Model 7003-001

EMGen™
RF Signal Generator
Plug-In Card

User Manual

ETS·LINDGREN®

An **ESCO Technologies** Company

Revision Record

MANUAL,EMGEN | Part #399346, Rev. B

Revision	Description	Date
A	Initial Release	March, 2015
B	Updated *EMGen Command Set*	April, 2015

Table of Contents

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.

Safety Information

OR

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.

Class 1M

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1.0   Introduction

The **ETS-Lindgren EMGen™ RF Signal Generator Plug-in Card** is a modular signal generator with AM and pulse modulation, covering a frequency range of 9 kHz to 6 GHz. EMGen is designed for EMC testing, and quickly and accurately performs EMC tests without the need for an external modulation source. Using an internal modulator, EMGen provides CW, AM, and pulse modulated signals.

EMGen provides two outputs via SMA connectors, eliminating the need for an RF switch:

- **LF OUT—**One output for the low frequency band (9 kHz to 230 MHz), typically used for conducted immunity measurements.

- **HF OUT—**One output for the higher frequencies (80 MHz to 6 GHz), typically used for radiated immunity measurements.

EMCenter Modular RF Platform (Required)

The EMCenter is required for operation, and is sold separately. Contact ETS-Lindgren for ordering information.

Front Panel

Back Panel

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

Contact ETS-Lindgren for ordering information.

2.0   Maintenance

CAUTION: Before performing any maintenance, follow the information provided in *Safety Information* on page v.

WARNING: Maintenance of the EMGen card is limited to external components such as cables or connectors.

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

Maintenance of Fiber Optics (If Used)

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 the fiber optic cables from the unit and turn off power.

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

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

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

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

Replacement and Optional Parts

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.

Following are the part numbers for ordering replacement or optional parts for the EMGen™ RF Signal Generator Plug-in Card.

Part Description	Part Number
EMGen RF Signal Generator Plug-in Card, 9 kHz–6 GHz	7003-001

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.

SENDING A COMPONENT FOR SERVICE

1. Contact ETS-Lindgren Customer Service to obtain a Service Request Order (SRO).

2. Briefly describe the problem in writing. Give details regarding the observed symptom(s) or error codes, and whether the problem is constant or intermittent in nature. Please include the date(s), the service representative you spoke with, and the nature of the conversation. Include the serial number of the item being returned.

3. Package the system or component carefully. If possible, use the original packing materials or carrying case to return a system or system component to ETS-Lindgren.

3.0 Specifications

Performance Specifications

Frequency Range:	9 kHz–6 GHz
Frequency Resolution:	1 Hz
Output Level:	• **Minimum:** –70 dBm • **Maximum:** +10 dBm (+4.0 dBm when using AM)
Amplitude Resolution:	0.1 dB
Amplitude Accuracy:	± 1.5 dB
Output Level Settling Time:	< 500 us
Harmonics:	< -20 dBc
Non-Harmonic Spurious:	< -50 dBc
Modulation Type:	AM and Pulse
Modulation Frequency Range:	10 Hz–100 kHz
AM Modulation Depth:	5% to 95% (usable from 0% to 100%)
Pulse Time-Range:	• **ON:** 200 ns–100 s • **OFF:** 200 ns–100 s
Pulse Modulation On/Off Ratio, Output LF:	> 60 dB (9 kHz–230 MHz)
Pulse Modulation On/Off Ratio, Output HF:	> 90 dB (80 MHz–1 GHz) > 70 dB (1 GHz–3 GHz) > 60 dB (3 GHz–6 GHz)

Physical Specifications

Height:	3U:100 mm (3.93 in)
Width:	One slot
Depth:	220 mm
Output Connector:	Output LF and HF, (2) SMA

Environmental Specifications

Temperature Range:	10°C to 40°C (50°F to 104°F)
Relative Humidity:	10% to 90% (non-condensing)

Power Specifications

Supply Voltage:	12 VDC
Power Consumption:	< 25 W

4.0 EMGen Plug-In Card Installation

> ! **CAUTION: Before connecting any components, follow the information provided in *Safety Information* on page v.**

> ! **CAUTION: The EMGen card is designed to be used ONLY with the EMCenter. Do not use the card in combination with any other system.**

Plug-In Card Installation

1. Determine in which empty slot in the EMCenter™ Modular RF Platform you want to install the EMGen™ RF Signal Generator Plug-in Card. Looking at the back of the EMCenter, the slots are numbered 1 through 7 from left to right.

