

Seren IPS DeviceNet™ Implementation for RF Generators

Introduction

This document describes the DeviceNet implementation for RF Generators manufactured by Seren IPS, Inc.

Revisions

2006-05-08 RampUp and RampDn units are in S, not mS

2006-06-23 Added description of DeviceNet status messages on front panel
Added mention of Electronic Data Sheet

2006-08-11 Added description of Product Codes, Product Names, Serial Numbers
Updated Electronic Data Sheet
Applies to Generator firmware V11.2A00 and above

2007-04-09 Corrected EDS file Seren-EDS-RFGEN-3p5.txt

2007-07-20 Assembly Set 3 was defined:

From Fieldbus to Generator, 30 bytes, ID 68hex

From Generator to Fieldbus, 36 bytes, ID 69hex

A new EDS file was created

The reported revision was changed from 3.4 to 3.5

The Generator remembers the last I/O Poll assembly set used and will retain the setting while powered off. The Generator allows this setting to be changed from the front panel so that the desired I/O Poll assembly set can be selected without using an explicit message.

These changes apply to Generator firmware V11.3W02 and above.



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Applicable Documents

Title: DeviceNet Specification Volume I: DeviceNet Communication Model and Protocol
Version: Release 2.0, Errata 5 March 31, 2002
Source: ODVA

Title: DeviceNet Specification Volume II: DeviceNet Device Profiles and Object Library
Version: Release 2.0, Errata 5 March 31, 2002
Source: ODVA

Title: Interface Guidelines for DeviceNet Devices On Semiconductor Manufacturing Tools
Version: Revision: 2.5 09-Sept-2005
Source: ODVA Semiconductor Special Interest Group (SIG)

Hardware

Status Indicators

Network Status LED, Module Status LED

Configuration Switches (see note below)

Communication Rate: rotary switch (0=125kbaud, 1=250kbaud, 2=500kbaud, others="program")
MAC ID: rotary switches (settings 0-63=ID, others="program")

Connector Style

Sealed Micro, Male

Physical Layer

Philips PCA82C250 CAN controller, optically isolated

NOTE: On smaller RF Generators such as the R301 and R601, DeviceNet configuration switches are not provided. For these units, the MAC ID and communication rate must be set from the front panel.

Software

Communications Model

Group 2 Only Server
Predefined Master/Slave Connection Set supported

Connections

Connection Instance 1: Explicit
Connection Instance 2: Polled I/O

Specifications

Vendor ID: 946 (3B2 hex)
Message body format: DeviceNet 8/8
Minimum time between I/O Poll Commands: 50ms

When the Generator is powered up it runs through a self-test, sends two "Duplicate MAC ID check" messages, and waits for a Master to establish a connection. To set up a connection, a Master should send "Allocate Master/Slave Connection Set" followed by "Set Single Attribute - Expected Packet Rate". After the connection is established, the Master may issue I/O Poll Command messages and the Generator will respond with I/O Poll Response messages. In the following examples, the Master's MAC ID is 01, and the Slave's MAC ID is 3F. Values are in hexadecimal.

Example: Allocate Master/Slave Connection Set

CAN ID:	5FE	Group 2, Destination MAC ID 3F, Message ID 6
Data Byte Count:	6	
Data:	01	Message header - source ID = 01
	4B	Service code = Allocate M/S Connection Set
	03	Class ID = DeviceNet
	01	Instance ID = 01
	03	Allocation choice = Polled + Explicit
	01	Allocator's MAC ID = 01

Example: Set Expected Packet Rate for the I/O Poll Connection

CAN ID:	5FC	Group 2, Destination MAC ID 3F, Message ID 4
Data Byte Count:	7	
Data:	01	Message header - source ID = 01
	10	Service code = Set Attribute Single
	05	Class ID = Connection
	02	Instance ID = I/O Poll
	09	Attribute = Expected Packet Rate
	00	Value LSB
	04	Value MSB Value = 0400 = 1024 ₁₀ ms

I/O Poll Command/Response Assembly Data Formats

While the Generator is connected to the Master and I/O Polling is in progress, the Master periodically sends a data packet to the Generator and the Generator sends a data packet in response. In DeviceNet terminology, each data packet is called an "assembly". The direction of data transfer is always with respect to the Master, so that "out" means "from Master to Slave" and "in" means "from Slave to Master".

The format of the data within each assembly depends on which "Assembly Set" is selected. The Generator supports three Assembly Sets, each with different sizes and capabilities, depending on the application. With Assembly Set 1 selected, the amount of data transferred is very small, but the Generator operation is limited to specifying the setpoint and turning RF power on and off. With Assembly Set 2 selected, nearly every Generator function is available, however the amount of data transferred is larger. Assembly Set 3 includes a subset of the functions available with Assembly Set 2, with correspondingly less data transferred.

The desired Assembly Set can be selected via DeviceNet by sending a Set Attribute Single explicit message to set the Consumed Connection Path of the I/O Poll Connection:

Assembly Set 1:	Set Attribute Single 20 04 24 64 30 03
Assembly Set 2:	Set Attribute Single 20 04 24 66 30 03
Assembly Set 3:	Set Attribute Single 20 04 24 68 30 03

When an Assembly Set is selected, the setting is retained while the Generator is powered off, so that it will not be necessary to re-select the Assembly Set each time the Generator is powered on.

The desired Assembly Set can also be selected from the front panel, as described below in the Setup section.

The formats of the assemblies are described in the following sections.

NOTE: The information above applies to Generators with firmware version 11.3W02 and above.
With earlier firmware, only Assembly Sets 1 and 2 are supported, and the Generator resets to Assembly Set 1 if powered off and back on again.

Assembly Set 1: I/O Poll Command Format - Assembly ID 64hex

Assembly ID 64hex (factory default): From Fieldbus To Generator

BYTE	7	6	5	4	3	2	1	0
0	Power Output LSB							
1	Power Output MSB							
2	Not Used							
3								
4								RFEN

Notes: Power values are in watts.

