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Version: 1.0  
Chiller: 8040



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# LONMARK<sup>®</sup>

# Functional Profile:

# Chiller

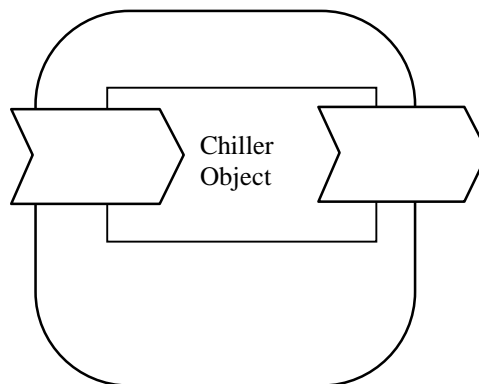
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## Overview

This document describes the profile for a generic Chiller controller object. While basically created around a model of a centrifugal Chiller, it also applies to absorption and reciprocating models of equipment. In all cases, the network variable input is a request for Chiller operation and does not bypass internal safety limits.



**Figure 1.1** Chiller Profile

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## Example Usage

The Chiller object is used in LONMARK devices and responds to standard network variable types that:

- signal a request to start or stop the Chiller,
- or that change the controlling setpoint for the leaving chilled water temperature
- or that modify the values of optional input variables.

Operation of the equipment is subject to the internal controller's safety checks before external requests are honored and processed.

