LonMark®
Functional Profile:
Clothes Washer, Domestic

SFPTclothesWasherDomestic
Overview

This document describes the Functional Profile of a Whitegoods’ Home Clothes Washer (drum & pulsator type) functional block.

This functional block is to fit both drum type & pulsator type washer, which is widely used in the marketplace.

Before start, we should understand networked whitegoods (including washer):

First, whitegoods are mostly part of a home control network, and powerline channel is used as the communication media.

Second, it requires a lot of information together to manage these appliances. For example, the washer needs to know all the options regarding Wash, Rinse, Spin, & Dry processes before starting to operate. The complete set of commands is necessary to properly manage the washer.

To deliver enough information through the narrow-bandwidth channel, data should be well optimized. This profile has been written to achieve this goal.

In the real world, complete commands for a washer will come mostly from a home gateway or home server. Therefore, putting all of the information into one NV is practical.

*Implementer’s notes:*

This profile does not follow conventions of CECED. AHAM specifications were considered in the creation of this profile in terms of expressly required data but not the format established by AHAM.

This profile is based on the drum-type washer but also accommodates the pulsator-type washer.

![Diagram](image)

**Figure 1** Device Concept
Figure 2 Washing Process
Functional-Block Details

Domestic Clothes Washer Functional Block

Mandatory network variables

- nviWasherCmd
  SNVT_clothes_w_c
- nviPowerOnOff
  SNVT_switch
- nviStartStop
  SNVT_switch

Optional network variables

- nviPowerOnOff
  SNVT_switch
- nvoPowerOnOffAct
  SNVT_switch

Configuration properties

- cp304 AHAM Appliance Model
- cp17 Location Label
- cp49 Send Heartbeat
- cp167 Object Major Version
- cp168 Object Minor Version

Figure 3 Functional-Block Details
### Table 1 SNVT Details

<table>
<thead>
<tr>
<th>NV # (M/O)*</th>
<th>Variable Name</th>
<th>SNVT Name</th>
<th>SNVT Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (M)</td>
<td>nviWasherCmd</td>
<td>SNVT_clothes_w_c</td>
<td>184</td>
<td>Washer Command Input</td>
</tr>
<tr>
<td>2 (M)</td>
<td>nvoWasherStatus</td>
<td>SNVT_clothes_w_s</td>
<td>186</td>
<td>Washer Status Output</td>
</tr>
<tr>
<td>3 (M)</td>
<td>nviPowerOnOff</td>
<td>SNVT_switch</td>
<td>95</td>
<td>Power On/Off Input</td>
</tr>
<tr>
<td>4 (M)</td>
<td>nvoPowerOnOffAct</td>
<td>SNVT_switch</td>
<td>95</td>
<td>Power On/Off Report Output</td>
</tr>
<tr>
<td>5 (M)</td>
<td>nviStartStop</td>
<td>SNVT_switch</td>
<td>95</td>
<td>Washing Start/Stop Input</td>
</tr>
<tr>
<td>6 (M)</td>
<td>nvoStartStopAct</td>
<td>SNVT_switch</td>
<td>95</td>
<td>Washing Start/Stop Report Output</td>
</tr>
<tr>
<td>7 (O)</td>
<td>nvoTimeTotalRem</td>
<td>SNVT_time_min</td>
<td>123</td>
<td>Total Time Remaining Output</td>
</tr>
<tr>
<td>8 (O)</td>
<td>nvoAlarmRpt</td>
<td>SNVT_clothes_w_a</td>
<td>187</td>
<td>Alarm-Status Report Output</td>
</tr>
<tr>
<td>9 (O)</td>
<td>nvoManageStatus</td>
<td>SNVT_clothes_w_m</td>
<td>185</td>
<td>Washer-Management Status Output</td>
</tr>
</tbody>
</table>