2. 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

3. Carefully insert the EMGen card into the slot of the EMCenter. Tighten the four screws.

4. Turn on the EMCenter. The EMCenter will automatically detect the newly-installed EMGen card.

5. Depending on the test setup requirements, connect coaxial cables to the relay connections on the back panel of the EMCenter.

6. Connect the EMCenter to a personal computer using USB, RS-232, Ethernet, or IEEE (optional).

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

The card installation is complete. You can control EMGen through the EMCenter touchscreen, with ETS-Lindgren TILE!™ (Totally Integrated Laboratory Environment), ETS-Lindgren EMQuest™ Data Acquisition and Analysis Software, and other test automation software packages. Contact ETS-Lindgren for additional information.

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5.0 Operation

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.

Plug-in Card Connectors & Indicators

- **LF OUT—**One output for the low frequency band (9 kHz to 230 MHz), typically used for conducted immunity measurements.

- **HF OUT—**One output for the higher frequencies (80 MHz to 6 GHz), typically used for radiated immunity measurements.

Powering On and Off EMCenter

Note: For information on using the EMCenter touchscreen, see the *EMCenter Modular RF Platform User Manual.*

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 screen. It will take approximately 20 seconds to boot. The Information screen will flash, and then the Home screen will display.
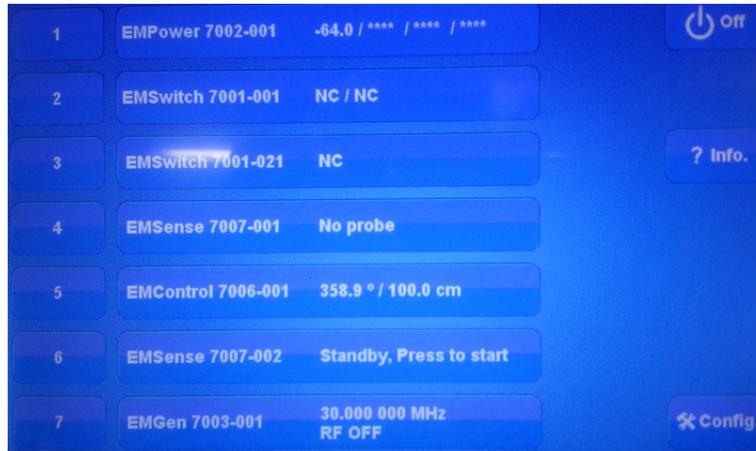
Sample EMCenter Home Screen

POWER OFF

1. Press the **Off** button located on the EMCenter screen.
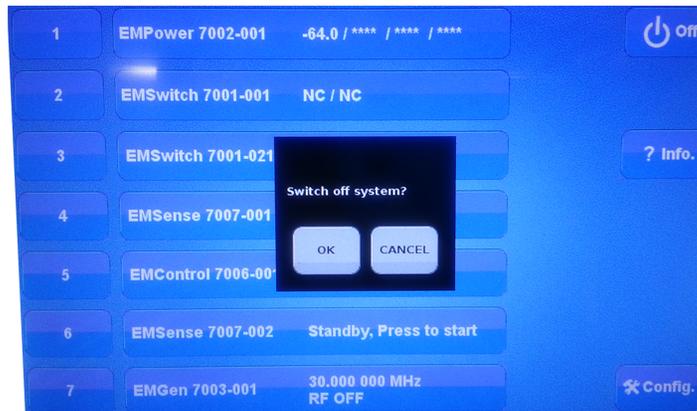
2. Press **OK** to switch off the system.

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

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.

Changing EMGen Settings

EMGEN CONTROL SCREEN

On the EMCenter Home screen press the EMGen status box that displays next to the installed slot number for the EMGen card. The EMGen Control screen will display, where you can change the following settings:

- Frequency

- Output power level

- Carrier on/off

- AM frequency

- AM modulation depth

- AM on/off

- Pulse modulation on/off times

- Pulse output

EMGEN CONFIGURATION SCREEN

On the EMGen Control screen press **Config** to display the Configuration screen and change the following settings:

- Step size for each parameter in the Control screen

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6.0   EMGen Command Set

See *Detailed Description of Remote Commands* on page 20 for the commands that can be used with the EMGen™ Plug-in Card. Each command must include a slot number as the prefix.

