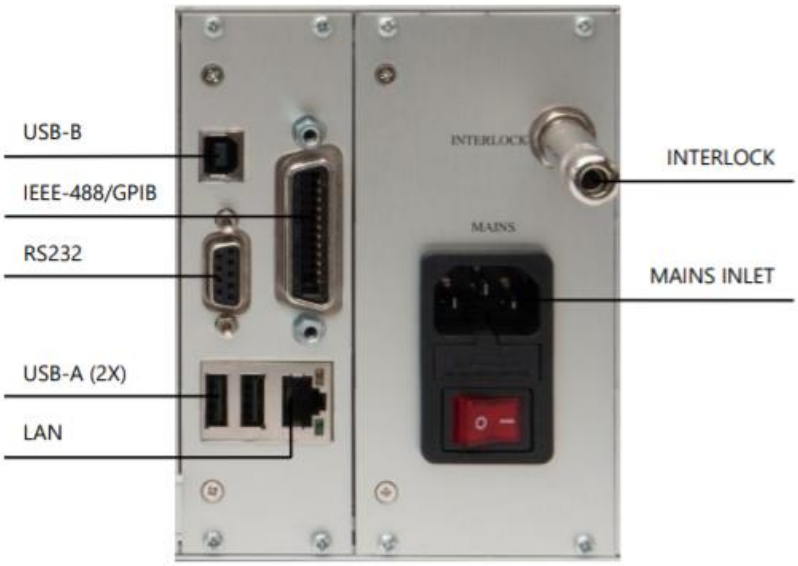
Back Panel



Slots 1 – 7 (Plug-In Cards)

Slots 1 – 9 allow you to install a combination of ETS-Lindgren plug-in cards. For more information on the cards, see the section EMCenter Plug-In Cards (Optional).

Slots 8 – 9 (Standard Components)



Slot 8 is dedicated to the processor card for the embedded Linux computer. The processor card also provides these connectors:

- **LAN (Ethernet)** – Local Area Network connection is used to remote control the EMCenter.

- **GPIB (IEEE-488)** – IEEE-488.2 interface bus to interface with a computer (optional).

Slot 9 is dedicated to the power supply card. The power supply card also provides a connection for an external interlock.

- **Interlock** – Safety interlock connection provides two floating contacts that require shorting for the EMCenter to operate. 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.

- **Mains Inlet** – Used to connect to the mains power to the EMCenter. This IEC inlet holds a primary fuse. Always use the correct fuse when replacing the fuse. The main power switch is also located on the IEC inlet.

Front Panel

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

- **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.
    - **WARNING! For safety reasons, never disconnect the fiber optic cables when one of the LASERS is switched on.**
- **Standby** — Illuminates when the EMCenter is in standby mode.
- **Power On** — Illuminates when the EMCenter is turned on.

Touchscreen

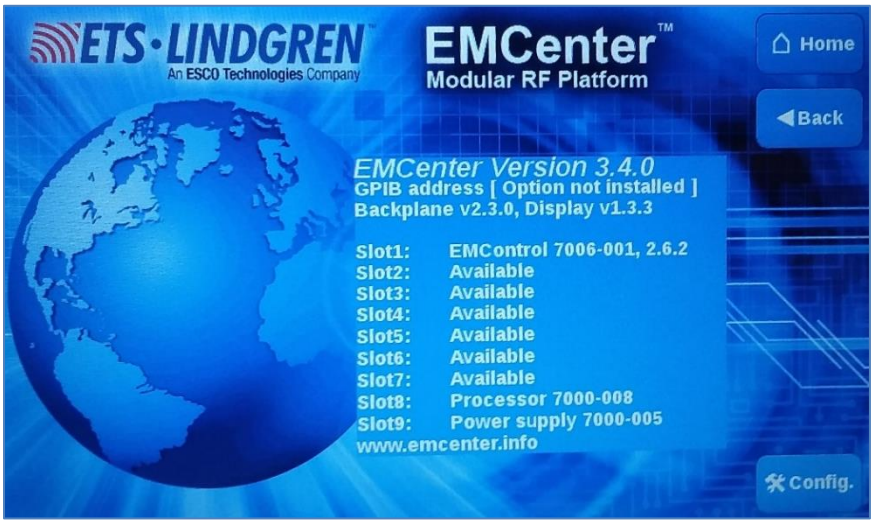
Home Page

The Home page shows the status of all plug-in cards and has the Config, Info, and OFF buttons.

- **Slot Buttons** – Use to see detailed info of the plug-in card.
- **Status Buttons** – 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.
    - If no card is installed in a slot, the Status box will display Available.
    - If there is an error, it will over-write the parameters and display the error code in red.
    - To display or change the data and configuration parameters of a card, press the Status box for that card's settings.
- **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 specific card manual for more information of these modes.
- **Local Mode** – Local control is disabled once the EMCenter is connected to a computer and has been operated by remote. To regain local control, press **Go to local** in the bottom right of the Home screen.

Info Page

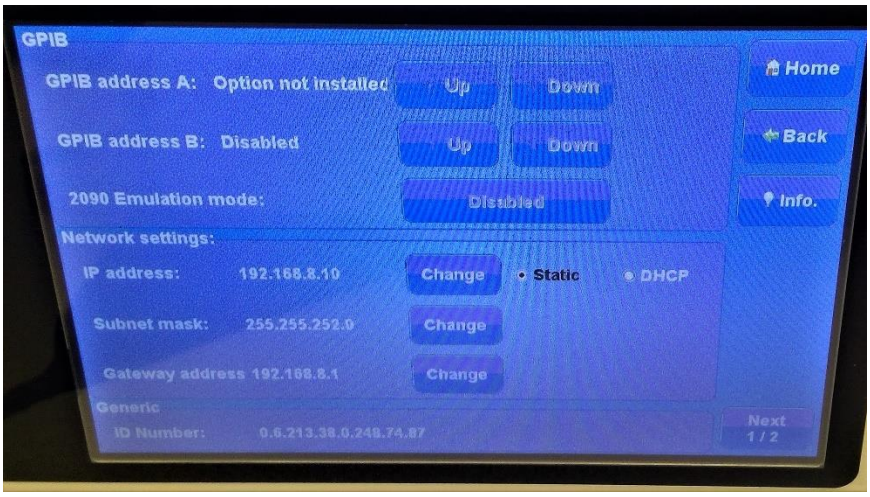
The Info page displays the version number of the EMCenter and the card versions. To access this page, the button is on the right-hand side of the Home screen.



Config Page 1/2

The first Config page has GPIB address (if applicable) and the network settings to connect remotely. To access this page, the button is on the right-hand side of the Home screen.

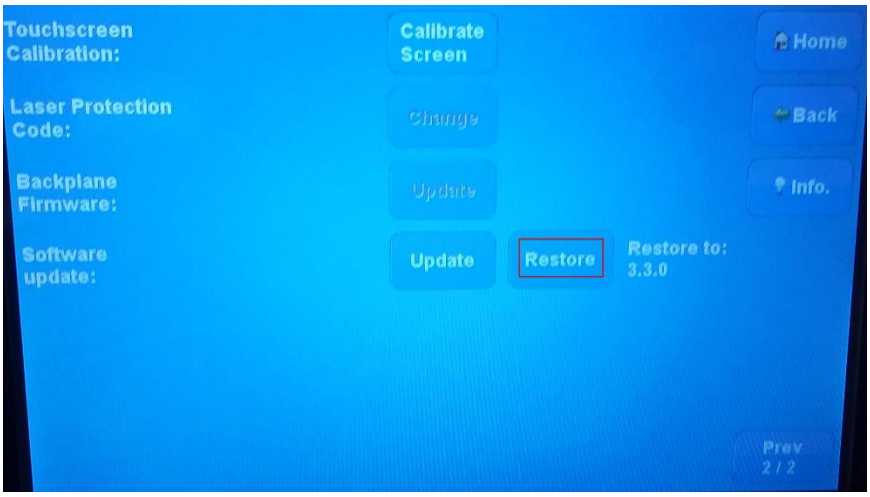
- **GPIB Address —** Press **Up** or **Down** to change the address (if installed).
- **IP Address —** Press **Change** to set a new address.
- **Subnet mask —** Press **Change** to set a new address.
- **Gateway Address —** Press **Change** to set a new address.



Config Page 2/2

The second Config page has options to update or restore software. To access this page, the button is on the right-hand side of Config page 1/2.

- **Touchscreen Calibration** — Press 'Calibrate Screen' and follow the on-screen instructions.
- **Laser Protection Code** — Press 'Change' to enter a new code.
- **Update** – Press 'Update' for options to install new software updates. See the next section for the Update page details.
- **Restore** – Press 'Restore' to change the main system firmware to the previous version number shown to the right of the button.



Update Page

The Update page shows the current versions of the EMCenter, all slots in use, and any active connected sensors. To access this page, the button is on Config page 2/2.

Available updates to select are white, and show the new update version. Any slot NOT selected (greyed out) will NOT be updated. You have to update the system and the card slots separately.

See for more information on installing new updates see the section the Updating Software.

Remote Control

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

Note: To control a device installed in the EMCenter from a remote computer using the LAN port, the IP address and Subnet Mask of the EMCenter must be set correctly.

Note: To control a device installed in the EMCenter from a remote computer using the USB Interface, a USB Driver must be installed on the remote computer. See the section *Using the USB Interface* for more information.

Example: How to Connect EMCenter via Ethernet to PC

Refer to the portal document/video *Ethernet Instrument Setup* for systematic instructions on how to setup the EMCenter for remote commands via NI MAX.

Using the USB Interface

The USB drivers for the ETS-Lindgren EMCenter™ Modular RF Platform and the EMPower™ Power Meters automatically download and install when the EMCenter or EMPower is plugged into a computer that is connected to the Internet and that is installed with one of the following supported Microsoft® Windows® operating systems.

- Windows 7 Client operating system
- Windows 7 Client x64 operating system
- Windows 8 Client operating system
- Windows 10 Client operating system
- Windows 8 Client x64 operating system
- Windows 10 Client x64 operating system

If you use an operating system not listed, please contact ETS- Lindgren.

If your computer is not connected to the Internet, or it is connected but the automatic installation failed or was cancelled, you will need to download the drivers from www.ets-lindgren.com and manually install them on your computer. See the next section for the steps to download the drivers.

Administrative rights are required to install the USB drivers on your computer.

Download USB Drivers

The USB drivers are located at ets-lindgren.com.

1. On the Resources menu, click *Software/Firmware*.
2. In the Software column, click *USB Virtual Comm Port Driver* (the name of the zip file may vary slightly). Save the zip file to the desired location on your computer.
3. Extract the files from the downloaded zip file.

If Your Computer Is Installed With Windows 7, 8, Or 10

1. Follow the Download USB Drivers steps, above.
2. Plug the EMCenter or EMPower into a USB port on the computer.
3. Open the Device Manager.
4. Click Ports (COM & LPT).
5. Click the name of the USB device.
6. Click the Driver tab.
7. Click *Update Driver* to start the software dialog box.
8. Click *Browse my computer* for driver software.
9. Click Browse, navigate to the location on your computer where you extracted the files from the downloaded zip file, and then click the location.
10. Click OK, and then click Next.
11. Click Closed.
12. Reboot the computer.

To Change the Com Port Assignment

1. Plug the EMCenter or EMPower into a USB port on the computer.
2. Open the Device Manager.
3. Click Ports (COM & LPT).
4. Click the name of the USB device.
5. Click the Port Settings tab.
6. Click Advanced.
7. Click COM Port Number and select the desired COM port.
8. Click OK, and then click OK.

Other software

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

Command Set

Syntax for Commands Prefix ID_Number

- **Prefix ID Number:** All commands for plug-in cards must have a prefix to refer to the specific card or sensor:
    - **First character identifies the card slot.** Each card in the EMCenter is assigned a unique device ID number (1-7) 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.
        - **Note:** If a card takes up 2 slots, then use the first of the 2 slots to identify it. For example, an EMSwitch in slots 3 and 4 would identify as slot 3 for commands.

    - **Second character provides the device port of the card (if applicable).** If the card provides a multiple port, like EMPower, the port letter must also precede the command (such as A, B, C, or D).
- **Command for EMCenter or plug-in card:** See the section *Command Set* for the full list of commands for all EMCenter Plug-In cards and sensors.
- **Termination character:** A carriage return (CR) **must** terminate each command. For example “\n”.