# Object Details

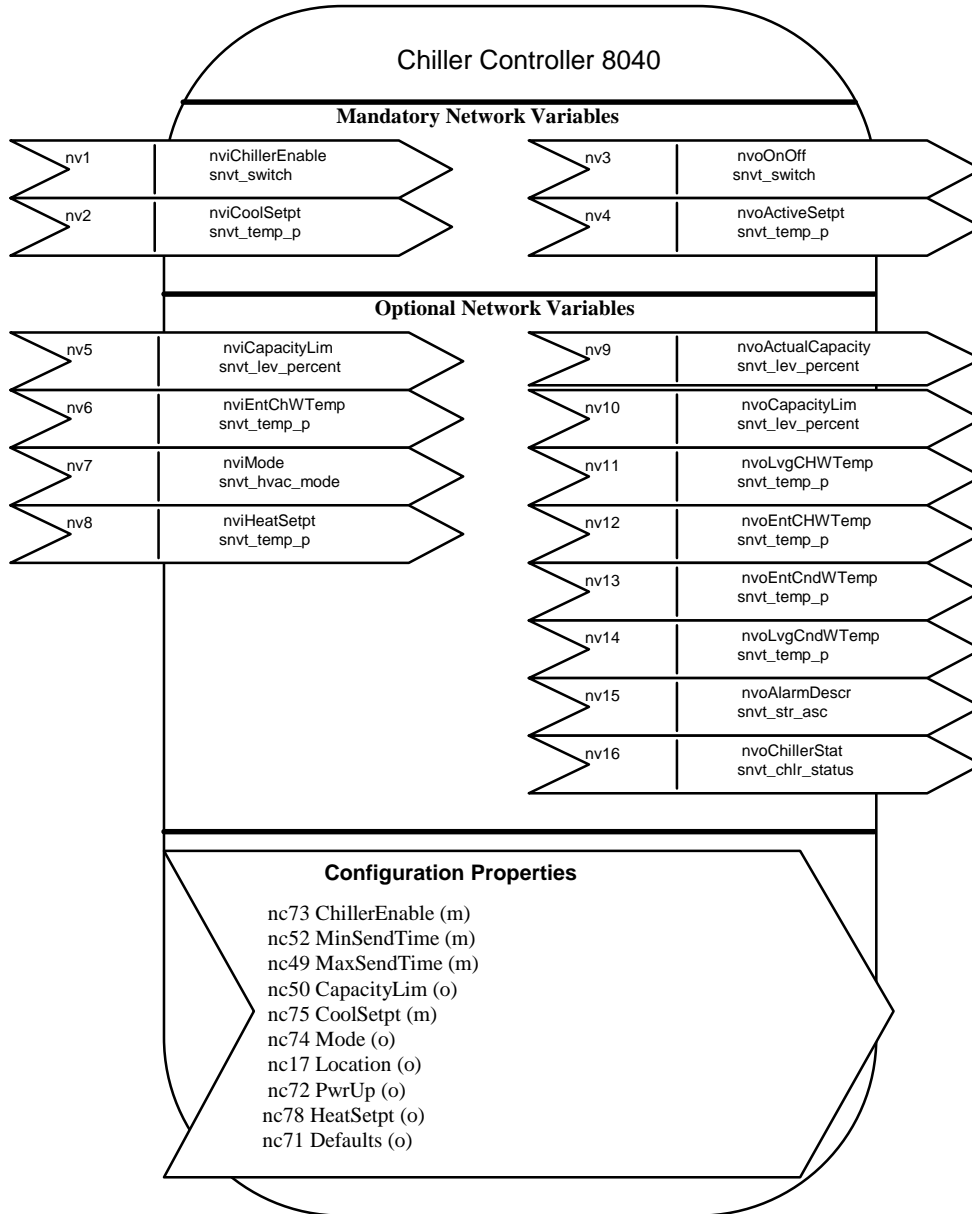


Figure 1.2 Chiller Controller Object Details

Table 1 SNVT Details

NV # (M/O)*	Name	In/ Out	SNVT Type (SNVT Index)	Class	Description
1 (M)	nviChillerEnable	In	SNVT_switch	Ram	Request Start/Stop Chiller
2 (M)	nviCoolSetpt	In	SNVT_temp_p	Ram	Desired Temp of Lvg Chilled Wtr
3 (M)	nvoOnOff	Out	SNVT_switch	Ram	Chiller On / Off run state
4 (M)	nvoActiveSetpt	Out	SNVT_temp_p	Ram	Active Cool or Heat Setpt
5 (O)	nviCapacityLim	In	SNVT_lev_percent	Ram	Capacity Limit of Chiller
6 (O)	nviEntChwTemp	In	SNVT_temp_p	Ram	Accommodates Remote Temp Sensor input
7 (O)	nviMode	In	SNVT_Hvac_mode	Ram	Chiller Mode s
8(O)	nviHeatSetpt	In	SNVT_temp_p	Ram	Heating Setpoint
9 (O)	nvoActualCapacity	Out	SNVT_lev_percent	Ram	Actual Running Capacity of Unit
10(O)	nvoCapacityLim	Out	SNVT_lev_percent	Ram	Current Capacity Limit Setting of Chiller
11(O)	nvoLvgChwTemp	Out	SNVT_temp_p	Ram	Leaving Chilled Water Temp
12(O)	nvoEntChwTemp	Out	SNVT_temp_p	Ram	Entering Chilled Water Temp
13(O)	nvoEntCndWTemp	Out	SNVT_temp_p	Ram	Entering Condenser Water Temp
14(O)	nvoLvgCndWTemp	Out	SNVT_temp_p	Ram	Leaving Condenser Water Temp
15(O)	nvoAlarmDescr	Out	SNVT_str_asc	Ram	Alarm annunciation text
16(O)	nvoChillerstat	Out	SNVT_chlr_stat	Ram	Chiller States , modes

\* M = mandatory, O = optional

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## Mandatory Network Variables

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### Chiller Enable

```
network input SNVT_switch nviChillerEnable;
```

This input variable provides the mechanism to enable (start) the chiller running if operating conditions are satisfied, or to disable (stop) the chiller from running if operating conditions are met.

#### *Valid Range*

value field: unused

State field: 0 = Request Chiller Off

1 = Request Chiller On

#### *Default Value*

The chiller object will use the configuration value of `nviChillerEnable` on power-up or loss of communications unless the configuration property `nviDefaults =1` (manufacturer-specific defaults).

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### Cool Setpoint

```
network input SNVT_temp_p nviCoolSetpt;
```

This input variable provides the Cooling setpoint of the Leaving Chilled Water when the chiller is operating in the Cooling Mode. The Cooling mode is the normal mode of chiller operation, unless overridden by using the optional Mode variable to change to another mode. Any setpoint value received outside the valid range will be handled with a vendor specific process.

#### *Valid Range*

The valid range is: -12.2.. 48.8°C

#### *Default Value*

The chiller object will use the configuration value of `nviCoolsetpt` on power-up or loss of communications unless the configuration property `nviDefaults =1` (manufacturer-specific defaults).

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## On Off

network output SNVT\_switch nvoOnOff;

This variable indicates the current state of the chiller.