The prefix is **s**, where:

> **s** = the slot number of the EMGen in the EMCenter

For example, to send the FREQ**?** command to the EMGen located in slot 6 of the EMCenter™ Modular RF Platform, the complete command would be:

> **6FREQ?\n**
> or
> **6:FREQ?\n**

- Terminate each command with a line feed (LF, shown as **\n** in command syntax).

- Each response from the device is terminated with a line feed (LF, shown as **\n** in command syntax).

Detailed Description of Remote Commands

The following notation is used for each command:

Description: Description of the command function and any associated special information.

Syntax: **cmd <required parameter> [optional parameter]**

Parameter list: List of parameters and their descriptions (as required) with any associated special information.

Response: If applicable, description of expected response from queries, with any associated special information.

Example: Write **sCMD PARM\n** : Command to set parameter
Write **s:CMD PARM\n** : Command to set parameter (alternate syntax)
Write **sCMD PARM?\n** : Command to query parameter
Write **s:CMD PARM?\n** : Command to query parameter (alternate syntax)

- **s** : slot number of the EMGen in the EMCenter

- **CMD** command

- **PARM** parameter

Detailed Command List : Static Parameters

The following commands are used to query settings that cannot be modified by the user.

FREQUENCY:MINIMUM?

Description:	Queries the lowest frequency the signal generator can correctly generate. This value depends on whether the LF Output or HF Output is currently selected.
Query Syntax:	**FREQuency:MINimum?**
Query Response:	**:FREQuency:MINimum <frequency>** : Returns lowest frequency of the signal generator in its current state as <frequency>.
Unit:	Hz
Example:	• Write **sFREQ:MIN?\n** : Query minimum frequency Read response Response is **:FREQ:MIN 80000000\n** : Minimum frequency is currently 80 MHz

FREQUENCY:MAXIMUM?

Description:	Queries the highest frequency the signal generator can correctly generate. This value depends on whether the LF Output or HF Output is currently selected.
Query Syntax:	**FREQuency:MAXimum?**
Query Response:	**:FREQuency:MAXimum <frequency>** : Returns highest frequency of the signal generator in its current state as <frequency>.
Unit:	Hz
Example:	• Write **sFREQ:MAX?\n** : Query maximum frequency Read response Response is **:FREQ:MAX 6000000000\n** : Maximum frequency is currently 6 GHz

POWER:MINIMUM?

Description:	Queries the lowest amplitude the signal generator can correctly generate.
Query Syntax:	**POWer:MINimum?**
Query Response:	**:POWer:MINimum <amplitude>** : Returns lowest amplitude of the signal generator as <amplitude>.
Unit:	dBm
Example:	• Write **sPOW:MIN?\n** : Query minimum amplitude Read response Response is **:POW:MIN -70.0\n** : Minimum amplitude is -70.0 dBm.

POWER:MAXIMUM?

Description:	Queries the highest amplitude the signal generator can correctly generate.
Query Syntax:	**POWer:MAXimum?**
Query Response:	**:POWer:MAXimum <amplitude>** : Returns highest amplitude of the signal generator as <amplitude>.
Unit:	dBm
Example:	• Write **sPOW:MAX?\n** : Query maximum amplitude Read response Response is **:POW:MAX 10.0\n** : Maximum amplitude is 10.0 dBm.

AM:INTERNAL:FREQUENCY:MINIMUM?

Description:	Queries the lowest frequency that can be used to modulate the carrier signal of the generator in amplitude.
Query Syntax:	**AM:INTernal:FREQuency:MINimum?**
Query Response:	**:AM:INTernal:FREQuency:MINimum <amplitude>** : Returns lowest AM frequency of the signal generator as <amplitude>.
Unit:	Hz
Example:	• Write **sAM:INT:FREQ:MIN?\n** : Query minimum AM frequency Read response Response is **: AM:INT:FREQ:MIN 10.0\n** : Minimum AM frequency is 10 Hz.

AM:INTᴇʀɴᴀʟ:FREQᴜᴇɴᴄʏ:MAXɪᴍᴜᴍ?