Syntax Examples

Example 1: Request Device Identification of EMSwitch Card in Slot 3:

3:*IDN?\n

Example 2: Request E-Field Reading from the EMSense card in slot 1:

1:D2\n

Example 3: Request a power value from the EMPower sensor connected to port B of the card in slot2:

2B:POWER?\n

Common General EMCenter Commands

*IDN?

Description	Request the identification of the EMCenter. **Note**: If you do not want the EMCenter system version, add the prefix to reference the specific slot/port.
Response	ETS-Lindgren, [Product name] XXXX-XXX, N.N.N • **XXXX-XXX** is the model number • **N.N.N** is the revision number
Example	Query ***IDN?\n** Read **ETS-Lindgren EMCenter version 4.3.4\n** **//**EMCenter system Query **1:*IDN?\n** Read **ETS-Lindgren, EMSwitch 7001-003, 4.3.3\n** **//**EMSwitch card Query **2:*IDN?\n** Read **ETS-Lindgren, EMPower 7002-001, 5.3.3\n** **//**EMPower card Query **2A:*IDN?\n** Read **ETS-Lindgren, EMPower 7002-003, 2.60** **//**EMPower probe Query **3:*IDN?\n** Read **ETS-Lindgren, EMGen 7003-003, 1.2.8** **//**EMGen card Query **4:*IDN?\n** Read **ETS-Lindgren, EMControl 7006-001, 2.8.0\n** //EMControl card Query **5:*IDN?\n** Read **ETS-Lindgren, EMSense 10 7007-200, 2.8.2** **//**EMSense 10 card Query **5A:*IDN?\n** Read **ETS-Lindgren, EMSense 10 7007-201, 2.8.0** **//**EMSense 10 probe

CLEAR

Description	Clears any present errors
Example	Write **CLEAR\n**

ID_NUMBER?

Description	Gets the system ID number of the plug-in card without header command
Response	x.x.x.x.x.x.x.x
Example	Query **ID_number?\n** Read **0.192.8.154.135.41.74.87\n** //unique id of EMCenter CPU Query **4:ID_number?\n** Read **1.53.138.129.21.0.0.100\n** //unique id of EMSwitch in slot 4

STATUS?

Description	Request the status of the EMCenter; reply is device-specific
Response	EMSense would have ‘LASER ON’ or ‘STANDBY’ or error
Example	Query **STATUS?\n** Read **OK\n**

LOCAL

Description	Return to local mode
Example	Write **LOCAL\n**

REBOOT SYSTEM

Description	Reboots the EMCenter / Restarts embedded software
Response	OK
Example	Write **REBOOT SYSTEM\n**

RESET

Description	Clears the current error
Example	Write **RESET\n**

VERSION_HW?

Description	Returns the hardware version number
Response	x.y.z
Example	Query **VERSION_HW?\n** Read **1.0.0\n** //EMCenter hardware version

VERSION_SW?

Description	Returns the software version number
Response	x.y.z
Example	Query **VERSION_SW?\n** Read **4.3.4\n** //EMCenter software version

EMSwitch Plug-In Cards 7001-0xx Commands

All EMSwitch Model Commands

INT_RELAY_<R>?

Description	Returns the status of internal relay
Parameters	<R> = A, B, C, or D
Response	NO or NC
Example	Query **4:INT_RELAY_A?\n** Read **NC\n** // Normally Closed Query **4:INT_RELAY_B?\n** Read **NO\n** // Normally Open

INT_RELAY_<R>_[NC/NO]

Description	Sets the internal relay position
Parameters	<R> = A, B, C, or D [NC or NO] = Normally Closed (NC) or Normally Open (NO)
Example	Write **4:INT_RELAY_A_NO\n** Write **4:INT_RELAY_B_NC\n**

INT_TEMPERATURE_<R>?

Description	Returns the analog temperature of the internal relay
Parameters	<R> = A, B, C, or D
Response	Three ASCII characters with temperature in degrees Celsius
Example	Query **4:INT_TEMPERATURE_A?\n** Read **353.0\n** //Slot 4, Relay A is 353°C Query **4:INT_TEMPERATURE_B?\n** Read **338.0\n** // Slot 4, Relay B is 338°C

External Relay Commands

EXT_CURRENT?

Description	Returns the total current consumption of the external relays in mA
Response	xx mA

EXT_READBACK_A?

Description	Returns if the indicator contacts of relay A are enabled or disabled
Response	ON or OFF

EXT_READBACK_A_OFF

Description	Disables the use of indicator contacts of external relay A

EXT_READBACK_A_ON

Description	Enables the use of indicator contacts of external relay A

EXT_READBACK_B?

Description	Returns if the indicator contacts of relay B are enabled or disabled
Response	ON or OFF

EXT_READBACK_B_OFF

Description	Disables the use of indicator contacts of external relay B

EXT_READBACK_B_ON

Description	Enables the use of indicator contacts of the relay B

EXT_RELAY_<R>?

Description	Returns status of external relay A or B
Parameters	<R> = Relay A or B
Response	1, 2, 3, 4, 5, 6
Example	EXT_RELAY_A? EXT_RELAY_B?

EXT_RELAY_<R>_<N>

Description	Sets external relay A or B to the positon 0-6.
Parameters	<R> = Relay A or B <N> = Positions (1-6), 0 means no outputs active
Example	EXT_RELAY_A_1 EXT_RELAY_A_2 EXT_RELAY_A_3 EXT_RELAY_A_4 EXT_RELAY_A_5 EXT_RELAY_A_6 EXT_RELAY_B_1 EXT_RELAY_B_2 EXT_RELAY_B_3 EXT_RELAY_B_4 EXT_RELAY_B_5 EXT_RELAY_B_6

EXT_VOLTAGE?

Description	Returns the supply voltage for external relays
Response	12V or 24V or 28V

EXT_VOLTAGE_<V>

Description	Sets the supply voltage for external relays
Parameters	<V> = 12, 24, or 28

Relay SP6T Card Commands

INTLK? SAFETYRELAY

Description	Returns the status of the interlock connector on the front of the plug-in card for the safety relay(s). The safety relay(s) can be selected with the jumpers on the PCB.
Response	0: No interlock (relay is working normal) 1: Interlock active (supply relay off)

INT_RELAY_<R>?

Description	Returns status of internal relay A or B
Parameters	<R> = A or B
Response	1, 2, 3, 4, 5, 6 If '0' is returned, no coil is energized, and all 6 outputs are open
Example	Query **1:INT_RELAY_A?\n** Read **0\n** //COM A, all open Query **1:INT_RELAY_B?\n** Read **6\n** //COM B in Position 6

INT_RELAY_<R>_<N>

Description	Sets internal relay A or B.
Parameters	<R> = Relay A or B <N> = Positions (1-6)
Response	1, 2, 3, 4, 5, 6
Example	Write **1:INT_RELAY_A_4\n** //Set Relay A to Position 4 Write **1:INT_RELAY_B_2\n** // Set Relay B to Position 2

Remote Relay Commands

N11RELAY_2?

Description	Get position of switch 2 of EMSwitch Remote Relay 1
Response	1, 2, 3, 4, 5, 6

N11RELAY_2_3

Description	Set switch 2 of EMSwitch Remote Relay 1 to position 3
Response	OK

N12RELAY_2_4

Description	Set switch 2 of EMSwitch Remote Relay 2 to position 4
Response	OK

N12RELAY_3?

Description	Get position of switch 3 of EMSwitch Remote Relay 2
Response	1, 2, 3, 4, 5, 6

N12RELAYTYPE_2?

Description	Get switch type of switch 3 of EMSwitch Remote Relay 2
Response	2, 3, 4, 5, 6

N12READBACK_3?

Description	Get readback status to switch 3 of EMSwitch Remote Relay 2
Response	0 (disabled) 1 (enabled)

N12READBACK_3_0

Description	Disable readback to switch 3 of EMSwitch Remote Relay 2
Response	OK

N12READBACK_3_1

Description	Enable readback to switch 3 of EMSwitch Remote Relay 2
Response	OK

N12RELAYTYPE_3_2

Description	Set switch type of switch 3 of EMSwitch Remote Relay 2 from 1 to 2
Response	OK

N12RELAYTYPE_3_3

Description	Set switch type of switch 3 of EMSwitch Remote Relay 2 from 1 to 3
Response	OK

N12RELAYTYPE_3_4

Description	Set switch type of switch 3 of EMSwitch Remote Relay 2 from 1 to 4
Response	OK

N12RELAYTYPE_3_5

Description	Set switch type of switch 3 of EMSwitch Remote Relay 2 from 1 to 5
Response	OK

N12RELAYTYPE_3_6

Description	Set switch type of switch 3 of EMSwitch Remote Relay 2 from 1 to 6.
Response	OK

EMPower Plug-In Card 7002-00X Commands

All EMPower Mode Commands

ACQ_SPEED?

Description	Returns ADC speed in KS/sec
Response	Speed in KS/sec
Example	Query **2A:ACQ_SPEED?\n** Read **1000.0\n**

ACQ_SPEED <s>

Description	Sets ADC sample speed in KS/sec
Parameters	<**s**> = 20, 100, 1000, or 10000 **Note**: Models 7002-002 and -004 can be set to 10 MS/sec in firmware versions higher than 2.7.0 **Note**: Different Settings for -006 power meter
Example	Write **2A:ACQ_SPEED 1000\n**

AUTO_STORE?

Description	Returns the current store setting
Response	0 or 1
Example	Query **2A:AUTO_STORE?\n** Read **0\n**

AUTO_STORE <s>

Description	Sets the auto store mode
Parameters	<**s**> = 0 (settings will not be automatically stored) <**s**> = 1 (settings will be stored in flash after each change of the settings)
Example	Write **2A:AUTO_STORE 1\n**

BURST? <NUM>

Description	Request multi measure power level in dBm Performs <number> of power measurements after each other. After the last send power measurement '<space>dBm' is sent.
Parameters	<NUM> = number of measurements
Response	Power level in dBm in the range of -12.34 - 12.35 dBm
Example	Query **2A:BURST? 5\n** Read **-63.92 -63.85 -63.85 -64.03 -63.99 dBm**

FILTER?

Description	Returns the filter setting
Response	Auto, 1, 2, 3, 4, 5, 6, 7
Example	Query **2A:FILTER?\n** Read **AUTO\n**

FILTER <n>

Description	Sets the number of samples used to calculate the RMS power value
Parameters	<1> = 10 samples <2> = 30 samples <3> = 100 samples <4> = 300 samples <5> = 1000 samples <6> = 3000 samples <7> = 5000 samples
Example	Write **2A:FILTER 7\n**

FILTER AUTO

Description	Sets the filter to automatic. The number of samples depends on the dBm range: +10 to -20 dBm = 100 samples -20 to -30 dBm = 300 samples -30 to -40 dBm = 1000 samples -40 to -50 dBm = 3000 samples below -50 dBm = 5000 samples
Response	OK
Example	Write **2A:FILTER AUTO\n**

FREQUENCY?

Description	Returns the frequency in kHZ
Response	**<f>** in kHz
Example	Query **2A:FREQUENCY?\n** Read **1300000 kHz\n**

FREQUENCY <f>

Description	Sets the frequency
Parameters	**<f>** in kHz **Note**: The frequency can be set at resolution 0.1 kHz in firmware versions higher than 2.4.x
Example	Write **2A:FREQUENCY 5000\n**

FREQUENCY? MAX

Description	Returns the Highest measurable frequency
Response	**<f>** in kHz
Example	Query 2A:**FREQUENCY? MAX\n** Read **6000000 kHz\n** ***II****(or 6 GHz)*

FREQUENCY? MIN

Description	Returns the Lowest measurable frequency
Response	**<f>** in kHz
Example	Query **2A:FREQUENCY? MAX\n** Read **9 kHz\n**

MODE?

Description	Returns current mode
Response	0, 1, 2, or 3
Example	Query **2A:MODE?\n** Read **0\n** //RMS mode

MODE <m>

Description	Sets the mode. **Note**: This command only applies to models 7002-003 and -005
Parameters	<**m**> = 0 for RMS mode <**m**> = 1 for max hold (peak) <**m**> = 2 for envelope tracing mode <**m**> = 3 for burst mode
Example	Write **2A:MODE 3** //Set Port A power meter to Burst mode

POWER?

Description	Returns the measured power in dBm
Response	**<p>** in dBm
Example	Query **2A:POWER?\n** Read **-63.84 dBm\n**

POWER_OFFSET?

