Honeywell

Excel 50/100/500/600

CONTROLLERS

EXCEL 5000 OPEN™ SYSTEM

SOFTWARE DESCRIPTION

EN2B-0092GE51 R0203 / 74-3448-2

CONTENTS

REVISION OVERVIEW

The following pages have been changed from the previous issue of this document:

page	change
28	Information on data-points of the type "pseudo totalizer inputs" added in section "Scaling Factor".
41	Alarm suppression in the "manual override" mode under controller firmware 2.06.02 and higher added to section "Point Alarm".

SYSTEM OVERVIEW

General

Excel 50/100/500/600 is a control and monitoring system specially designed for use in buildings. These Excel controllers use the latest Direct Digital Control (DDC) technology. Excel 50 and Excel 500 controllers are also capable of communicating on an open Echelon® LONWORKS® network. Excel 100/500/600 controller are particularly well-suited to controlling buildings such as schools, hotels, offices, and hospitals. Excel 100 controllers differ from Excel 500/600 controllers in having a fixed input/output configuration.

Excel 50 controllers have a smaller fixed input/output configuration, and are designed for smaller buildings such as restaurants, shops, banks, and offices. Furthermore, Excel 50 controllers also feature a wider range of embedded configurable applications to simply set up. With the Lizard application selector software tool, you can generate a series of configuration codes and then enter them via an operator interface. The CARE application engineering tool is not required.

Excel 50/100/500/600 functions are:

- Heating control
- Air conditioning control
- Energy management
- Energy optimization

Software

The Excel 50/100/500/600 system includes a comprehensive software package specially designed to meet the requirements of application engineers. It comprises the following:

- Data-point description
- Time program
- Alarm handling
- Password protection

The software package comes with all the files listed. The menu-driven format allows quick and easy operation.

Firmware version number

All information appearing in this Software Description is valid for firmware versions V1.3.xx and earlier. All information, functions, and attributes valid for newer firmware versions (V1.5.xx or higher) are marked by the corresponding version number for which they are valid. Fig. 1 shows various controllers and the firmware version numbers that they support.

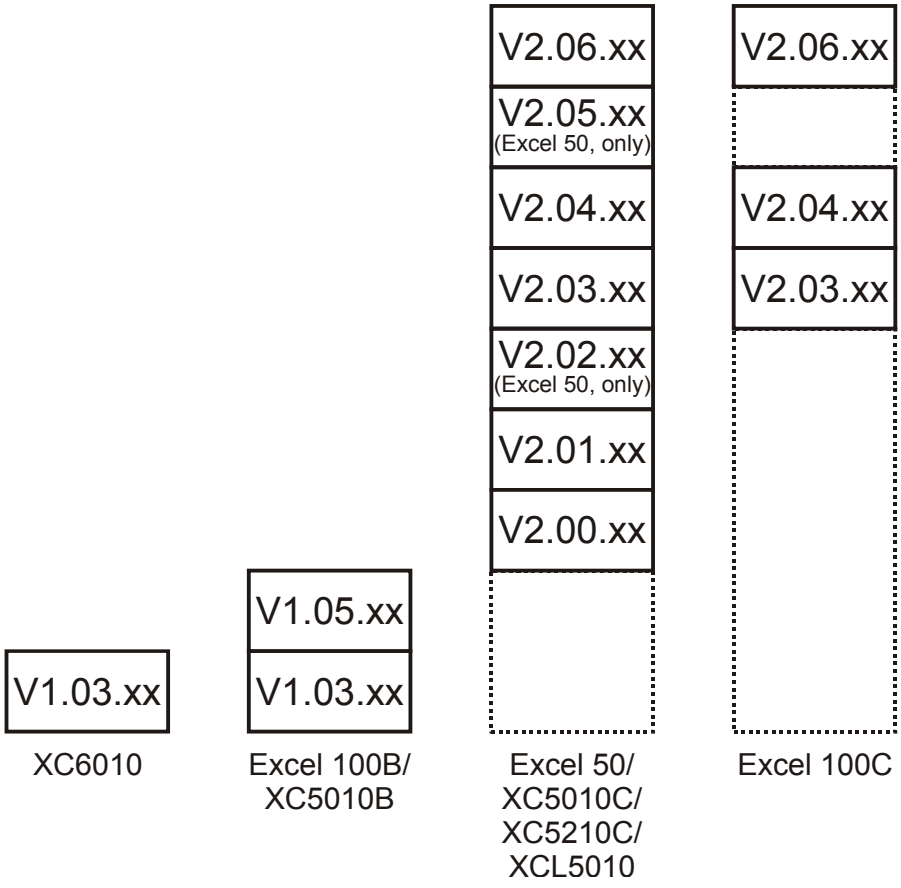

Fig. 1. Controllers and their supported firmware versions

Data-point description

Data-points are the basis of the Excel 50/100/500/600 system. Data-points contain system-specific information such as values, status, limit values, and default settings. The user has easy access to data-points and the information they contain.

The user can recall and modify information in the data-points.

Time programs

Whenever you want, you can use time programs to enter the setpoint or status for any data-point.

The following time programs are available:

- Daily programs
- Weekly programs
- Annual programs
- The "TODAY" function
- Special day list

Daily programs are used to create a weekly program. The annual program is created automatically by multiplying the weekly program and then incorporating additional daily programs.

The "TODAY" function enables you to have a direct influence on the switching program. This function enables you to allocate a setpoint or status to the selected data-points for a defined time period. This action does not depend on the current daily program.

Alarm handling

The alarm handling facility offers system security. Alarm signals can, for example, alert the operator to maintenance work that is due. All alarms that occur are stored in data files and reported immediately. If your system configuration allows, you can also list alarms on a printer or transmit alarms to higher-level centrals.

There are two kinds of alarm: Critical and Non-critical. Critical alarms have priority over non-critical alarms. System alarms, caused by a fault in a controller, are always critical alarms.

To distinguish between alarm types, you can generate your own alarm messages or select appropriate messages already in the system.

The following events all generate alarm messages:

- Exceeding limit values
- Overdue maintenance work
- Totalizer readings
- Digital data-point changes of state

Application program

You can use the Honeywell CARE engineering tool to create application programs for your system. A particular advantage offered by Honeywell CARE is the ability to create a fully functional control program without needing to be familiar with the programming language.

CARE stands for Computer Aided Regulation Engineering.

Passwords

Your control system is also protected by passwords. This ensures that only authorized persons have access to the system data. There are four operator levels, each protected by its own password.

- Operator level 1: Read only; the operator can display information about setpoints, switching points, and operating hours.
- Operator level 2: Read and make limited changes; the operator can display system information and modify certain preset values.
- Operator level 3: Read and make changes; system information can be displayed and modified.
- Operator level 4: Programming.

Password protection prevents unauthorized access system information and ensures permanent, secure system operation.

DATA-POINTS

An Excel 50/100/500/600 system can have up to 128 physical data-points (22 with Excel 50 and 36 with Excel 100C) and up to 256 pseudo data-points, depending on the application the system runs.

A data-point has different attributes according to its type. Attributes are displayed and modified on the XI581AH (not with XCL5010, Excel 100C), XI582AH, and XI584 operator interfaces or on the Excel 50 MMI. Attributes contain information about the given data-point. This information could be:

- Input limits values
- Operating status
- Current temperature
- Elapsed run time

The following sections provide more-detailed information about the different kinds of data-points and data-point attributes and explain which attributes are assigned to which data-points.

Physical Data-Points

Physical data-points are inputs and outputs attached to hardware devices like sensors and actuators.

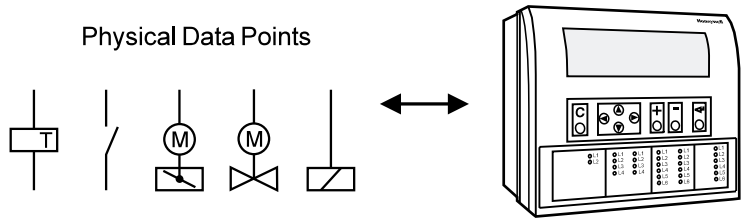

Fig. 2. Physical data-point symbols

The following are examples of physical data-points

Analog inputs NTC, PT 1000, PT 3000, BALCO Sensors (PT 3000/BALCO not with Excel 100C), standard 0...10 V / 0 (4)...20 mA input, to connect outside air temperature sensors, for example.

Analog outputs Outputs with a continuous 0...10 V output signal for controlling continuous actuators (Excel 100C supplies up to 20 mA on the analog outputs).

Digital inputs Inputs for processing voltage-free signals (switches, contacts).

Digital outputs (not Excel 100C) Outputs for driving three-position actuators, for example, a damper motor; two position devices, for example, a circulation pump; 0...10 V and pulsed outputs

Totalizer inputs Digital inputs for processing pulsed signals up to 20 Hz (depending on Distributed I/O module specifications), for example, metered energy consumption.

Flexible Data-Points

Flexible data-points allow to control more than one physical output with one datapoint. There are three subordinate types of flexible data-points:

1. Pulse 2

2. Multi-stage

3. Feedback.

Pulse 2 flexible data-point

A pulse 2 data-point allows to pulse two digital outputs (e.g. relays). When activated (e.g. set to “on”), Pulse 2 triggers one of the digital outputs, and when deactivated, Pulse 2 triggers the other digital output.

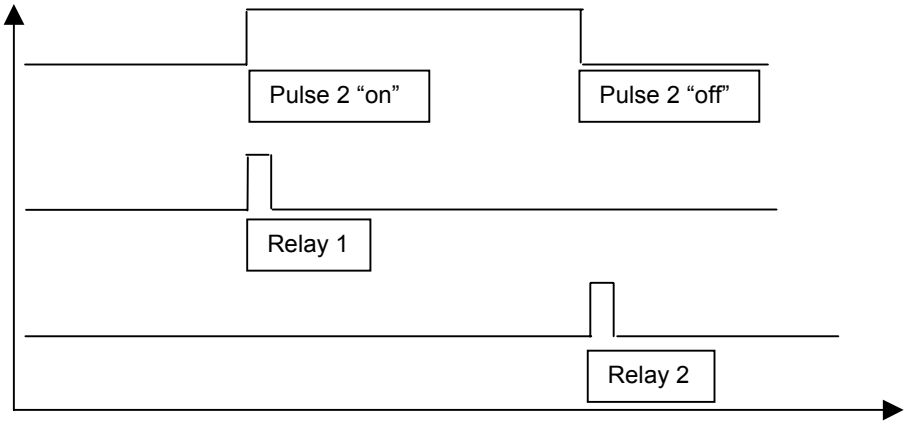

Fig. 3. Pulse 2 flexible data-point switching

Multistage flexible data-point

Multistage flexible data-points allow to switch up to six physical digital outputs via one data-point. A typical example would be a multi-stage electric heater or a multi-stage fan.

A multistage flexible data-point provides up to six editable stage texts, e.g., stage 1, stage 2, stage 3, etc, to be edited in CARE.

Feedback flexible data-point

Feedback flexible data-points, also called “DO feedback DI” combine up to three pairs of digital outputs/digital inputs to form up to three-stage switching with feedback. The digital inputs of each pair act as the feedback point.

If the digital input does not feedback the actual equipment status within a predefined time “Off Phase”, then the software will switch down this point type until a "non-alarm" state is reached. In extreme cases, the point may be switched to the off position. See also “Off Phase”.

Increased support (V2.04.xx or higher)

Excel 500 controllers now support up to 60 flexible data-points. In case of Feedback flexible points, the maximum number is 128.

Previous firmware versions supported only up to 20 flexible data-points.

Pseudo Data-Points

Pseudo data-points are values (intermediate results and parameters) computed while the application program is running. In contrast to physical data-points, pseudo data-points are not directly connected to hardware devices.

Access via the user address

During system operation, you may need to access these values. To simplify this process, you can include pseudo data-points in the data-point list, where you can access them directly via their user addresses.

Like physical data-points, pseudo data-points, too, can have different attributes; for example, they can specify a manual value, set minimum and maximum values, or log trends.

The following are types of pseudo data-points:

- Pseudo analog points
- Pseudo digital points
- Pseudo totalizer inputs
- Pseudo point multistage

Pseudo analog points

Pseudo analog points are software points containing an analog value in the user program.

A pseudo analog point could, for example, contain a flow temperature setpoint calculated from the room setpoint and the outside air temperature via the heating curve.

Pseudo digital points

Pseudo digital points are software points containing a digital value in the user program.

For example, logical AND operation.

The AND operation provides a logical 1 output when all input conditions are also logical 1. Otherwise the output is a logical 0. If the user program contains such an AND operation on different input conditions, then the output could be available as a pseudo digital data-point.

Pseudo totalizer inputs

Pseudo totalizer inputs are digital software points from the user program, where a totalizer counter input is recorded.

Pseudo point multistage

Pseudo point multistage data-points are identical to flexible data-point of the type "multistage" except that they allow for 16 stages (including the “off stage“) and the attribute "Status Text" allows for 16 status texts to be attached. The attribute "Technical Address" is not required.

Global Data-Points

If your control and monitoring system contains more than one controller, the controllers communicate with one another via the system bus. This enables one controller both to read and set the data-points from other controllers.

These data-points are called global data-points. Global data-points can be both physical and pseudo data-points. They always originate in another controller. The maximum number of global data-points is limited to 128 remote digital and 128 remote analog points.