RFEN RF Enable Control 1 = RF on 0 = RF off

Assembly Set 1: I/O Poll Response Format - Assembly ID 65hex

Assembly ID 65hex (factory default): From Generator To Fieldbus

BYTE	7	6	5	4	3	2	1	0
0	Forward Power LSB							
1	Forward Power MSB							
2	Reflected Power LSB							
3	Reflected Power MSB							
4	Not Used							
5	Not Used							
6	Not Used							
7	Not Used							
8				EXT		TMP	CMP	RFON

Notes: Power values are in watts.

EXT External interlock 1 = OK, 0 = alarm condition

TMP Temperature 1 = OK, 0 = alarm condition

CMP Compliance 1 = setpoint reached

RFON RF Output 1 = RF output is ON

Assembly Set 2: I/O Poll Command Format - Assembly ID 66hex

Assembly ID 66hex: From Fieldbus To Generator

BYTE	7	6	5	4	3	2	1	0
0	Setpoint (low byte)							
1	Setpoint (high byte)							
2	MaxPwr (low byte)							
3	MaxPwr (high byte)							
4	Freq (low byte)							
5	Freq (high byte)							
6	MaxFreq (low byte)							
7	MaxFreq (high byte)							
8	MinFreq (low byte)							
9	MinFreq (high byte)							
10	MaxV (low byte)							
11	MaxV (high byte)							
12	PulsHiPwr (low byte)							
13	PulsHiPwr (high byte)							
14	PulsLoPwr (low byte)							
15	PulsLoPwr (high byte)							
16	PulsRate (low byte)							
17	PulsRate (high byte)							
18	PulsHiTime (low byte)							
19	PulsHiTime (high byte)							
20	RampUp (low byte)							
21	RampUp (high byte)							
22	RampDn (low byte)							
23	RampDn (high byte)							
24	MaxVF (low byte)							
25	MaxVF (high byte)							
26	MinVF (low byte)							
27	MinVF (high byte)							
28	CoarseF (low byte)							
29	CoarseF (high byte)							
30	FineF (low byte)							
31	FineF (low byte)							
32	StrikeF (low byte)							
33	StrikeF (high byte)							
34	(res)							
35	(res)							
36	CtrlMode							
37	PulsDuty							
38	PresetEna							
39	PreTune							
40	PreLoad							
41	CoarseR							
42	FineT							

43	TuneFB							
44	LinkTimer							
45	MatchLoad							
46	MatchTune							
47	(res)							
48	FreqCtrl	PrbPol	Rng5/10	ExcCtrl	RngPwr	Level	RegPV	RFEN
49	FreqTune	MatchConn	RampEna	(res)	PlsMon	PlsSrc	(res)	PlsEna
50	(res)	(res)	(res)	LinkMon	(res)	(res)	XrfvEna	XimpEna
51	(res)	(res)	(res)	(res)	(res)	(res)	(res)	IGNORE

This assembly is sent from the Master to the Generator, and is used to set various parameters as follows:

- Bytes 0,1 Setpoint - Power or Voltage Setpoint
If RegPV=0 and RngPwr=0: value in Watts*10, min = 0, max = MaxPwr
If RegPV=0 and RngPwr=1: value in Watts, min = 0, max = MaxPwr
If RegPV=1: value in Volts, min = 0, max = MaxV
- Bytes 2,3 MaxPwr - Maximum Power
If RngPwr=0: value in Watts, min = 0, max = rated power / 10
If RngPwr=1: value in Watts, min = 0, max = rated power
- Bytes 4,5 Freq - Generator Output Frequency
Value in KHz, min = MinFreq, max = MaxFreq
- Bytes 6,7 MaxFreq - Maximum Output Frequency
Value in KHz, min = min rated freq, max = max rated freq
- Bytes 8,9 MinFreq - Minimum Output Frequency
Value in KHz, min = min rated freq, max = max rated freq
- Bytes 10,11 MaxV - Maximum DC Voltage in Voltage Control
Value in Volts, min = 0, max = rated F.S.
- Bytes 12,13 PulsHiPwr - Pulse High Power (Pulse Type 1)
Value in Watts, min = 0, max = MaxPwr
- Bytes 14,15 PulsLoPwr - Pulse Low Power (Pulse Type 1)
Value in Watts, min = 0, max = MaxPwr
- Bytes 16,17 PulsRate - Pulse Rate (Pulse Type 0)
Value in Hz, min = 1, max = 10000
- Bytes 18,19 PulsHiTime - Pulse High Time (Pulse Type 1)
Value in mS, min = 1, max = 9999
- Bytes 20,21 RampUp - Ramp-Up Time
Value in S, min = 1, max = 9999

Bytes 22,23	RampDn - Ramp-Down Time Value in S, min = 1, max = 9999
Bytes 24,25	MaxVF - Maximum Tune Frequency Value in KHz, min = min rated freq, max = max rated freq
Bytes 26,27	MinVF - Minimum Tune Frequency Value in KHz, min = min rated freq, max = max rated freq
Bytes 28,29	CoarseF - Coarse Tune Frequency Step Value in Hz, min = 1, max = 30000
Bytes 30,31	FineF - Fine Tune Frequency Step Value in Hz, min = 1, max = 30000
Bytes 32,33	StrikeF - Strike Frequency Value in KHz, min = MinVF, max = MaxVF
Byte 36	CtrlMode - Control Mode 0 = Panel Control 1 = Analog Control 2 = Serial Control
Byte 37	PulsDuty - Pulse Duty Cycle Value in percent, min = 0, max = 100
Byte 38	PresetEna - Preset Mode Enable 0 = disabled 1 = enabled (standard rfok output) 2 = enabled (inverted rfok output)
Byte 39	PreTune - Tune Preset Value in percent, min = 0, max = 100
Byte 40	PreLoad - Load Preset Value in percent, min = 0, max = 100
Byte 41	CoarseR - Coarse Tune Trip Ratio Value in percent, min = 1, max = 100
Byte 42	FineT - Fine Tune Suspension Point Value in Watts, min = 1, max = 100
Byte 43	TuneFB - Tune Feedback Source 0 = reflected power 1 = external phase detector, positive polarity 2 = external phase detector, positive polarity