Description	Returns the power offset in dB
Response	Power offset in dB
Example	Query **2A:POWER_OFFSET?\n** Read **30.00 dB\n**

POWER_OFFSET <p>

Description	Sets the power offset in dB
Parameters	**<p>** = -100.00 to 100.00 dB
Example	Write **2A:POWER_OFFSET -12.50\n**

POWER_UNIT?

Description	Returns the power unit
Response	0 or 1
Example	Query **2A:POWER_UNIT?\n** Read **0\n**

POWER_UNIT <u>

Description	Sets the power unit; Applies only to the “POWER?” command in mode 0 and mode 1.
Parameters	**<u>** = 0 for dBm **<u>** = 1 for Watts
Example	Write **2A:POWER_UNIT 0\n**

STORE

Description	Stores the current settings in flash memory
Response	OK
Example	Write **2A:STORE\n**

TEMPERATURE?

Description	Returns board temperature in 0.1 degrees. **Note**: Power measurements will be interrupted if a temperature reading is requested
Response	Temp in Degrees
Example	Query **2:TEMPERATURE?\n** Read **307.0\n** ***//*** Slot 2 board is *30.7°C*

VBW?

Description	Returns the VBW setting
Response	0, 1, 2, 3, or AUTO
Example	Query **2A:VBW?\n** Read **3\n** ***//*** 1kHz

VBW <n>

Description	Sets the video bandwidth (VBW). The VBW should be 10 times smaller than the lowest frequency to be measured. **Note**: This command only applies to models 7002-002 and -003 **Note**: If a VBW has been set for mode 0, this will not affect the VBW setting for mode 1, 2, or 3, and vice versa. Each mode remembers its own VBW setting separate from the other modes.
Response	<0> = 10MHz <1> = 1MHz <2> = 200kHz <3> = 1kHz **Note**: Different Settings for -006 power meter
Example	Write **2A:VBW 0\n**

VBW AUTO

Description	Set the VBW to automatic; the VBW is coupled to the sample speed of the power meter.
Options	VBW = 10 MHz at 1 MS/sec VBW = 1 MHz at 100 KS/sec VBW = 200 kHz at 20 KS/sec **Note**: Different Settings for -006 power meter
Example	Query **2A:VBW AUTO\n**

VERSION_SW?

Description	Returns sensor software version
Response	x.xx
Example	Query **2A:VERSION_SW?\n** Read **2.60\n** **//**probe -003

Mode 2: Envelope Tracing Commands

ACQ_ AUTO_TRIGGER?

Description	Returns trigger mode.
Response	0 or 1
Example	Query **2A:ACQ_ AUTO_TRIGGER?\n** Read **0\n** **//**single trigger

ACQ_ AUTO_TRIGGER <t>

Description	Sets the trigger mode that should be used
Parameters	<0> = single triggering <1> = automatic (normal) triggering **Note**: If auto trigger mode is set to 1, the power sensor will automatically arm each time the data has been read from the device.
Example	Write **2A:ACQ_ AUTO_TRIGGER 1\n** **//**auto trigger

ACQ_LOG_DATA?

Description	Returns log power values from buffer in dBm (ASCII text dump, values are separated by a “;”)
Response	Power values from buffer samples 0 to 1000
Time	The approximate time for the data transfer at 115200 bps is 720 ms

ACQ_LOG_DATA_ENH? <i>,<j>

Description	Returns log data from pre and/or post trigger buffer (text dump)
Parameters	Buffer sizes <i> and <j> can be 0 to 2000
Response	Power values from buffer <i> samples before trigger to <j> samples after trigger
Time	The approximate time for the data transfer at 115200 bps is • 720ms for i=j=500 • 1425ms for i=j=1000 • 2850ms for i=j=2000

ACQ_LOG_DATA_ENH_BIN? <i>,<j>

Description	Returns log data from pre and/or post trigger buffer (binary dump, 2 byte integer *100) special code 0x7777 represents data start, 0xAAAA represents data end
Response	Power values from buffer <i> samples before trigger to <j> samples after trigger
Time	The approximate time for the data transfer at 115200 bps is • 180ms for i=j=500 • 360ms for i=j=1000 • 720ms for i=j=2000

ACQ_LOG_DELAY?

Description	Returns number of samples that searching for a trigger will be delayed after first occurring trigger
Response	0 to 2000000
Example	Query **2A:ACQ_ LOG_DELAY?\n** Read **50\n**

ACQ_LOG_DELAY <d>

Description	Sets number of samples that a trigger will be delayed after the measurement is armed
Parameters	<d> = 0 to 2000000
Example	Write **2A:ACQ_ LOG_DELAY 25\n**

ACQ_LOG_MAX?

Description	Returns the highest power value in dBm recorded in buffers
Response	highest power in dBm
Example	Query **2A:ACQ_ LOG_MAX?\n** Read **-9.97 dBm\n**

ACQ_LOG_RESET

Description	Resets (clears) the sample buffers and arms the envelope trace measurement to wait for the next valid trigger
Example	Write **2A:ACQ_ LOG_RESET\n**

ACQ_LOG_STATUS?

Description	Returns the log status
Response	0 = waiting for trigger 1 = buffers filled
Example	Query **2A:ACQ_ LOG_RESET?\n** Read **0\n**

ACQ_LOG_THRESHOLD?

Description	Returns trigger level; second value is an internal level for debug purposes
Example	Query **2A:ACQ_ LOG_THRESHOLD?\n** Read **-40.00; 12345\n**

ACQ_LOG_THRESHOLD <l>

Description	Sets the trigger level to power level <l> in dBm
Parameters	<l> in dBm
Example	Write **2A:ACQ_ LOG_THRESHOLD 10\n**

ACQ_LOG_TRIGGER?

Description	Returns Trigger mode
Response	<a> = mode (0 or 1) <b> = rising/falling edge (0 or 1) <c> = trigger filter (1 to 100)
Example	Query **2A:ACQ_ LOG_TRIGGER?\n** Read **1,1,1\n**

ACQ_LOG_TRIGGER <a>,<b>,<c>

Description	Sets trigger mode
Parameters	<a> = 0 for Edge triggering or 1 for Level triggering (**Note**: During edge trigger the distance between two samples is 10, during level trigger the distance between to samples is 1) <b> = 0 for Falling edge or 1 for Rising edge <c> = 1 to 100 for number of samples used to evaluate edge or level trigger
Example	Write **2A:ACQ_ LOG_TRIGGER 0,1,10\n**

ACQ_LOG_TRIG_DIST <d>

Description	Sets the distance between two consecutive samples for detecting rising or falling edge. **Note**: This command is only used for debugging. Default distance is 10 samples. VALUE will not be stored in flash memory.
Parameters	<d> =1 to100
Example	Write **2A:ACQ_ LOG_ TRIG_DIST 10\n**

ACQ_LOG_TRIG_HOLDOFF?

Description	Returns number of samples that trigger will be held off after first occurring trigger
Response	0 to 1000000
Example	Query **2A:ACQ_ LOG_TRIG_HOLDOFF?\n** Read **100\n**

ACQ_LOG_TRIG_HOLDOFF <d>

Description	Sets number of samples that a trigger will be held off after first occurring trigger. If a trigger occurs during the hold off period, the counter will be reset.
Parameters	<d> = 0 to 1000000
Example	Write **2A:ACQ_ LOG_TRIG_HOLDOFF 100\n**

Mode 3: Burst Logging Commands

BM_BURST_COUNT?

Description	Returns the number of bursts found within the set measurement period.
Response	Number of bursts; the maximum number is 800
Example	Query **2A:BM_BURST_COUNT?\n** Read **252\n**

BM_BURST_DATA?<i>

Description	Returns for burst with number<i> the start time (x); end time (y); RMS power (z). Final character is a newline.
Parameters	**<i>** = burst number
Response	“x;y;z” or “NO DATA” • <x> = start time • <y> = end time • <z> = RMS power

BM_BURST_DATA_DUMP

Description	Returns for each burst within the measurement period the start time (x); end time (y); RMS power (z). Final character is a newline.
Response	“x;y;z” or “NO DATA” • <x> = start time • <y> = end time • <z> = RMS power

BM_GO

Description	Starts a single burst measurement
Response	OK
Example	Write **2A:BM_GO\n**

BM_MEASURE_PERIOD?

Description	Returns the measurement period
Response	Time in milliseconds (ms)
Example	Query **2A:BM_ MEASURE_PERIOD?\n** Read **500\n**

BM_MEASURE_PERIOD <T>

Description	Sets the measurement period <T >in ms
Parameters	**<T>** can be set from 1 to 1000 ms
Example	Write **2A:BM_ MEASURE_PERIOD 500\n**

BM_NOISE_TIMER?

Description	Returns the number of samples that are set
Response	Number of samples
Example	Query **2A:BM_NOISE_TIMER?\n** Read **10\n**

BM_NOISE_TIMER <n>

Description	Sets the number of samples allowed below the threshold before a new burst is counted
Parameters	**<n>** can be set between 0 and 5000 samples
Example	Write **2A:BM_NOISE_TIMER 10\n**

BM_STAT?

Description	Returns the status of the burst measurement
Response	0 = measurement is not started or in progress. 1 = measurement is completed and the data is ready to be read
Example	Query **2A:BM_STAT?\n** Read **1\n**

BM_TRIG_LEVEL?

Description	Returns the trigger level in dBm
Response	**<l>** in dBm
Example	Query **2A:BM_TRIG_LEVEL?\n** Read **-40\n**

BM_TRIG_LEVEL <l>

Description	Sets the trigger level for burst detection
Parameters	**<l>** can be set between -70 and +12 dBm
Example	Write **2A:BM_TRIG_LEVEL -10\n**

7002-006 Only Commands

ACQ_SPEED <s>

Description	Sets ADC sample speed in KS/sec
Parameters	<**s**> = 10, 50, 100, 500, 1000, 5000, 10000, 20000, or 40000
Example	Write **2A:ACQ_SPEED 5000\n**

FILTER_BW?

Description	Returns the filter bandwidth in Hz. Sample speed divided by number of averages defined by the filter setting.
Response	<**BW**> in Hz
Example	Query **2A:FILTER_BW?\n**

VBW?

Description	Returns the VBW setting
Response	Auto, 1 kHz, 10 kHz, 100 kHz, 1 MHz, or 10 MHz
Example	Query **2A:VBW?\n** Read **1 MHz\n**

VBW AUTO

Description	Set the VBW to automatic; the VBW is coupled to the sample speed of the power meter.
Options	VBW = 10 MHz at 20 MS/sec and 40 MS/sec VBW = 1 MHz at 5 MS/sec VBW = 100 kHz at 1 MS/sec and 500 KS/sec VBW = 10 kHz at 100 KS/sec VBW = 1 kHz at 10 KS/sec and 50 KS/sec
Example	Query **2A:VBW AUTO\n**

7002-009 Only Commands

ACQ_SPEED?

Description	Gets set ADC sample speed in KS/sec
Response	<**s**> in KS/sec
Example	Write **2A:ACQ_SPEED?\n** Read **1000\n**

ACQ_SPEED <s>

Description	Sets ADC sample speed in KS/sec
Parameters	<**s**> = 1000 or 5000* * 5000 is not supported in range mode
Example	Write **2A:ACQ_SPEED 1000\n**

FILTER_BW?

Description	Returns the filter bandwidth in Hz. Filter bandwidth is calculated by ACQ_speed divided by averaging.
Response	<**BW**> in Hz.
Example	Query **2A:FILTER_BW?\n**

Get_DATA?

Description	Returns power, frequency, and filter in a single reply.
Example	Query **2A:Get_DATA?\n**

EMGen Plug-In Card 7003-003 Commands

General EMGen Commands

*CLS

Description	CLS (Clear Status) is used to clear the status byte (STB) and event status enable register (ESR) by setting them to 0

*ESE?

Description	Gets the result of the event status enable (ESE) register
Response	Value can be set from 0 to 128

*ESE <value>

Description	Set bits in the standard event status enable (ESE) register
Parameters	Value can be set from 0 to 128

*OPC?