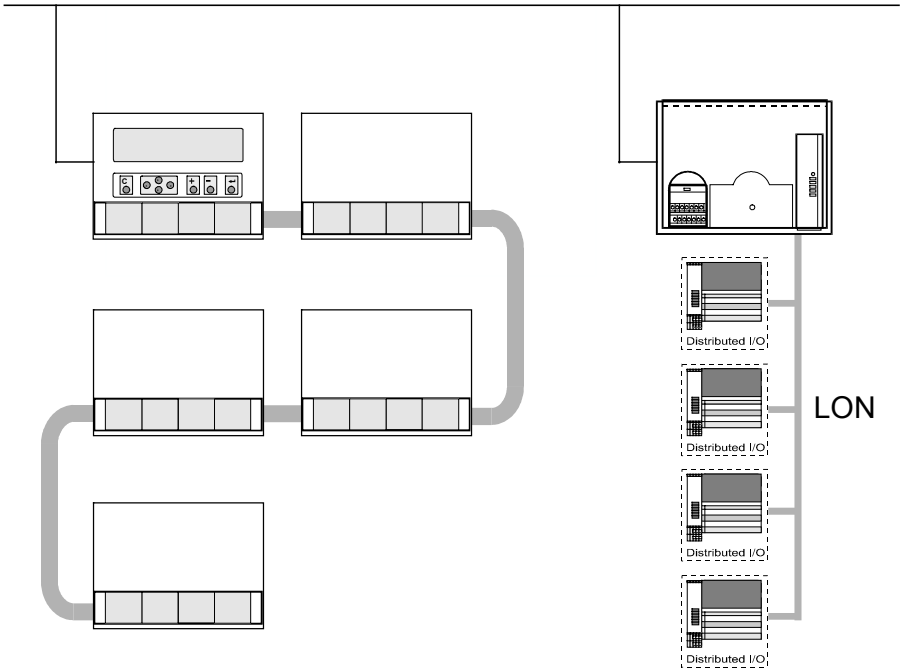

Fig. 4. Global data-points are available to all controllers on the system bus

Mapped Data-Points (V2.04.xx or higher)

With firmware version V2.04.xx or higher, those Excel 50/500 controllers which feature free programmability on LONWORKS (those that contain the 3120E5 Neuron chip, i.e. date code 0044 or higher) may have I/O devices connected via the LONWORKS network. LONWORKS network variables (or individual fields of structured network variables) can be mapped to the attribute "Value" of physical data-points (AI/DI/AO/DO). Pseudo analog, pseudo digital, and pseudo multistage points are also supported for NV mapping.

See Excel 50/500 LONWORKS Mechanisms Interface Description, EN0B-0270GE51, for more information on LONWORKS network variables and data-point mapping.

ATTRIBUTES

Each data-point type has associated with it various parameters which allow the user to set, e.g., the user address, the level of access protection, alarm behavior, and other options. These parameters are called attributes. Each attribute performs a specific function related to the data-point.

A complete list of data-point types and their attributes appears in Table 13 through Table 15. Not all attributes are available for every data-point type.

Point refreshing (V1.5.x)

Four attributes ("Value", "Manual Value", "Operating Mode", and "Alarm Status") will be simultaneously refreshed to an XBS or XI584 operator interface.

NOTE: A complete list of attributes associated with the various data-point types can be found in the section "List of Data-Point Attributes" on page 33.

Access Level

Four levels of protection

The attribute "Access Level" protects data-points against unauthorized changes on the basis of the password level needed to modify a data-point.

"Access Level" attributes between "1" and "4" are assigned to a point. These attributes correspond to the four password levels found in the XI581AH (not with XCL5010, Excel 100C), XI582AH, and XI584 operator interfaces and the Excel 50 MMI:

- Operator level 1: Read only.
- Operator level 2: Read and make limited changes.
- Operator level 3: Read and make changes.
- Operator level 4: Programming.

For example, setting the "Access Level" attribute for the data-point with the user address "room temp floor 1" to "2" means that all attributes for this data-point can now only be edited or modified at password level 2 or higher.

Acknowledge Alarm (V2.04.xx or higher)

The attribute "Acknowledge Alarm" allows a controller to acknowledge an alarm for a flexible data-point of the type "feedback" without changing the operating mode. The controller takes the point out of alarm as soon as a rising edge is detected on the input of the WIA statement writing to the attribute "Acknowledge Alarm".

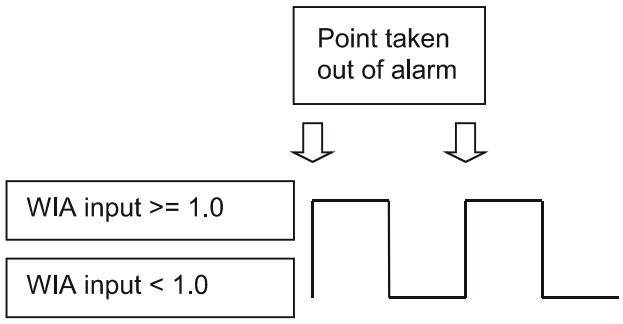

Fig. 5. The "Acknowledge Alarm" attribute for WIA statement

This attribute is a virtual attribute and can be accessed only by a WIA statement in CARE. It is not part of the data-point description and therefore cannot be displayed on an MMI or building supervisor.

Active State (prior to V2.04.x)

The attribute "Active State" defines when a digital input/output is active.

NOTE: The "Active State" attribute does **not** reflect the current condition of a digital data-point.

NOTE: This is not applicable to digital inputs in applications designed for controllers using V2.04.xx firmware or higher. In such applications, this attribute is fixed at 1, and the new attribute "Normally Open/Normally Closed" (NO/NC) is active (see section "Normally Open/Normally Closed (V2.04.xx or higher)" on page 24 for more details).

The following values are possible:

- 0 = digital input/output is active when a "logical 0 signal" is present
- 1 = digital input/output is active when a "logical 1 signal" is present

Table 1 indicates the active state for various conditions of the XF523 and XFL523 modules.

Table 1. Active state for digital input XF523 and XFL523 modules

	Digital Input							
Contact status	Open				Closed			
CARE Definition (NC/NO system diagram)	NC		NO		NC		NO	
Definition - in the XI584 DP-Editor attribute "Active State" (change Active/Passive State text)	1	0	1	0	1	0	1	0
CARE Interpretation (control table)	1	1	0	0	0	0	1	1
Display at operator interface (status text)	OFF/ Trouble: Alarm	ON/ Operating RTN*	OFF/ Trouble: Alarm	ON/ Operating RTN*	ON/ Operating RTN*	OFF/ Trouble: Alarm	ON/ Operating RTN*	OFF/ Trouble: Alarm

* RTN = Return To Normal

NOTE: XFL523 Module is applicable only for V2.0.xx software.

Alarm Delay

Delaying alarm outputs

The alarm delay time (in seconds) is entered in the attribute "Alarm Delay". The alarm delay time determines how long an alarm condition must exist before an alarm is generated. Entering an alarm delay time of 10 seconds means that the limit value must be exceeded for at least 10 seconds before this data-point generates an alarm. If the limit value only lasts for 7 second, then no alarm occurs.

Alarm Suppression

The attribute “Suppress Alarm” establishes whether or not alarm messages from the following alarm attributes should be suppressed:

- Operational status
- Min/Max. limit
- Maintenance alarm
- Interval counter
- Alarm Status

The following entries are possible:

- Off = Alarms not suppressed
- On = Alarms suppressed

Example: digital input

In addition to a variety of other attributes, a digital input also has the "Operating Mode", "Alarm Status", and "Maintenance Alarm" attributes.

If alarm suppression is activated for this data-point, then no message is displayed during an operating mode change-over, or when changing into the alarm condition, or when reaching the maintenance alarm.

Suppression of system alarms (V2.04.xx or higher)

The controller will not issue a system alarm when the alarm's system alarm text starts with an @ character.

Alarm Status (prior to V2.04.x)

Alarm monitoring

In the case of a digital input or a pseudo digital point, the attribute "Alarm Status" specifies whether or not alarm monitoring is required.

The following entries are possible:

- Yes Alarm monitoring is required
- No Alarm monitoring is not required

When alarm monitoring is required, the alarm message occurs when the digital point changes from the active state to the passive state (alarm reached). A further message is generated (alarm going) when the digital point returns to the active state (see Fig. 6).

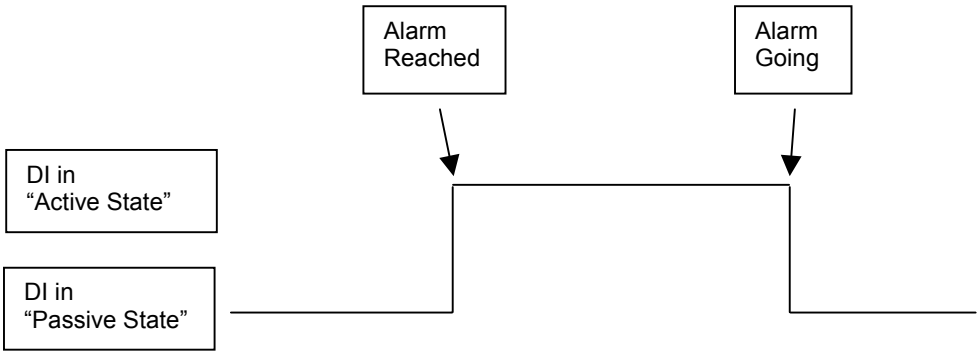

Fig. 6. Alarm status messaging

NOTE: The active state and passive state are defined in the "Active State" data-point attribute.

Alarm Status (V2.04.xx or higher)

Alarm monitoring

In the case of a digital input or a pseudo digital point, the attribute "Alarm Status" specifies whether or not alarm monitoring is required.

The following entries are possible:

- Yes Alarm monitoring is required
- No Alarm monitoring is not required

When alarm monitoring is required, the alarm message occurs depending on the physical contact status and on the logical status as defined in the online attribute "Normally Open/Normally Closed".

Alarm Type

The attributes listed in Table 2 are capable not only of generating alarms, but also of writing them to the internal alarm memory and sending them to the PC central or to the modem module (when connected).

Table 2. Alarm attributes

Attribute	Always critical	Optional critical or non-critical
Operating Mode	X	
Min. Limit		X
Max. Limit		X
Maintenance Alarm		X
Interval Counter		X
Alarm Status		X

Changing over the attribute "Operating Mode" always results in a critical alarm, but the attribute "Alarm Type" offers a choice for the alarm attributes "Min. Limit", "Max. Limit", "Maintenance Alarm", "Totalizer", and "Alarm Status" whether an alarm is classified as critical or non-critical.

Distinguishing between critical and non-critical alarms is significant for the subsequent reporting of the alarms to the PC central or to the modem module. Compared to non-critical alarms, critical alarms are given priority on the bus when several alarms are in the alarm queue.

When the type of alarm for a data-point has been decided, e.g. "critical" alarm type, it refers to all alarm attributes for this data-point.

Alarm Definition

In the data-point description, the alarms can be influenced using the functions described below (see also Table 3 on page 13).

Alarm type For each data-point in the data-point description, the user can determine whether the signals generated are to be treated as critical or non-critical alarm.

Alarm delay An alarm signal can be delayed by entering an alarm delay time. An alarm signal will be generated only if an alarm continues uninterrupted during the alarm delay time.

Suppress alarm If an alarm signal is not desired from a particular data-point, this can be fixed in the data-point description. Thus, all the alarm signals relevant to the particular data-point and the Operating Mode alarm types are suppressed.

Fig. 7 shows an example of a changing point value that rises above and falls below the limit Max 2. If Suppress Alarm is not active, then the alarm condition switches between normal to alarm, according to the limit Max 2. If Suppress Alarm is active, then the alarm condition remains normal unless Suppress Alarm is switched off before the point value falls below the limit Max 2. Regardless of the setting of the Alarm suppression flag, an alarm is entered into the controller's history buffer and is also available in the XBS alarm report.

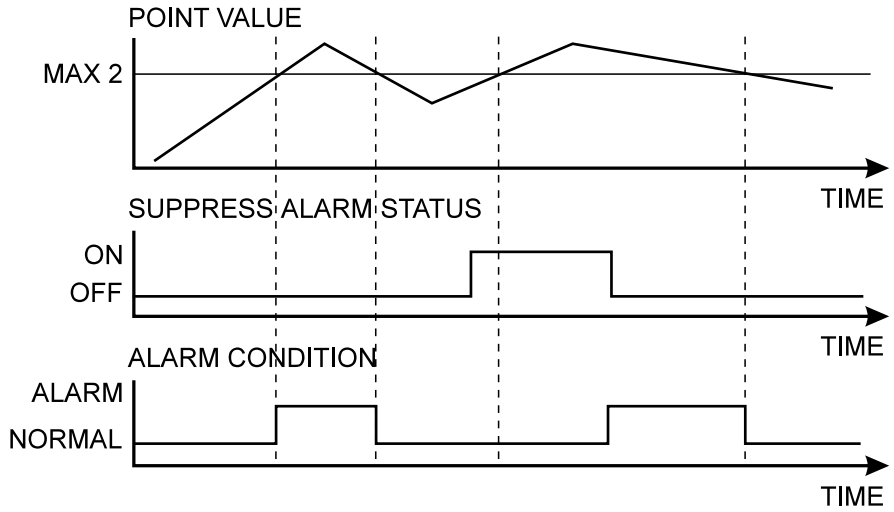

Fig. 7. Alarm condition depending on point value and Suppress Alarm status

Point alarm

It is possible to view all data-points at the operator interfaces for which the limit value (analog point) or the alarm status (digital point) is currently exceeded.

Driven by a menu, the user address and the accompanying alarm text are displayed on the XI581AH (not with XCL5010, Excel 100C) or XI582AH operator interfaces or Excel 50 MMI.

On the XI584 operator interface, a data-point within the framework of the data-point description can be seen in all four password levels. If a current alarm is present for the point in question, the attribute “Point in Alarm” produces the display “Yes”, otherwise “No”.

Within the framework of the data-point description, it is possible, under the attribute “Alarm text”, to enter an alarm text of up to 18 characters in addition to the preprogrammed text.

Table 3 gives a summary of various alarm types and attributes.

Table 3. Alarm summary

Alarm type/attributes	Alarm status	Enter alarm delay time	Alarm suppression	Point in alarm	No. of preprogrammed texts	Supplementary text
Limit values	Selection in DPD	possible	possible	X	8	possible
Alarm Status	Selection in DPD	possible	possible	X	2	possible
Maintenance alarm	Selection in DPD	-	possible	-	1	-
Totalizer	Selection in DPD	-	possible	-	1	-
Operating Mode	always critical	-	possible	-	2	-
System alarms	always critical	-	-	-	approx. 110	-
User program reports	always non-critical	-	-	-	-	-

DPD = Data-point description

There are 256 alarm texts in total.