### *Valid Range*

value: not used

state field: 0 = Chiller Off

1 = Chiller On

0xff = invalid

### *When Transmitted*

When a change in status occurs.

### *Update Rate*

0 secs

### *Default Service Type*

Acknowledged Service

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## Active Setpoint Output

network output SNVT\_temp\_p nvoActiveSetpt;

This variable indicates the current value of the setpoint temperature used to control the temperature of the Leaving Chilled Water or Leaving Hot Water. Based on the operating mode of the chiller, this value will be derived from the Cooling Setpoint or the optional Heating Setpoint. The default mode is Cooling and will be used unless changed by the Mode input.

### *Valid Range*

-40.. 93° C.

### *When Transmitted*

When a significant change in the temperature occurs based on the application.

### *Update Rate*

Set to 0 secs

### *Default Service Type*

Acknowledged Service

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## Optional Network Variables

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### Capacity Limit Input

network input SNVT\_lev\_percent nviCapacityLim;

This input network variable sets the maximum capacity level the chiller can use. This level may be adjusted via an operator workstation or other network device, but can not be adjusted above a manufacturer-specified limit.

#### *Valid Range*

0 to 160%

#### *Default Value*

The chiller object will use the configuration value of `nviCapacityLim` on power-up or loss of communications unless the configuration property `nviDefaults = 1` (manufacturer-specific defaults).

---

### Entering Chilled Water Temperature Input

network input SNVT\_temp\_p nviEntCHWTemp;

This input network variable provides the Entering Chilled Water Temperature when this sensor is not locally available on the chiller. If a local sensor is available, it shall take precedence over this input.

#### *Valid Range*

-12.2..48.9°C

#### *Default Value*

0x7FFF



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## Chiller Mode

network input SNVT\_hvac\_mode nviMode;

This input network variable provides the mode of operation of the chiller and provides the ability for another node on the network to place a chiller in another mode.

### *Valid Range*

HVAC\_HEAT = Heat mode

HVAC\_COOL = Cool mode

HVAC\_FREE\_COOL = Cooling with compressor not running

HVAC\_ICE = Ice making mode

HVAC\_OFF, HVAC\_MRNG\_WRMUP, HVAC\_NIGHT\_PURGE,

HVAC\_PRECOOL, HVAC\_AUTO, HVAC\_TEST,

HVAC\_EMERG\_HEAT, HVAC\_FAN\_ONLY = not used

HVAC\_NUL = 0XFF

### *Default Value*

The chiller object will use the configuration value of `nciMode` on power-up or loss of communications unless the configuration property `nciDefaults =1` (manufacturer-specific defaults).

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## Heating Setpoint

network input SNVT\_temp\_p nviHeatSetpt;

This input network variable provides the heating setpoint when the chiller is operating in the heat mode. The value will be ignored if the control is in cooling mode.

### *Valid Range*

10..93°C

### *Default Value*

The chiller object will use the configuration value of `nciHeatSetpt` on power-up or loss of communications unless the configuration property `nciDefaults =1` (manufacturer-specific defaults).

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## Actual Capacity Level

network output SNVT\_lev\_percent nvoActualCapacity;

This network variable provides the current level of capacity the chiller is using. It may be more or less than the nominal value of the chiller's capacity.

### *Valid Range*

0..160%

### *When Transmitted*

When a significant change in capacity occurs.

### *Update Rate*

tbd

### *Default Service Type*

Acknowledged

---

## Capacity Limit

network output SNVT\_lev\_percent nvoCapacityLim;

This variable provides network visibility of the current capacity limit setpoint of the chiller.

### *Valid Range*

0..160%

### *When Transmitted*

When a significant change in value occurs.

### *Update Rate*

tbd

### *Default Service Type*

Acknowledged

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## Leaving Chilled Water Temperature

network output SNVT\_temp\_p nvoLvgCHWTemp;

This network variable provides the current temperature of the leaving chilled water.

### *Valid Range*

-40.. 118°C

### *When Transmitted*

When a significant change in value occurs.

### *Update Rate*

tbd

### *Default Service Type*

Acknowledged

---

## Entering Chilled Water Temperature

network output SNVT\_temp\_p nvoEntCHWTemp;

This network variable provides the current temperature of the entering chilled water.