Description	Operation Complete (OPC) queries whether the last command has been executed. OPC returns 1 when the previous command has been processed. This command allows for software synchronization following the setting of signal generator parameters. ETS-Lindgren recommends using the *OPC? query following FREQuency and POWer setting changes. The command can be appended to the previous command using a semicolon as the separator (see Example).
Example	Write **POW 3** = Set output level to 3 dBm Query ***OPC?** = Query operation status Read ***OPC 1** = Previous command is complete Write **FREQ 30MHZ** Query ***OPC?** Read ***OPC 1** = Previous command is complete

*RST

Description	Resets the device (RST). Reset all parameters to their specified default values. Device remains in remote mode.
Response	

AM:DEPTh	80 %
AM:INTernal:FREQuency	1000 Hz
AM:STATe	OFF
FM:DEViation	1000 Hz
FM:INT:FREQuency	1000 Hz
FM:STATe	OFF
FREQuency	125 MHz
OUTPut:STATe	OFF
POWer	-30 dBm
PULM:BURST:NUMber	50
PULM:BURST:PERiod	1 Hz
PULM:BURST:STATe	OFF
PULM:STATe	OFF
PULSe:DELay	PULSe:DELay:MINimum
PULSe:WIDTh	PULSe:WIDTh:MINimum

*SRE?

Description	Gets the current state of the service request enable (SRE) register
Response	Value can be set from 0 to 128

*SRE <value>

Description	Sets bits in the service request enable (SRE) register
Parameters	Value can be set from 0 to 128

*STB?

Description	Gets the value of the instrument's status byte (STB)
Response	Value can be set from 0 to 128

HVER?

Description	Gets the current version of hardware
Response	x.x.x.x.x.x.x.x

REF:EXT:CLK?

Description	Queries if the external clock input is being used
Response	ON = external clock reference OFF = internal clock reference
Example	Query **REF:EXT:CLK?** Read **REF:EXT:CLK OFF**

REF:EXT:CLK [ON/OFF]

Description	Sets the clock reference
Parameters	ON|OFF|1|0 ON = external clock reference OFF = internal clock reference
Example	Write **REF:EXT:CLK ON** = external clock Write **REF:EXT:CLK OFF** = internal clock

SOFTWARE:UPDATE

Description	Starts the software update procedure

STAT:OPER?

Description	Gets the status operation event register value
Response	value from 0 to 128
Example	Query **STAT:OPER?** Read **STAT:OPER 0**

STAT:OPER:COND?

Description	Gets the status operation condition register value
Response	value from 0 to 128
Example	Query **STAT:OPER:COND?** Read **STATUS:OPER:COND 0**

STAT:OPER:ENAB <value>

Description	Sets the Status Operation Enable register value
Parameters	Value from 0 to 128

STAT:PRES

Description	The Status Operation Enable and Status Questionable Enable registers are cleared

SVER?

Description	Gets the current software version of firmware
Response	x.x.x
Example	Query **SVER?** Read **SVER 1.2.8**

SYST:BUSA?

Description	Gets the bus address of the plug-in card
Response	Bus address
Example	Query **SYST:BUSA?** Read **SYST:BUSA 4**

SYST:ERR?

Description	Get the first system error. When this command is sent again, the second/next error is replied. To clear the error queue, continue sending SYST:ERR? until the response 0, “No Error” is returned. The *CLS command will also clear the EMGen error queue.
Response	See EMGen Error list
Example	Query **SYST:ERR?** Read **SYST:ERR 0, “No error”** = No error Query **SYST:ERR?** Read **SYST:ERR -222, "Data out of range"** = Data out of range

SYST:IDNU?

Description	Gets the system ID number of the plug-in card including header command
Response	x.x.x.x.x.x.x.x
Example	Query **SYST:IDNU?** Read **SYSTEM:IDNUMBER 1.44.65.178.27.0.0.207**

SYST:PRES

Description	Resets all the user parameters. **Note**: This command does the same operation as *RST.

SYST:SAVECON

Description	Saves the following system parameters of the outputs into memory: • Frequency • Amplitude • AM frequency • AM depth • AM state • FM frequency • FM dev • FM state • PM delay • PM width • PM state • BM number • BM period • BM state These settings will be loaded as default when the EMGen is restarted.

TEMP?

Description	Gets the temperature of the device and returns the temperature in °C. The two values returned represent the temperature readings of individual sensors on the EMGen card.
Response	:TEMP <temp_board1> / TEMP <temp_board2>
Example	Query **TEMP?** Read **TEMP 51.2 / TEMP 53.3**

TEMP:MAX?

Description	Gets the Max temperature of the device and returns the temperature in °C.
Example	Query **TEMP:MAX?** Read **35.0** //35°C

TEMP:MIN?

Description	Gets the Min temperature of the device and returns the temperature in °C.
Example	Query **TEMP:MIN?** Read **0.0** //0°C

Amplitude Modulation Commands

AM:DEPT?

Description	Gets the amplitude modulation depth in %.
Response	<value> = 0 to 100 in %
Example	Query **AM:DEPT?** Read **AM:DEPT 50.0** **//**Gets 50%

AM:DEPT <value><unit>

Description	Sets the amplitude modulation depth from 0 to 100 in %
Parameters	<value> = 0 to 100 <unit> = %
Example	Write **AM:DEPT 100** **//**Sets amplitude modulation depth to 100 % Write **AM 20 %** **//**Sets amplitude modulation depth to 20 %

AM:DEPT:MAX?

Description	Gets the maximum amplitude modulation depth as a %
Response	Max Depth as a %
Example	Query **AM:DEPT:MAX?** Read **AM:DEPT:MAX 100.0**

AM:DEPT:MIN?

Description	Gets the minimum amplitude modulation depth as a %
Response	Min Depth as a %
Example	Query **AM:DEPT:MIN?** Read **AM:DEPT:MAX 0.0**

AM:INT:FREQ?

Description	Gets the amplitude modulation frequency in Hz
Response	Frequency in Hz
Example	Query **AM:INT:FREQ?** Read **AM:INT:FREQ 2000**

AM:INT:FREQ <value><unit> [Up|Down]

Description	Sets the amplitude modulation frequency in Hz.
Parameters	<value> = frequency in Hz <unit> = Default is Hz but can also be specified as KHZ, MHZ or GHZ The value can also be increased or decreased by step size: UP = Increase amplitude modulation frequency by step size DOWN = Decrease amplitude modulation frequency by step size Use the *AM:INT:FREQ:STEP* command to change the current step size.
Example	Write **AM:INT:FREQ 1000** Write **AM:INT:FREQ 2 KHZ**

AM:INT:FREQ:MAX?

Description	Gets the highest amplitude modulation frequency in Hz
Response	Max frequency in Hz
Example	Query **AM:INT:FREQ:MAX?** Read **AM:INT:FREQ:MAX 100000**

AM:INT:FREQ:MIN?

Description	Gets the lowest amplitude modulation frequency in Hz
Response	Min frequency in Hz
Example	Query **AM:INT:FREQ:MIN?** Read **AM:INT:FREQ:MIN 10.0**

AM:INT:FREQ:STEP?

Description	Gets the step size of the amplitude modulation frequency in Hz
Response	step size of frequency in Hz
Example	Query **AM:INT:FREQ:STEP?** Read **AM:INT:FREQ:STEP 10**

AM:INT:FREQ:STEP <value><unit>

Description	Sets the step size of the amplitude modulation frequency in Hz
Parameters	<value> = step size of frequency in Hz <unit> = Default is Hz but can also be specified as KHZ, MHZ or GHZ
Example	Write **AM:INT:FREQ:STEP 10**

AM:INT:FREQ:STEP:MAX?

Description	Gets the maximum step size of the amplitude modulation frequency
Response	Max step size of frequency in Hz
Example	Query **AM:INT:FREQ:STEP:MAX?** Read **AM:INT:FREQ:STEP:MAX 1000**

AM:INT:FREQ:STEP:MIN?

Description	Gets the minimum step size of the amplitude modulation frequency
Response	Min step size of frequency in Hz
Example	Query **AM:INT:FREQ:STEP:MIN?** Read **AM:INT:FREQ:STEP:MIN 1**

AM:OPT:2HZ

Description	Set the AM frequency to 2Hz and depth to 80%
Parameters	This is equivalent to sending the commands: AM:INT:FREQ 2 AM:DEPT 80

AM:POW:MAX?

Description	Gets the maximum carrier level when the AM is turned ON
Response	maximum carrier level
Example	Query **AM:POW:MAX?** Read **AM:POW:MAX 4.0**

AM:POW:MIN?

Description	Gets the minimum carrier level when the AM is turned ON
Response	minimum carrier level
Example	Query **AM:MIN?** Read **AM:POW:MIN -70.0**

AM:STAT?

Description	Gets the state of the amplitude modulation as ON or OFF
Response	ON or OFF
Example	Query **AM:STAT?** Read **AM:STAT ON**

AM:STAT [ON/OFF]

Description	Sets the amplitude modulation state to ON or OFF. **Note**: Frequency modulation must be turned OFF before amplitude modulation can be enabled.
Parameters	ON/OFF/1/0
Example	Write **AM:STAT ON**

Frequency Modulation Commands

FM:DEV?

Description	Gets the frequency modulation deviation in Hz
Response	frequency in Hz
Example	Query **FM:DEV?** Read **FM:DEV 100**

FM:DEV <value><unit>

Description	Sets the frequency modulation deviation in Hz. **Note**: The deviation frequency can be limited by the carrier frequency. The minimum carrier frequency is 9 kHz. For example, if the carrier frequency is set to 20 kHz, then the maximum deviation frequency is 11 kHz (20 kHz – 9 kHz).
Parameters	<value> = frequency in Hz between 1 Hz and 100 kHz <unit> = Default is Hz but can also be specified as KHZ, MHZ or GHZ
Example	Write **FM:DEV 100** Write **FM:DEV 1 KHZ**

FM:INT:FREQ?

Description	Gets the frequency modulation frequency in Hz
Response	Frequency in Hz
Example	Query **FM:INT:FREQ?** Read **FM:INT:FREQ 1000**

FM:INT:FREQ <value><unit>

Description	Sets the frequency modulation frequency in Hz
Parameters	<value> = frequency in Hz between 1 Hz and 100 kHz <unit> = Default is Hz but can also be specified as KHZ, MHZ or GHZ
Response	options
Example	Write **FM:INT:FREQ 1000**

FM:STAT?

Description	Gets the state of the frequency modulation as ON or OFF
Response	ON or OFF
Example	Query **FM:STAT?** Read **FM:STAT OFF**

FM:STAT [ON/OFF]

Description	Sets the frequency modulation state to ON or OFF. **Note**: Amplitude modulation must be turned OFF before frequency modulation can be enabled.
Parameters	ON/OFF/1/0
Example	Write **FM:STAT ON**

Carrier Frequency Commands

FREQ?

Description	Gets the current carrier frequency in Hz
Response	Frequency in Hz
Example	Query **FREQ?** Read **FREQ 100000000**

FREQ <value><unit> [Up|Down]

Description	Sets the current carrier frequency in Hz.
Parameters	<value> = frequency in Hz <unit> = Default is Hz but can also be specified as KHZ, MHZ or GHZ The value can also be increased or decreased by step size: UP = Increase amplitude modulation frequency by step size DOWN = Decrease amplitude modulation frequency by step size Use the *FREQ:STEP* command to change the current step size
Example	Write **FREQ 100000000 //**Sets frequency to 100 MHz Write **FREQ 200 MHZ //**Sets frequency to 200 MHz Write **FREQ DOWN //**Decrease frequency by step size

FREQ:MAX?

Description	Gets the highest carrier frequency in Hz
Response	Max frequency in Hz
Example	Query **FREQ:MAX?** Read **FREQ:MAX 6000000000**

FREQ:MIN?

Description	Gets the lowest carrier frequency in Hz. **Note**: This value depends on whether the LF Output or HF Output is currently selected.
Response	Min frequency in Hz
Example	Query **FREQ:MIN?** Read **FREQ:MIN 80000000**

FREQ:STAR?

Description	Gets the start frequency in Hz
Response	start frequency in Hz
Example	Query **FREQ:STAR?** Read **FREQ:STAR 4000**

FREQ:STAR <value><unit>

Description	Sets the start frequency to the lowest carrier frequency. **Note**: Setting a carrier frequency (using the FREQ command) below this frequency generates a “Data out of range” error. When using the FREQ UP command, the generator is set to this frequency when the next step will be higher than the stop frequency. When using the FREQ DOWN command, the generator is set to the stop frequency when the next step will be lower than this frequency.
Parameters	<value> = start frequency in Hz <unit> = Default is Hz but can also be specified as KHZ, MHZ or GHZ
Example	Write **FREQ:STAR 1 MHZ** **//**start frequency set to 1 MHz

FREQ:STEP?