NOTE: A point is still seen as “in alarm” even when alarm suppression is enabled.

Cycle Count

The attribute "Cycle Count" contains the value indicating the number of transitions to the active state (see "Active State (prior to V2.04.x)" on page 10).

Delay Time Switching Up

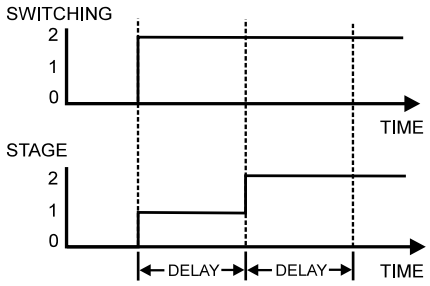

Fig. 8. Delay time switching up

This attribute is used in conjunction with flexible points of the type "feedback". It defines the delay time between switching upwards from one stage to another. The delay time affects every stage. The delay time also takes effect when switching, e.g. from manual value 0 to 2. In this case, it is switched from stage 0 to stage 1, then to stage 2 with the delay time between the switching processes.

- Range: 0 to 255s
- Default value: 10s
- Resolution: 1s

Delay Time Switching Down

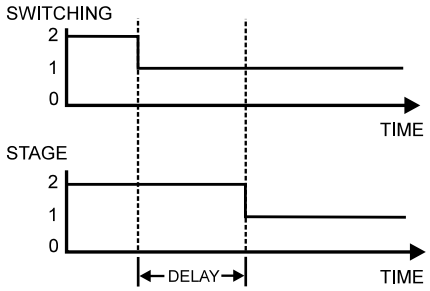

Fig. 9. Delay time switching down

This attribute is used in conjunction with flexible points of the type "feedback". It defines the delay time between switching downwards from one stage to another. The delay time affects every stage.

- Range: 0 to 255s
- Default value: 10s
- Resolution: 1s

The feedback delay time starts to count after termination of delay time switching up/delay time switching down.

Descriptors

Informative descriptors

A controller contains up to 128 physical data-points and up to 256 pseudo data-points. The Excel 100C provides 36 physical data-points. An individual user address can be assigned to each of these 384 data-points.

255 plain-language descriptors can be created with a maximum of 32 characters each. These descriptors are then assigned to data-points in the data-point description via the attribute "Descriptor".

Descriptors complete the information concealed behind the user address. They can contain, for instance, a reference to a section of a building.

The following list is an example of the relationship between user addresses and descriptors:

User Address	Descriptor
Room temp floor 1	Heating circuit, West wing
Room temp floor 3	Heating circuit, West wing
Room temp floor 10	Heating circuit, East
Room temp corridor	Heating circuit, East
Flow temp floor 1	Heating circuit, West wing
Lights floor 1	Building section V
Lights corridor	Building section V

Engineering Unit

The attribute "Engineering Unit" contains a list for selecting different engineering units for both analog data-points (physical and pseudo), totalizer inputs (physical and pseudo), and digital data-points.

If, for instance, the external temperature is measured by an analog data-point, the engineering unit of this data-point must be set to "°C" or "°F". If the electrical load is

detected by a totalizer input, the engineering unit must be set to "kWh" for kilowatt-hours.

Feedback Delay

The attribute "Feedback Delay" determines the time delay between, e.g. when a pump switched on (and detected) and when this status is made available to a program.

High/Low Alarm/Warning Limits

Specifying limit values

In the case of analog inputs (e.g. inputs for sensing room temperature) and pseudo analog points (for instance, internally computed data-points for the heating flow setpoint), two minimum and two maximum monitored limit values may be entered.

The following four limit value attributes exist:

- Low Warning Limit
- Low Alarm Limit
- High Warning Limit
- High Alarm Limit

Exceeding the limit values generates an alarm.

Example: Monitoring supply air temperature limits (see Fig. 10).

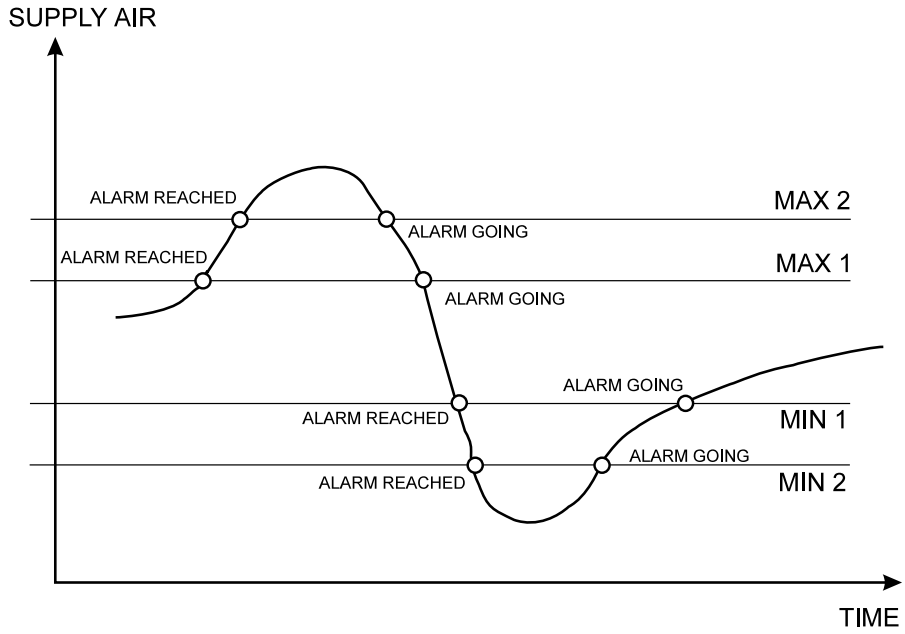

Fig. 10. Monitoring supply air temperature limits

Hours Run

Display of elapsed hours

The attribute "Hours Run" returns the total number of hours during which any of the stages is in the ON position. However, if more than one stage is in the ON position, the "Hours Run" count is not added up, but rather counted only once.

Display of the elapsed hours run with activated hours run logging (see also "Hours Run Log" on page 16).

NOTE: If the attribute "Active State" of the point is 0, then the OFF position is also counted.

Hours Run Log

Hours run log

An hours run log can be carried out for digital data-points (physical and pseudo) and for flexible data-points, e.g. logging the hours run by a heating circuit pump. This requires the decision: hours run log = Yes/No to be made in the attribute "Hours Run Log". The accumulated hours run are displayed in the attribute “Hours Run”. Hours run are logged with a sample rate of 1 minute.

Hours Since Serviced

Display hours run since last maintenance

The elapsed hours run since the last maintenance work are totaled in the attribute "Last Maintained". If, for example, the maintenance alarm is 500 hours, and a pump has already been running for 120 hours, then the entry in the attribute “Last maintained” will be 120 hours. By comparing the attributes "Maintenance Alarm" and "Last Maintained", the user can see that the next maintenance period will be after a further 380 hours have elapsed.

If the maintenance alarm is reached, and the maintenance work has been performed, the counter can be reset manually. The counter can also be reset manually before reaching the maintenance alarm if, for instance, the maintenance has been performed earlier.

If the counter is not reset, on expiration of the maintenance alarm, e.g. after 500 hours, the elapsed hours run continues to be incremented, and a further alarm will be generated when 1000 hours running has been reached.

Hysteresis

The following hysteresis attributes allow the user to control the triggering conditions based on a changing parameter under which actions are taken, such as alarm signaling, writing values to buffers, etc. A hysteresis can be used, e.g., to prevent an alarm from being generated unless the value being monitored changes by more than a given value. This eliminates unnecessary alarm generation and reduces bus communication traffic.

Alarm Hysteresis

Alarm hysteresis (V1.5.x)

In the case of analog inputs and pseudo analog points, the attribute "Alarm Hysteresis" is available. It provides variable hysteresis that can be implemented, e.g., in order to reduce communication costs to a remote central.

The hysteresis value is set from an MMI and can have a value anywhere in the range defined by [10^{-a} to (Max1 - Min1)] where “a” is the number of decimal places set in the attribute "Engineering Unit". The minimum value for the hysteresis is 10^{-a}.

Alarms are generated under the following conditions:

- Max 1 Alarm (generated if MAX 1 is exceeded)
- Max 2 Alarm (generated if MAX 2 is exceeded)
- Max 2 Normal (generated if the value falls below MAX 2-Hysteresis)
- Max 1 Normal (generated if the value falls below MAX 1-Hysteresis)
- Min 1 Alarm (generated if the value falls below MIN 1)
- Min 2 Alarm (generated if the value falls below MIN 2)
- Min 2 Normal (generated if the value MIN 2+Hysteresis is exceeded)
- Min 1 Normal (generated if the value MIN 1+Hysteresis is exceeded)

The CARE default value (i.e. 1% of actual value and no less than 0.2) for this attribute is 0. Access to "Alarm Hysteresis" is also possible via RIA/WIA.

NOTE: The number of decimal places can only be changed from CARE.

NOTE: Attempting to enter a hysteresis value that is less than the allowed minimum will result in the attribute being assigned the minimum value as defined above.

Example:

In this example, the number of decimal places in the attribute "Engineering Unit" has been chosen to have a value of 2. Fig. 11 shows an example data-point value as a function of time that increases and decreases over the range from Max 1 to Min 1.

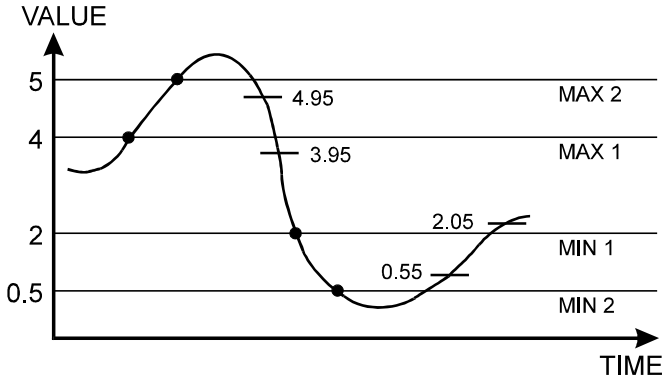

Fig. 11. Example of alarm hysteresis

The “normal” and “alarm” states as defined by the attribute "Alarm Hysteresis" are the determined using the appropriate values in the formula given above:

Range = [10^{-2} to (Max1 -Min1)] = [0.01 to 2]

Table 4 lists the resulting alarm conditions for the chosen hysteresis value of 0.05:

Table 4. Alarm conditions for alarm hysteresis

Limit	Normal to alarm condition	Alarm to normal condition
Max 1	4.00	4.00 - 0.05 = 3.95
Max 2	5.00	5.00 - 0.05 = 4.95
Min 1	2.00	2.00 + 0.05 = 2.05
Min 2	0.5	0.5 + 0.05 = 0.55

Trend Hysteresis

Trend hysteresis (V1.5.x)

The attribute "Trend Hysteresis" is available for the trend functions “Local Trend Data” and “Trend Setup Data”. The attribute "Trend Hysteresis" prevents new values from being written to the trend buffer unless the data-point value changes (positively or negatively) at more than the specified trend hysteresis. The minimum hysteresis value is 10^{-a} (a = number of decimal places set in the attribute "Engineering Unit"). The CARE default value (i.e. 1% of actual value and no less than 0.2) for this attribute is 0. Access to "Trend Hysteresis" is also possible via RIA/WIA.

This value can be edited from an operator interface (XI581AH (not with XCL5010, Excel 100C), XI582AH, XI584, or Excel 50 MMI) via the B port (XC5010C/XC6010) or the serial port, the system bus (XBS 1.3.3 and higher and XFI 1.6.1 and higher) and CARE RIA/WIA statements. The password level for this attribute is determined by the attribute "Access" (default initialization value in CARE is 0).

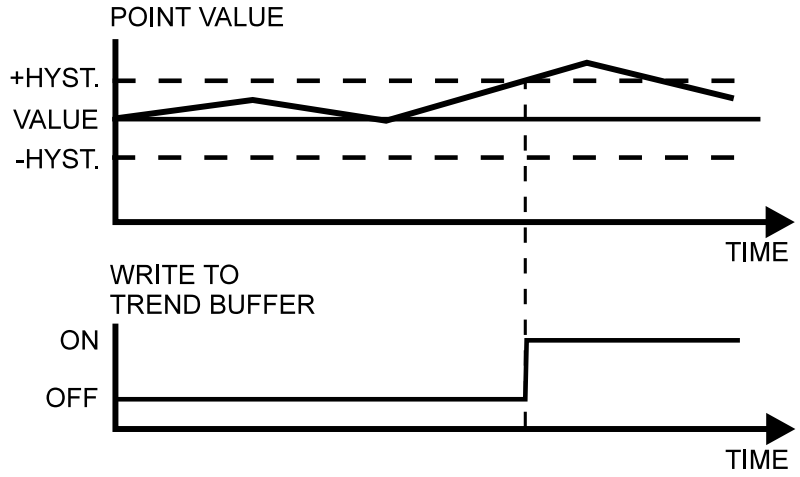

Fig. 12. Example of the attribute "Trend Hysteresis"

Broadcast Hysteresis

Broadcast hysteresis (V1.5.x)

The attribute "Broadcast Hysteresis" is available for the data-point type "Global Analog". The attribute "Broadcast Hysteresis" prevents new values from being broadcast to other controllers unless the data-point value changes (positively or negatively) at least by the amount specified in the attribute "Broadcast Hysteresis". The minimum hysteresis value is 10^{-a} (a = number of decimal places set in the attribute "Engineering Unit"), but not smaller than 0.2 (see also the example in section "Value Hysteresis" on page 30). The CARE default value (i.e. 1% of actual value and no less than 0.2) for this attribute is 0. Access to the attribute "Alarm Hysteresis" is also possible via RIA/WIA.