Byte 44	LinkTimer - Link Loss Detection Timer Value in Seconds, min = 0, max = 30
Byte 45	MatchLoad - Match Load Position Value in percent, min = 0, max = 100
Byte 46	MatchTune - Match Tune Position Value in percent, min = 0, max = 100
Byte 48 bit 7	FreqCtrl - Frequency Control Enable 0 = Disabled 1 = Enabled
Byte 48 bit 6	PrbPol - Probe Polarity 0 = +PRB DB25 (probe inverter disabled) 1 = -PRB BNC (probe inverter enabled)
Byte 48 bit 5	Rng5/10 - Analog Interface Range Select, 5V or 10V 0 = 5V F.S. 1 = 10V F.S.
Byte 48 bit 4	ExcCtrl - Exciter Control 0 = Master 1 = Slave
Byte 48 bit 3	RngPwr - Range Select, Low or High Power 0 = Low Power Range 1 = High Power Range
Byte 48 bit 2	Level - Level Mode 0 = Regulate on forward power 1 = Regulate on forward power - reflected power
Byte 48 bit 1	RegPV - Regulation Type, Power or Voltage 0 = Regulate on power 1 = Regulate on voltage
Byte 48 bit 0	RFEN - RF Off/On Control 0 = RF Off 1 = RF On
Byte 49 bit 7	FreqTune - Frequency Tune Enable 0 = Disabled 1 = Enabled
Byte 49 bit 6	MatchConn - Connect to Match Controller 0 = Do not connect 1 = Connect : send desired match/load positions, report current positions

Byte 49 bit 5	RampEna - Ramping Enable 0 = Disabled 1 = Enabled
Byte 49 bit 3	PlsMon - Pulse Monitor Output (Type 1) 0 = Peak 1 = Real time
Byte 49 bit 2	PlsSrc - Pulse Source 0 = Internal 1 = External
Byte 49 bit 0	PlsEna - Pulse Enable 0 = Disabled 1 = Enabled
Byte 50 bit 4	LinkMon - Link Loss Monitor Enable 0 = Disabled 1 = Enabled
Byte 50 bit 1	XrfvEna - Excessive RF Voltage Alarm Enable 0 = Disabled 1 = Enabled
Byte 50 bit 0	XimpEna - Excessive Impedance Alarm Enable 0 = Disabled 1 = Enabled
Byte 51 bit 0	IGNORE - Ignore All Parameters in I/O Poll Command 0 = Process all parameters in the I/O Poll Command 1 = Ignore all parameters in the I/O Poll Command Use this when only the I/O Poll Response is desired.

Assembly Set 2: I/O Poll Response Format - Assembly ID 67hex

Assembly ID 67hex: From Generator To Fieldbus

BYTE	7	6	5	4	3	2	1	0
0	Setpoint (low byte)							
1	Setpoint (high byte)							
2	MaxPwr (low byte)							
3	MaxPwr (high byte)							
4	Freq (low byte)							
5	Freq (high byte)							
6	MaxFreq (low byte)							
7	MaxFreq (high byte)							
8	MinFreq (low byte)							
9	MinFreq (high byte)							
10	MaxV (low byte)							
11	MaxV (high byte)							
12	PulsHiPwr (low byte)							
13	PulsHiPwr (high byte)							
14	PulsLoPwr (low byte)							
15	PulsLoPwr (high byte)							
16	PulsRate (low byte)							
17	PulsRate (high byte)							
18	PulsHiTime (low byte)							
19	PulsHiTime (high byte)							
20	RampUp (low byte)							
21	RampUp (high byte)							
22	RampDn (low byte)							
23	RampDn (high byte)							
24	MaxVF (low byte)							
25	MaxVF (high byte)							
26	MinVF (low byte)							
27	MinVF (high byte)							
28	CoarseF (low byte)							
29	CoarseF (high byte)							
30	FineF (low byte)							
31	FineF (low byte)							
32	StrikeF (low byte)							
33	StrikeF (high byte)							
34	(res)							
35	(res)							
36	CtrlMode							
37	PulsDuty							
38	PresetEna							
39	PreTune							
40	PreLoad							
41	CoarseR							
42	FineT							
43	TuneFB							

44	LinkTimer							
45	MatchLoad							
46	MatchTune							
47	(res)							
48	FreqCtrl	PrbPol	Rng5/10	ExcCtrl	RngPwr	Level	RegPV	RFEN
49	FreqTune	MatchConn	RampEna	(res)	PlsMon	PlsSrc	PlsType	PlsEna
50	(res)	(res)	(res)	LinkMon	(res)	(res)	XrfvEna	XimpEna
51	(res)	(res)	(res)	(res)	(res)	(res)	(res)	IGNORE
52	Bits that are set indicate which corresponding bits in Byte 48 may be changed							
53	Bits that are set indicate which corresponding bits in Byte 49 may be changed							
54	Bits that are set indicate which corresponding bits in Byte 50 may be changed							
55	Bits that are set indicate which corresponding bits in Byte 51 may be changed							
56	(res)	(res)	(res)	EXTOK	(res)	TMPOK	CMPOK	RFON
57	UNBAL	DISS	REFLIM	MAXPWR	TEMP	RFON	EXT	RFOK
58	(res)	(res)	(res)	LINK	(res)	XIMP	XRFV	PACLIM
59	(res)	(res)	(res)	(res)	(res)	(res)	(res)	(res)
60	FwdPwr (low byte)							
61	FwdPwr (high byte)							
62	RefPwr (low byte)							
63	RefPwr (high byte)							
64	ProbeDC (low byte)							
65	ProbeDC (high byte)							
66	MatchPhs (low byte)							
67	MatchPhs (high byte)							
68	MatchMag (low byte)							
69	MatchMag (high byte)							

This assembly is sent from the Generator to the Master, and is used to report the current values of various parameters as follows:

Bytes 0,1 Setpoint - Power or Voltage Setpoint
 If RegPV=0 and RngPwr=0: value in Watts*10
 If RegPV=0 and RngPwr=1: value in Watts
 If RegPV=1: value in Volts