Description	Gets the step size of the carrier frequency in Hz
Response	frequency in Hz
Example	Query **FREQ:STEP?** Read **FREQ:STEP 100000000**

FREQ:STEP <value><unit>

Description	Sets the step size of the amplitude modulation frequency in Hz. The step size is applied to the carrier frequency using the command FREQ UP or FREQ DOWN.
Parameters	<value> = step size of frequency in Hz <unit> = Default is Hz but can also be specified as KHZ, MHZ or GHZ
Example	Write **FREQ:STEP 1000** Write **FREQ:STEP 10 KHZ**

FREQ:STEP:MAX?

Description	Gets the highest step size of the carrier frequency in Hz.
Response	Max step size of frequency in Hz
Example	Query **FREQ:STEP:MAX?** Read **FREQ:STEP:MAX 1000000000**

FREQ:STEP:MIN?

Description	Gets the lowest step size of the carrier frequency in Hz.
Response	Min step size of frequency in Hz
Example	Query **FREQ:STEP:MIN?** Read **FREQ:STEP:MIN 1**

FREQ:STOP?

Description	Get the stop frequency in Hz
Response	stop frequency in Hz
Example	Query **FREQ:STOP?** Read **FREQ:STOP 10000000**

FREQ:STOP <value><unit>

Description	Sets the stop frequency to the lowest carrier frequency.
Parameters	<value> = stop frequency in Hz <unit> = Default is Hz but can also be specified as KHZ, MHZ or GHZ
Example	Write **FREQ:STOP 100 MHZ** ***//***stop frequency set to 100 MHz

POW?

Description	Gets the carrier amplitude power in dBm
Response	power in dBm
Example	Query **POW?** Read **POW -30.0**

POW <value><unit> [Up|Down]

Description	Sets the carrier amplitude power in dBm.
Parameters	<value> = The value can be set between -70 dBm and +13 dBm. <unit> = dBm The value can also be increased or decreased by step size: UP = Increase amplitude by step size DOWN = Decrease amplitude by step size Use the *POW:STEP* command to change the current step size.
Example	Write **POW -20.1 DBM** = Sets power to -20.1 dBm Write **POW 3** = Sets power to 3 dBm

POW:MAX?

Description	Gets the highest carrier amplitude power in dBm
Response	Max power in dBm
Example	Query **POW:MAX?** Read **POW:MAX 13.0**

POW:MIN?

Description	Gets the lowest carrier amplitude power in dBm
Response	Min power in dBm
Example	Query **POW:MIN?** Read **POW:MIN -70.0**

POW:STEP?

Description	Gets the step size of the carrier amplitude
Response	Step size in dB
Example	Query **POW:STEP?** Read **POW:STEP 1.00**

POW:STEP <value>

Description	Set the step size of the carrier amplitude in dB. The step size is applied to the output power when using the command POW UP or POW DOWN.
Parameters	The value can be set between 0.01 and 100 dB
Example	Write **POW:STEP 100**

POW:STEP:MAX?

Description	Get the maximum step size of the carrier amplitude step size
Response	Max step size
Example	Query **POW:STEP:MAX?** Read **POW:STEP:MAX 100.00**

POW:STEP:MIN?

Description	Get the minimum step size of the carrier amplitude step size
Response	Min step size
Example	Query **POW:STEP:MIN?** Read **POW:STEP:MIN 0.01**

Output Commands

OUTP:SELECT?

Description	Gets the currently selected output port of the EMGen card: This command is only included for compatibility with other EMGen model types that support two ports (e.g. 7003-002). For the EMGen 7003-003, this command will always return a value of 1.
Response	1 = Output 1
Example	Query **OUTP:SELECT?** Read **OUTP:SELECT 1**

OUTP:STAT?

Description	Gets the state of the output signal state as ON or OFF.
Response	ON or OFF
Example	Query **OUTP:STAT?** Read **OUTP:STAT ON**

OUTP:STAT [ON/OFF]

Description	Turns the output signal ON or OFF
Parameters	ON/OFF/1/0
Example	Write **OUTP:STAT ON**

Pulse Burst Commands

PULM:BURST:NUM?

Description	Gets the number of pulses in a period for the pulse burst modulation (pulse gating)
Response	number of pulses
Example	Query **PULM:BURST:NUM?** Read **PULM:BURST:NUM 50**

PULM:BURST:NUM <pulse>

Description	Set the number of pulses in a period for the pulse burst modulation (pulse gating). **Note** that the maximum number is depending on the period time, pulse width and delay, as the number of pulses will need to fit in the selected burst period time
Parameters	<pulse> = Number of pulses between 1 – 1000
Example	Write **PULM:BURST:NUM 50**

PULM:BURST:NUM:MAX?

Description	Gets the maximum number for the pulses for burst modulation (pulse gating)
Response	Max number of pulses
Example	Query **PULM:BURST:NUM:MAX?** Read **PULM:BURST:NUM:MAX 1000**

PULM:BURST:NUM:MIN?

Description	Gets the minimum number for the pulses for burst modulation (pulse gating)
Response	Min number of pulses
Example	Query **PULM:BURST:NUM:MIN?** Read **PULM:BURST:NUM:MIN 1**

PULM:BURST:PER?

Description	Gets the period time for the pulse burst modulation (pulse gating) in seconds
Response	period time
Example	Query **PULM:BURST:PER?** Read **PULM:BURST:PER 1.000**

PULM:BURST:PER <value><unit>

Description	Sets the period time for the pulse burst modulation (pulse gating) in seconds
Parameters	<value> = period time between 2 ms and 100 sec with 1 ms resolution <unit> = Default to S but can also be specified as MS (milliseconds), US (microseconds), or NS (nanoseconds).
Example	Write **PULM:BURST:PER 1.000** Write **PULM:BURST:PER 500MS**

PULM:BURST:PER:MAX?

Description	Gets the maximum time for the pulse burst modulation (pulse gating) in seconds
Response	Max period time
Example	Query **PULM:BURST:PER:MAX?** Read **PULM:BURST:PER:MAX 100.000**

PULM:BURST:PER:MIN?

Description	Gets the minimum time for the pulse burst modulation (pulse gating) in seconds
Response	Min period time
Example	Query **PULM:BURST:PER:MIN?** Read **PULM:BURST:PER:MIN 0.002**

PULM:BURST:STAT?

Description	Gets the state of the pulse burst modulation (pulse gating) as ON or OFF
Response	ON or OFF
Example	Query **PULM:BURST:STAT?** Read **PULM:BURST:STAT OFF**

PULM:BURST:STAT [ON/OFF]

Description	Sets the pulse burst modulation (pulse gating) state to ON or OFF
Parameters	ON/OFF/1/0
Example	Write **PULM:BURST:STAT ON**

Pulse Modulation Commands

PULM:STAT?

Description	Gets the state of the pulse modulation as ON or OFF
Response	ON or OFF
Example	Query **PULM:STATE?** Read **PULM:STATE OFF**

PULM:STAT [ON/OFF]

Description	Sets the pulse modulation state to ON or OFF
Parameters	ON/OFF/1/0
Example	Write **PULM:STATE ON**

PULS:DEL?

Description	Gets the delay (OFF time) for pulse modulation in seconds
Response	Delay in seconds
Example	Query **PULS: DEL?** Read **PULS:DEL 0.00020000**

PULS:DEL <value><unit>

Description	Sets the delay (OFF time) for pulse modulation in seconds
Parameters	<value> = Delay between 200 ns and 100 seconds with 100 ns resolution <unit> = Default to S but can also be specified as MS (milliseconds), US (microseconds), or NS (nanoseconds).
Example	Write **PULS: DEL 2.1** Write **PULS: DEL 500 us**

PULS:DEL:MAX?

Description	Gets the maximum delay (OFF-time) for the pulse modulation
Response	Max delay in seconds
Example	Query **PULS:DEL:MAX?** Read **PULS:DEL:MAX 100.00000000**

PULS:DEL:MIN?

Description	Gets the minimum delay (OFF-time) for the pulse modulation
Response	Min delay in seconds
Example	Query **PULS:DEL:MIN?** Read **PULS:DEL:MIN 0.00000020**

PULS:WIDT?

Description	Gets the width (ON time) for pulse modulation in seconds
Response	Width in seconds
Example	Query **PULS:WIDT?** Read **PULS:WIDT 0.00020000**

PULS:WIDT <value><unit>

Description	Sets the width (ON time) for pulse modulation in seconds
Parameters	<value> = width in seconds <unit> = Default to S but can also be specified as MS (milliseconds), US (microseconds), or NS (nanoseconds).
Example	Write **PULS:WIDT 0.5** Write **PULS:WIDT 100 ms**

PULS:WIDT:MAX?

Description	Gets the largest pulse modulation width (ON time) in seconds
Response	Max width in seconds
Example	Query **PULSE:WIDTH:MAX?** Read **PULSE:WIDTH:MAX 100.00000000**

PULS:WIDT:MIN?

Description	Gets the shortest pulse modulation width (ON time) in seconds
Response	Min width in seconds
Example	Query **PULSE:WIDTH:MIN?** Read **PULSE:WIDTH:MIN 0.00000020**

General Positioner Commands

*CLS

Description	Clear Status of all Event Registers summarized in the Status Byte Register and places the controller in the Operation Complete Idle State
Example	Write **5B:*CLS\n** //Clear status registers

*ESE?

Description	Query Standard Event Status Enable Register prepares the controller to respond with the contents of the Standard Event Status Enable Register when queried.
Response	**XXX** = Integer value representing the setting of the Event Status Enable Register in the range of 0 to 255
Example	Query **5B:*ESE?\n** //Query ESE register Read **16\n** //Set to allow an execution error to set ESB

*ESE <XXX>

Description	Set Standard Event Status Enable Register causes changes in the contents of the Standard Event Status Enable Register. Requires an integer argument in binary form to set the register. The bits of the argument correspond to the bits of the Standard Event Status Register. Setting a bit in this register allows the corresponding bit in the Standard Event Status Register to cause the Event Status Bit in the Status Byte Register to be set.
Parameters	**XXX** = Integer value representing eight-bit binary number 0–255
Example	Write **5B:*ESE 16\n** //Allow an Execution Error to set the ESB

*OPC?

Description	Query Operation Complete prepares controller to respond to a query with a single character message.
Response	**<flag>** = Indicates if commanded motion is complete **0** = Device is in motion **1** = Motion is complete **Note:** This is a slight deviation from the ANSI/IEEE 488.2 standard for this command, which does not return a response until the operation is complete. That response is **1** always.
Example	Query **5B:*OPC?\n** //Query operation complete Read **1\n** //Motion is complete

*RST

Description	Resets the controller, which remains in remote mode. All moving devices are stopped immediately, and the command queue is cleared.
Example	Write **5B:*RST\n** //Reset turntable

*SRE?

Description	Query Service Request Enable Register prepares controller to respond with the contents of the Service Request Enable Register when queried.
Response	**XXX** = Integer value representing the setting of the Service Request Enable Register in the range of 0 to 255
Example	Query **5B:*SRE?\n**: //Query the value of the SRE Read **32\n** //Allow the Event Status Bit to generate an SRQ

*SRE <XXX>

Description	Set Service Request Enable Register changes contents of the Service Request Enable Register. The bits of the argument (with the exception of bit 6 which is unused) correspond to the bits of the Status Byte Register. Setting a bit in this register allows the corresponding bit in the Status Byte Register to generate a Service Request.
Parameters	**XXX** = Integer value representing eight-bit binary number 0–255
Example	Write **5B:*SRE 32\n** //Allow the Event Status Bit to generate an SRQ

*STB?

Description	Query Status Byte. Prepares the controller to respond to the contents of the Status Byte Register when queried. The value returned is a decimal in the range of 0 to 255. This value, when expressed in binary form, represents the eight-bit value of the Status Byte Register.
Response	**XXX** = Integer value representing the bits of the Status Byte Register: **0 = Device Dependent Error (DDE)**: Set when the logical AND of the Device Dependent Error Register and the Device Dependent Error Enable Register is non-zero. **1, 2, 3, 7 = Undefined** **4 = Message Available (MAV)**: Set when there is data in the device output queue waiting to be read over the GPIB. **5 = Event Status Bit (ESB)**: Set when the logical AND of the Event Status Register and the Event Status Enable Register is non-zero. **6 = Master Summary Status (MSS)**: Set when the logical AND of the remaining bits of the Status Byte Register and the Status Byte Enable Register is non-zero.
Example	Query **5B:STB?\n** //Query status byte Read **16\n** //Message Available

*WAI

Description	Wait to Continue causes the controller to place execution of the next GPIB command on hold while there are devices in motion. Once motion has ceased, the next command is executed normally. While a command is on hold, additional commands are not accepted. Normal operation will continue after the command on hold had been executed. Time out of the GPIB bus must be disabled before execution of *WAI command. The *OPC commands are a more program-friendly method of waiting for device motion to stop.
Example	Write **5B:*WAI\n** //Wait for tower motion to stop

ACC?