This value can be edited from an operator interface (XI581AH [not with XCL5010, Excel 100C], XI582AH, XI584, and Excel 50 MMI) via the B port (XC5010C / XC6010) or the serial port (Excel 100C, Excel 500), the system bus (XBS 1.3.3 and higher and XFI 1.6.1 and higher), and CARE RIA/WIA statements. The password level for this attribute is determined by the "Access" attribute (default initialization value in CARE is 0). If several global points (remote points) are assigned to the same physical point, the lowest global point "Broadcast Hysteresis" value of all assigned global points is used.

Intrinsic Hysteresis for Analog Input Signals

A minimum default hysteresis of 37 mV (24 - 1 bit) for 0 to 10 V input signals is implemented. Due to the nonlinearity of NTC sensors, the hysteresis varies over the temperature range, whereas it is approximately constant for PT 100/1000/3000 and Balco 500 sensors. Approximations of hysteresis depending on the sensor and temperature range are summarized below.

NOTE The Intrinsic Hysteresis for Analog Input Signals is **not** a user-programmable attribute, but rather an intrinsic hysteresis of the Excel 50/100/500/600.

NTC 20k Ω Hysteresis varies nonlinearly over the entire temperature range and depending on whether the upper boundary (MAX LIMIT) or the lower boundary (MIN LIMIT) is exceeded. The approximations shown in Table 5 can be used in practice (intermediate values can be interpolated):

Table 5. Intrinsic hysteresis values for various temperature ranges

Temperature range	Average hysteresis MIN LIMIT	Average hysteresis MAX LIMIT
-40 °C (-40 °F)	2.2 K (4.0 °F)	2.5 K (4.5 °F)
-30 °C (-22 °F)	1.3 K (2.3 °F)	1.3 K (2.3 °F)
0 °C (32 °F)	0.4 K (0.7 °F)	0.4 K (0.7 °F)
40 °C(104 °F)	0.5 K (0.9 °F)	0.4 K (0.7 °F)
80 °C (40 °F)	1.5 K (2.7 °F)	1.5 K (2.7 °F)
100 °C (212 °F)	3.0 K (5.4 °F)	2.7 K (4.9 °F)
130 °C (266 °F)	8.5 K (15.3 °F)	7.2 K (13.0 °F)

PT 100 (not with Excel 100C) Hysteresis increases approx. linearly with temperature.

Average hysteresis: 0.75 K (1.35 °F)
Hyst. At -45 °C (-49 °F): 0.7 K (1.3 °F)
Hyst. At 145 °C (293 °F): 0.8 K (1.4 °F)

PT 1000/1 Hysteresis increases approx. linearly with temperature.

Average hysteresis: 0.8 K (1.4 °F)
Hyst. At -45 °C (-49 °F): 0.7 K (1.3 °F)
Hyst. At 145 °C (293 °F): 0.9 K (1.6 °F)

PT 1000/2 Hysteresis increases approx. linearly with temperature.

Average hysteresis: 1.6 K (2.9 °F)
Hyst. At 0 °C (32 °F): 1.3 K (2.3 °F)
Hyst. At 400 °C (752 °F): 2.0 K (3.6 °F)

PT 3000 (not with Excel 100C) Hysteresis increases approx. linearly with temperature.

Average hysteresis: 0.8 K (1.4 °F)
Hyst. At -45 °C (-49 °F): 0.7 K (1.3 °F)
Hyst. At 145 °C (293 °F): 1.0 K (1.8 °F)

Balco 500 (not with Excel 100C) Hysteresis decreases approx. linearly with temperature.

Average hysteresis: 0.9 K (1.6 °F)
Hyst. At -50 °C (-49 °F): 1.0 K (1.8 °F)
Hyst. At 150 °C (293 °F): 0.7 K (1.3 °F)

Input/Output Status Text (prior to V2.04.xx)

2 status texts per digital data output Two status texts can be assigned to each digital data-point status. Status texts give an overview of the condition of the sensor or switching device connected to the data-point.

The associated status text appears in the attribute "Value" depending on the actual point status.

For instance, the status texts could be as follows for a point connected to a digital output:

Digital point status 0: Status Text: "Passive”

Digital point status 1: Status Text: "Active”

Table 6. Relationships between Input/Output Status, Active Status, and Status Text

Input/Output Status	Active State (prior to V.2.04.x)	Status Text
0	0	Active
0	1	Passive
1	0	Passive
1	1	Active

Status Text with flexible data-points

The attribute "Status Text" allows you to describe the value sent to the controller by the digital output Pulse 1 and by flexible data-points. In the case of flexible data-points of the type "feedback", the status text refers to the value of the feedback flexible data-point and not to the required value.

Input/Output Status Text (V2.04.xx or higher)

With firmware 2.04.xx or higher, the relationship between physical output status and logical output status as defined by the attribute "Normally Open/Normally Closed" determines the display of the equivalent status text. See section "Normally Open/Normally Closed (V2.04.xx or higher)" on page 24 for details.

Interval Count

Interval count

The attribute "Interval Count" shows the totalizer value (pulse x scaling factor) accumulated since the last reset.

Displaying the interval count

The attribute "Interval Count" can be viewed on the XI581AH, XI582AH, and Excel 50 MMI operating units as well as via the XI584 Operating Software and building Supervisor centrals like XBS, EBI and XFI. Based on mathematical rounding, it is possible that not every value is displayed when high frequency values with high scaling factors are received.

Resetting the interval count

Resetting takes place either manually via an operating unit, by reaching the “Interval Limit” value, or by reaching the “totalized” constant, which is 2 to the power of 31.

Totalizer overflow

When the “Interval Limit” or the “totalized” constant is reached, a “Totalizer Overflow” system alarm is created.

Interval Limit

The attribute“Interval Limit” is that value of the "Interval Count" attribute which, when reached, will generate a “Totalizer Overflow” alarm. The highest possible value for the attribute "Interval Count" is 99,999,999.

Electrical energy example

A message should be generated after the “consumption” of 5 MWh of electrical power. The input in the attribute “Interval Limit” must therefore be 5 MWh.

Once the interval count reaches its reporting level of 5 MWh, then a report is generated, the interval count is reset to “Zero”, and a new totalizing period is started.

I/O Characteristic

The attribute "I/O Characteristic" enables the user to display special input and output characteristics (see Fig. 13) for analog inputs/outputs. Special characteristics permit, for instance, the adaptation of Excel 50/100/500/600 to many different sensor types. Ten individual input/output characteristics are available per Excel 50/100/500/600 controller.

Each special characteristic is assigned a name that can be recalled from the attribute "I/O Characteristic". Thus, the desired characteristic can be assigned to the selected data-point.

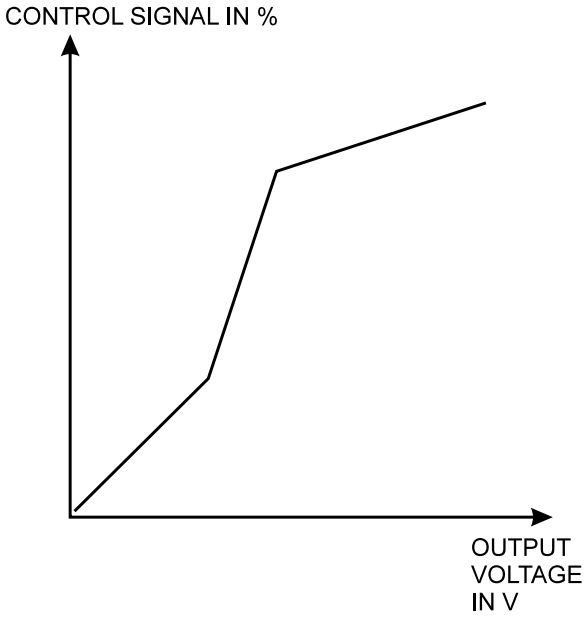

Fig. 13. Example of a special output characteristic

Creation of characteristics is carried out at programming level. Up to a maximum of four reference points can be specified per characteristic. Up to 10 different characteristics can be defined for each controller.

Pull-Up Resistor Handling (O.S. 2.04.00 or higher)

High-Impendance Sensors and Active Sensors

When high impedance sensors and active sensors are connected to the XFL521B, Excel 50, and Excel 100 inputs, the recognized value will not differ significantly from the measured value if the pull-up resistor is de-activated as follows:
Put the character "@" as the first digit of the chosen input characteristic name in the CARE text editor.

Example:
Characteristic name: "@0-10V"; the internal pull-up resistor is then disabled.

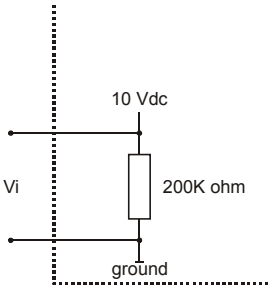

Fig. 14. Analog input / high-impedance sensors

NTC and Low-Impedance Sensors

Characteristic name: "NTC"; the internal pull-up resistor is then enabled.

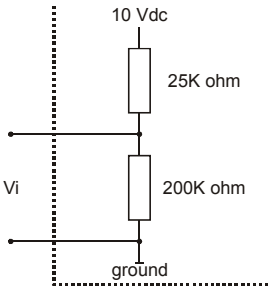

Fig. 1. Analog input / low-impedance sensors

Pull-Up Resistor Handling when Using Analog Inputs as Digital Inputs (O.S. 2.03.xx)

When the input is identified as a DI point in CARE (DI subtype AI), the internal pull-up resistor is disabled.

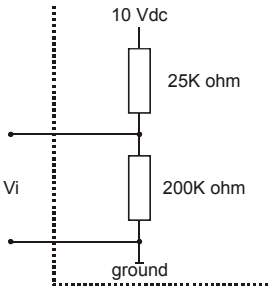

Fig. 15. Analog inputs identified as DI point (O.S. 2.03.xx)

Pull-Up Resistor Handling when Using Analog Inputs as Digital Inputs (O.S. 2.04.00 or higher)

When the input is identified as a DI point in CARE (DI subtype AI), the internal pull-up resistor is enabled.

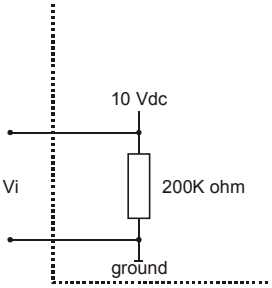

Fig. 16. Analog inputs identified as DI point (O.S. 2.04.00 or higher)

Last Change

In the attribute "Last Change", the last change of state of a digital input/output is stored with the time and date.

In this way it is possible to determine the last switch-on point of a fan, pump, etc. connected via a digital output.

In the case of analog inputs and pseudo analog points, the last time an alarm limit occurred is stored.

Maintenance Alarm

Specifying a maintenance alarm

In the case of those data-points for which an hours run log has been activated, a time entry can occur within the attribute "Maintenance Alarm" to indicate after how many operational hours an alarm message should be generated. Entering “Zero” results in no alarm message.

Example:

Maintenance should be carried out every 500 hours on the heating circuit pump controlled via a digital output. To achieve this, a time interval duration of 500 hours is entered in the attribute "Maintenance Alarm" for this data-point. At the same time, activation of the hours run log must also take place in the attribute “Hours Run log” for this data-point.

An alarm message now occurs after 500 hours, to bring to the operator’s attention the necessary pump maintenance.

Manual Value

When the attribute "Operating Mode" is set to "Manual", the operator can enter a manual value or state, and the application program will work with this manual value or state until the operating mode is set back to “Automatic”.

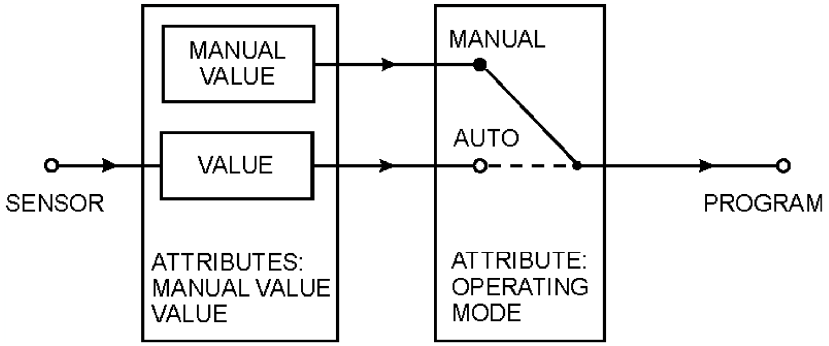

Fig. 17. Example of a sensor input

In Fig. 17, the attribute "Operating Mode" is set to "Manual", i.e. the value entered manually is processed in the application program.

NOTE:

“Value” and “Manual Value” are online attributes, only relevant during controller operation via MMI or Excel Online (Formerly XI584).
Furthermore “Manual Value” is an internal online attribute only, not visible to the operator ! The operator will only see the online attribute “value”, which can be edited only, when the attribute "Operating Mode" is set to "Manual".

See also section "Operating Mode" on page 25 for details.

Network Variable (V2.04.xx or higher)

Data-points which are mapped to network variables on the LONWORKS network have an attribute named "Network Variable" containing the network variable index (0-4095) and the network variable name which allows this information to be displayed on an MMI.

Normally Open/Normally Closed (V2.04.xx or higher)

The attribute "Normally Open/Normally Closed" defines the relationship between the input/output signal of a digital data-point and its logical status. This attribute is also applicable when the digital point is the basic point of a flexible data-point.

NOTE: The attribute "Active State" is fixed at 1 and is no longer relevant for applications designed for this controller firmware version. Applications designed for an older controller version will still work with this firmware though, and in that case the attribute "Active State" is still active.

Table 7 and Table 8 show the relationship between the I/O signals, the attributes, and the logical status for digital inputs and digital outputs, respectively.

Table 7. The attribute " Normally Open/Normally Closed " – Digital Inputs

Input Signal	NO/NC Attribute	Logical Status	Text Displayed
Low (<2.5V)	NO	0	Passive
High (>5V)	NO	1	Active
Low (<2.5V)	NC	1	Active
High (>5V)	NC	0	Passive

Table 8. The attribute " Normally Open/Normally Closed " – Digital Outputs

Output Signal	NO/NC Attribute	Logical Status	Text Displayed
Low (<2.5V)	NO	0	Passive
High (>5V)	NO	1	Active
Low (<2.5V)	NC	1	Active

High (>5V)	NC	0	Passive

Motor Run Time

Time to open / time to close

For actuators controlled via a three-position output, two values (time to open / time to close) can be entered in the attribute “Motor Run Time”. This attribute defines the time required by the actuator to change from the “Open” to the “Closed” state, and vice versa.