Bytes 2,3 MaxPwr - Maximum Power
 Value in Watts

Bytes 4,5 Freq - Generator Output Frequency
 Value in KHz

Bytes 6,7 MaxFreq - Maximum Output Frequency
 Value in KHz

Bytes 8,9 MinFreq - Minimum Output Frequency
 Value in KHz

Bytes 10,11	MaxV - Maximum DC Voltage in Voltage Control Value in Volts
Bytes 12,13	PulsHiPwr - Pulse High Power (Pulse Type 1) Value in Watts
Bytes 14,15	PulsLoPwr - Pulse Low Power (Pulse Type 1) Value in Watts
Bytes 16,17	PulsRate - Pulse Rate (Pulse Type 0) Value in Hz
Bytes 18,19	PulsHiTime - Pulse High Time (Pulse Type 1) Value in mS
Bytes 20,21	RampUp - Ramp-Up Time Value in S
Bytes 22,23	RampDn - Ramp-Down Time Value in S
Bytes 24,25	MaxVF - Maximum Tune Frequency Value in KHz
Bytes 26,27	MinVF - Minimum Tune Frequency Value in KHz
Bytes 28,29	CoarseF - Coarse Tune Frequency Step Value in Hz
Bytes 30,31	FineF - Fine Tune Frequency Step Value in Hz
Bytes 32,33	StrikeF - Strike Frequency Value in KHz
Byte 36	CtrlMode - Control Mode 0 = Panel Control 1 = Analog Control 2 = Serial Control
Byte 37	PulsDuty - Pulse Duty Cycle Value in percent
Byte 38	PresetEna - Preset Mode Enable 0 = disabled 1 = enabled (standard rfok output) 2 = enabled (inverted rfok output)

Byte 39	PreTune - Tune Preset Value in percent
Byte 40	PreLoad - Load Preset Value in percent
Byte 41	CoarseR - Coarse Tune Trip Ratio Value in percent
Byte 42	FineT - Fine Tune Suspension Point Value in Watts
Byte 43	TuneFB - Tune Feedback Source 0 = reflected power 1 = external phase detector, positive polarity 2 = external phase detector, positive polarity
Byte 44	LinkTimer - Link Loss Detection Timer Value in Seconds
Byte 45	MatchLoad - Match Load Position Value in percent
Byte 46	MatchTune - Match Tune Position Value in percent
Byte 48 bit 7	FreqCtrl - Frequency Control Enable 0 = Disabled 1 = Enabled
Byte 48 bit 6	PrbPol - Probe Polarity 0 = +PRB DB25 (probe inverter disabled) 1 = -PRB BNC (probe inverter enabled)
Byte 48 bit 5	Rng5/10 - Analog Interface Range Select, 5V or 10V 0 = 5V F.S. 1 = 10V F.S.
Byte 48 bit 4	ExcCtrl - Exciter Control 0 = Master 1 = Slave
Byte 48 bit 3	RngPwr - Range Select, Low or High Power 0 = Low Power Range 1 = High Power Range
Byte 48 bit 2	Level - Level Mode 0 = Regulate on forward power 1 = Regulate on forward power - reflected power

Byte 48 bit 1	RegPV - Regulation Type, Power or Voltage 0 = Regulate on power 1 = Regulate on voltage
Byte 48 bit 0	RFEN - RF Off/On Control 0 = RF Off 1 = RF On
Byte 49 bit 7	FreqTune - Frequency Tune Enable 0 = Disabled 1 = Enabled
Byte 49 bit 6	MatchConn - Connect to Match Controller 0 = Do not connect 1 = Connect : send desired match/load positions, report current positions
Byte 49 bit 5	RampEna - Ramping Enable 0 = Disabled 1 = Enabled
Byte 49 bit 3	PlsMon - Pulse Monitor Output (Type 1) 0 = Peak 1 = Real time
Byte 49 bit 2	PlsSrc - Pulse Source 0 = Internal 1 = External
Byte 49 bit 1	PlsType - Pulse Type 0 = Single-level, pulse rate, duty cycle 1 = Dual-level, high time, duty cycle
Byte 49 bit 0	PlsEna - Pulse Enable 0 = Disabled 1 = Enabled
Byte 50 bit 4	LinkMon - Link Loss Monitor Enable 0 = Disabled 1 = Enabled
Byte 50 bit 1	XrfvEna - Excessive RF Voltage Alarm Enable 0 = Disabled 1 = Enabled
Byte 50 bit 0	XimpEna - Excessive Impedance Alarm Enable 0 = Disabled 1 = Enabled

Byte 51 bit 0	IGNORE - Ignore All Parameters in I/O Poll Response 0 = Values in I/O Poll Response are valid 1 = Ignore all values in the I/O Poll Response
Byte 52	Bits that are set in this byte indicate which bits in Byte 48 can be set.
Byte 53	Bits that are set in this byte indicate which bits in Byte 49 can be set.
Byte 54	Bits that are set in this byte indicate which bits in Byte 50 can be set.
Byte 55	Bits that are set in this byte indicate which bits in Byte 51 can be set.
Byte 56 bit 4	EXTOK - External Interlock OK 0 = Interlock not detected (alarm) 1 = Interlock detected
Byte 56 bit 2	TMPOK - Temperature OK 0 = Temperature alarm 1 = Temperature OK
Byte 56 bit 1	CMPOK - Compliance 0 = Output has not yet reached the setpoint 1 = Setpoint reached
Byte 56 bit 0	RFON - RF ON 0 = RF Off 1 = RF On
Byte 57 bit 7	UNBAL - Unbalanced 0 = Amplifier currents are balanced 1 = Amplifier currents not balanced
Byte 57 bit 6	DISS - Regulating on Dissipation Setpoint 0 = Not regulating on dissipation setpoint 1 = Regulating on dissipation setpoint
Byte 57 bit 5	REFLIM - Reflected Power Limit 0 = No alarm 1 = Alarm: reflected power limit
Byte 57 bit 4	MAXPWR - Maximum Power Limit 0 = No alarm 1 = Alarm: maximum power output
Byte 57 bit 3	TEMP - Temperature 0 = No alarm 1 = Alarm: temperature limit exceeded