Description	Gets acceleration for towers and turntables
Response	Acceleration between 0.1 seconds and 30.0 seconds
Example	Query **5B:ACC?\n** Read **2.0\n** //Acceleration is 2.0 s

ACC <a>

Description	Sets acceleration for towers and turntables
Parameters	**<a>** = range of 0.1 seconds to 30.0 seconds
Example	Write **5B:ACC 0.1** **//**Set acceleration to 0.1 s

AUX#?

Description	Queries the state of the specified auxiliary device control
Parameters	# = Desired auxiliary control device number in the range of 1 - 2
Response	1 = ON 0 = OFF
Example	Query **5:AUX1?\n** Read **1\n** //Auxiliary is ON

AUX# <ON/OFF>

Description	Activates or deactivates specified auxiliary device
Parameters	# = Desired auxiliary control device number in the range of 1 - 2 **ON/OFF**= Set the specified auxiliary port ON or OFF
Example	Write **5:AUX1 ON\n** //Turn auxiliary 1 ON for EMControl in Slot #5

CAL?

Description	Query the encoder calibration setting of the device
Response	Value returned is between 1 and 9999. This number is the number of encoder counts per meter or revolution.
Example	Query **5B:CAL?\n** //Query encoder cal Read **2000\n** //Encoder set to 2000 counts/meter

CAL <XXXX>

Description	Changes the encoder calibration setting of the device
Parameters	<**XXXX**> = Integer value 1 and 9999; Leading zeroes are optional. **NOTE**: The default value for an ETS Lindgren tower is 2000 counts per meter, and for an ETS Lindgren turntable is 3600 counts per revolution.
Example	Write **5B:CAL 2000\n** //Set tower encoder to 2000 counts/meter

CP?

Description	Query the current position
Response	**[-]XXX[.X] =** Value of the current position in centimeters for towers or degrees for turntables
Example	Query **5B:CP?\n** //Query tower current position Read **100.2 CM\n** //Current position is 100.2 cm Query **5B:CP?\n** Read **200.5 DEGREES\n** //Current position is 200.5 degrees

CP [+/-] XXX[.X]

Description	Changes the current position of the device
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX[.X]** = Decimal value for the current position to be set must be between –999.9 and 999.9 in centimeters for towers and degrees for turntables. **[.X]** and leading zeroes are optional.
Example	Write **5B:CP 100.7\n** //Change tower current position to 100.7 cm

CY?

Description	Queries the cycle count for the device
Response	**XXX.X** = Value of the scan cycle setting between the value of 000.0 and 999.5. A value of 000.0 represents an infinite scan count.
Example	Query **5B:CY?\n** //Query turntable cycle count Read **5\n** //Cycle count is 5

CY <XXX.X>

Description	Changes the cycle count for the device. A cycle represents a full scan from limit to limit and back again starting at the closest limit. The addition of the 0.5 cycle steps allows the controller to scan between the limits an integral number of times instead of always performing an even number of scans from limit to limit.
Parameters	**<XXX.X>** = Decimal value between 0.0 and 999.5 in steps of 0.5. A value of 0 or 000.0 represents an infinite scan count. Leading zeroes are optional.
Example	Write **5B:CY 000\n** //Set cycle count of tower to infinite Write **5B:CY 2.5\n** //Set turntable to scan between its limits 2.5 times

DIR?

Description	Queries the motion direction for the device
Response	**<direction>** = Value indicating the current motion of the queried device **+1** = Device is moving up/clockwise **0** = Device is stopped **–1** = Device is moving down/counterclockwise
Example	Query **5B:DIR?\n** //Query tower motion direction Read **–1\n** //Device is moving down Query **5B:DIR?\n** //Query turntable motion direction Read **1\n** //Turntable is moving clockwise.

ERE <XXXXX>

Description	Set Device Dependent Error Enable Register. Causes changes in the contents of the Device Dependent Error Enable Register. Requires a decimal argument in binary form to set the register. The bits of the argument correspond to the bits of the Device Dependent Error Register. Setting a bit in this register allows the corresponding bit in the Device Dependent Error Register to cause the DDE bit in the Status Byte Register to be set.
Parameters	**<XXXXX>** = Integer value representing a 16-bit binary number 0–65535
Example	Write **5B:ERE 64\n** //Allow polarization violation to set DDE bit of STB

ERE?

Description	Query Device Dependent Error Enable Register. Prepares the controller to respond with the contents of the Device Dependent Error Enable Register when queried.
Response	**<ERE bits>** = Integer value representing a 16-bit binary number 0–65535
Example	Query **5B:ERE?\n** //Query ERE register Read **64\n** //Allow a polarization violation to set the DDE bit of STB

ERR?

Description	Query Device Dependent Error Register prepares the controller to respond to the contents of the Device Dependent Error Register. **Note:** Upon reading this register, its contents will be cleared. As long as bits are set in this register, any commands related to device motion or position settings will generate an execution error.
Response	**<error bits>** = Integer value representing a 16-bit binary number 0–65535. The bits are defined as follows: **0 = Undefined** **1 = Parameters Lost**: Set at startup if the EMControl detects that previous settings have been lost. **2 = Motor Not Moving**: Indicates a device stuck condition. The controller automatically generates a STOP condition to protect the motor. **3 = Motor Not Stopping**: Indicates that the device failed to stop moving when commanded. **4 = Moving Wrong Direction**: Indicates that the device moved in the opposite direction of than commanded. **5 = Hard Limit Hit** //Indicates that the device is unable to move because it is at a hardware limit. **6 = Polarization Limit Violation**: Indicates that the tower was told to change polarization while it was outside the position limits specified for the new polarization. **7 = Communication Lost**: Indicates that the controller is unable to communicate with the device over the fiber optic link. **8 = Flotation Violation**: Indicates that the air flotation turntable was told to turn flotation off while it was moving. **9 = Encoder Failure**: Indicates that the EMControl has detected device encoder behavior consistent with a fault in the encoder, its wiring, or connections. **10 – 15 = Undefined**
Example	Query **5B:ERR?\n** //Query error register Read **4\n** //Motor not moving

MBSND?

Description	Queries the sound mode of the motor base
Response	Value of sound mode
Example	Query **5B:MSBND?\n** //Query sound mode Read **1\n** //Sound mode is 1

MBSND <X>

Description	Sets the sound mode of the motor base
Parameters	**<X>** is between 0 and 3
Example	Write **5B:MBSND 1\n** //Set the sound mode to 1

PARM:BCT?

Description	Queries the bore sight correction
Response	**<correction>** = Value of boresight correction **0** = Standard **1** = Alternate **2** = Dual-Mast
Example	Query **5B:PARM:BCT?\n** //Query bore sight correction Read **1\n** //Bore sight correction is Alternate

PARM:BCT <X>

Description	Sets the bore sight correction
Parameters	**<X>** = Value of bore sight correction **0** = Standard **1** = Alternate **2** = Dual-Mast
Example	Write **PARM:BCT 1\n** //Set bore sight correction to **Alternate**

PARM:LIMST?

Description	Queries the step key limit
Response	**<limit>** = Value of step key limit **0** = Disabled **1** = Enabled
Example	Query **5B:PARM:LIMST?\n** //Query bore sight correction Read **0\n** //Step key limit disabled

PARM:LIMST <X>

Description	Sets the step key limit
Parameters	**<X>** = Enable or disable step key limit **0** = Disable **1** = Enable
Example	Write **5B:PARM:LIMST 0\n** //Disable step key limit

PARM:QKST?

Description	Queries the quick stop parameter
Response	**<quick stop>** = Value of quick stop parameter **0** = Normal deceleration **1** = Fast deceleration
Example	Query **5B:PARM:QKST?\n** //Query the quick stop parameter Read **0\n** //Normal deceleration

PARM:QKST <X>

Description	Sets the quick stop
Parameters	**<X>** = Enable or disable quick stop **0** = Normal deceleration **1** = Fast deceleration
Example	Write **5B:PARM:QKST 0\n** //Set normal deceleration

S#

Description	Changes the speed selection of a two-speed or variable speed device
Parameters	# = For a two-speed device: 1=high, 2=low For variable speed devices: 1–8=preset speed selection
Example	Write **5B:S1\n** //Change to high speed/preset 1

S?

Description	Queries the speed selection of a two-speed or variable speed device
Response	**<speed select>** = For a two-speed device: 1=high, 2=low For variable speed devices: 1–8=preset speed selection
Example	Query **5B:S?\n** //Query turntable speed Read **3\n** //Speed setting is 3

SC

Description	Instructs the device to begin scanning between preset lower and upper limits. The number of scans performed is determined by the value of cycles (CY) parameter which must be set prior to issuing the scan command.
Example	Write **5B:SC\n** //Put device in scan mode

SC?

Description	Queries the device to determine if scan mode is active
Response	**<active>** = Value indicating if scan mode is active for the queried device **0** = Device is not in scan mode **1** = Device is scanning
Example	Query **5B:SC?\n** //Ask device if it is scanning Read **1\n** //Device Scanning

SK [+/–] XXX[.X]

Description	Instructs the device to begin seeking the specified target value. The target must be located between the current upper/clockwise and lower/counterclockwise limits. For a continuous rotation turntable or tuner, the device will seek the target value by the shortest possible path. Thus, a seek from 359.9 to 0.0 will rotate clockwise, not counterclockwise.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX[.X]** = Decimal value for the seek target in centimeters for towers and degrees for turntables. Leading zeroes are optional.
Example	Write **5B:SK 100.0\n** //Instruct tower boom to seek 100.0 cm or turntable to seek 100.0 degrees

SKN [+/–] XXX[.X]

Description	Instructs the device to begin seeking the specified target value in the negative (down/counterclockwise) direction only. If the target is up/clockwise from the current position, no motion occurs. The target must be located between the current upper/clockwise and lower/counterclockwise limits. This command is provided primarily to support continuous rotation turntables and reverberation paddles. It allows forcing the seek of a position from a particular direction. Thus, a SKN from 180.0 to 181.0 will rotate counterclockwise to reach the target value.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX[.X]** = Decimal value for the seek target in centimeters for towers and degrees for turntables. Leading zeroes are optional.
Example	Write **5B:SKN 100.0/n** //Instruct tower boom to seek 100.0 cm if CP > 100.0 or turntable to seek 100.0 degrees if CP > 100.0 in continuous rotation mode

SKP [+/–] XXX[.X]

Description	Instructs the device to begin seeking the specified target value in the position (up/clockwise) direction only. If the target is down/ counterclockwise from the current position, no motion occurs. The target must be located between the current upper/clockwise and lower/counterclockwise limits. This command is provided primarily to support continuous rotation turntables and reverberation paddles. It allows forcing the seek of a position from a particular direction. Thus, a SKP from 181.0 to 180.0 will rotate clockwise to reach the target value.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX[.X]** = Decimal value for the seek target in centimeters for towers and degrees for turntables. Leading zeroes are optional.
Example	Write **5B:SKP 255.0\n** **//**Instruct tower boom to seek 255.0 cm if CP < 255.0 or turntable to seek 255.0 degrees if CP < 255.0 or ‘ in continuous rotation mode

SKR [+/–] XXX[.X]

Description	Instructs the device to begin seeking the specified target value relative to the current position. The specified value is added to the current position to obtain the target position. Thus, a positive value will cause up/clockwise motion and a negative value will cause down/counterclockwise motion. If the calculated target is not located between the current upper/clockwise and lower/counterclockwise limits, motion will continue in the target direction until a limit is hit.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX[.X]** = Decimal value for the distance to move from the current position. This value is in centimeters for towers and degrees for turntables. Leading zeroes are optional.
Example	Write **5B:SKR 10.0\n** **//**Instruct tower boom to move up 10.0 cm from CP, or Instruct turntable to move CW 10.0 degrees

SPEED?

Description	Queries the speed as a percentage of maximum speed
Response	**<speed >** = Value as a percentage of maximum speed
Example	Query **5B:SPEED?\n** Read **25\n** **//**Speed is 25% of max speed

SPEED XX.[X]

Description	Sets the speed as a percentage of maximum speed
Parameters	**XX.[X]** = Percentage of maximum speed
Example	Write **5B:SPEED 54.3\n**//Change to 54.3% of max speed

SS#?