Description:	Queries the highest frequency that can be used to modulate the carrier signal of the generator in amplitude.
Query Syntax:	**AM:INTernal:FREQuency:MAXimum?**
Query Response:	**:AM:INTernal:FREQuency:MAXimum \<frequency>** : Returns highest AM frequency of the signal generator as \<frequency>.
Unit:	Hz
Example:	• Write **sAM:INT:FREQ:MAX?\n** : Query maximum AM frequency Read response Response is **:AM:INT:FREQ:MAX 100000\n** : Maximum AM frequency is 100 kHz.

AM:MINɪᴍᴜᴍ?

Description:	Queries the smallest amplitude modulation depth the generator can correctly generate.
Query Syntax:	**AM:MINimum?**
Query Response:	**:AM:MINimum \<depth>** : Returns smallest AM depth of the signal generator as \<depth>.
Unit:	%
Example:	• Write **sAM:MIN?\n** : Query minimum AM depth Read response Response is **: AM:MIN 0.0\n** : Minimum AM depth is 0%.

AM:MAXIMUM?

Description:	Queries the largest amplitude modulation depth the generator can correctly generate.
Query Syntax:	**AM:MAXimum?**
Query Response:	**:AM:MAXimum <depth>** : Returns largest AM depth of the signal generator as <depth>.
Unit:	%
Example:	• Write **sAM:MAX?\n** : Query maximum AM depth Read response Response is **:AM:MAX 100.0\n** : Maximum AM depth is 100%.

PULSE:WIDTH:MINIMUM?

Description:	Queries the shortest pulse modulation width the generator can correctly generate.
Query Syntax:	**PULSe:WIDTh:MINimum?**
Query Response:	**:PULSe:WIDTh:MINimum <pulsewidth>** : Returns shortest PM width of the signal generator as <pulsewidth>.
Unit:	s
Example:	• Write **sPULSE:WIDTH:MIN?\n** : Query minimum PM width Read response Response is **: PULSE:WIDTH:MIN 0.00000020\n** : Minimum PM width is 200 ns.

PULSe:WIDTh:MAXimum?

Description:	Queries the largest pulse modulation width the generator can correctly generate.
Query Syntax:	**PULSe:WIDTh:MAXimum?**
Query Response:	**:PULSe:WIDTh:MAXimum <pulsewidth>** : Returns largest PM width of the signal generator as <pulsewidth>.
Unit:	s
Example:	• Write **sPULSE:WIDTH:MAX?\n** : Query maximum PM width Read response Response is **:PULSE:WIDTH:MAX 100.0\n** : Maximum PM width is 100 S.

SVERsion?

Description:	Queries the current version of firmware.
Query Syntax:	**SVERsion?**
Query Response:	**:SVERsion <version>** : Returns the current version of firmware stored in the EMGen module as <version>.
Example:	• Write **sSVER?\n** : Query the firmware version Read response Response is **:SVER 2.4.8\n** : Current firmware version is 2.4.8.

TEMPERATURE:MINIMUM?

Description:	Queries the minimum temperature in which the signal generator should continue to operate within specifications. An error message is generated if the current temperature is lower than this value.
Query Syntax:	**TEMPerature:MINimum?**
Query Response:	**:TEMPerature:MINimum <temperature>** / : **:TEMPerature:MINimum 0.0** : Returns minimum temperature of the signal generator as <temperature>.
Unit:	°C
Example:	• Write **sTEMP:MIN?\n** : Query minimum temperature Read response Response is **:TEMP:MIN 45.0 / :TEMP:MIN 0.0\n** : Minimum temperature is 45.0°C.

TEMPERATURE:MAXIMUM?

Description:	Queries the maximum temperature in which the signal generator should continue to operate within specifications. An error message is generated if the current temperature is higher than this value.
Query Syntax:	**TEMPerature:MAXimum?**
Query Response:	**:TEMPerature:MAXimum <temperature> / :** **:TEMPerature:MAXimum 0.0**: Returns maximum temperature of the signal generator as <temperature>.
Unit:	°C
Example:	• Write **sTEMP:MAX?\n** : Query maximum temperature Read response Response is **:TEMP:MAX 60.0 / :TEMP:MAX 0.0\n** : Maximum temperature is 60°C.

Detailed Command List: Variable Parameters

The following commands are used to set and query variable settings in the EMGen.