If no value is entered for the “Time to Closed” motor run time, then the “Time to Open” motor run time is assumed automatically. In the case of the motor run-on time, when reversing directions, 1% of the “Time to Open” motor run time is added to the calculated time.

The three-position output relay energizes when the calculated run time reaches 500 ms. The stated run time always amounts to 500 ms or a multiple thereof. A calculated run time of, for instance, 1215 ms results in an actual run time of 1000 ms.

Off Phase

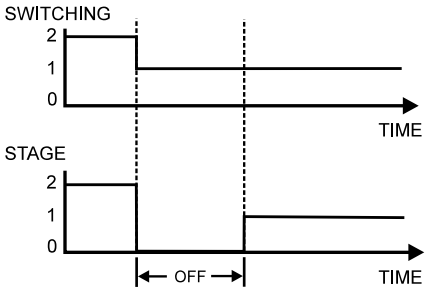

Fig. 18. Off phase

The attribute "Off Phase" is used in conjunction with flexible data-points of the type "feedback". It defines the duration of the OFF phase on switching down. It is of relevance only if the attribute “Switching Down” is set to 0, i.e. if OFF phases are selected on switching down.

- Range: 0 to 255s
- Default value : 10s
- Resolution: 1s

The OFF phase has to be defined for devices with large inertia, such as fans.

Operating Mode

The attribute "Operating Mode" enables the user to switch between manual and automatic operation.

Automatic Under automatic operation, the controller processes the values at the inputs, for instance from temperature sensors. For outputs, under automatic operation, the status shown by the user/time switch program is adopted, e.g., "Heating circuit pump off".

Manual During manual operation, the controller uses the manual values, for example, "flow temperature setpoint = 60°C". Outputs adopt the preselected condition, for example, "Heating circuit pump on".

Automatic/Manual Alarm

For automatic operation, the attribute "Operating Mode" contains the inputs "Auto" and "Manual". Each switch from automatic to manual operation and back again generates a critical alarm.

Remote (V2.0.x) (not Excel 100C)

If manual override controls are present on either the Analog Output (XFL522) or Digital Output (XFL524) modules connected via a LONWORKS network, then the status of these controls (automatic/manual override) is stored in the attribute "Operating Mode". If the manual override controls are set to automatic, the attribute "Operating Mode" can be set to either automatic or manual. If the manual override controls are set to manual override, then the attribute "Operating Mode" can be in the remote mode, only.

Fig. 19 and Fig. 20 demonstrate the relationship between the attribute "Operating Mode", and both the attributes "Value" and "Manual Value" for input and output functions.

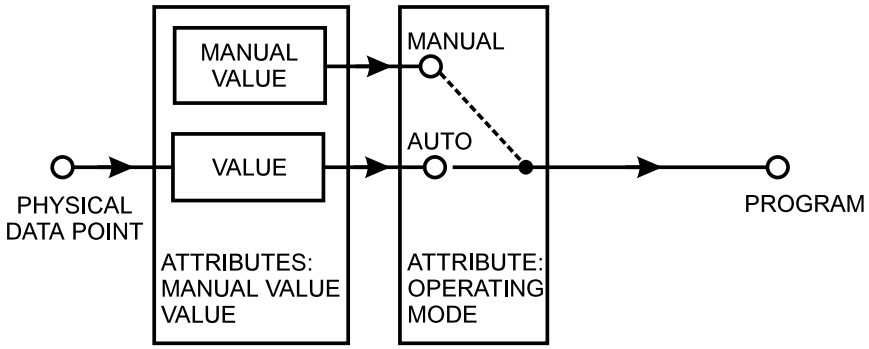

Fig. 19. Control flow for input functions

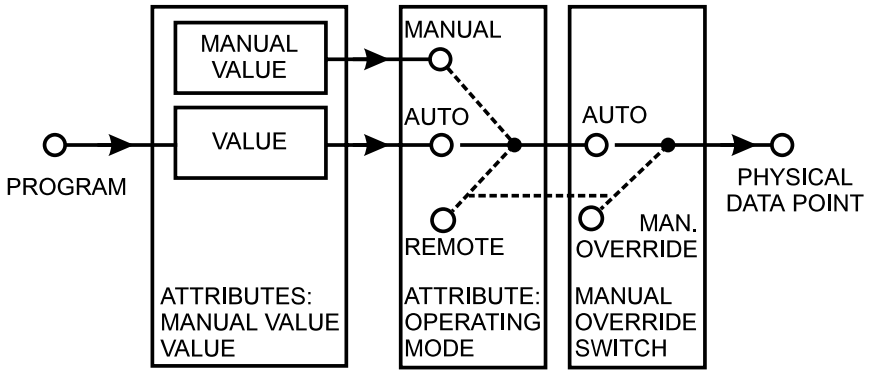

Fig. 20. Control flow for output functions

NOTE: The attribute "Remote" is available only if Manual Override modules are installed on the Distributed I/O output modules. This attribute is therefore not applicable to Excel 50/100/600.

Analog Points

Table 9 indicates the analog point signals depending on the attribute "Operating Mode":

Table 9. Analog point signals

	Auto operating mode	Manual operating mode	Remote** operating mode
Automatic value*	20%	don't care	don't care
Manual value	don't care	10%	don't care
Remote value	don't care	don't care	50%
Resulting value	20%	10%	50%
Output signal	2 V	1 V	5 V

* Automatic value is either the physical point value (inputs) or the value from the program (outputs)

** Output only (V2.0.x)

Digital points

Table 10 indicates the digital point signals depending on the attribute "Operating Mode":

Table 10. Digital point signals

	Auto operating mode	Manual operating mode	Remote** operating mode
Automatic value*	ON	don't care	don't care
Manual Value	don't care	OFF	don't care
Remote value	n/a	n/a	ON
Resulting Value	ON	OFF	ON
Output signal	HIGH	LOW	HIGH

* Automatic value is either the physical point value (inputs) of the value from the program (outputs)

** Output only (V2.0.x)

Alarming

The change from the 'automatic' to the 'manual' mode will create a point alarm if other alarm conditions are set accordingly.

Firmware prior to V.2.04.x

With controller firmware prior to V.2.04.xx, the alarm will report the status of the operating mode as it was BEFORE the change.

Firmware V.2.04.x

Beginning with controller firmware V.2.04.x, the alarm will report the status of the operating mode as it is *after* the change.

Output Type

Three-position outputs are digital outputs. From an operational viewpoint, they are assigned the same data-point description as analog outputs, i.e. a three-position output possesses attributes similar to those of an analog output.

Analog or 3-position output

The attribute "Output Type" determines whether the analog output data-point description should be assigned to an analog output or to a three-position output.

The following inputs are possible:

- Continuous: The analog output data-point description is assigned to an analog output.
- Three-position: The analog output data-point description is assigned to a three-position output.
- Remote three-position: Output to the Excel 100 MCE 3 and MCD 3 output modules.

Subtype

The attribute "Subtype" is used in conjunction with digital outputs and flexible data-points. It determines whether the digital output is of the nonpulsed type.

Point Alarms

The attribute "Point in Alarm" refers to alarm messages from the alarm attributes "Min. Limit", "Max. Limit", and "Alarm Status".

The attribute "Point in Alarm" indicates whether or not those data-points using these attributes are currently in alarm.

The following entries are possible:

- Yes = the chosen data-point is in alarm
- No = the chosen data-point is not in alarm

As soon as an alarm occurs (e.g. through exceeding a limit value), the attribute "Point in Alarm" is set to "Yes". The attribute is immediately set back to "No" when the limit value returns to normal.

Pulse Duration

The attribute "Pulse Duration" is used for the pulsed subtypes of the digital output (i.e. "Pulse 1") and flexible data-points of the type "Pulse 2". It defines the duration between coming and going edge of a pulsed signal. The values for this attribute can vary from 1 to 255 seconds; the resolution is 1 second. The default value is 1 second.

NOTE: After a power failure or disconnection of the controller, the “Pulse 1” and “Pulse 2” outputs will resume their last output pulse behavior before the outage.

Scaling Factor

Input pulses from utility meters (gas, water, heat, etc.) can be connected to the totalizer inputs using the attribute "Scaling Factor". The pulses supplied by the meters are multiplied by the scaling factor and are then ready to be read as pure consumption values. The "Scaling Factor" thus always indicates the value of each pulse received.

The adjustable range is 0.0 through 100,000,000.0,

The number of decimal places depends on the selected engineering unit.

Example: A heat meter supplies 10 pulses per kWh "consumed". Accordingly, the scaling factor (= value of a pulse) is 0.1 kWh/pulse.

Pseudo totalizers: In the event that you have selected the data-point type "pseudo totalizer inputs," you must set the attribute "Scaling Factor" to "1"; otherwise, the number of pseudo totalizer inputs will not be counted.

Sensor Offset

The attribute “Sensor Offset” is designed for the compensation of the resistance of the sensor wiring for low-resistance sensors, like Pt 100, Pt 1000, Balco 500.

The voltage offset due to the wire resistance is approximately constant, the attribute “Sensor Offset” functionality has therefore been designed to compensate constant voltage offsets at the analog input.

Function principle

The principle is that the attribute “Sensor Offset” can be defined at a selected temperature, e.g., 1 °C at 20 °C. The Excel controller processes this temperature offset into a voltage offset, e.g., -0.11 V, and applies this very voltage offset for correcting (offsetting) all voltages measured.

In order to display a temperature, the controller processes the resulting voltage back into a temperature. This principle and the processing (including mathematical rounding) from “°C” into “volt” and back into “°C” leads to slightly inconstant offsets across the temperature range.

Example for a selected “Sensor Offset” of 1°C:

Measured Temperature	Corrected Temperature
20°C	19°C
-10°C	-8,4°C

Suppress Point

The attribute "Suppress Point" means that data-points are no longer processed and checked. As a result, no alarms are generated for suppressed points.

Where you have flexible data-points, this attribute acts upon all basic types of physical data-points.

IMPORTANT

Never suppress a data-point used via your application program. This causes system failure.

Switching Down

The attribute "Switching Down" is used in conjunction with flexible data-points of the type "feedback". On switching down from one stage to another, it determines whether the off-phase is selected between the single stages, e.g., for ventilators, or whether the next lower stage is selected directly, e.g., for electrical air heaters.

Switching down	Switching down behavior
0	3, OFF, 2, OFF, 1, OFF
1	3, 2, 1

Switch-On Counter

Record switching frequency

The attribute "Switch-On Counter" gives information about the switching frequency of digital data-points. The change of state from 0 to 1 is counted in each case.

Technical Address

Technical address

An Excel 500/600 controller consists of 16 Distributed input/output modules with a total of 128 physical inputs and outputs. The Excel 100C provides 36 physical I/Os (see Excel 100C Installation Instructions, form no. EN1R-144, for technical addresses). Where a system requires additional inputs and outputs, several controllers can be connected together. Controllers then communicate with one another via the system bus.

Each physical data-point within the system must have an address that identifies the point uniquely. The technical address contains information about the controller number, the I/O module number, and also the input/output number in this module (see Fig. 21).

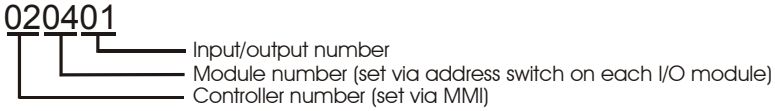

Fig. 21. Example of a technical address

Thus, the address 02.04.01 uniquely identifies the first input/output in the fourth module of the second controller in your system.

NOTE: The Excel 50 controller does not have I/O modules, but its technical addresses follow the same pattern, with module numbers referring to internal I/O boards. For details, see the Excel 50 Installation Instructions.

Mapped points (V2.04.xx or higher)

Data-points that are mapped only to LONWORKS network variables are not assigned to any I/O board. In this case, the board number (module number) of the technical address is zero.

Trend Logging

Up to 20 data-points (all data-point types, except for global data-points) in each controller can be trend logged simultaneously. This means changes in the input or

output value can be stored with the user address, value (or status), date, and time for 20 different data-points. This is achieved by selecting the attribute "Trend Logging" to YES in the data-point description.

RAM controllers (V2.04.xx or higher)

Excel 50 controllers with the XD52-FC and XD52-FCL application modules, as well as the XC5210C controllers have increased RAM capacity and can support up to 100 data-points in remote trend. See "Adjustable Remote Trend Buffer (V2.03.xx or higher)" on page 54 for additional information regarding remote trending.

For analog values (see Fig. 22), the value, e.g., 20 °C / 68 °F, is displayed in addition to the user address, date, and time. For digital values (see Fig. 23), the status text, e.g., "On", is displayed in addition to the user address, date, and time.

Trend log:		Outdoor temp.
31.07.97	11:20	17.6°C
31.07.97	11:07	17.0°C
31.07.97	10:45	16.4°C
31.07.97	10:03	16.0°C
31.07.97	09:23	15.6°C

Fig. 22. Trend log display (analog input)

Trend log:		Extract fan
31.07.97	17:00	off
31.07.97	16:22	on
31.07.97	13:45	off
31.07.97	09:23	on
31.07.97	06:10	off

Fig. 23. Trend log display (digital input)

200 values can be written to the local trend log memory. If the memory is full, the earliest data is overwritten with new data. The 200 most up-to-date values are always available in the memory.

If several data-points are selected for the trend log, those data-points whose value or status changes more frequently will create a larger number of values to be logged.

Each change in status is logged for digital points. For analog points, there are two different types of trending: value hysteresis and time-based. The data-point attributes for each of these types of trending are described below.

Value Hysteresis

When value hysteresis trending is selected (i.e. when the attribute "Trend Cycle" is set to 0), a new value is written to the memory when the point changes more than the given hysteresis compared to the previous value.