Byte 57 bit 2	RFON 0 = RF Off 1 = RF On
Byte 57 bit 1	EXT - External Interlock 0 = No alarm 1 = Interlock not detected
Byte 57 bit 0	RFOK 0 = RF is Off, or RF is On and reflected power limit reached 1 = RF on and reflected power is below the limit
Byte 58 bit 2	XIMP - Excessive Impedance 0 = No alarm 1 = Excessive impedance detected
Byte 58 bit 1	XRFV - Excessive RF Voltage 0 = No alarm 1 = Excessive RF voltage detected
Byte 58 bit 0	PACLM - PA Current Limit 0 = No alarm 1 = Current limit reached
Bytes 60,61	FwdPwr - Forward Power If RngPwr=0: value in Watts*10 If RngPwr=1: value in Watts
Bytes 62,63	RefPwr - Reflected Power If RngPwr=0: value in Watts*10 If RngPwr=1: value in Watts
Bytes 64,65	ProbeDC - DC Voltage in Voltage Control Value in Volts
Bytes 66,67	Match Phase Value in mV
Bytes 68,69	Match Magnitude Value in mV

Assembly Set 3: I/O Poll Command Format - Assembly ID 68hex

Assembly ID 68hex: From Fieldbus To Generator

BYTE	7	6	5	4	3	2	1	0
0	Setpoint (low byte)							
1	Setpoint (high byte)							
2	Freq (low byte)							
3	Freq (high byte)							
4	PulsHiPwr (low byte)							
5	PulsHiPwr (high byte)							
6	PulsLoPwr (low byte)							
7	PulsLoPwr (high byte)							
8	PulsRate (low byte)							
9	PulsRate (high byte)							
10	PulsHiTime (low byte)							
11	PulsHiTime (high byte)							
12	RampUp (low byte)							
13	RampUp (high byte)							
14	RampDn (low byte)							
15	RampDn (high byte)							
16	CoarseF (low byte)							
17	CoarseF (high byte)							
18	FineF (low byte)							
19	FineF (low byte)							
20	StrikeF (low byte)							
21	StrikeF (high byte)							
22	CtrlMode							
23	PulsDuty							
24	CoarseR							
25	FineT							
26	FreqCtrl	PrbPol	Rng5/10	ExcCtrl	RngPwr	Level	RegPV	RFEN
27	FreqTune	(res)	RampEna	(res)	PlsMon	PlsSrc	(res)	PlsEna
28	(res)	(res)	(res)	LinkMon	(res)	(res)	XrfvEna	XimpEna
29	(res)	(res)	(res)	(res)	(res)	(res)	(res)	IGNORE

This assembly is sent from the Master to the Generator, and is used to set various parameters as follows:

- Bytes 0,1 Setpoint - Power or Voltage Setpoint
 If RegPV=0 and RngPwr=0: value in Watts*10, min = 0, max = MaxPwr
 If RegPV=0 and RngPwr=1: value in Watts, min = 0, max = MaxPwr
 If RegPV=1: value in Volts, min = 0, max = MaxV
- Bytes 2,3 Freq - Generator Output Frequency
 Value in KHz, min = MinFreq, max = MaxFreq
- Bytes 4,5 PulsHiPwr - Pulse High Power (Pulse Type 1)
 Value in Watts, min = 0, max = MaxPwr

Bytes 6,7	PulsLoPwr - Pulse Low Power (Pulse Type 1) Value in Watts, min = 0, max = MaxPwr
Bytes 8,9	PulsRate - Pulse Rate (Pulse Type 0) Value in Hz, min = 1, max = 10000
Bytes 10,11	PulsHiTime - Pulse High Time (Pulse Type 1) Value in mS, min = 1, max = 9999
Bytes 12,13	RampUp - Ramp-Up Time Value in S, min = 1, max = 9999
Bytes 14,15	RampDn - Ramp-Down Time Value in S, min = 1, max = 9999
Bytes 16,17	CoarseF - Coarse Tune Frequency Step Value in Hz, min = 1, max = 30000
Bytes 18,19	FineF - Fine Tune Frequency Step Value in Hz, min = 1, max = 30000
Bytes 20,21	StrikeF - Strike Frequency Value in KHz, min = MinVF, max = MaxVF
Byte 22	CtrlMode - Control Mode 0 = Panel Control 1 = Analog Control 2 = Serial Control
Byte 23	PulsDuty - Pulse Duty Cycle Value in percent, min = 0, max = 100
Byte 24	CoarseR - Coarse Tune Trip Ratio Value in percent, min = 1, max = 100
Byte 25	FineT - Fine Tune Suspension Point Value in Watts, min = 1, max = 100
Byte 26 bit 7	FreqCtrl - Frequency Control Enable 0 = Disabled 1 = Enabled
Byte 26 bit 6	PrbPol - Probe Polarity 0 = +PRB DB25 (probe inverter disabled) 1 = -PRB BNC (probe inverter enabled)
Byte 26 bit 5	Rng5/10 - Analog Interface Range Select, 5V or 10V 0 = 5V F.S. 1 = 10V F.S.

Byte 26 bit 4	ExcCtrl - Exciter Control 0 = Master 1 = Slave
Byte 26 bit 3	RngPwr - Range Select, Low or High Power 0 = Low Power Range 1 = High Power Range
Byte 26 bit 2	Level - Level Mode 0 = Regulate on forward power 1 = Regulate on forward power - reflected power
Byte 26 bit 1	RegPV - Regulation Type, Power or Voltage 0 = Regulate on power 1 = Regulate on voltage
Byte 26 bit 0	RFEN - RF Off/On Control 0 = RF Off 1 = RF On
Byte 27 bit 7	FreqTune - Frequency Tune Enable 0 = Disabled 1 = Enabled
Byte 27 bit 5	RampEna - Ramping Enable 0 = Disabled 1 = Enabled
Byte 27 bit 3	PlsMon - Pulse Monitor Output (Type 1) 0 = Peak 1 = Real time
Byte 27 bit 2	PlsSrc - Pulse Source 0 = Internal 1 = External
Byte 27 bit 0	PlsEna - Pulse Enable 0 = Disabled 1 = Enabled
Byte 28 bit 4	LinkMon - Link Loss Monitor Enable 0 = Disabled 1 = Enabled
Byte 28 bit 1	XrfvEna - Excessive RF Voltage Alarm Enable 0 = Disabled 1 = Enabled

- Byte 28 bit 0 XimpEna - Excessive Impedance Alarm Enable
 0 = Disabled
 1 = Enabled
- Byte 29 bit 0 IGNORE - Ignore All Parameters in I/O Poll Command
 0 = Process all parameters in the I/O Poll Command
 1 = Ignore all parameters in the I/O Poll Command
 Use this when only the I/O Poll Response is desired.