FREQUENCY

Description:	Sets the carrier frequency to be generated by the signal generator.
Syntax:	**FREQuency <frequency>** Sets the frequency to the specified value.
Query Syntax:	**FREQuency?** Queries the current carrier frequency.
Query Response:	**:FREQuency <frequency>** : Returns the carrier frequency as <frequency>.
Unit:	Hz
*RST Value:	Set to FREQuency:MIN setting
Example:	• Write **sFREQ 100000000\n** : Set frequency to 100 MHz Write **s*OPC?\n** : Query operation complete status Read Response • Write **sFREQ 200 MHZ\n** : Set frequency to 200 MHz Write **s*OPC?\n** : Query operation complete status Read Response • Write **sFREQ 1GHZ\n** : Set frequency to 1 GHz Write **s*OPC?\n** : Query operation complete status Read Response • Write **sFREQ?\n** : Query the frequency Read Response Response is **:FREQ 100000000 \n** : Frequency is 100 MHz.

POWer

Description:	Sets the desired output level of the signal generator.
Syntax:	**POWer \<value\>**
	Sets the output level.
Query Syntax:	**POWer?**
	Queries the output level.
Query Response:	**:POWer \<value\>** : Returns the output level as \<value\>.
Unit:	dBm
*RST Value:	Set to POWer:MINimum setting.
Example:	• Write **sPOW 3\n** : Set output level to 3 dBm Write **s*OPC?\n** : Query operation complete status Read Response • Write **sPOW -20.1 DBM\n** : Set output level to -20.1 dBm Write **s*OPC?\n** : Query operation complete status Read Response • Write **sPOW?\n** : Query the output level Read Response Response is **:POW -30.0 \n** : Output level is -30 dBm.

OUTPᴜᴛX:STATᴇ

Description:	Turns the output signal on or off and switches between the outputs. Only one output (HF and LF) can be selected and enabled at a time. If one output is selected and On, it should be turned Off before selecting the other output. When an output is selected, the parameters of that output (level, frequency, etc.) can be changed.
Syntax:	**OUTPut1:STATe ON** Selects the HF output and turns the output signal on. **OUTPut1:STATe OFF** Selects the HF output and turns the output signal off. **OUTPut2:STATe ON** Selects the LF output and turns the output signal on. **OUTPut2:STATe OFF** Selects the LF output and turns the output signal off.
Query Syntax:	**OUTPutX:STATe?** Queries the output state of the specified output (X = 1 for HF output; X = 2 for LF output)
Query Response:	**:OUTPutX:STATe <state>** : Returns the output state of output X as <state>, where <state> = ON or OFF.
*RST Value:	Both outputs Off. HF output selected.

Example: Select the LF output, change its parameters and turn on the output signal:

>   Write **sOUTP1:STAT OFF\n** : Ensure that HF output is off
>   Write **sOUTP2:STAT OFF \n** : Select the LF output
>   Write **sFREQ 10 MHZ\n** : Set LF output to 10 MHz
>   Write **s*OPC?\n** : Query operation complete status
>   Read Response
>   Write **sPOW 3\n** : Set LF output level to 3 dBm
>   Write **s*OPC?\n** : Query operation complete status
>   Read Response
>   Write **sOUTP2:STAT ON\n** : Turn the LF output signal on

Enable the HF output (starting point is from previous example):

>   Write **sOUTP2:STAT OFF\n** : Turn the LF output off
>   Write **sOUTP1:STAT OFF \n** : Select the HF output

This copies the values for power and modulation to the HF output. The frequency is loaded from the previous HF frequency and the output state will be OFF.

OUTPUT:SELECTED?

Description: Queries the currently selected output (query only).

Query Syntax: **OUTPut:SELECTed?**

Query Response: **:OUTPut:SELECTed <output>**: Returns the selected output of the EMGen card.

>   **1** : HF Output selected

>   **2** : LF Output selected

Example: • Write **sOUTP:SELECT?\n** : Query selected output
>   Read response
>   Response is **:OUTP:SELECT 2\n** : LF Output is selected

AM:INTERNAL:FREQUENCY

Description: Sets the frequency used for amplitude modulation.

Syntax: **AM:INTernal:FREQuency < frequency >**

Sets the AM frequency.

Query Syntax: **AM:INTernal:FREQuency?**

Queries the AM frequency.