The default hysteresis value is 1% of the actual value, but not less than 0.2 (see also section "Trend Hysteresis" on page 17).

Example 1: The current measured value is 20°C

1 % of 20°C = 0.2°C

A new trend log value is stored at either 20.2°C or 19.8°C

Example 2: The current measured value is 9°C

A new trend log value is stored at either 9.2°C or 8.8°C

The trend can be displayed as text and as a graphic. The graphic display offers the following features:

- Simultaneous display of an analog and a digital data-point

- Auto-scaling of the time and the value axis
- Scrolling the time axis
- Manual re-scaling of the time axis (ZOOM/UNZOOM function) with possible
  - resolutions:
  - minute display
  - hourly display
  - daily display
  - weekly display
- Quick change between graphic and text display

Trend Cycle (V2.03.x)

With V2.03.xx firmware, it is possible to perform time-based trending for physical and pseudo analog points for both local and remote trending. A trend value is stored in the trend buffer at the end of a fixed interval given by the data-point attribute "Trend Cycle", as shown in Fig. 24:

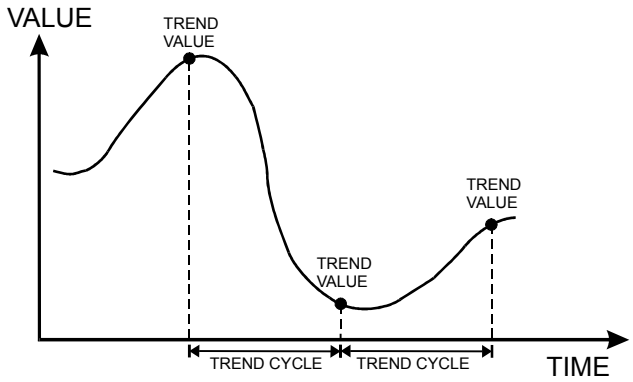

Fig. 24. The attribute "Trend Cycle"

The value of the attribute "Trend Cycle" is given in minutes, and the valid range is 0 to 1440 min (=24 hours). A trend cycle value of 0 will disable time-based trending (this is the default) and value-hysteresis trending is used if the trend log attribute is set. The value for the attribute "Trend Cycle" can be changed via the MMI, C-Bus, or modem connection to XBS, and also via CARE RIA/WIA statements.

NOTE If the attribute "Trend Cycle" is set to anything other than 0, trending will be time-based and the attribute "Trend Hysteresis" will be ignored.

User Address

The attribute "User Address" is a sequence of up to 18 letters and numbers assigned to each data-point (physical and pseudo).

Example The temperature of a room is recorded at a sensor input, then the associated user address could be as follows:

Room Temp.1.10 (Room temperature, 1st floor, room 10)

The data-point can be accessed directly by selecting this user address on the XI581AH (not with XCL5010, Excel 100C), XI582AH, and XI584 operator interfaces or the XL50-MMI.

In the case of basic types of physical data, a user address always corresponds exactly to one technical address (see Table 11).

The user address of flexible data-points may refer to up to six technical addresses.

Table 11. Number of technical addresses for flexible data-points

Flexible data-point	Number of technical addresses
Pulse 2	2
Multi-stage	up to 6
Feedback	up to 6 (in pairs of 2)

Value

When the controller is working in automatic (the attribute "Operating Mode" is set to "Auto"), the value currently being processed by the program, or the current status, can be found in the attribute "Value".

The attribute "Value" for an analog input could contain, for example, the current room temperature of 21 °C / 70 °F.

A pump switched by a digital output could contain the current status of the pump, for example ON, in its attribute "Value".

Write Protection

The attribute "Write Protection" (XBS only) stops data from being overwritten. The default setting of the attribute is 0 (="No"). If the data-point needs to be protected, then "No" must be overwritten with a value between 0 and 100.

- 0 = No write protection
- 100 = Highest priority required

To change this attribute, the operator must log in at an operator level that corresponds to the current write protection attribute (see Table 12).

Table 12. Access values for operator levels

Operator level XBS	Access for write protection values
1	no access
2	no access
3	0 to 60
4	0 to 80
5	0 to 100

The operator's authority level is compared to the write protection status of the data-point to establish whether or not any modification can be made.

As soon as the operator receives permission, he can alter the attribute of secured data-points. The operator can also set the write protection to a higher value or cancel write protection completely.

Example: A data-point with a write protection value of 61 can only be altered at operator level 4 or 5.

The write protection can be reduced to 0 from level 4 as well as level 5. The data-points can be altered through level 3. A detailed high priority can then be given through the write protection.

NOTE: When online, the XI581AH (not with XCL5010, Excel 100C), XI582AH, and XI584 operator interfaces and the XL50-MMI do not recognize the attribute "Write Protection". You can still change any data-point via the user interface, even if the data-point is write-protected.

List of Data-Point Attributes

Different attributes are assigned to each data-point type. Table 13, Table 14, and Table 15 list the attributes assigned to the various data-point types:

Table 13. Data-point attributes

Analog input	Analog output	Digital iInput	Digital output	Digital output (Pulse 1)
User Address	User Address	User Address	User Address	User Address
Descriptor	Descriptor	Descriptor	Descriptor	Descriptor
Technical Address	Technical Address	Technical Address	Technical Address	Technical Address
Suppress Point	Suppress Point	Suppress Point	Suppress Point	Suppress Point
Access Level	Access Level	Access Level	Access Level	Access Level
Write Protection	Write Protection	Write Protection	Write Protection	Write Protection
Operating Mode	Operating Mode	Operating Mode	Operating Mode	Operating Mode
Value	Value	Value	Value	Value
Manual Value	Manual Value	Manual Value	Manual Value	Manual Value
Engineering Unit	Engineering Unit	Alarm Delay	Alarm Type	Alarm Type
I/O Characteristic	I/O Characteristic	Alarm Type	Alarm Reporting	Alarm Reporting
Sensor Offset	Alarm Reporting	Alarm Status	Trend Logging	Trend Logging
Low Warning Limit	Trend Logging	Point in Alarm	Hours Run Log	Hours Run Log
Low Alarm Limit	Subtype	Alarm Reporting	Hours Run	Hours Run
High Warning Limit	Time to Open	Trend Logging	Service Interval	Pulse Duration
High Alarm Limit	Time to Close	Hours Run Log	Hours Since Serviced	Service Interval
Alarm Delay	Trend Hysteresis	Hours Run	Active State	Hours Since Serviced
Alarm Type	Trend Cycle	Service Interval	Active State Text	Active State
Point in Alarm	Suppress Alarm	Hours Since Serviced	Passive State Text	Active State Text
Alarm Reporting	NV Name and Index	Active State	Cycle Count	Passive State Text
Trend Logging		Active State Text	Last Changed	Cycle Count
Alarm Status changed		Passive State Text	Subtype	Last Changed
Alarm Hysteresis		Last Changed	Suppress Alarm	Subtype
Trend Hysteresis		Cycle Count		Suppress Alarm
Trend Cycle		Suppress Alarm		NV Name and Index *
Sensor Offset		Normally Open/ Normally Closed	Normally Open/ Normally Closed	
Suppress Alarm		NV Name and Index *	NV Name and Index *	
NV Name and Index *				
* Read-only attribute. Changing the NV name and index requires changing the data-point to NV mapping in CARE.				

Table 14. Data-point attributes

Totalizer input	Pseudo totalizer input	Pseudo analog point	Pseudo digital point	Pseudo point multistage
User Address	User Address	User Address	User Address	User Address
Descriptor	Descriptor	Descriptor	Descriptor	Descriptor
Technical Address	Suppress Point	Access Level	Access Level	Point Enable
Suppress Point	Access Level	Write Protection	Write Protection	Access
Access Level	Write Protection	Operating Mode	Operating Mode	Write protection
Write Protection	Operating Mode	Value	Value	Operating Mode
Operating Mode	Value	Manual Value	Manual Value	Value
Value	Manual Value	Engineering Unit	Alarm Type	Value Manual
Manual Value	Engineering Unit	Low Warning Limit	Alarm Delay	Status Text
Engineering Unit	Alarm Type	Low Alarm Limit	Alarm Status	Alarm Type
Alarm Type	Trend Logging	High Warning Limit	Point in Alarm	Trend Logging
Trend Logging	Scaling Factor	High Alarm Limit	Alarm Reporting	Hours Run log
Scaling Factor	Interval Limit	Alarm Type	Trend Logging	Hours Run
Interval Limit	Interval Value	Alarm Delay	Hours Run Log	Maintenance Alarm
Interval Value	Suppress Alarm	Point in Alarm	Hours Run	Last Serviced
Suppress Alarm		Trend Logging	Service Interval	Last Change
		Alarm Status changed	Active State	Switch on Counter
		Alarm Hysteresis	Hours Since Serviced	Number of Stages
		Trend Hysteresis	Active State Text	Suppress Alarm
		Trend Cycle	Passive State Text	NV Name and Index *
		Suppress Alarm	Cycle Count	
		NV Name and Index *	Last Changed	
			Suppress Alarm	
			NV Name and Index *	
* Read-only attribute. Changing the NV name and index requires changing the data-point to NV mapping in CARE.				

Table 15. Data-point attributes

Global data-point (analog)	Global data-point (digital)	Flexible data-point (type: Pulse 2)	Flexible data-point (type: feedback)	Flexible data-point (type: multi-stage)
User Address	User Address	User Address	User Address	User Address
Descriptor	Descriptor	Descriptor	Descriptor	Descriptor
Technical Address	Technical Address	Technical Address 1/2	Technical Address 1/2/3/4/5/6	Technical Address 1/2/3/4/5/6
Access Level	Access Level	Suppress Point	Status	Suppress Point
Write Protection	Write Protection	Access Level	Switching down	Access Level
Operating Mode	Operating Mode	Write Protection	Off phase	Write Protection
Value	Value	Operating Mode	Delay switch up	Operating Mode
Manual Value	Manual Value	Status	Delay switch down	Value
Engineering Unit	Alarm Type	Manual Status	Feedback Delay	Manual Value
Low Warning Limit	Alarm Delay	Status Text	Operating Mode	Status Text
Low Alarm Limit	Alarm Status	Alarm Type	Manual status	Active State
High Warning Limit	Point in Alarm	Trend Logging	Status Text	Alarm Type
High Alarm Limit	Alarm Reporting	Hours Run Log	Suppress Point	Alarm Reporting
Alarm Type	Trend Logging	Hours Run	Access Level	Trend Logging
Alarm Delay	Hours Run Log	Pulse Duration	Write Protection	Hours Run Log
Point in Alarm	Hours Run	Service Interval	Trend Logging	Hours Run
Trend Logging	Service Interval	Hours Since Serviced	Hours Run Log	Service Interval
Alarm Status changed	Active State	Last Changed	Hours Run	Hours Since Serviced
Alarm Hysteresis	Hours Since Serviced	Cycle Count	Service Interval	Last Changed
Trend Hysteresis	Active State Text	Suppress Alarm	Subtype	Cycle Count
Trend Cycle	Passive State Text		Hours Since Serviced	Suppress Alarm
Suppress Alarm	Cycle Count		Alarm Type	
Broadcast Hysteresis	Last Changed		Point in Alarm	
	Suppress Alarm		Alarm Reporting	
			Last Changed	
			Cycle Count	
			Suppress Alarm	

TIME PROGRAMS

Time programs allow you to set values and control states for specific data-points at specific times.

You can adapt time programs to suit the structure of your system.

Network-wide time synchronization

Time synchronization of all devices connected to the system bus is carried out by the controller designated as the synchronization master. Synchronization is based on date, hours, minutes, and seconds to an accuracy of ± 120 seconds (see also "Network-Wide Controller Time Synchronization" on page 51).

Structure

Flexible time programs

An Excel 50/100/500/600 time program can consist of several individual time programs. You define these individual time programs according to their function and assign a name to each one. This means you can generate a time program for each section of your system or building.

Time programs are created on the basis of the following modules:

- daily programs.
- weekly programs;
- annual programs;

Further, these modules can be modified as needed using the following two functions:

- the special day list;
- the “TODAY” function.

Daily programs are combined to form a weekly program. The weekly program is then automatically copied repeatedly to form the annual program. If you need to execute a different daily program on certain days of the year, you can enter the customized daily program directly in the annual program.

The special day list and the "TODAY" function are available as additional features. The special day list allows you to mark specific days as being legal holidays. You can also use the special day list for floating legal holidays, for example Good Friday and Easter Monday. The "TODAY" function allows you to overwrite time program assignments "ad hoc" for a defined time period without permanently changing the entire time program.

Individual Time Programs

Daily Program

Daily programs are the basic building blocks of any time program. Using daily programs, you enter the switching times with the desired setpoints and switching conditions for the data-points.

When preparing a daily program and assigning the name, there is initially no specific relationship to a particular day in the week.

The modular structure of the time program makes it possible for the user to establish various different daily programs, keep them in a library, and to include them in the weekly program as desired. The user is free to extend the list of daily programs to meet his special requirements.

The repeated use of the same daily program is also possible (for example, the same daily program can apply from Monday to Friday in the weekly program).

Changes in a daily program are immediately effective in the weekly and annual programs as well as in the special day list.

A daily program can also have the name "Sundays and holidays", for example. The names of the daily program provide a reference to the switching points. In the "Workday 22 hr" daily program, the setpoint is reduced from 22.0°C to 12.0°C at 22.00 hr.

The daily programs of the heating loops are independent from each other. In spite of their having the same name, such as "Sunday and holidays", the daily programs for all heating circuits are distinguished through the user addresses defined. The same also applies to the service water loop daily programs.

The switch points and values can therefore be changed as desired in any daily program without influencing another daily program.

The exact procedure for creating a daily program is described in the Operating Instructions.

Switching points

A daily program can be regarded as a module that contains information about switching times related to the duration of one day. It contains all user addresses addressed in this time interval.

The number of switching points per user address is not restricted.