Assembly Set 3: I/O Poll Response Format - Assembly ID 69hex

Assembly ID 69hex: From Generator To Fieldbus

BYTE	7	6	5	4	3	2	1	0
0	Freq (low byte)							
1	Freq (high byte)							
2	PulsHiPwr (low byte)							
3	PulsHiPwr (high byte)							
4	PulsLoPwr (low byte)							
5	PulsLoPwr (high byte)							
6	PulsRate (low byte)							
7	PulsRate (high byte)							
8	PulsHiTime (low byte)							
9	PulsHiTime (high byte)							
10	RampUp (low byte)							
11	RampUp (high byte)							
12	RampDn (low byte)							
13	RampDn (high byte)							
14	CoarseF (low byte)							
15	CoarseF (high byte)							
16	FineF (low byte)							
17	FineF (low byte)							
18	StrikeF (low byte)							
19	StrikeF (high byte)							
20	PulsDuty							
21	CoarseR							
22	FineT							
23	FreqCtrl	PrbPol	Rng5/10	ExcCtrl	RngPwr	Level	RegPV	RFEN
24	FreqTune	(res)	RampEna	(res)	PlsMon	PlsSrc	PlsType	PlsEna
25	(res)	(res)	(res)	LinkMon	(res)	(res)	XrfvEna	XimpEna
26	(res)	(res)	(res)	(res)	(res)	(res)	(res)	IGNORE
27	(res)	(res)	(res)	EXTOK	(res)	TMPOK	CMPOK	RFON
28	UNBAL	DISS	REFLIM	MAXPWR	TEMP	RFON	EXT	RFOK
29	(res)	(res)	(res)	LINK	(res)	XIMP	XRFV	PACLIM
30	FwdPwr (low byte)							
31	FwdPwr (high byte)							
32	RefPwr (low byte)							
33	RefPwr (high byte)							
34	ProbeDC (low byte)							
35	ProbeDC (high byte)							

This assembly is sent from the Generator to the Master, and is used to report the current values of various parameters as follows:

Bytes 0,1 Freq - Generator Output Frequency
Value in KHz

Bytes 2,3	PulsHiPwr - Pulse High Power (Pulse Type 1) Value in Watts
Bytes 4,5	PulsLoPwr - Pulse Low Power (Pulse Type 1) Value in Watts
Bytes 6,7	PulsRate - Pulse Rate (Pulse Type 0) Value in Hz
Bytes 8,9	PulsHiTime - Pulse High Time (Pulse Type 1) Value in mS
Bytes 10,11	RampUp - Ramp-Up Time Value in S
Bytes 12,13	RampDn - Ramp-Down Time Value in S
Bytes 14,15	CoarseF - Coarse Tune Frequency Step Value in Hz
Bytes 16,17	FineF - Fine Tune Frequency Step Value in Hz
Bytes 18,19	StrikeF - Strike Frequency Value in KHz
Byte 20	PulsDuty - Pulse Duty Cycle Value in percent
Byte 21	CoarseR - Coarse Tune Trip Ratio Value in percent
Byte 22	FineT - Fine Tune Suspension Point Value in Watts
Byte 23 bit 7	FreqCtrl - Frequency Control Enable 0 = Disabled 1 = Enabled
Byte 23 bit 6	PrbPol - Probe Polarity 0 = +PRB DB25 (probe inverter disabled) 1 = -PRB BNC (probe inverter enabled)
Byte 23 bit 5	Rng5/10 - Analog Interface Range Select, 5V or 10V 0 = 5V F.S. 1 = 10V F.S.

Byte 23 bit 4	ExcCtrl - Exciter Control 0 = Master 1 = Slave
Byte 23 bit 3	RngPwr - Range Select, Low or High Power 0 = Low Power Range 1 = High Power Range
Byte 23 bit 2	Level - Level Mode 0 = Regulate on forward power 1 = Regulate on forward power - reflected power
Byte 23 bit 1	RegPV - Regulation Type, Power or Voltage 0 = Regulate on power 1 = Regulate on voltage
Byte 23 bit 0	RFEN - RF Off/On Control 0 = RF Off 1 = RF On
Byte 24 bit 7	FreqTune - Frequency Tune Enable 0 = Disabled 1 = Enabled
Byte 24 bit 5	RampEna - Ramping Enable 0 = Disabled 1 = Enabled
Byte 24 bit 3	PlsMon - Pulse Monitor Output (Type 1) 0 = Peak 1 = Real time
Byte 24 bit 2	PlsSrc - Pulse Source 0 = Internal 1 = External
Byte 24 bit 1	PlsType - Pulse Type 0 = Single-level, pulse rate, duty cycle 1 = Dual-level, high time, duty cycle
Byte 24 bit 0	PlsEna - Pulse Enable 0 = Disabled 1 = Enabled
Byte 25 bit 4	LinkMon - Link Loss Monitor Enable 0 = Disabled 1 = Enabled