* M = mandatory, O = optional

### Table 2 SCPT Details

<table>
<thead>
<tr>
<th>Man/Opt</th>
<th>SCPT Name</th>
<th>NV Name</th>
<th>Type or SNVT</th>
<th>SCPT Index</th>
<th>Associated NVs **</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man</td>
<td>SCPTahamApplianceModel</td>
<td>nciApplianceMod</td>
<td>aham_appl_t</td>
<td>304</td>
<td>Entire Functional Block</td>
<td>Used to provide the AHAM-specified appliance model information of a device</td>
</tr>
<tr>
<td>Man</td>
<td>SCPTLocation</td>
<td>nciLocation</td>
<td>SNVT_str_asc (36)</td>
<td>17</td>
<td>Entire Functional Block</td>
<td>Used to provide physical location of the functional block, or of the device</td>
</tr>
<tr>
<td>Man</td>
<td>SCPTmaxSendTime</td>
<td>nciMaxSendTime</td>
<td>SNVT_time_sec (107)</td>
<td>49</td>
<td>Entire Functional Block</td>
<td>Maximum period of time that expires before the NVs will automatically update their values</td>
</tr>
<tr>
<td>Opt</td>
<td>SCPTobjMajVer</td>
<td>nciObjMajVer</td>
<td>unsigned short</td>
<td>167</td>
<td>Entire Functional Block</td>
<td>Defines the major version number of the functional block</td>
</tr>
<tr>
<td>Opt</td>
<td>SCPTobjMinVer</td>
<td>nciObjMinVer</td>
<td>unsigned short</td>
<td>168</td>
<td>Entire Functional Block</td>
<td>Defines the minor version number of the functional block</td>
</tr>
</tbody>
</table>
   It should be Mandatory for CPs that are Mandatory for an NV that is also
   Mandatory. This is also valuable for CPs that apply to the Entire Functional
   Block.

** List of NVs to which this configuration property applies.
An “(M)” means that the CP is Mandatory if the NV (to which it applies) is
implemented. An “(O)” means that the CP is Optional if the NV (to which it
applies) is implemented.
Mandatory Network Variables

Washer Command — Input

network input sd_string("@p|1") SNVT_clothes_w_c
nviWasherCmd;

This input network variable contains all required information to control the
washer. For example, when starting to wash clothes, the cycle type, plus the
wash, rinse, spin, and dry options should be selected before actual starting of the
washer. This network variable contains these data.

Valid Range
The range of SNVT_clothes_w_c.

Default Value
None specified.

Configuration Considerations
None specified.

Washer Status — Output

network output sd_string("@p|2") bind_info(unackd)
SNVT_clothes_w_s nvoWasherStatus;

This input network variable contains the present status of the washer. It then the
information contained in SNVT_clothes_w_c, plus cycle/sub-cycle information,
alarm conditions, and timing information.

Valid Range
The range of SNVT_clothes_w_s.

Default Value
Default value is APPL_CWC_NUL. This value will be adopted at power-up.
**Configuration Considerations**

This network variable is subject to the send heartbeat time: nciMaxSendTime.

**When Transmitted**

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.
- Regularly at the interval defined by the configuration property nciMaxSendTime.

**Default Service Type**

The default service type is unacknowledged.

---

**Power On/Off — Input**

```plaintext
network input sd_string("@p|3") SNVT_switch
nviPowerOnOff;
```

Commands the washer to turn-on or turn-off. The mode of Off is such that the network interface remains active to receive inputs. The extent of the Off mode for the other functions of the washer are manufacturer-specific.

**Valid Range**

The range and rules of a two-state SNVT_switch.

**Default Value**

None specified.

**Configuration Considerations**

None specified.
Power On/Off Report — Output

network input sd_string("@p 3") bind_info(unackd)
SNVT_switch nviPowerOnOff;

Commands the washer to turn-on or turn-off. The mode of Off is such that the network interface remains active to receive inputs. The extent of the Off mode for the other functions of the washer are manufacturer-specific.

Valid Range

The range and rules of a two-state SNVT_switch.