These switching points are defined by means of a switching time, referenced user address, and a setpoint value or control state. The switching times are set to the minute. Several switching points can be allocated to one switching instant. Switching points can be re-entered, changed, or deleted to modify the daily program. The permissible range (minimum or maximum value) for a user address or its control state is defined in the data-point description. No values may be entered outside this range.

New daily program

Daily programs can be generated at operator level 2 (read and limited changes) of the XI581AH (not with XCL5010, Excel 100C), XI582AH, and XI584 operator interfaces and the XL50-MMI. It is possible to assign a name to a daily program generated on the XI584.

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The daily program is automatically assigned the name "DPn" (English language) or "TPn" (German language) (n = sequence power of the daily program) if no name is assigned by the user or, if the program is generated on the XI581AH (not with XCL5010, Excel 100C) or XI582AH operator interfaces or the Excel 50 MMI. Once selected, program names can be changed via the XI584.

Application

Daily programs are used in the following sections of time programs:

1. To generate weekly programs
2. For direct entries in annual programs
3. For holidays in the special day list

Deleting a daily program

If a daily program is to be deleted, the system will check whether this program is still required in the time program. This daily program cannot be deleted if it is still contained in the time program.

Weekly Program

A separate weekly program is generated for each time program. The weekly program defines which daily program is to be used for which weekday. A daily program is assigned to each day of the week (Monday to Sunday). It is also possible to assign the same daily program to several weekdays. The weekly program, if defined, is automatically copied for each week in the annual program.

If a change is made to a weekday in a weekly program, this change will affect the weekday in every week of the year. If a daily program is entered directly in the annual program, this daily program will have priority over the daily program from the weekly program.

The definition of a weekly program forms the basis of the annual program.

Annual Program

The annual program is structured like a calendar and consists of successive weekly programs. It provides an overview of which daily programs are valid on which

calendar days. If the daily program in a weekly program does not apply on a particular calendar date, another daily program can be entered for it directly in the annual program.

The annual program starts on the current day. Each day, the time frame shifts one day. Days added at the end are automatically assigned the daily program from the weekly program. This ensures that every day is assigned a daily program.

Entries in the annual program must therefore be made only if a daily program differing from the one selected is to be used. An undefined daily program to be inserted in the annual program can be defined in the daily program.

Special Day List

One special day list exists per time program. It makes a number of holidays and special days available to which a daily program can be assigned. This daily program will then apply to this holiday or special day every year. The date of floating holidays is calculated automatically by the Excel 500. If no daily program is entered on certain holidays, the special day list is not taken into account on this day.

The following holidays and special days are contained in the list:

- New Year's Day (1st January)
- Epiphany (6th January)
- Monday before Ash Wednesday
- Shrove Tuesday
- Ash Wednesday
- Good Friday
- Easter Sunday
- Easter Monday
- Labor Day (1st May)
- Ascension Day
- Whit Sunday
- Whit Monday
- Corpus Christi
- Assumption Day (15th August)
- Day of German Unity (3rd October)
- Reformation Day (31st October)
- All Saint's Day (1st November)
- Day of Prayer and Repentance
- 1st to 4th Sundays in Advent
- Christmas Eve (24th December)
- Christmas Day (25th December)
- Boxing Day (26th December)
- New Year's Eve (31st December)
- First Saturday in the month (Germany)

If a daily program that has not yet been defined should be entered in the special day list, it must first be defined in the "Daily program" section of the time program.

NOTE: To activate the special day list, you must set the special day status to ON.

The "TODAY" Function

Using the "TODAY" function, it is possible to perform on/off changes to setpoint values or control states without having to access the annual program or to define a new daily program. New setpoint values or control states and the period of validity (i.e. start and end) for a specific user address are defined. These changes are carried out at operator level 2 of the XI581AH (not with XCL5010, Excel 100C), XI582AH, and XI584 operator interfaces or the Excel 50 MMI. The start time must be within 24 hours from the entry time. The end time must be within 24 hours from the start time. The duration of the change can thus amount to a maximum of 24 hours. The entry is deleted automatically after the end time point is exceeded.

Generating a Time Program

A new time program is defined at operator level 4 (programming level) of the XI584 or on the Excel CARE engineering system. The new time program is given a name and assigned a user address. This process thus defines which user addresses are to be referenced by the time program.

Up to 20 time programs can be defined for each Excel 500. The time programs are extremely flexible. The switching points for a section of the system or building are usually combined in one time program. It is also possible to combine all data-points in one time program.

The following steps can also be carried out at operator level 2 (read and limited changes) of the XI581AH (not with XCL5010, Excel 100C), XI582AH, and XI584 operator interfaces and the XL50-MMI.

1) Daily programs are generated and given a name.
2) User addresses with a switching time and setpoint value or control state are entered in the daily program.
3) A daily program is assigned to each weekday in the weekly program section after the daily programs have been generated.
4) This weekly program is automatically copied for each week in the annual program.

The generation of an executable time program is now complete.

If, on a certain day in the annual program, a daily program differing from the one specified in the weekly program is to be used, this new daily program can be entered directly in the annual program. The defined weekly program is not modified and continues to be used on those days which have not been modified, in any way, in the annual program.

Any changes to be made to switching times, setpoint values, or control states must be carried out in the daily programs.

The special day list is available. It contains a number of holidays; a different daily program can be assigned to each holiday. Once assigned to a holiday, the daily program will apply on this holiday every year. That is valid for holidays with fixed date (for example New Year’s Day or Christmas Eve) as well as for floating holidays (Ascension Day, Good Friday). The dates of floating holidays will be calculated automatically by Excel 500. If there are no entries, then the existing daily program of the annual program remains valid on that holiday.

ALARM HANDLING

The Excel 50/100/500/600 alarm handling facility offers a high degree of security by both storing and immediately displaying all alarms that occur at the operator interfaces.

The user chooses whether an alarm is critical or non-critical. The user can also create personalized alarm texts, if required.

If your Excel 50/100/500/600 is connected to a central or a modem, critical alarms are transmitted as high priority.

Point Alarms

The type of alarm generated by a data-point depends on the type of data-point involved. Furthermore, there are alarm types which are valid for all data-points or refer to system alarms in the control unit.

Limit monitoring

In the case of an analog input or pseudo analog point, two maximum limits (limit Max. 1, limit Max. 2) and two minimum limits (limit Min 1, limit Min 2) can be set for a particular value. The limit values are entered in the data-point description. Each time this limit value is reached, irrespective of the direction, an alarm is triggered. If, for example, a measured value takes on a value that exceeds a maximum limit or drops below a minimum limit, an alarm is generated (alarm reached).

If the value returns from the alarm range to the normal range and, in doing so, reaches a limit value in the opposite direction, an alarm signal is given in the same way (alarm reached).

Since this sequence is identical for all four limit values, a total of eight different alarm signals are possible for one analog data-point. These eight alarm signal texts are programmed permanently, and need no input from the user.

Alarm status

In the case of a digital input or pseudo digital point, a decision can be made whether or not an alarm check is desired. The entry is made in the data-point description.

Prior to V.2.04.x

Alarm Check Enter "Yes"

No Alarm Check Enter "No"

If an alarm check is desired, an alarm signal is produced if the digital point changes from Active State to Passive State (alarm reached). When the digital point returns to Active State, a further signal is generated (alarm going). The two alarm signal texts are permanently programmed and need no input from the user.

The fixing of active and passive states must be carried out in the data-point description under the attribute "Active State".

0 = Active state with "0" signal

1 = Active state with "1" signal

V.2.04.x

The attribute "Active State" is fixed to “1”.

This means that the alarm status is no longer dependant upon the attribute "Active State", but rather only upon the physical contact status and upon the logical status as defined in the online attribute "Normally Open/Normally Closed".

Maintenance Alarm

In the case of a digital input, a digital output, or a pseudo digital point, the hours run time entry can be activated and a maintenance interval can be fixed. If the latter is exceeded, an alarm signal is generated. The text of this signal is permanently programmed and needs no input from the user.

If a check is to be skipped, a "0" is entered in the data-point descriptor under the attribute "Maintenance Interval".

Totalizer

A pulse input signal interval can be fixed for a totalizer input that, if exceeded, triggers an alarm signal. The alarm signal text is permanently programmed and needs no input from the user.

If a check is not desired, a "0" is entered in the data-point description under the attribute "Interval Count".

Operational status

All data-points can be switched from the 'automatic' to the 'manual' operational mode. Each time the operating mode is changed, irrespective of the direction involved, a critical alarm signal is generated. Both alarm signal texts are preprogrammed and need no input from the user.

Remote (V2.0.x) (not with Excel 100C)

If a manual override control is changed on a Distributed I/O module, an alarm “overr.switch_manu” or “overr.switch_auto” is generated and the “manu” value is transmitted.

Alarm suppression in manual mode

Under controller firmware 2.06.02 and higher, the following data-point alarms can be suppressed for as long as the corresponding data-points are in the 'manual override' mode:

- min. and max. limit alarms (of analog data-points, only);
- status alarms (of digital data-points, only).

This alarm suppression is activated during CARE engineering by inserting the "at" sign ("@") at the beginning of the descriptor text of the pseudo data-point "Startup".

Benefits:

As long as this alarm suppression is in effect, the repair or replacement of defective and/or malfunctioning (flickering) inputs (resulting e.g. from sensor breakage, sensor short-circuiting, defective alarm switches, etc.) can be performed while the corresponding data-point is in the "manual override" mode.

NOTE: Only when using XFI 2.1.0 SIM1 will the event behavior and visualization behavior be identical to that of Honeywell Deltanet controllers.

System Alarms

Operating errors that occur in a control unit or during communication with other Excel 50/100/500/600 units are recognized and displayed by the computer module. These alarm signals can relate, for example, to a defective module, the need to change the buffer battery (data protection), or the presence of one digital output module too many (maximum 10). These alarm signal texts are preprogrammed. They are always critical alarms.

Table 16. System alarms

Alarm no.	Alarm text (English)	Cond. code #	Cause/reason
1	AI Module Defect	25	Maximum conversion time was exceeded while testing ADC (defect on an AI card).
2	AI 0 Volt Error	24	While measuring GND voltage on an AI card, one value greater than 0.5 V was measured (AI card defect).
3	AI 5 Volt Failure	23	While measuring the 5-V reference voltage on an AI card, one value greater than 5 V or smaller than 4.5 V was measured (AI card defect or incorrect power supply of AI card).
4	MAX 2 alarm	2	Alarm limit for AI-, PA points
5	MAX 2 normal	76	Alarm limit for AI-, PA points
6	MAX 1 alarm	1	Alarm limit for AI-, PA points
7	MIN 2 alarm	4	Alarm limit for AI-, PA points
8	MIN 2 normal	78	Alarm limit for AI-, PA points
9	MIN 1 alarm	3	Alarm limit for AI-, PA points
10	MAX 1 normal	75	Alarm limit for AI-, PA points
11	MIN 1 normal	77	Alarm limit for AI-, PA points

Alarm no.	Alarm text (English)	Cond. code #	Cause/reason
12	Alarm memory full	22	1) After starting the Field I/O Task with the parameter "INIT", the default data-point description couldn't be installed because USX didn't provide enough storage space for sending CNAP telegrams. 2) Alarm send buffer full.
13	Alarm	6	Alarm condition control for DI , PD points.
14	Return to normal	79	Alarm condition control for DI, PD points.
15	Hware clock failed	61	Error while initializing the system clock.
16	Battery low	17	Battery voltage too low or battery not existent.
17	Battery status OK	87	Battery voltage back to normal again (alarm occurs only after alarm message "Battery low").
18	Wrong Module ID	71	An invalid module ID is read (error on internal I/O or defect module or the module has an as-yet unspecified module ID).
19	Too Many DO Module	60	Too many modules of the same type (XF521, XF522, ...).
20	Contr. w/o Flash	81	Error occurred when burning the Flash EPROM.
21	FLASH Mem Full	82	Not enough Flash memory space to save application.
22	Link Point Alarm	-	Xlink alarm.
23	Link Comm Down	-	Xlink alarm.
24	No characteristic	57	The application part "Characteristics" is defect.
25	RCL Submod missing	-	RACL sub-module missing.
26	Download SSI Now	-	Xlink alarm.
27	Download CPU Now	-	Xlink alarm.
28	RACL inconsistent	29	Incompatible version numbers of RACL program and RACL parameter files and/or data-point description.
29	Nested submodules!	30	RACL program contains errors (MCAL from submodule).
30	alarm message 158	-	Alarm not used.
31	RACL undef. OpCode	32	RACL program contains errors (undefined Operation code).
32	RACL program fault	33	RACL program contains errors (Checksum changed).
33	Unknown data-point	34	1) During RACL run, data-point contains errors or point is locked. 2) An unrecognized (missing) characteristic in the data-point editor has been used. Check if the default file set of the controller is different from the default files set used in CARE.
34	SSI Points Active		Xlink alarm.
35	Invalid operation	36	Non-valid arithmetical operation during RACL performance (e.g. division by zero or RACL statements LN with input value 1.0).
36	RACL overflow	37	Arithmetic overflow at RACL performance "+infinite".
37	RACL neg. overflow	38	Arithmetic underflow at RACL performance "-infinite".
38	RACL inval. OpCode	39	RACL program contains errors (invalid Operation Code).
39	Z-Reg. index error	40	Access to non-existing Z register (e.g.: RACL statements ISTO and IRCL).
40	Invalid Y-Register	41	Too many statements (exits) in one column.
41	Invalid P-Register	42	Attempt to use nonexistent P register.
42	Invalid T-Register	43	Attempt to use nonexistent T register.
43	Invalid Z-Register	44	Attempt to use nonexistent Z register.
44	SSI Interface Up	-	Xlink alarm.
45	No parameter file	-	RACL parameter file missing.
46	No Z file	-	RACL Z register file missing.