### *Valid Range*

-40..118°C

### *When Transmitted*

When a significant change in value occurs.

### *Update Rate*

tbd

### *Default Service Type*

Acknowledged

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## Entering Condenser Water Temperature

network output SNVT\_temp\_p nvoEntCndWTemp;

This network variable provides the current temperature of the entering condenser water.

### *Valid Range*

-40..118°C

### *When Transmitted*

When a significant change in value occurs.

### *Update Rate*

tbd

### *Default Service Type*

Acknowledged

---

## Leaving Condenser Water Temperature

network output SNVT\_temp\_p nvoLvgCndWTemp;

This network variable provides the current temperature of the leaving condenser water.

### *Valid Range*

-40..118°C

### *When Transmitted*

When a significant change in value occurs.

### *Update Rate*

tbd

### *Default Service Type*

Acknowledged

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## Alarm Description

network output SNVT\_str\_asc nvoAlarm\_msg;

This network variable provides alarm messages based on manufacturer-determined criteria. Alarm text will vary significantly based on the chiller model. Therefore, the text supplied to the receiving node can simply be displayed, stored, or passed to another node.

### *Valid Range*

0..30 characters plus a NUL terminator

Examples of typical messages:

Failed To Start

Low Oil Pressure

Low Chilled Water Flow

Low Condenser Water Flow

Sensor Fault- Lvg ChW Temp

Sensor Fault- Lvg CndW Temp

Sensor Fault- Ent ChW Temp

Sensor Fault- Ent CndW Temp

### *When Transmitted*

When a change in alarm condition occurs.

### *Update Rate*

tbd

### *Default Service Type*

Acknowledged

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## Chiller Status

network output SNVT\_chlr\_status nvoChillerstat;

This variable indicates the main running mode and states of the Chiller. The mode provides enumerates the primary running states of a chiller and the state provides an indicator of other conditions present.

### *Valid Range*

Chiller Run Mode: Chlr\_Off, Chlr\_Start, Chlr\_Run, Chlr\_PreShutdn, Chlr\_Service

(other enumerations unused)

Chiller Operating Mode: HVAC\_HEAT, HVAC\_COOL, HVAC\_FREE\_COOL, HVAC\_ICE

(other enumerations unused)

Chiller State: 1= In\_Alarm, the Chiller is in an alarm condition. This condition may also be observed in the Node Object's status.

0= No alarm condition

Run\_Enabled 1= Chiller will start if operating conditions are satisfied,

0= Chiller not permitted to run. Chiller may be in local mode or placed in an disabled condition and can't be run via a remote request.

Local 1= Chiller has been placed in a locally controlled mode of operation and will not respond to remote requests.

0= Chiller is not in local mode and network visible values may be changed or monitored remotely.

Limited 1= Chiller conditions may exist that prevent the Chiller from reaching setpoint.

0= Chiller is not restricted from attempting to reach setpoint.

CHW\_flow 1= Chiller Water flow is detected.

0= No chilled water flow present.

CONDW\_flow 1= Condenser Water flow has been detected

0= No condenser water flow is observed.

(all other bits unused)

### *When Transmitted*

When a change in Chiller status has occurred

### *Default Service Type*

Acknowledged Service

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## Configuration Properties

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### Chiller Enable (mandatory)

```
network input config SNVT_switch nciChillerEnable;
```

This input configuration network variable provides the default power up and restart modes of the Chiller, unless the configuration property `nciDefaults=1`. Then use the manufacturer-specified values, instead.

#### *Valid Range:*

value field: unused

state field: 0 = Request Chiller Off

1 = Request Chiller Auto (run)

0xff = Invalid

#### *Default Value*

0 = Request Chiller Off

#### *SCPT Reference*

SCPTChillerEnable (#73)

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### Maximum Send Time (mandatory)

```
network input config SNVT_time_sec nciMAXSendTime;
```

This input configuration network variable controls the maximum period of time that expires before the following network variables are transmitted:

```
nvoChillerstat  
nvoActiveSetpt  
nvoActualCapacity  
nvoLvgCHWTemp  
nvoLvgCndWTemp  
nvoEntCndWTemp  
nvoEntCHWTemp
```

#### *Valid Range:*

0..6553.4 secs

#### *Default Value*

0 (no automatic update)