Description	Queries a preset speed setting for a variable speed device. **Note:** There can be no white space between the command, the number, and the question mark (?).
Parameters	# = A value from 1–8 to select the preset speed register to query
Response	**<speed setting>** = Value between 0 (minimum) and 255 (maximum) speed
Example	Query **5B:SS7?\n** //Query speed preset #7 Read **127\n** //Preset 7 is set to half max speed

SS# <speed>

Description	Sets a preset speed setting for a variable speed device. **Note:** There can be no white space between the command and the register number. However, there must be white space between the register number and the speed value.
Parameters	# = A value from 1–8 to select the preset speed register to set **<speed>** = Value from 0–255 representing the desired speed setting for the specified speed selection. A value of 0 represents the minimum available speed of the device, while a value of 255 represents the maximum. The actual speed of the device is given approximately by the formula: Actual Speed = <speed> (MaxSpeed – MinSpeed) / 255 + MinSpeed
Example	Write **5B:SS2 127\n** //Set speed 2 to half speed Write **5B:SS5 63\n** //Set speed 5 to quarter speed

ST

Description	Causes device motion to stop
Example	Write **5B:ST\n** //Stops device motion

TYP?

Description	Queries the current device type configuration
Response	**<type string>** = String indicating the device type and configuration: **TWR NRM** = Tower, Normal **TWR BOR** = Tower, Bore sight **TT NRM CONT** = Turntable, Normal, Continuous rotation **TT NRM NONCONT** = Turntable, Normal, Non-Continuous rotation **TT AIR CONT** = Turntable, Air Flotation, Continuous rotation **TT AIR NONCONT** = Turntable, Air Flotation, Non-Continuous **TT TWO CONT** = Turntable, Two Speed, Continuous rotation **TT TWO NONCONT** = Turntable, Two Speed, Non-Continuous
Example	Query **5B:TYP?\n** //Query device type Read **TWR BOR\n** //Tower Bore sight

UL?

Description	Queries the upper limit of the device associated with the current polarization mode.
Response	**[–]XXX** = Value of the upper limit for the current polarization in centimeters
Example	Query **5B:UL?\n**: Query tower upper limit for current polarization Read **400/n** //Upper limit is 400 cm

UL [+/–] XXX

Description	Changes the upper limit of the device. The specified value must be greater than the lower limit. This command simultaneously affects the horizontal and vertical limits.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX** = Decimal value for the upper limit to be set between –999 and 999 in centimeters. Leading zeroes are optional.
Example	Write **5B:UL 400\n**: Change both the horizontal and vertical polarization upper limits of the tower to 400 cm

VS?

Description	Queries the variable speed capability of the device
Response	**<flag>** = Indicates if a device is capable of variable speed control **0** = Device is not capable of variable speed control **1** = Device supports variable speed
Example	Query **5B:VS?\n** //Is device variable speed? Read **1\n** //Is a variable speed device

Turntable Only Commands

CC

Description	Instructs the turntable to move in the counterclockwise direction. This movement is limited by the counterclockwise limit.
Example	Write **5B:CC\n** //Direct turntable to rotate counterclockwise

CL?

Description	Queries the turntable counterclockwise limit
Response	**[-]XXX** = Value of the counterclockwise limit setting in degrees
Example	Query **5B:CL?\n** //Query turntable counterclockwise limit Read **200\n** //Counterclockwise limit is 200 degrees

CL [+/–] XXX

Description	Changes the counterclockwise limit of the device. The specified value must be less than the clockwise limit.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX** = Decimal value for the counterclockwise limit to be set in degrees between –999 and 999. Leading zeroes are optional.
Example	Write **5B:CL –100\n** //Change CCW limit of the turntable to –100 degrees

CW

Description	Instructs the turntable to move in the clockwise direction. This movement is limited by the clockwise limit
Example	Write **5B:CW\n** //Instruct turntable to rotate clockwise

TT <Type> <Rotation>

Description	Selects turntable mode of operation. Allows the selection of normal, two speed, and air flotation turntables. In the air flotation mode of operation, the UP/DOWN is controlled automatically by the EMControl, assuring that the table is floating before a movement is made.
Parameters	**<Type>:** • **NRM** = Normal turntable • **AIR** = Air flotation turntable • **TWO** = Two-speed turntable **<Rotation>:** • **CONT** = Continuous rotation turntable • **NONCONT** = Non-continuous rotation turntable
Example	Write **5B:TT NRM CONT\n** //Change device from a tower to a normal, continuous turntable

WL?

Description	Queries the clockwise limit of the turntable
Response	**[–]XXX** = Value of the clockwise limit setting in degrees
Example	Query **5B:WL?\n** //Query turntable clockwise limit Read **300\n** //Clockwise limit is 300 degrees

WL [+/-] XXX

Description	Changes the clockwise limit of the device. The specified value must be greater than the counterclockwise limit.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX** = Decimal value for the clockwise limit to be set between –999 and 999 in degrees. Leading zeroes are optional.
Example	Write **5B:WL 90\n** //Change CW limit of the turntable to 90 degrees

ZERO

Description	Initiates a zero reference scan for devices equipped with absolute zero reference pulses
Example	Write **5B:ZERO\n** //Initiate zero scan

ZERO?

Description	Queries if the device is equipped with an absolute zero reference to determine if the ZERO command can be used.
Response	**<flag>** = Indicates if a device supports zeroing **0** = Device does not support zeroing **1** = Device can execute ZERO function
Example	Query **5B:ZERO?\n** //Query zeroing capability Read **0\n** //Device does NOT supports ZERO function

Tower Only Commands

DN

Description	Instructs the tower boom to move in the down direction. This movement is limited by the lower limit.
Example	Write **5B:DN\n** //Instruct the boom of the tower to move down

LH?

Description	Queries the lower limit of the device for horizontal polarity
Response	**[–]XXX** = Value of the lower limit for horizontal polarization in centimeters
Example	Query **5B:LH?\n** //Query horizontal lower limit Read **235\n** //Horizontal lower limit is 235 cm

LH [+/-] XXX

Description	Changes the lower limit of the device for horizontal polarity. The specified value must be less than the upper limit for the horizontal polarization.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX** = Decimal value for the lower limit to be set between –999 and 999 in centimeters. Leading zeroes are optional.
Example	Write **5B:LH 235\n** //Set horizontal polarity lower limit to 235 cm

LL?

Description	Query the lower limit of the device associated with the current polarization mode.
Response	**[–]XXX** = Value of the lower limit for the current polarization in centimeters
Example	Query **5B:LL?\n** //Query tower lower limit for current polarization Read **208\n** //Lower limit of the tower is 208 cm

LL [+/–] XXX

Description	Changes the lower limit of the device. The specified value must be less than the upper limit. This command simultaneously affects the horizontal and vertical limits.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX** = Decimal value for the lower limit to be set between –999 and 999 in centimeters. Leading zeroes are optional.
Example	Write **5B:LL 208\n** //Change both the horizontal and vertical polarization lower limits of the tower to 208 cm

LV?

Description	Queries the lower limit of the device for vertical polarity
Response	**[–]XXX** = Value of the lower limit for the vertical polarization in centimeters
Example	Query **5B:LV?\n** //Query vertical lower limit Read **95\n** //Vertical lower limit is 95 cm

LV [+/–] XXX

Description	Changes the lower limit of the device for vertical polarity. The specified value must be less than the upper limit for the vertical polarization.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX** = Decimal value for the lower limit to be set between –999 and 999 in centimeters. Leading zeroes are optional.
Example	Write **5B:LV 95\n** //Set vertical polarity lower limit to 95 cm

P?

Description	Queries the polarization of the tower boom
Response	**<polarization>** = Value indicating the polarization setting of the queried device **0** = Vertical **1** = Horizontal **2 =** Bypass
Example	Query **5B:P?\n** //Query tower boom polarization Read **1\n** //Polarization is horizontal

PH

Description	Instructs a tower to change its boom polarization to horizontal
Example	Write **5B:PH\n** //Change boom polarization to horizontal

PV

Description	Instructs a tower to change its boom polarization to vertical
Example	Write **5B:PV\n** //Change boom polarization to vertical

P 2

Description	Instructs a tower to change its boom polarization to bypass
Example	Write **5B:P 2\n** //Change boom polarization to bypass

SEP?

Description	Query the separation distance between the mast and the EUT
Response	**<distance>** - Value of the bore sight separation distance: **003** - 3 meters **010** - 10 meters **030** - 30 meters
Example	Query **5B:SEP?\n** //Query separation distance Read **3\n** //Separation distance is 3 m

SEP <XX>

Description	Changes the separation distance between the mast and the EUT. This value is used in the calculation of the adjusted height when in bore sight mode.
Parameters	**XX** = 3, 10, or 30. Invalid values are ignored and leading zeroes are optional.
Example	Write **5B:SEP 03\n** //Change separation distance to 3 meters

TWR <Type>

Description	Selects tower mode of operation. Allows the selection of both normal and bore sight towers. In the bore sight mode of operation, the separation distance is taken into account when reporting boom height.
Parameters	**<Type>:** • **NRM** = Normal tower • **BOR** = Bore sight tower
Example	Write **5B:TWR NRM\n** //Change device to a normal tower

UH?

Description	Queries the upper limit of the device for horizontal polarity
Response	**[–]XXX** = Value of the upper limit for horizontal polarization in centimeters
Example	Query **5B:UH?\n** //Query horizontal upper limit Read **300\n** //Horizontal polarity upper limit is 300 cm

UH [+/–] XXX

Description	Changes the upper limit of the device for horizontal polarity. The specified value must be greater than the lower limit for horizontal polarization.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX** = Decimal value for the upper limit to be set between –999 and 999 in centimeters. Leading zeroes are optional.
Example	Write **5B:UH 300\n** //Set horizontal polarity upper limit to 300 cm

UP

Description	Instructs the tower boom to move in the up direction. This movement is limited by the upper limit.
Example	Write **5B:UP\n** //Instructs the boom of the tower to move up

UV?

Description	Queries the upper limit of the device for vertical polarity
Response	**[–]XXX** = Value of the upper limit for the vertical polarization in centimeters
Example	Query **5B:UV?\n**: Query vertical upper limit Read **350\n** //Vertical upper limit is 350 cm

UV [+/–] XXX

Description	Changes the upper limit of the device for vertical polarity. The specified value must be greater than the lower limit for vertical polarization.
Parameters	**[+/–]** = Optional for positive values; Necessary for negative values **XXX** Decimal value for the upper limit to be set between –999 and 999 in centimeters. Leading zeroes are optional.
Example	Write **5B:UV 355\n** //Set vertical polarity upper limit to 355 cm

B

Description	Get sensor supply voltage
Response	“nn.nn Where nn.nn is a 4 digit number representing the supply voltage in the sensor typical around 6V.
Example	Query **:B** Read **B06.23**

CAL?

Description	Query calibration status
Response	“ON” if calibration data is active “OFF” if calibration data is not used
Example	Query **7:CAL?\n** Read **OFF\n**

CAL [ON/OFF]

Description	Turns ON or OFF the user correction factors
Parameters	“ON” if calibration data is active “OFF” if calibration data is not used
Example	Write **7:CAL ON\n**

CALDUMP

Description	Getting the calibration table
Example	Write **7:CALDUMP\n** Read **10000,0.93,0.95,0.95;20000,0.92,0.94,0.91;40000,0.92,0.93,0.91;\r\n**

Filter?

Description	Get filter / averaging factor
Response	“DYN” = dynamic (16 to 128 times depending on value) • “1” = 4 times average • “2” = 8 times average • “3” = 16 times average • “4” = 32 times average • “5” = 64 times average • “6” = 128 times average • "7" = 256 times average • "8" = 512 times average • "9" = 1024 times average • "10" = 2048 times average • "11" = 4096 times average • "12" = 8192 times average
Example	Query **7:FILTER?\n** Read **12\n**

Filter <a>

Description	Set filter / averaging factor
Parameters	“DYN” = dynamic (16 to 128 times depending on value) • “1” = 4 times average • “2” = 8 times average • “3” = 16 times average • “4” = 32 times average • “5” = 64 times average • “6” = 128 times average • "7" = 256 times average • "8" = 512 times average • "9" = 1024 times average • "10" = 2048 times average • "11" = 4096 times average • "12" = 8192 times average
Example	Write **7:FILTER DYN\n** //Dynamic filtering

FREQ?

