
Version 1.1
December 1998
Generator Set : 13110



LONMARK®

Functional Profile:

Generator Set

Overview

This document describes the functional profile of a Generator Set (genset) object. The genset object does not require other nodes for operation. The object is self-contained but may be monitored and controlled by other nodes. The Genset Functional Profile is shown below:

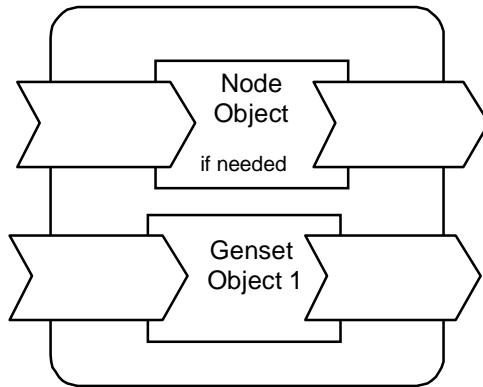


Figure 1 Generator Set

Example Usage

The Generator Set object may interact with one or more of the following LONMARK devices:

- Transfer Switch node
- Annunciation Panel node
- Supervisory node (Master Controller)
- Circuit Breaker node

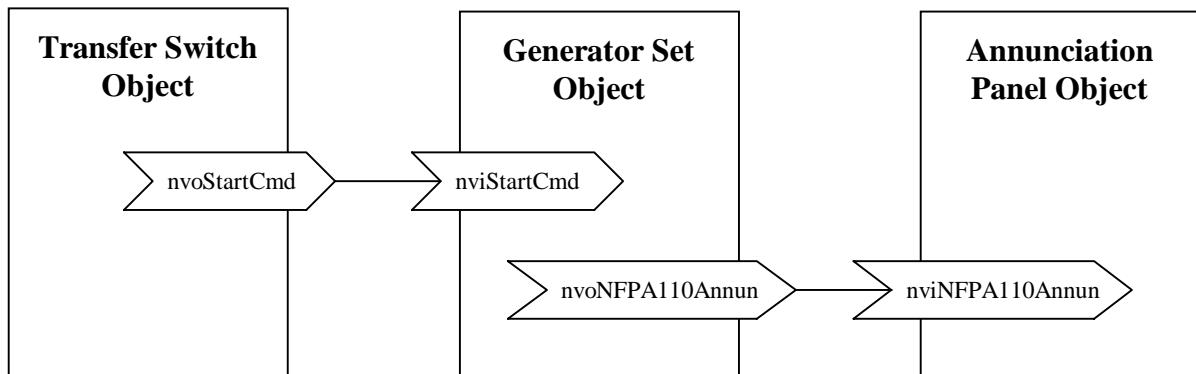


Figure 1.2 Example Usage of Generator Set Object

Object Details

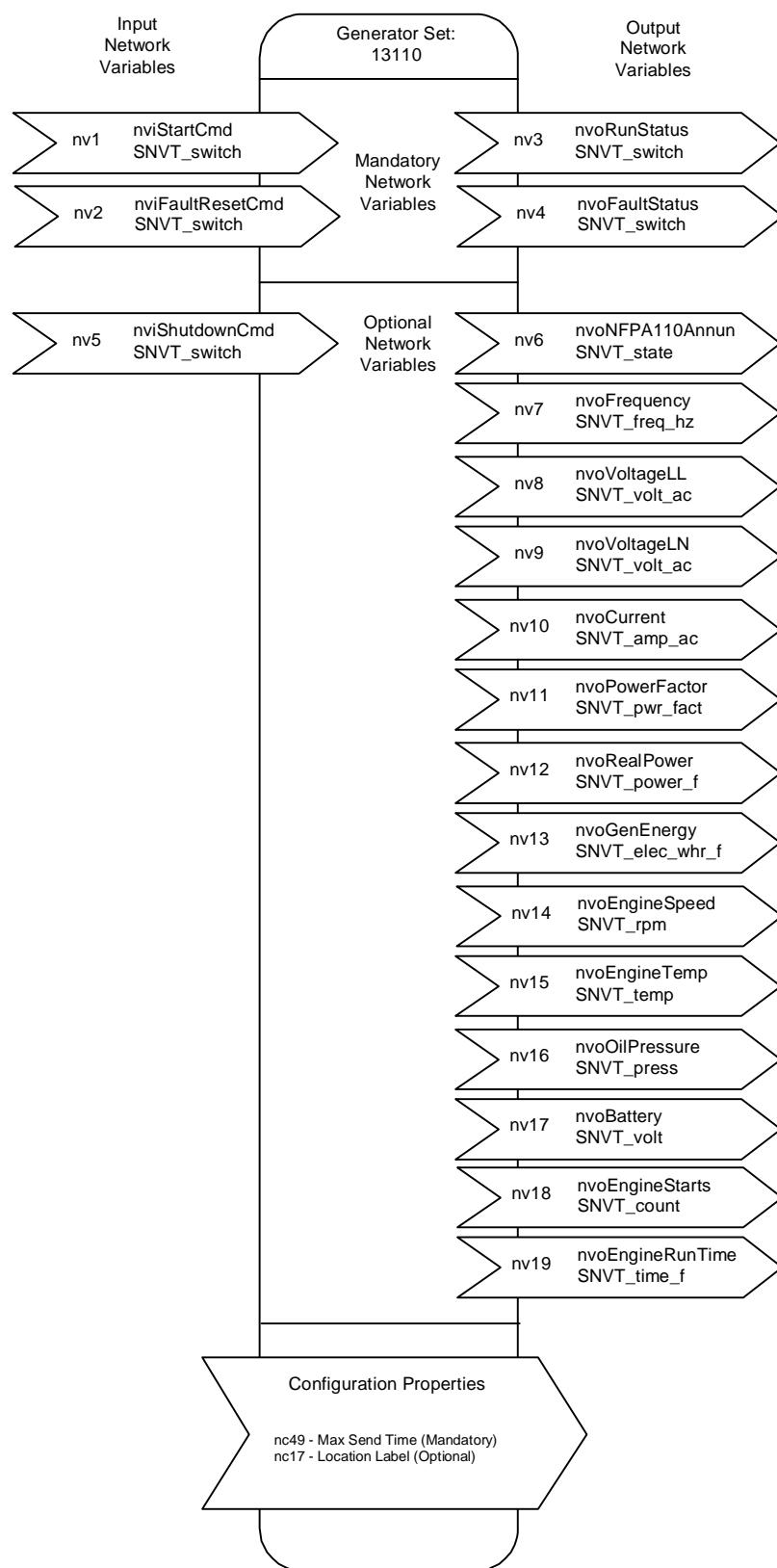


Figure 1.3 Generator Set Object Details

Table 1 SNVT Details

NV # (M/O)*	Name	In/Out	SNVT Type (SNVT Index)	Class	Description
1 (M)	nviStartCmd	In	SNVT_switch (95)	I/O	start and stop the generator set
2 (M)	nvi FaultReset Cmd	In	SNVT_switch (95)	I/O	reset or clear a generator set fault
3 (M)	nvoRunStatus	Out	SNVT_switch (95)	I/O	running at rated speed and voltage and is ready to accept load
4 (M)	nvo FaultStatus	Out	SNVT_switch (95)	I/O	report the presence of a generator set fault