#### *SCPT Reference*

SCPTmaxSendTime (#49)

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## Minimum Send Time (mandatory)

```
network input config SNVT_time_sec nciMinSendTime;
```

This input configuration network variable controls the minimum period of time that expires before objects can be retransmitted:

*Valid Range:*

0..6553.4 secs

*Default Value*

0 (no automatic update)

*SCPT Reference*

SCPTminSendTime (#52)

---

## Capacity Limit (optional)

```
network input config SNVT_lev_percent nciCapacityLim;
```

This input configuration network variable sets the default value for the Capacity Limit of the Chiller, unless the configuration property `nciDefaults=1`. Then use the manufacturer-specified values, instead.

The capacity limit value is not the nominal capacity limit of the Chiller.

*Valid Range:*

0..160%

*Default Value*

100%

*SCPT Reference*

SCPTCapacityLimit (#81)



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## Cool Setpoint (mandatory)

```
network input config SNVT_temp_p nciCoolsetpt;
```

This input configuration network variable establishes the default Setpoint for the Leaving Chilled Water Temperature, unless the configuration property `nciDefaults =1`. Then use the manufacturer-specified values, instead.

### *Valid Range:*

-40..48.8°C

### Default Value

7.2° C

### *SCPT Reference*

SCPTCoolSetpoint (#75)

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## Heat Setpoint (optional)

```
network input config SNVT_temp_p nciHeatSetpt;
```

This input configuration network variable establishes the default Setpoint for the Leaving Water Temperature when in the heating mode, unless the configuration property `nciDefaults =1`. Then use the manufacturer-specified values, instead.

### *Valid Range:*

-40..93°C

### Default Value

35° C

### *SCPT Reference*

SCPTHeatSetpoint (#78)

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## Mode (optional)

```
network input config SNVT_hvac_mode nciMode;
```

This configuration network variable sets the default operating mode of the Chiller, unless the configuration property `nciDefaults =1`. Then use the manufacturer-specified values, instead.

### *Valid Range*

HVAC\_HEAT = Heat mode

HVAC\_COOL = Cool mode

HVAC\_FREE\_COOL = cooling with compressor not running

HVAC\_ICE = Ice making mode

HVAC\_OFF, HVAC\_MRNG\_WRMUP, HVAC\_NIGHT\_PURGE,  
HVAC\_PRECOOL, HVAC\_AUTO, HVAC\_TEST,  
HVAC\_EMERG\_HEAT, HVAC\_FAN\_ONLY = not used

HVAC\_NUL = 0XFF

### *Default Value*

HVAC\_COOL = Cool Mode

### *SCPT Reference*

SCPTHVACmode (#74)

---

## Location (optional)

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

This input configuration network variable provides a description of the location.

### *Valid Range*

Any NUL terminated ASCII string up to 31 bytes.

### *Default Value*

ASCII string of zeros + NUL

### *SCPT Reference*

SCPT\_location (#17)

---

## Power Up Delay (optional)

```
network input config SNVT_elapsed_tm nciPwrup
```

This input configuration network variable controls the minimum period of time that expires before outputs are retransmitted. It also is the minimum amount of elapsed time after a power-up or re-establishment of communications before a control action takes place. (This is to account for the settle-down time of the network)

*Valid Range:*

0..65,534 secs

*Default Value*

0

*SCPT Reference*

SCPTpwrUpDelay (#72)

---

## Default Values (optional)

```
network input config SNVT_switch nciDefaults;
```

This configuration network variable determines which set of values will be used on power up and communications failure. The choice is the stated default values or a list of manufacturer specified values.

*Valid Range*

value field: unused

state field: 0 = use default values

1 = use manufacturer-specified values

*Default Value*

0 = use stated default values

*SCPT Reference*

SCPTDefaultBehavior (#71)

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## Data Transfer

None specified.

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## Power-up State

On power-up, the following mandatory variables are set to their default values based on configuration `nciDefaults = 0`. If `nciDefaults = 1`, then use the manufacturer-specified values, instead.

`nviChillerEnable` is in the Request Chiller Off mode

`nviCoolsetpt` is 7.2°C

The mandatory output variables are set to their initial values:

`nvoOnOff` is Off

`nvoActiveSetpoint` is 7.2°C

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## Boundary and Error Conditions

None specified.

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## Additional Considerations

None specified.