Byte 25 bit 1	XrfvEna - Excessive RF Voltage Alarm Enable 0 = Disabled 1 = Enabled
Byte 25 bit 0	XimpEna - Excessive Impedance Alarm Enable 0 = Disabled 1 = Enabled
Byte 26 bit 0	IGNORE - Ignore All Parameters in I/O Poll Response 0 = Values in I/O Poll Response are valid 1 = Ignore all values in the I/O Poll Response
Byte 27 bit 4	EXTOK - External Interlock OK 0 = Interlock not detected (alarm) 1 = Interlock detected
Byte 27 bit 2	TMPOK - Temperature OK 0 = Temperature alarm 1 = Temperature OK
Byte 27 bit 1	CMPOK - Compliance 0 = Output has not yet reached the setpoint 1 = Setpoint reached
Byte 27 bit 0	RFON - RF ON 0 = RF Off 1 = RF On
Byte 28 bit 7	UNBAL - Unbalanced 0 = Amplifier currents are balanced 1 = Amplifier currents not balanced
Byte 28 bit 6	DISS - Regulating on Dissipation Setpoint 0 = Not regulating on dissipation setpoint 1 = Regulating on dissipation setpoint
Byte 28 bit 5	REFLIM - Reflected Power Limit 0 = No alarm 1 = Alarm: reflected power limit
Byte 28 bit 4	MAXPWR - Maximum Power Limit 0 = No alarm 1 = Alarm: maximum power output
Byte 28 bit 3	TEMP - Temperature 0 = No alarm 1 = Alarm: temperature limit exceeded

Byte 28 bit 2	RFON 0 = RF Off 1 = RF On
Byte 28 bit 1	EXT - External Interlock 0 = No alarm 1 = Interlock not detected
Byte 28 bit 0	RFOK 0 = RF is Off, or RF is On and reflected power limit reached 1 = RF on and reflected power is below the limit
Byte 29 bit 2	XIMP - Excessive Impedance 0 = No alarm 1 = Excessive impedance detected
Byte 29 bit 1	XRFV - Excessive RF Voltage 0 = No alarm 1 = Excessive RF voltage detected
Byte 29 bit 0	PACLIM - PA Current Limit 0 = No alarm 1 = Current limit reached
Bytes 30,31	FwdPwr - Forward Power If RngPwr=0: value in Watts*10 If RngPwr=1: value in Watts
Bytes 32,33	RefPwr - Reflected Power If RngPwr=0: value in Watts*10 If RngPwr=1: value in Watts
Bytes 34,35	ProbeDC - DC Voltage in Voltage Control Value in Volts

Setup

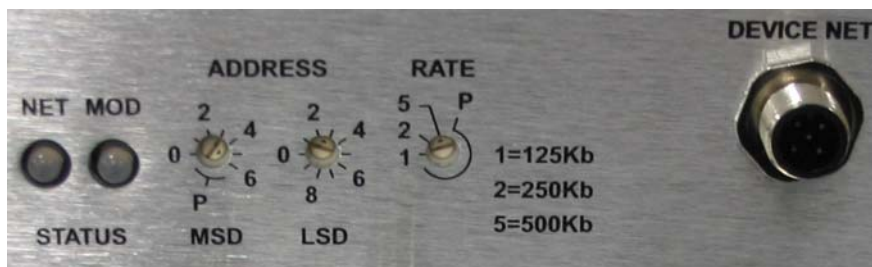


Figure 1. Rear Panel Indicators, Switches, and Connector

1. Make sure the Generator is powered off.
2. If the Generator has switches on the rear panel as shown in Figure 1 above, set the desired address (00 - 63) and data rate (125, 250, or 500 kbit/sec). In Figure 1, the address is set to 63 and the data rate is set to 500 kbit/sec.
3. Power up the Generator. The display should appear similar to this:

```
SET:    0W REF:    0W
SERIAL PWR    MST EXT

PGM  DOWN  UP  ENT
```

4. Press the PGM softkey. The display should appear similar to this:

```
SET:    0W REF:    0W
SERIAL PWR    MST EXT
SERIAL CONTROL
RUN  DOWN  UP  ENT
```

The third line of the display should say PANEL CONTROL, ANALOG CONTROL, or SERIAL CONTROL. If not, press the DOWN softkey until it does. If the display does not say "SERIAL CONTROL", press the up-arrow key until it does.

5. Press the DOWN softkey. The display should appear similar to this:

```
SET:    0W REF:    0W
SERIAL PWR    MST EXT
DEVICENET
RUN  DOWN  UP  ENT
```

If the display does not say "DEVICENET", press up-arrow or down-arrow until it does.

Setup (continued)

6. Press the DOWN softkey. The display should appear similar to this:

```
SET:    OW REF:    OW
SERIAL PWR    MST EXT
ADDRESS #      63
PGM  DOWN    UP    ENT
```

Use up-arrow and down-arrow to set the address, then press the ENT softkey. If the Generator has DeviceNet address switches on the rear panel, the switches will override the front panel setting unless the switches are set to 64 or higher. It is recommended that the front panel setting should match the switches.

7. Press the DOWN softkey. The display should appear similar to this:

```
SET:    OW REF:    OW
SERIAL PWR    MST EXT
DATA RATE    500 Kbps
PGM  DOWN    UP    ENT
```

Use up-arrow and down-arrow to set the data rate, then press ENT. If the Generator has a DeviceNet rate switch on the rear panel, the switch will override the front panel setting unless the switch is set to the "P" position. It is recommended that the front panel setting should match the switch setting.

8. Press the DOWN softkey. The display should appear similar to this:

```
SET:    OW REF:    OW
SERIAL PWR    MST EXT
DN Data  5 out  9 in
PGM  DOWN    UP    ENT
```

Use up-arrow and down-arrow to select the desired Assembly Set, then press ENT.

```
DN Data  5 out  9 in  (Assembly Set 1)
DN Data 52 out 70 in  (Assembly Set 2)
DN Data 30 out 36 in  (Assembly Set 3)
```

9. Press the UP softkey twice. The display should appear similar to this:

```
SET:    OW REF:    OW
SERIAL PWR    MST EXT
DEVICENET
PGM  DOWN    UP    ENT
```

10. Press the ENT softkey. The Generator will restart.

Seteup (continued)

11. Power down the Generator and connect the DeviceNet cable. Power up the Generator. If the Generator has DeviceNet status indicators on the rear panel, they should light up in the following sequence:

NET and MOD both flash green briefly (normal turn-on behavior)
NET off MOD green
NET off MOD red
NET green MOD green
NET red MOD green
NET off MOD off
NET amber MOD amber
NET off MOD off

If the Generator has DeviceNet status indicators on the rear panel, they will light up in a certain sequence when the unit is powered up. Once the powerup sequence is complete, the MOD indicator should stay off. The NET indicator should either be flashing green (waiting for connection) or solid green (connection established). If the NET LED is red, check the following:

- Make sure there is proper power available on the DeviceNet network.
- Make sure the DeviceNet network is properly terminated.
- Make sure the Generator's address and data rate settings are valid.