5 (O)	nvi ShutdownCmd	In	SNVT_switch (95)	I/O	emergency, unconditional shutdown/disable of run
6 (O)	nvo NFPA110 Annun	Out	SNVT_state (83)	I/O	report state of National Fire Protection Agency (USA) genset faults (NFPA §110)
7 (O)	nvoFrequency	Out	SNVT_freq_hz (76)	I/O	output frequency of the generator set
8 (O)	nvoVoltageLL	Out	SNVT_volt_ac (138)	I/O	line-to-line output voltage(s) of the generator set
9 (O)	nvoVoltageLN	Out	SNVT_volt_ac (138)	I/O	line-to-neutral output voltage(s) of the generator set
10 (O)	nvoCurrent	Out	SNVT_amp_ac (139)	I/O	output line current(s) of the generator set
11 (O)	nvo PowerFactor	Out	SNVT_pwr_fact (98)	I/O	power factor of the generator set
12 (O)	nvoRealPower	Out	SNVT_power_f (57)	I/O	real power output as a floating type (in Watts)
13 (O)	nvoGenEnergy	Out	SNVT_elec_whr_f (68)	I/O	total (cumulative) electrical energy (WHR) generated by genset
14 (O)	nvo EngineSpeed	Out	SNVT_rpm (102)	I/O	engine speed of the generator set
15 (O)	nvo EngineTemp	Out	SNVT_temp (39)	I/O	engine temperature of the generator set
16 (O)	nvo OilPressure	Out	SNVT_press (30)	I/O	engine oil pressure of the generator set
17 (O)	nvoBattery	Out	SNVT_volt (44)	I/O	starting battery voltage of the engine
18 (O)	nvo EngineStarts	Out	SNVT_count (8)	I/O	total number of successful engine starts