Default Value

NULL.

Configuration Considerations

This network variable is subject to the send heartbeat time: nciMaxSendTime.

When Transmitted

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.
- Regularly at the interval defined by the configuration property nciMaxSendTime.

Default Service Type

The default service type is unacknowledged.

Washing Start/Stop — Input

network input sd_string("@p 3") SNVT_switch
nviStartStop;

Commands the washer to begin or halt the programmed/commanded cycle.
Valid Range
The range and rules of a two-state SNVT_switch, where TRUE is to Start operations and FALSE is to Stop operations.

Default Value
None specified.

Configuration Considerations
None specified.

Washing Start/Stop Report — Output

```network input sd_string("@p3") bind_info(unackd) SNVT_switch nviPowerOnOff;
```

Reports the washer’s actual state of operation.

Valid Range
The range and rules of a two-state SNVT_switch, where TRUE is represents that it is presently in use, performing operations. FALSE represents that the washer is presently in a ready state, awaiting commands but not presently performing operations.

Default Value
NULL.

Configuration Considerations
This network variable is subject to the send heartbeat time: nciMaxSendTime.

When Transmitted
The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.
- Regularly at the interval defined by the configuration property nciMaxSendTime.
**Default Service Type**

The default service type is unacknowledged.

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**Optional Network Variables**

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**Total Time Remaining — Output**

```c
network output sd_string("@p|7") bind_info(unackd)
SNVT_time_min nvoTimeTotalRem;
```

This output network variable provides the total remaining time before the entire wash process is complete.

**Valid Range**

The valid range of SNVT_time_min.

**Default Value**

Default value is 0x0 (no time remaining). The value will be adopted at power-up.

**Configuration Considerations**

This network variable is subject to the send heartbeat time: nciMaxSendTime.

**When Transmitted**

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.
- Regularly at the interval defined by the configuration property nciMaxSendTime.

**Default Service Type**

The default service type is unacknowledged.
Alarm-Status Report — Output

```plaintext
network output sd_string("@p8") bind_info(unackd)
SNVT_clothes_w_a nvoAlarmRpt;
```

This output network variable provides duplicate information of the alarm field of nvoWasherStatus.

**Valid Range**

The valid range of SNVT_clothes_w_a.

**Default Value**

None specified.

**Configuration Considerations**

This network variable is subject to the send heartbeat time: nciMaxSendTime.

**When Transmitted**

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.
- Regularly at the interval defined by the configuration property nciMaxSendTime.

**Default Service Type**

The default service type is unacknowledged.

Washer-Management Status — Output

```plaintext
network output sd_string("@p9") bind_info(unackd)
SNVT_clothes_w_m nvoManageStatus;
```

This output network variable provides the status of the door/lid and the drain.

**Valid Range**

The valid range of SNVT_clothes_w_m.
**Default Value**

None specified.

**Configuration Considerations**

This network variable is subject to the send heartbeat time: nciMaxSendTime.

**When Transmitted**

The output variable is transmitted:

- When the value has changed by what the manufacturer considers significant.
- Regularly at the interval defined by the configuration property nciMaxSendTime.

**Default Service Type**

The default service type is unacknowledged.
Configuration Properties

AHAM Appliance Model (Mandatory)

```
config network input sd_string("&1,p,0\x84,304")
aham_appl_t nciApplianceMod;
```

This configuration property is used to provide the appliance model of the device as specified by the USA-based Association of Home Appliance Manufacturers (AHAM).

Valid Range

The valid range of SCPTahamApplianceModel.

Default Value

The default value is AHAM_CLOTHES_WASHER.

Configuration Requirements/Restrictions

This CP is a constant (const_flg). It is not to be modified except that it is allowable to modify the value in a download of new code to the device.