If both LEDs stay amber, make sure the serial mode is set to DEVICENET.

If the Generator does not have DeviceNet status indicators on the rear panel, the DeviceNet status should appear on the third line of the front panel display. Examples:

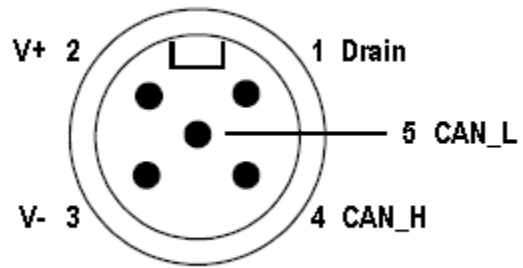
```
DN63/500 CHK DN CARD
DN63/500 COMM ERROR
DN63/500 No Master
DN63/500 On-Line
```

The number following the "DN" is the DeviceNet address, which can be 0-63. The number following the slash is the DeviceNet data rate, which can be 125, 250, or 500 kbits/sec.

CHK DN CARD	The internal DeviceNet Card is not responding
COMM ERROR	Make sure there is proper power available on the DeviceNet network. Make sure the DeviceNet network is properly terminated. Make sure the Generator's address and data rate settings are valid.
No Master	The unit is waiting to be contacted by a DeviceNet Master.
On-Line	The unit is under the control of a DeviceNet Master

DeviceNet Connector Pinout

Figure 2 below shows the pinout of the Generator's DeviceNet connector:



Product Codes and Product Names

Each model in the R/L Series of Generators has its own Product Code and Product Name. The Product Code is a 16-bit integer, and the Product Name is a 16-character ASCII string. These parameters are included in the Identity Object and can be obtained via DeviceNet using the Get Attribute Single request.

<u>Product Code</u>	<u>Product Name</u>
101	"Seren IPS R301 "
102	"Seren IPS R601 "
103	"Seren IPS R1001 "
104	"Seren IPS R2001 "
105	"Seren IPS R3001 "
106	"Seren IPS R5001 "
107	"Seren IPS R10001"
201	"Seren IPS L301 "
202	"Seren IPS L601 "
203	"Seren IPS L1001 "
204	"Seren IPS L2001 "
205	"Seren IPS L3001 "
206	"Seren IPS L5001 "
207	"Seren IPS L10001"
301	"Seren IPS MC2 "

Serial Number

The serial number on file at the factory consists of the model followed by a 4-digit number. For example, an R5001 may have a serial number of R5001-0655. When the serial number is reported via DeviceNet, it is a 32-bit integer which, when shown as a decimal value, consists of the Product Code and the last 4 digits of the factory serial number. For example, if the factory serial number is R5001-0655, the DeviceNet serial number is 1060655.

Electronic Data Sheet

An EDS (Electronic Data Sheet) is available. Please contact your Seren IPS dealer or Seren IPS Tech Support.

With Generator firmware 11.3W02 and above, the EDS is distributed as a text file named Seren-EDS-RFGEN-3p5-20070720.txt. The contents of this file appears on the next page.

It may be necessary to change ProdCode and ProdName values to match those of the particular model of RF Generator. These are described on the previous page of this document.

```

[File]
DescText = "EDS File for RF Generators from Seren IPS";
CreateDate = 08-11-2006;
CreateTime = 00:00:00;
ModDate = 07-19-2007;
ModTime = 00:00:00;
Revision = 3.5;

[Device]
VendCode = 946;
VendName = "Seren IPS Inc.";
ProdType = 32;
ProdTypeStr = "RF Power Generator";
ProdCode = 101; $ Depends on model. 101 = R301. See manual.
MajRev = 3; $ Device Major Revision
MinRev = 5; $ Device Minor Revision
ProdName = "Seren IPS mmmmmm"; $ mmmmmm = model such as R301.
Catalog = "R/L Series";

[IO_Info]
Default = 0x0001; $ Poll Only
PollInfo=
0x0001, $ Poll
1, $ Default Input = Input1
1; $ Default Output = Output1
$ -- Input Connections --
Input1=
9, $ 9 bytes
0, $ All bits are significant
0x0001, $ Poll Connection
"Forward Power + Reflected Power + Status", $ Name String
6, $ Path Size
"20 04 24 65 30 03", $ Assy Obj Inst 65 Attr 3
"See Seren documentation."; $ Help String
Input2=
70, $ 70 bytes
0, $ All bits are significant
0x0001, $ Poll Connection
"Reports settings, power readings, status", $ Name String
6, $ Path Size
"20 04 24 67 30 03", $ Assy Obj Inst 67 Attr 3
"See Seren documentation."; $ Help String
Input3=
36, $ 36 bytes
0, $ All bits are significant
0x0001, $ Poll Connection
"Reports settings, power readings, status", $ Name String
6, $ Path Size
"20 04 24 69 30 03", $ Assy Obj Inst 69 Attr 3
"See Seren documentation."; $ Help String
$ -- Output Connections --
Output1=
5, $ 5 bytes
0, $ All bits are significant
0x0001, $ Poll Connection
"Power Setpoint + Output On/Off", $ Name String
6, $ Path Size
"20 04 24 64 30 03", $ Assy Obj Inst 64 Attr 3
"See Seren documentation."; $ Help String
Output2=
52, $ 52 bytes

```

```
0, $ All bits are significant
0x0001, $ Poll Connection
"Output On/Off and all other settings", $ Name String
6, $ Path Size
"20 04 24 66 30 03", $ Assy Obj Inst 66 Attr 3
"See Seren documentation."; $ Help String
Output3=
30, $ 30 bytes
0, $ All bits are significant
0x0001, $ Poll Connection
"Output On/Off, other settings", $ Name String
6, $ Path Size
"20 04 24 68 30 03", $ Assy Obj Inst 68 Attr 3
"See Seren documentation."; $ Help String
```