19 (O)	nvo EngineRun Time	Out	SNVT_time_f (64)	I/O	total (cumulative) run time of the engine
nc49 (M)	nci MaxSendTime	-	SNVT_time_sec (107)	config	Send Heartbeat SCPTmaxSendTime
nc17 (O)	Location Label	-	SNVT_str_asc (36)	config	Label, Location SCPTlocation

* M = mandatory, O = optional

Table 2 SCPT Details

SCPT Index (M/O)*	Name	Association **	Description
nci49 (M)	SCPTmaxSendTime nciMaxSendTime SNVT_time_sec (107)	nv3 (M), nv13 (O), nv14 (O), nv15 (O), nv16 (O), nv17 (O), nv19 (O)	maximum period of time that expires before the generator set object will automatically update NVs
nci17 (O)	SCPTlocation nciLocation SNVT_str_asc (36)	nv0	used to provide physical location of the node

* M = mandatory, O = optional

** List of NVs to which this configuration property applies. NV index = 0 means configuration property applies to the object as a whole (nv0).

Mandatory Network Variables

Start Command Input

```
network input SNVT_switch    nviStartCmd;
```

This input network variable is used to allow an external node to start and stop the generator set. This input is mandatory but does not have to be bound to an external node. When state = TRUE, the generator set will start and begin running. When state = FALSE, the generator set will stop running (if other non-network start commands are not present).

The 'value' field may be used to specify the percent of rated electrical load the generator set will provide when base loading. A value of 0 (zero) implies the generator will provide the required electrical load (no base loading). The 'value' field is only applicable when state = TRUE.

Valid Range

state	value	command
0 (FALSE)	NA	Stop
1 (TRUE)	0	Start (no base loading)
1 (TRUE)	1 .. 125%	Start (value = base load)

Default Value

state: 0 (STOP)
value: 0

Fault Reset Command Input

```
network input SNVT_switch    nviFaultResetCmd;
```

This input network variable is used to allow an external node to reset or clear a generator set fault. This input is mandatory but does not have to be bound to an external node. When state = TRUE, the generator set will clear all active faults. When state = FALSE, generator set will do nothing. The 'value' field is not used.

Valid Range

state: 0 (FALSE) or 1 (TRUE)
value: NA

Default Value

state:	0 (FALSE)
value:	0

Run Status Output

```
network output SNVT_switch    nvoRunStatus;
```

This output network variable will report if the generator set is running at rated speed and voltage and is ready to accept load. This output is mandatory but does not have to be bound to an external node. When state = TRUE, the genset is running at rated speed and voltage (ready to load). When state = FALSE, the genset is not running at rated speed and/or voltage (not ready to load).

The 'value' field will indicate the percent of rated electrical power the generator set is providing.

Valid Range

state	value	run status
0 (FALSE)	NA	Not Running
1 (TRUE)	0 .. 125%	Running* (value = percent of rated load)
1 (TRUE)	0xFF	Running (percent of rated load unknown)

* 'Running' is defined as the ability to accept load.

Default Value

state:	0xFF (INVALID), indicating the Run Status is unknown.
value:	0

When Transmitted

The output variable is transmitted:

- Upon node reset, after obtaining valid data.
- When the 'state' has changed.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Fault Status Output

```
network output SNVT_switch    nvoFaultStatus;
```

This output network variable will report the presence of a generator set fault. This output is mandatory but does not have to be bound to an external node. When state = TRUE, the generator set has detected a fault condition. When state = FALSE, no faults are present at the generator set or all faults have been cleared. The 'value' field is not used.

Valid Range

state:	0 (FALSE) or 1 (TRUE)
value:	NA

Default Value

state: unknown.	0xFF (INVALID), indicating the Fault Status is
value:	0

When Transmitted

The output variable is transmitted:

- Upon node reset, after obtaining valid data.
- When the fault status has changed.

Update Rate

There is no maximum update rate.

Default Service Type

The default service type is acknowledged.