Query Response: **:AM:INTernal:FREQuency <frequency>** : Returns the AM frequency as <frequency>.

Unit: Hz

*RST Value: Set to AM:INTernal:FREQuency:MINimum setting.

Example:
- Write **sAM:INT:FREQ 1000\n** : Set AM frequency to 1 kHz

- Write **sAM:INT:FREQ?\n** : Query the AM frequency
  Read Response
  Response is **:AM:INT:FREQ 2000 \n** : AM frequency is 2 kHz.

AM

Description:	Sets the depth of the amplitude modulation with respect to the carrier signal.
Syntax:	**AM <depth>** Sets the AM frequency.
Query Syntax:	**AM?** Queries the AM depth value.
Query Response:	**:AM <depth>** : Returns the AM depth as <depth>.
Unit:	%
*RST Value:	Set to AM:MINimum setting.
Example:	• Write **sAM 100\n** : Set AM depth to 100 % • Write **sAM 20 %\n** : Set AM depth to 20 % • Write **sAM?\n** : Query the AM depth Read Response Response is **:AM 50 \n** : AM depth is 50%.

AM:STATE

Description:	Turns the amplitude modulation on or off.
Syntax:	**AM:STATe \<value\>**
	Sets the AM state.
Query Syntax:	**AM:STATe?**
	Queries the AM state.
Query Response:	**:AM:STATe \<value\>** : Returns the AM state as \<value\>, where \<value\> = ON or OFF.
*RST Value:	OFF

Example:

- Write **sAM:STAT ON\n** : Turn amplitude modulation on

- Write **sAM:STAT OFF\n** : Turn amplitude modulation off

- Write **sAM:STAT 1\n** : Turn amplitude modulation on

- Write **sAM:STAT?\n** : Query the AM state
  Read Response
  Response is **:AM:STAT ON \n** : AM is on

PULSe:WIDTh

Description: Sets the width (ON time) for pulse modulation.

Syntax: **PULSe:WIDTh <width>**

Sets the pulse ON time.

Query Syntax: **PULSe:WIDTh?**

Queries the pulse ON time.

Query Response: **:PULSe:WIDTh <width>** : Returns the pulse ON time as <width>.

Unit: s

*RST Value: Set to PULSe:WIDTh:MINimum setting.

Example:

- Write **sPULS:WIDT 0.5\n** : Set pulse ON time to 500 ms

- Write **sPULS:WIDT 100 ms\n** : Set pulse ON time to 100 ms

- Write **sPULS:WIDT?\n** : Query the pulse ON time
  Read Response
  Response is **:PULS:WIDT 0.00020000\n** : Pulse ON time is 200 us

PULSE:DELAY

Description: Sets the delay (OFF time) for pulse modulation.

Syntax: **PULSe:DELay <delay>**

Sets the pulse OFF time.

Query Syntax: **PULSe: DELay?**

Queries the pulse OFF time.

Query Response: **:PULSe: DELay <delay>** : Returns the pulse OFF time as <delay>.

Unit: s

*RST Value: Set to PULSe: DELay:MINimum setting.

Example:
- Write **sPULS: DEL 2.1\n** : Set pulse OFF time to 2.1 s

- Write **sPULS: DEL 500 us\n** : Set pulse OFF time to 500 us

- Write **sPULS: DEL?\n** : Query the pulse OFF time
  Read Response
  Response is **:PULS:DEL 0.00020000\n** : Pulse OFF time is 200 us

PM:STATᴇ

Description:	Turns the pulse modulation on or off.
Syntax:	**PM:STATe <value>** Sets the PM state.
Query Syntax:	**PM:STATe?** Queries the PM state.
Query Response:	**:PM:STATe <value>** : Returns the PM state as <value>, where <value> = ON or OFF.
*RST Value:	OFF

Example:	• Write **sPM:STAT ON\n** : Turn pulse modulation on
	• Write **sPM:STAT OFF\n** : Turn pulse modulation off
	• Write **sPM:STAT 1\n** : Turn pulse modulation on
	• Write **sPM:STAT?\n** : Query the PM state
	  Read Response
	  Response is **:PM:STAT ON \n** : PM is on

TEMPᴇʀᴀᴛᴜʀᴇ?