SCPT Reference

SCPTahamApplianceModel (304)

Location Label (Mandatory)

```
config network input sd_string("&1,p,0\x80,17")
SNVT_str_asc nciLocation;
```

This configuration property can be used to provide the location of the functional block (or device), where p is the functional-block index. The above code declaration is for providing the location of the functional block.

If it is preferred, the location of the device can be represented with the following code declaration only if no Node Object functional block exists on the device; otherwise, the Location Label from the Node Object should be used to represent the location of the device:
config network input sd_string("&0,,0\x80,17")
SNVT_str_asc nciLocation;

**Valid Range**

Any NULL-terminated ASCII string up to 31 bytes of total length (including NULL). The string must be truncated if the length does not allow the 31st character to be the NULL (0x00).

**Default Value**

The default value is an ASCII string containing 31 NULLs (0x00).

**Configuration Requirements/Restrictions**

This CP has no modification restrictions (no_restrictions). It can be modified at any time.

**SCPT Reference**

SCPTlocation (17)

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**Send Heartbeat (Mandatory)**

config network input sd_string("&1,p,0\x80,49")
SNVT_time_sec nciMaxSendTime;

This input configuration property sets the maximum period of time that can expire before the functional block will automatically update all output network variables.

Whether the CP is associated with any NVs that are not explicitly stated in this profile, can be defined by the manufacturer.

**Valid Range**

The valid range is 0.0 to 3600.0 seconds.

Values outside this range are invalid and will disable the automatic update mechanism. A value of zero (0) will be used for the internal timer in cases where configured values are above 3600.0 seconds. If a value of 0.0 is used it will disable the automatic update mechanism.

**Default Value**

The default value is 0.0 (no automatic update).
**Configuration Requirements/Restrictions**
This CP has no modification restrictions (no_restrictions). It can be modified at any time.

**SCPT Reference**
SCPTmaxSendTime (49)

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**Object Major Version (Optional)**

```c
config network input sd_string("&1,p,0\x84,167")
unsigned short nciObjMajVer;
```

This configuration property can be used to provide the major version number of the functional block when implemented on a device.

**Valid Range**
Any integer number from 0 to 255. Only 1-byte of information is accepted.

**Default Value**
The default value is one (1).

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**Configuration Requirements/Restrictions**
This CP is a Constant (const_flg).

The Constant flag means that all devices with the same Standard Program Identifier (SPID) will have the same value, while the Device-Specific flag attribute means that devices with an identical SPID may have different values for this configuration property.

The presence of these configuration properties within the functional block defines the major version and minor version of the functional block. The major version number must be incremented when the network interface for the functional block changes, while the minor version number must be incremented when the network interface remains the same, but the functional block has a different behavior.

**SCPT Reference**
SCPTobjMajVer (167)
Object Minor Version (Optional)

```c
cfg network input sd_string("$1,p,0\xA4,168")
unsigned short nciObjMinVer;
```

This configuration property can be used to provide the minor version number of the functional block when implemented on a device.

**Valid Range**

Any integer number from 0 to 255. Only 1-byte of information is accepted.

**Default Value**

The default value is zero (0).

**Configuration Requirements/Restrictions**

This CP has modification restrictions of Constant (const_flg) and Device-Specific (device_specific_flg): \xA4. It is not to be modified except that it is allowable to modify the value in a download of new code to the device.

The Constant flag means that all devices with the same Standard Program Identifier (SPID) will have the same value, while the Device-Specific flag attribute means that devices with an identical SPID may have different values for this configuration property.

The presence of these configuration properties within the functional block defines the major version and minor version of the functional block. The major version number must be incremented when the network interface for the functional block changes, while the minor version number must be incremented when the network interface remains the same, but the functional block has a different behavior.

**SCPT Reference**

SCPTobjMinVer (168)
Key for Unresolved References

\( p \) is this functional block’s index relative to the Device Self-Documentation String (DSDS) declaration, when implemented in the device.

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Data Transfer

None specified.

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Power-up State

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

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Boundary and Error Conditions

None specified.

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Additional Considerations

None specified.