Optional Network Variables

Shutdown Command Input

```
network input SNVT_switch    nviShutdownCmd;
```

In the event of an emergency, this input network variable is used to allow an external node to unconditionally shutdown the generator set (stop it from running). If the generator set is not running, this input is used to inhibit it from running. When state = TRUE, the generator set will be shutdown or inhibited from running (regardless of any run commands). When state = FALSE, the generator set returns to normal operation. The shutdown command must be cleared before the generator can return to normal operation. The 'value' field is not used.

The 'shutdown' command differs from the 'stop' command (setting nviRunCmd = FALSE), in that the stop command will not override other local or remote run commands. While the shutdown command will override all local or remote run commands.

Valid Range

state:	0 (FALSE) or 1 (TRUE)
value:	NA

Default Value

state:	0 (FALSE)
value:	0

NFPA 110 Annunciation Output

```
network output SNVT_state    nvoNFPA110Annun;
```

This output network variable will report the state of all the applicable National Fire Protection Agency, section 110, generator set faults (NFPA 110). This output is intended for providing the required NFPA 110 generator set status. Normal Battery Voltage, Generator Set Running and Normal Supplying Load states are not required by NFPA 110 but have been added to complete the bit-field. Any states, which are unknown to the generator set, will be set FALSE.

The states included in this variable are:

Bit	Description
0	High Battery Voltage
1	Low Battery Voltage
2	Normal Battery Voltage*
3	Generator Set Running*
4	Normal Supplying Load*
5	Emergency Supplying Load
6	Pre-Low Oil Pressure
7	Low Oil Pressure
8	Pre-High Engine Temperature
9	High Engine Temperature
10	Low Engine Temperature
11	Overspeed
12	Fail To Start (Overcrank)
13	Not in Automatic
14	Battery Charger Malfunction
15	Low Fuel Main Tank

* These states are not required by NFPA 110.

Valid Range

All bits: 0 (FALSE) .. 1 (TRUE)

Default Value

The network variable will default to 0 (all bit-states FALSE).

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- When any bit/state has changed.

Update Rate

There is no maximum update rate.

Default Service Type

The default service type is acknowledged.

Frequency Output

```
network output SNVT_freq_hz    nvoFrequency;
```

This output network variable will report the output frequency of the generator set. This output is intended for monitoring the generator output.

Valid Range

The valid range is 0 to 6553.4 Hz.

Default Value

The default value is 0xFFFF (6,553.5 Hz), indicating the generator frequency is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Line-to-Line Voltage Output

```
network output SNVT_volt_ac    nvoVoltageLL;
```

This output network variable will report the line-to-line output voltage(s) of the generator set. For multi-phase generator sets, this output may have several instances in order to display the output voltage between phases A-B, B-C, C-A or the average line-to-line voltage of all phases. This output is intended for monitoring the generator output.

Valid Range

The valid range is 0 to 65534 VAC.

Default Value

The default value is 0xFFFF (65,535 VAC), indicating the generator output voltage is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Line-to-Neutral Voltage Output

```
network output SNVT_volt_ac    nvoVoltageLN;
```

This output network variable will report the line-to-neutral output voltage(s) of the generator set. For multi-phase generator sets, this output may have several instances in order to display the output voltage of phase A-N, B-N, C-N or the average line-to-neutral voltage of all phases. This output is intended for monitoring the generator output.

Valid Range

The valid range is 0 to 65534 VAC.

Default Value

The default value is 0xFFFF (65,535 VAC), indicating the generator output voltage is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Line Current Output

```
network output SNVT_amp_ac    nvoCurrent;
```

This output network variable will report the output line current(s) of the generator set. For multi-phase generator sets, this output may have several instances in order to display the line current of phases A, B, C or the average line current of all phases. Another instance of this output may also be used to display the neutral phase current of the generator set. This output is intended for monitoring the generator load.

Valid Range

The valid range is 0 to 65534 A.

Default Value

The default value is 0xFFFF (65,535 A), indicating the line current is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Power Factor Output

```
network output SNVT_pwr_fact    nvoPowerFactor;
```

This output network variable will report the power factor of the generator set. This output is intended for monitoring the generator load characteristic.

Valid Range

The valid range is -1.00000 to $+1.00000$. Values less than zero indicate a 'leading' power factor.

Default Value

The default value is $0x7FFF$ ($+1.63835$), indicating the power factor is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable `nciMaxSendTime`.

Update Rate

The update rate is determined by the configuration variable `nciMaxSendTime`.

Default Service Type

The default service type is acknowledged.