Description:	Queries the temperature of the device (query only).
Query Syntax:	**TEMPerature?**
Query Response:	**:TEMPerature <temp_board1> / : TEMPerature <temp_board2>** : Returns temperature of the EMGen module. The two values returned represent the temperature readings of individual sensors on the EMGen card.
Unit:	°C

Example:	• Write **sTEMP?\n** : Query device temperature
	  Read response
	  Response is **:TEMP 51.2 / :TEMP 53.3\n** : Device temperature of board 1 is 51.2°C and device temperature of board 2 is 53.3°C

IEEE 488.2 Mandatory Instruction Set

- IEEE commands for **Interface Clear** and **Clear** are not supported.

- IEEE status flags in either serial or parallel poll or as a service request are not supported.

- When IEEE communication is used, the first command/request should be ***IDN?\r**.

*IDN?

Description:	Identification query. Determines the nature of device located at a given address on the GPIB bus.
	Prepares controller to respond with an ASCII character string when queried. The string returned (**ETS Lindgren, EMGen XXXX-XXX, N.N.N**) identifies this controller as an EMGen module.
	The XXXX-XXX parameter is a placeholder for the device model number.
	The N.N.N parameter is a placeholder for the firmware revision level.
Syntax:	***IDN?**
Response:	ETS-Lindgren, EMGen XXXX-XXX, N.N.N

- N.N.N is the revision number

- XXXX-XXX is the model number

Example:

- Write **s*IDN?\n** : Query the identification string

- Read response

- Response is **ETS-Lindgren, EMGen 7003-001, 2.4.8\n** : EMGen model 7003-001, firmware version 2.4.8

*OPC?

Description: Query Operation Complete. Allows for software synchronization following the setting of signal generator parameters.

Returns **1** when the previous command has been processed.

ETS-Lindgren recommends using the *OPC? query following FREQuency and POWer setting changes.

Syntax: ***OPC?**

Response:
- ***OPC \<flag\>** : Indicates if previous command is complete

  1 : Previous command is complete

Example:
- Write **sPOW 3\n**: set output level to 3 dBm
  Write **s*OPC?\n** : Query operation complete
  Read Response
  Response is ***OPC 1\n** : Previous command is complete

*RST

Description: Resets the device. Device remains in remote mode. All settings are returned to their reset values.

Syntax: ***RST**

Example: Write **s*RST\n** : Reset device

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Appendix A: Warranty

Scope and Duration of Warranties

Seller warrants to Buyer that the Products to be delivered hereunder will be (1) free from defects in material, manufacturing workmanship, and title, and (2) conform to the Seller's applicable product descriptions and specifications, if any, contained in or attached to Seller's quotation. If no product descriptions or specifications are contained in or attached to the quotation, Seller's applicable product descriptions and specifications in effect on the date of shipment shall apply. The criteria for all testing shall be Seller's applicable product specifications utilizing factory-specified calibration and test procedures and instruments.

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

Product Warranted	Duration of Warranty Period
EMGen™ RF Signal Generator Plug-in Card	3 Years

Any product or part furnished to Buyer during the warranty period to correct a warranty failure shall be warranted to the extent of the unexpired term of the warranty applicable to the repaired or replaced product.

The warranty period shall commence on the date the product is delivered to Buyer; however, if Seller assembles the product, or provides technical direction of such assembly, the warranty period for such product shall commence on the date the assembly of the product is complete. Notwithstanding the foregoing, in the event that the assembly is delayed for a total of thirty (30) days or more from the date of delivery for any reason or reasons for which Seller is not responsible, the warranty period for such product may, at Seller's options, commence on the thirtieth (30th) day from the date such product is delivered to Buyer. Buyer shall promptly inspect all products upon delivery. No claims for shortages will be allowed unless shortages are reported to Seller in writing within ten (10) days after delivery. No other claims against Seller will be allowed unless asserted in writing within thirty (30) days after delivery (or assembly if the products are to be assembled by Seller) or, in the case of alleged breach of warranty, within the applicable warranty period.