Description	Gets frequency in Hz
Example	Query **7:FREQ?\n** Read **100000000** //100 MHz

FREQ <f>

Description	Sets frequency in Hz
Parameters	Frequency in Hz
Example	Write **7: FREQ 100000000\n** //100 MHZ

FREQ? MAX

Description	Returns the maximum frequency of the sensor in Hz
Example	Query **7:FREQ? MAX\n** Read **40000000** //40 GHz

FREQ? MIN

Description	Returns the minimum frequency of the sensor in Hz
Example	Query **7:FREQ? MIN\n** Read **10000000** //10 MHz

H3

Description	Get the field measurement. **Note**: Setting the frequency is mandatory for the EMSense 10/40 to send corrected readings.
Response	:Hxx.xx;yy.yy;zz.zz_V_ Where xx.xx, yy.yy and zz.zz are 4 digit floating point values of the electrical field measured by that axis.
Example	Query :**H3** Read **H10.04;10.15;10.03 V**

H5

Description	Get the field measurement in long notation. **Note**: Setting the frequency is mandatory for the EMSense 10/40 to send corrected readings.
Response	:Hxx.xx;yy.yy;zz.zz;cc.cc_V_ Same response as H3 with added cc.cc which is a 4 digit floating point value of the total electric field.
Example	Query :**H5** Read **H10.04;10.15;10.03;10.07 V**

H6

Description	Get the field measurement in short notation. **Note**: Setting the frequency is mandatory for the EMSense 10/40 to send corrected readings.
Response	:cc.cc Where cc.cc which is a 4 digit floating point value representing the total electric field.
Example	Query :**H6** Read **H10.07 V**

RESET

Description	Resets the EMSense 10 probe: • Sets frequency to highest frequency if CAL is set to ON • Sets frequency to 1 GHz if CAL is set to OFF • Filter is set to “Filter 2” • Any errors are cleared
Example	Write **7:RESET\n**

TC

Description	Temperature in degrees Celsius
Response	:Tnn.nn Where nn.nn is a 4 digit number representing the temperature
Example	Query **TC** Read **:T35.75** //35.75°C

TF

Description	Temperature in degrees Fahrenheit
Response	:Tnn.nn Where nn.nn is a 4 digit number representing the temperature
Example	Query **TF** Read **:T96.35** //96.35°F

ZERO

Description	Zeros the sensor
Example	Write **7:ZERO\n**

Error Codes

EMCenter General Errors

Error Code	Description
1	Wrong command
2	Parameter too high
3	Parameter too low
4	Invalid parameter
5	Buffer overflow
6	Already in progress
7	Parity error
8	Hardware failure
20	Unknown device type
21	Unknown device number
22	No reply from device
23	No such device
29	I2C Different clock setting
30	I2C Timeout
31	I2C Not-Acknowledge (NACK)
32	I2C Arbitration lost
33	Not enough memory
34	Memory fault
35	Time out
36	Serial number chip not connected
37	Serial number CRC fault
38	PWM wrong mode
39	PWM no special function

40	PWM timer not running
41	PWM max duty zero
42	SN string build fall
50	Wrong command - Command not supported by the software update protocol
51	Time out - Not all command data is received within the timeout period
52	Memory fault – An erase verify or program verify in Flash memory failed
53	Not allowed – Arguments of the command are not allowed
54	Command CRC invalid – The CRC check over the command data failed
55	Block CRC invalid – The CRC check over the memory block failed
56	Buffer overflow – There are too many bytes to write or too many blocks to check
100	EMSense probe not connected; laser off
101	EMSense probe busy zeroing
1300	Software upgrade in progress
1301	Slot Preserved for 2090 Emulation mode
1302	EMCenter interlock tripped
1303	EMCenter is still initializing

EMSwitch 7001-0xx Errors

Error Code	Description
201	Switch error while trying to switch to NC (internal relays only)
202	Switch error while trying to switch to NO (internal relays only)
203	Temperature error NC (internal relays only)
204	Temperature error NO (internal relays only)
205	Interlock error (internal relays only)
206	Error Switch A or Error 1-6
207	Error Switch B
208	Error Switch
209	Error external card
210	Error no external card connected
211	Error status unknown
212	Error current limit
213	28V Not Present
214	Interlock 1
215	Interlock 2
216	Interlock 3
217	Interlock 4
218	Interlock 5
219	Interlock 6
220	Switch temperature NC
221	Switch temperature NO

EMPower 7002-00x Errors

Error Code	Description
601	Error frequency not set
602	Error over range
603	Error under range
604	No cal data
605	(7002-006 only) External trigger pin error
606	(7002-006 only) Command not supported in the mode
607	(7002-006 only) Combination measure speed and time not allowed. On 1MS/s the maximum measure time ins 32 seconds. At 5MS/s the maximum measure time is 6.2 seconds.

EMControl Plug-In Card 7006-001 Errors

Error Code	Description
ERR 7	Communication lost
800	Speed min equal or higher than speed max
801	Speed max equal or lower than speed min

EMSense 7007-xxx Errors

Error Code	Description
700	Wrong identifier
701	Invalid target
702	Probe invalid reply
703	No update in time (Field is questioned but there is no valid field of the probe received in time.)
704	Invalid data frame received
705	Probe not connected

706	MSP interlock tripped
707	Laser off through time out (Communication time out or startup probe timed out that caused laser to shut off)
708	Error during justation store
709	Software update fault
710	Flash fault
711	Serial Number fault
712	PWM fault
713	ADC fault
714	Binary data fault
715	Dump not received ok
716	Card type unknown
717	Probe type unknown
718	Safety controller card type fault
719	Safety controller probe type fault
720	Justation already stopped
721	Potmeter fault
722	Justation point of 0 V/m not available
723	No valid calibration data available
724	Frequency lower than calibration table
725	Frequency higher than calibration table
726	No points stored
728	Calibration fault
729	Temperature correction fault
730	Flash fault
731	Serial number fault
732	Justation field not monotone

733	Justation adc not monotone
734	Not allowed for probe type
737	Data frame CRC incorrect
738	Start aborted by user
739	Command not supported in software update mode
740	MSP too long no communication probe (longer than 5 ms)
741	SC IDN fault
742	SC HW version fault
743	SC not received start on RS232
744	SC not received start on USB
745	SC not received start on button
746	SC switch 2 not high
747	SC switch 2 not low
748	MSP switch 1 fault
749	MSP switch 2 fault
750	SC not responding
751	reserved
752	SC invalid reply
753	Laser turned on
754	3V3 out of range
755	5V out of range
756	12V out of range
757	Laser current out of range
758	Laser temperature out of range
759	Trigger not received
760	SC (Safety Controller) - too long no communication with Probe

761	SC (Safety Controller) - MSP switch 1 not high
762	SC (Safety Controller) - MSP switch 1 not low
763	SC (Safety Controller) - switch 1 fault
764	SC (Safety Controller) - switch 2 faults
765	SC (Safety Controller) - MSP not questioning
766	SC (Safety Controller) - interlock tripped
767	SC (Safety Controller) - Trigger received outside window
768	SC (Safety Controller) - Start source not received
769	SC (Safety Controller) - Trigger not received
770	SC (Safety Controller) - Current out of limits
771	SC (Safety Controller) - 3V3 LPC out of limits
772	SC (Safety Controller) - 3V3 MSP out of limits
773	Startup sequence busy, command currently not allowed
774	Not supported by probe model
775	Received during start invalid data
797	Potentiometer offset temperatures not monotone
798	Potentiometer offset build busy
799	Potentiometer offset store busy

Maintenance

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

WARNING: Maintenance of the EMCenter is limited to external components such as cables or connectors. If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

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.

Fiber Optic Maintenance

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.

CAUTION: Before performing any maintenance, disconnect 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.**

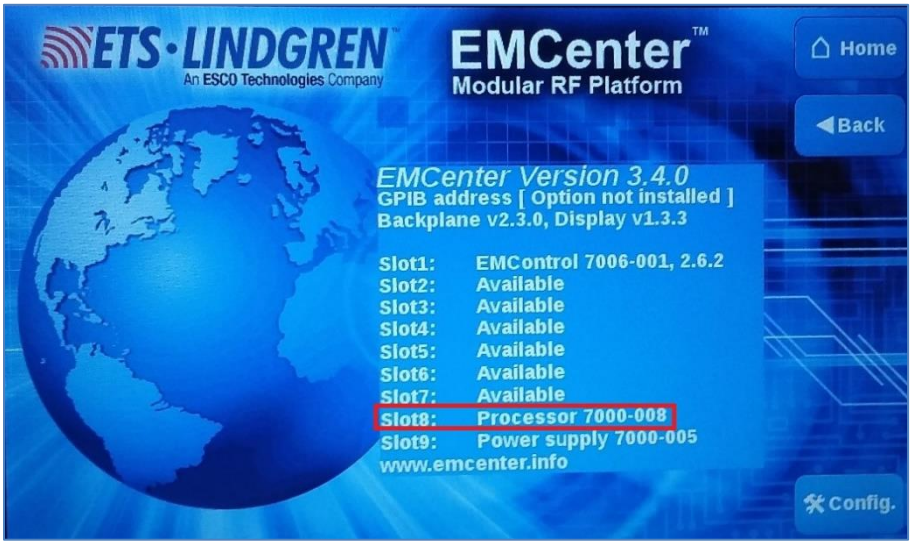
Identify CPU Card

There are two types of CPU for the EMCenter: x86 or ARM.

It is important to know which CPU card you are using because the instructions for the GOLD update are dependent upon which chipset you have.

X86 is now in long-term support, so the version numbers will be different from the ARM. The X86 version will remain at v3.3.X, as new functionality will not be added. For example: EMSense10 is not X86 compatible.

Software Identification



If the CPU is in an EMCenter, then you can look at the info page to identify the CPU. The processor number in slot 8 tells you the CPU type:

- X86
    - EMCENTER PROCESSOR BOARD STD (X86) = 7000-006
    - EMCENTER PROCESSOR BOARD + GPIB (X86) = 7000-007
- ARM
    - EMCENTER PROCESSOR BOARD STD (ARM) = 7000-008
    - EMCENTER PROCESSOR BOARD + GPIB (ARM) = 7000-009

Hardware Identification

If you are just looking at the card without it in an EMCenter, the CPU is easily identifiable by whether it has a 9-pin serial port. As shown in the figures below, the x86 has a 9-pin serial port and the ARM does NOT have a 9-pin serial port.

x86

ARM

Service Procedures

Contacting ETS-Lindgren

Note: Please see www.ets-lindgren.com for a list of ETS-Lindgren offices, including phone and email contact information.

Note: ETS-Lindgren is not responsible for service on equipment that has been configured with software other than what is provided by ETS-Lindgren. Support for such configurations requires a secondary charge from ETS-Lindgren.

Replacement and Optional Parts

Note: 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.

Sending a Component for Service

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

Calibration Services and Annual Calibration

See the *Product Information Bulletin* included with your shipment for information on ETS-Lindgren calibration services.

Upgrade Policies

Periodically, field probes are upgraded to enhance functionality. Contact ETS-Lindgren Customer Service for the upgrade status of your field probe.

Specifications

Performance Specifications

Slots:	2 to 7 modular card slots (depends on model)
Display:	• TFT with touchscreen • 7.0-in WVGA (800 x 480)
Processor:	800 MHz ARM A9 CPU
Memory:	512 MB RAM, 4 GB 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:	• **Standby**: < 1.0 W • **Empty**: 33 W • **Max load**: 200 W
Fuses:	2 A T

Interface and Cable Specifications

Interfaces:	• Ethernet • GPIB (IEEE-488)
Connectors:	• IEC Inlet • Sub D-9 • USB-A 2.0 (2) • USB-B 1.1 • Ethernet • GPIB (IEEE-488) • Interlock
Cables:	• IEC power cord
Interlock:	External interlock and interlocked laser outputs

Appendix A: EC Declaration on Conformity

ETS-Lindgren Inc. declares these products to be in conformity with the following standards and provisions:

Product Models: **EMCenter Modular RF Platform**

Directives: EMC Directive 2014/30/EU
Low Voltage Directive 2014/35/EU
RoHS Directive: 2015/863/EU

Emission: EN 61326-1:2013, Class A1
Electrical equipment for measurement, control and laboratory use.

Immunity: EN 61326-1:2013, 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.

RoHs: EN 63000:2018, Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Technical Construction Files are available upon request.