Real Power Output

```
network output SNVT_power_f    nvoRealPower;
```

This output network variable will report the real power output of the generator set. This output is intended for monitoring the generator load.

Valid Range

The valid range is -1E38 to +1E37 W. Values less than zero indicate a reverse power condition.

Default Value

The default value is +1E38 W, indicating the real power output is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Generated Energy Output

```
network output SNVT_elec_whr_f    nvoGenEnergy;
```

This output network variable will report the total (cumulative) electrical energy generated by the generator set. This output is intended to provide engine usage information.

Valid Range

The valid range is 0 to +1E37 WHr. Values less than 0 (zero) are invalid.

Default Value

The default value is +1E38 WHr, indicating the total generated energy is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Engine Speed Output

```
network output SNVT_rpm    nvoEngineSpeed;
```

This output network variable will report the engine speed of the generator set. This output is intended for monitoring the engine governing.

Valid Range

The valid range is 0 to 65,534 RPM.

Default Value

The default value is 0xFFFF (65,535 RPM), indicating the engine speed is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Engine Temperature Output

```
network output SNVT_temp    nvoEngineTemp;
```

This output network variable will report the engine temperature of the generator set. This output is intended for engine monitoring purposes.

Valid Range

The valid range is -274.0 to +6279.4 °C.

Default Value

The default value is 0xFFFF (6279.5 °C), indicating the engine temperature is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Engine Oil Pressure Output

```
network output SNVT_press    nvoOilPressure;
```

This output network variable will report the engine oil pressure of the generator set. This output is intended for engine monitoring purposes.

Valid Range

The valid range is 0.0 to +3276.7 kPa.

Default Value

The default value is 0xFFFF (-0.1 kPa), indicating the oil pressure is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Battery Voltage Output

```
network output SNVT_volt    nvoBattery;
```

This output network variable will report the engine's starting battery voltage. This output is intended for engine monitoring purposes.

Valid Range

The valid range is 0.0 to +3276.7 VDC.

Default Value

The default value is 0xFFFF (-0.1 VDC), indicating the battery voltage is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Engine Starts Output

```
network output SNVT_count    nvoEngineStarts;
```

This output network variable will report the total number of successful engine starts. This output is intended to provide engine usage information.

Valid Range

The valid range is 0 to 65534 Starts.

Default Value

The default value is 0xFFFF (65,535 Starts), indicating the number of engine starts is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- When the number of engine starts has changed.

Update Rate

There is no maximum update rate.

Default Service Type

The default service type is acknowledged.

Engine Run Time Output

```
network output SNVT_time_f    nvoEngineRunTime;
```

This output network variable will report the total (cumulative) run time of the engine. This output is intended to provide engine usage information.

Valid Range

The valid range is 0 to +1E37 Seconds. Values less than 0 (zero) are invalid.

Default Value

The default value is +1E38 Seconds, indicating the engine run time is unknown.

When Transmitted

The variable is transmitted:

- Upon node reset, after obtaining valid data.
- Regularly at the interval defined by the configuration variable nciMaxSendTime.

Update Rate

The update rate is determined by the configuration variable nciMaxSendTime.

Default Service Type

The default service type is acknowledged.

Configuration Properties

Maximum Send Time (Mandatory)

```
network input config SNVT_time_sec    nciMaxSendTime;
```

This input configuration variable sets the maximum period of time that expires before the generator set object will automatically update the following network variables:

- nvoRunStatus (mandatory).
- nvoEngineSpeed, nvoEngineTemp, nvoOilPressure, nvoBattery, nvoEngineRunTime, nvoGenEnergy (optional).

Valid Range

The valid range is 1.0 to 3600.0 sec. Values outside this range are invalid and will disable the automatic update mechanism.

Default Value

The default value is 0.0 sec (no automatic update).

SCPT Reference

SCPTmaxSendTime (49)

Location Label (Optional)

```
network input config SNVT_str_asc    nciLocation;
```

This configuration property can be used to provide physical location of the node. Write access can be disabled by the manufacturer.

Valid Range

Any NULL-terminated ASCII string up to 31 bytes of total length (including NULL).

Default Value

The default value is an ASCII string containing all NULLs (0x00).

SCPT Reference

SCPT_location (17)

Data Transfer

None specified.

Power-up State

There is no immediate network action on Power-up State.

Boundary and Error Conditions

None specified.

Additional Considerations

None.

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