Warranty Exclusions

Except as set forth in any applicable patent indemnity, the foregoing warranties are exclusive and in lieu of all other warranties, whether written, oral, express, implied, or statutory. EXCEPT AS EXPRESSLY STATED ABOVE, SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, BY STATUTE OR OTHERWISE, WHETHER OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE OR OTHERWISE ON THE PRODUCTS, OR ON ANY PARTS OR LABOR FURNISHED DURING THE SALE, DELIVERY OR SERVICING OF THE PRODUCTS. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

Warranty coverage does not include any defect or performance deficiency (including failure to conform to product descriptions or specifications) which results, in whole or in part, from (1) negligent storage or handling of the product by Buyer, its employees, agents, or contractors, (2) failure of Buyer to prepare the site or provide an operating environmental condition in compliance with any applicable instructions or recommendations of Seller, (3) absence of any product, component, or accessory recommended by Seller but omitted at Buyer's direction, (4) any design, specification, or instruction furnished by Buyer, its employees, agents or contractors, (5) any alteration of the product by persons other than Seller, (6) combining Seller's product with any product furnished by others, (7) combining incompatible products of Seller, (8) interference with the radio frequency fields due to conditions or causes outside the product as furnished by Seller, (9) improper or extraordinary use of the product, or failure to comply with any applicable instructions or recommendations of Seller including maintenance, calibration and cleaning procedures and intervals, or (10) acts of God, acts of civil or military authority, fires, floods, strikes or other labor disturbances, war, riot, or any other causes beyond the reasonable control of Seller.

This warranty does not include (1) batteries, (2) cables, (3) gasket, (4) fingerstock, or any item that is designed to be consumable. Seller does not warranty products of others which are not included in Seller's published price lists.

Buyer's Remedies

If Seller determines that any product fails to meet any warranty during the applicable warranty period, Seller shall correct any such failure by either, at its option, repairing, adjusting, or replacing without charge to Buyer any defective or nonconforming product, or part or parts of the product. Seller shall have the option to furnish either new or exchange replacement parts or assemblies.

Warranty service shall be performed at the Seller's factory, or the Buyer's site at the sole discretion of the Seller. Within the warranty period, the Buyer shall be responsible for all transportation to the Seller's factory, and the Seller shall be responsible for transportation of goods to the Buyer's site.

Within the contiguous 48 United States, warranty service performed during the applicable warranty period will be performed without charge to Buyer during Seller's normal business hours. After the warranty period, service will be performed at Seller's prevailing service rates. Subject to the availability of personnel, after-hours service is available upon request at an additional charge.

Outside the contiguous 48 United States, travel and per diem expenses, when required, shall be the responsibility of the Buyer, or End User, whichever is applicable regardless of the warranty period.

The remedies set forth herein are conditioned upon Buyer promptly notifying Seller within the applicable warranty period of any defect or non-conformance and making the product available for correction.

The preceding paragraphs set forth Buyer's exclusive remedies and Seller's sole liability for claims based on failure of the products to meet any warranty, whether the claim is in contract, warranty, tort (including negligence and strict liability) or otherwise, and however instituted, and, upon the expiration of the applicable warranty period, all such liability shall terminate. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND ARISING OUT OF, OR AS A RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, ASSEMBLING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT DESPITE ANY NEGLIGENCE ON BEHALF OF THE SELLER. IN NO EVENT SHALL SELLER'S LIABILITIES UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCT IN RESPECT OF WHICH DAMAGES ARE CLAIMED. This agreement shall be construed in accordance with laws of the State of Texas. In the event that any provision hereof shall violate any applicable statute, ordinance, or rule of law, such provision shall be ineffective to the extent of such violation without invalidating any other provision hereof.

Any controversy or claim arising out of or relating to the sale, delivery, non-delivery, servicing, assembling, use or loss of use of the products or any part thereof or for any charges or expenses in connection therewith shall be settled in Austin, Texas by arbitration in accordance with the Rules of the American Arbitration Association, and judgment upon the award rendered by the Arbitrator may be entered in either the Federal District Court for the Western District of Texas or the State District Court in Austin, Texas, all of the parties hereto consenting to personal jurisdiction of the venue of such court and hereby waive the right to demand a jury trial under any of these actions.

Appendix B: EC Declaration of Conformity

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

EMGen RF Signal Generator Plug-In Card

Emission: EN 61326-1:2006, Class B

Electrical equipment for measurement, control, and laboratory use.

Immunity: EN 61326-1:2006, Industrial level, performance criteria A

Electrical equipment for measurement, control, and laboratory use.

Technical Construction Files are available upon request.