Alarm no.	Alarm text (English)	Cond. code #	Cause/reason
47	No T file	-	RACL time register file missing.
48	Part applic. miss	46 47 48 49 52	1) No RACL program. 2) No parameter file. 3) No Z register file. 4) No T register file. 5) No data-point description.
49	RACL environ fault	26	1) Submodule does not exist.
		27	2) Parameter file missing.
		28	3) No M0 module.
		31	4) Invalid SKIP destination.
		34	5) Info points STARTUP, SHUTDOWN, or EXECUTING_STOPPED are missing or 6) During RACL start data-point contains errors.
		1	7) free programmable application loaded into Excel 50 controller (system alarm parameters set to 0,0,0).
50	INIT div. by zero	14	Reason of new start: Division by zero.
51	INIT under OpCode	15	Reason of new start: the system software contains an undefined Operation Code.
52	Power failure	16	Reason of new start: Powerfail, Data in RAM ok.
53	Link Config Bad	-	Xlink alarm.
54	I/O board missing	19	The required configuration contains at least one module which is not included in the hardware configuration.
55	Unused I/O board	18	The hardware configuration contains at least one module that is not needed (can be taken out).
56	HW Config. failure	20	1) Hardware Configuration file (.kfx file) not complete loaded. 2) Different modules are plugged under the same address (set using the rotary HEX switch) in the required configuration and in the hardware configuration. 3) An application containing NV-mapping is rejected by the target controller because the hardware does not have the 3120E5 Neuron® chip.
57	Wrong version no.	21	The version number of the application files and the configuration file are not the same.
58	Totalizer overflow	5	Overflow operation hours counter, point value of counters and interval impulse counter.
59	Maintenance alarm	7	Course of a service interval for digital points or course or the message/calling interval for counters. Call intervals for counters.
60	Undef. RACL input	62	Undefined RACL errors.
61	Too many Globals	63	The loaded application contains too many Remote points. An application with more than 46 NVs has been rejected for download into an Excel 50 free programmable controller located on a LONWORKS network.
62	C-Bus error	64	Communication defect/disturbance between an Excel 500 and a C-Bus submodule. Logical modem device in the controller has got a C-Bus number that is already in use for a C-Bus controller.
63	No Globals memory	9	No remote storage; the remote controller has no storage left for requested remote points.
64	Global pnt missing	10	The user address of the remote point was not found in the remote controller.
65	Glob Pnt Occupied	11	A remote output to a remote controller is already assigned to another controller.
66	CPU stopped	12	The remote controller is in stopped condition.
67	CPU not available	13	The remote controller is switched off or does not respond to C-Bus communication.
68	Init. actuators	65	Floating outputs (3-position outputs) are synchronized.
69	WARM START	66	Reason of new start: watchdog.
70	COLD START	67	Reason of new start: power failure, data in RAM destroyed.
71	Point in manual	68	When falling back to password level 3 there are still points in manual override.
72	Report too large	69	Not enough space in the Report File for Initialization.
73	XI 581 required	70	After a download, an entry is demanded in the initializing phase of the ASPECD application. This can only happen with XI581 emulation.
74	New appli. loaded	74	Download of a new application part or entire application.
75	Auto operation	80	Point is in automatic mode.

Alarm no.	Alarm text (English)	Cond. code #	Cause/reason
76	Manual operation	8	Point is in manual override mode.
77	Too many trend pnt	73	Too many points in trend.
78	No C-BUS refresh	110	No memory to execute refresh / trend functionality.
79	Template too long	85	Template for wildcard search too long.
80		206	Only used for MCR200 controllers. MCR200 rejects the setting of summer time if it is done with corresponding function of XBS or XI584.
81		207	Only used for MCR200 controllers. A weekday is allocated to the daily programs of another weekday by copying the corresponding data. While copying, the name of the daily programs (weekday) remains whereas it would be exchanged by allocation.
82		83	Only used for MCR200 controllers. Texts from XIP100 or MCR200 Fax were not able to be loaded into the MCR200.
83	B-Port Download	100	Download was done via B-Port. In addition to this alarm, one of the following alarms is displayed: 88 to 98.
84	C-Bus Download	101	Download was done via C-Bus. In addition to this alarm, one of the following alarms is displayed: 88 to 98.
85	B-Port change	102	Online changes were done via B Port. In addition to this alarm, one of the following alarms is displayed: 88 to 93.
86	C-Bus change	103	Online changes were done via C-Bus. In addition to this alarm, one of the following alarms is displayed: 88 to 93.
87	Device logged	84	Operator has logged himself in with MMI via C-Bus (Remote Login). Not sent on C-bus.
88	DDC Parameter	-	This alarm is shown in addition to one of the following alarms: 83 to 86.
89	DDC Z-Register	-	This alarm is shown in addition to one of the following alarms: 83 to 85.
90	DDC T-Register	-	This alarm is shown in addition to one of the following alarms: 83 to 84.
91	Data-Points	-	This alarm is shown in addition to one of the following alarms: 83 to 86.
92	Time Program	-	This alarm is shown in addition to one of the following alarms: 83 to 86 and 101.
93	ASPECD Program	-	This alarm is shown in addition to one of the following alarms: 83 to 85.
94	Alarm Texts	-	This alarm is shown in addition to one of the following alarms: 83 and 84.
95	Characteristics	-	This alarm is shown in addition to one of the following alarms: 83 and 84.
96	Descriptors	-	This alarm is shown in addition to one of the following alarms: 83 and 84.
97	Engineering Units	-	This alarm is shown in addition to one of the following alarms: 83 and 84.
98	State Texts	-	This alarm is shown in addition to one of the following alarms: 83 and 84.
99	Field I/O	-	This alarm is shown in addition to one of the following alarms: 101.
100	Glob.Pnt.Transfer	-	This alarm is shown in addition to one of the following alarms: 101.
101	Applic. stopped	104 105 106 107	Application task was stopped. This alarm, together with one of the following alarms, is shown: 92, 99, 100, 102.
102	DDC Program	-	This alarm is shown in addition to one of the following alarms: 83 to 86 and 101.
103	I/O board present	108	A module which is part of the required configuration but was missing in the hardware configuration has been added to the hardware configuration again.
104	Time dev. > 2 min	98	A time deviation greater than 2 minutes has been detected on a device on the C-Bus.
105	Manual time sync.	99	Somebody has changed the system time of the C-Bus devices via a local MMI.
106	Dig.Out.Conflict	109	Application error: An Excel 50 digital output uses a triac which is already used by a 3-position output.
107	Overr. switch auto	111	Manual override switches on Distributed I/O output modules are reset to automatic mode.
108	Overr. switch manu	112	Manual override switches on Distributed I/O output modules are set into override mode (values coming from the XL controller will be overwritten by the switches).
109	Hardware Failure	88	A Distributed I/O module was removed from the LONWORKS network or a sensor break or a sensor short-circuit or missing NV update from a bound NV was detected on a Distributed I/O module.
110	Hardware OK	89	A missing Distributed I/O module was reconnected to the LONWORKS network or a missing sensor was reconnected on a Distributed I/O module or a sensor break / short-circuit was repaired or a missing NV update from a bound NV was supplied.

Alarm no.	Alarm text (English)	Cond. code #	Cause/reason
111	M-Bus (Excel 50, only)	-	Only used in Excel 50 fixed applications. This alarm is shown together with M-Bus-related alarms.
112	OVFL crit. alarms	113	Critical alarm buffer full.
113	OVFL non-crit. al.	114	Non-critical alarm buffer full.
114	OVFL trend	115	Remote trend buffer full.
115	NV Bindings lost	116	If the network interface has been changed in CARE and the changed application has been downloaded, all bindings will be lost.
116	pls upload trends!	117	The remote trend buffer has reached its notification level and should be uploaded in order to avoid trend buffer overflow.
117	config data def.	118	Configuration data for the remote communication lost or corrupt due to power failure, EEPROM fault or uncharged gold cap.
118	unauthorized acc.	119	Unauthorized telephone number and/or unauthorized password tried to dial in.
119	out of memory	120	No more memory available for alarm handling.
120	Please disconnect !	121	Central X is online while remote trend buffer for Central Y exceeds the notification level. Terminate dial-up connection with the controller in order to allow it to transmit its remote trend buffer to Central Y.
121	central not avail.	122	Central could not be reached. Line occupied or disconnected.
122	config complete	123	Configuration for the remote communication received, accepted and complete.
123	modem device OK	124	Response message to the XBS life check.
124	C bus error	125	No C-Bus communication between remote communication device number and application device number. Probably the application device number is missing.
125	LON- I/O init start	126	Initialization start of the Distributed I/O modules.
126	LON- I/O init done	127	Initialization of the Distributed I/O modules finished.
127	IP-DIO conflict	128	Standard I/O module XF5xx plugged with address of already-used DIO module XFL5xx..
128	Invalid user ID	212	CARE license key tag in the application is incorrect.
129	MTO Binding failed	155	The user has tried to make more “many-to-one-bindings” during controller runtime than were specified during CARE engineering. The “many” relation of a “many-to-one-binding” (MTO) is specified during CARE engineering. (The entered “many” relation will be used to calculate the memory space taken from the controller's application memory for the “many-to-one-binding”.)
130	board missing	19	This alarm is related to the data-points on this board, in case of module defect or power failure (initialization)! The required configuration contains at least one module not included in the hardware configuration.
131	board present	108	This alarm is related to the data-points on this board, in case of module defect or power failure (initialization)! A module which is part of the required configuration but was missing in the hardware configuration has been added to the hardware configuration again.

System Alarms Suppression (V. 2.04.xx or higher)

System alarms can be suppressed during CARE engineering by inserting the "at" sign ("@") at the beginning of the corresponding alarm text in the alarm text file.

In order to avoid alarm showers at power failure and power return, separate system alarms are provided for module power failure and for input failures on the modules (see Table 17).

Table 17. Avoiding alarm data-point showers

	Reason for fault	Module alarm	Point alarm
Care 3.x applications for controller firmware V. 2.04.xx	defective module or power failure	"I/O board missing" (54) "I/O board present" (103)	"hardware failure" (109) "hardware OK" (110)
	sensor break / short-circuit or missing NV update from bound NV		"hardware failure" (109) "hardware OK" (110)
Care 4.x applications for controller firmware V. 2.04.xx	defective module or power failure	"I/O board missing" (54) "I/O board present" (103)	"board missing" (130) "board present" (131)
	sensor break / short-circuit or missing NV update from bound NV		"hardware failure" (109) "hardware OK" (110)
Care 4.x applications for controller firmware V. 2.06.xx	defective module or power failure	Due to open LON, module alarms are no longer possible!	"board missing" (130) "board present" (131)
	sensor break / short-circuit or missing NV update from bound NV		"hardware failure" (109) "hardware OK" (110)

Procedure Engineer CARE 4.x applications for controller firmware version 2.04.xx, and then suppress the data-point system alarms 109 and 110 by placing the @ character at the first position of the corresponding alarm text.

User Program Alarms

It is possible to generate alarm signals at any point in the user program by using a special program command.

The alarm text can be individually created and may contain up to 18 characters.

Data Storage

Each alarm is stored in the alarm memory that can hold up to 99 alarms. Alarm signals in the alarm memory contain neither an indication of the nature of the alarm signals in the alarm (critical/non-critical) nor an acknowledgment of the alarm on the operator interface.

The alarm memory entry contains user address, alarm text, date, and time. If the memory capacity is exceeded, new alarm signals are accepted, such that the last 99 alarms always remain in the alarm memory.

The alarm memory can be viewed on the XI581AH (not with XCL5010, Excel 100C), XI582AH and XI584 operator interfaces and the Excel 50 MMI.

Alarms Sent across the System Bus

Alarm recovery Once the capacity of the temporary alarm buffer for system alarms is reached (max. 99 alarms for firmware 2.03.xx or lower, and max. 50 alarms for firmware 2.04.x), then any additional alarms cause the data-point to be labeled "in alarm" and given a description of the type of alarm that has occurred. Labeling is carried out only for the last occurring alarm for that data-point.

When a C-bus connection to a Central has been established, then all alarm messages of the temporary system alarm buffer are sent to the Central. Afterwards, alarms for data-points that are labeled “in alarm” are sent directly to the C-bus (except those that are in alarm suppression).

If the controller’s alarm history buffer still contains information related to such an alarm, then this information is sent to the Central. Otherwise, only the alarm type is sent without data or time. In this case, the data-points appear at the Central with an asterisk indicating that the data and time shown do not correspond to the generation of the alarm.

Refresh list deletion (V1.5.x) If an XBS or XI584 is disconnected from the bus/controller, then the refresh list is deleted after a period of 2 minutes. This allows point values to be updated that are set in refresh after a short-time interruption (maximum: 2 minutes) due to a communication error.

TEST MODE (V2.03.X)

General

Excel 50/100/500 controllers feature a special test mode intended specifically for troubleshooting or system checkout and which allows manually setting outputs and verifying inputs. When entering the test mode, a set of default data-points is generated corresponding to the physical I/O of the controller. The default user addresses are coded to correspond with the physical I/O in the following way:

- AI0101: Analog input, module 1, input 1
- AO0201: Analog output, module 2, output 1
- DI0301: Digital input, module 3, input 1
- DO0401: Digital output, module 4, output 1
- 3P0101: Motor output, module 1, output 1

NOTE: Excel 50/100 controllers do not have I/O modules, but their technical addresses follow the same pattern, with module numbers referring to internal I/O boards. For details, see the Excel 50 and Excel 100 Installation Instructions.

Values are displayed (0/1 for digital points) for each of the default data-points, and the values are refreshed in this screen as they change. Outputs can be set manually via MMI. The alarm buffer records all system alarms and all changes of state of inputs.

Distributed I/O testing (V2.04.xx or higher)

Beginning with controller firmware V2.04.x, Distributed I/O modules can be checked out in the same way as described above. For details, see the Software Release Bulletin for XL500, controller firmware version 2.04.00.

COMMUNICATION

General

Control systems often need to carry out complex monitoring and control functions as part of their building management task. This is difficult if individual subsystems cannot exchange data with one another. Control applications using such equipment soon reach the performance limits of their controllers. This is because there is only a limited number of inputs and outputs available and it is difficult for the controller to monitor several processes simultaneously. In addition, it may not be economical to connect different parts of a plant because they are too far away from one another.

Equipment that has been specially designed to implement only a particular application has the disadvantages of being more expensive in the first place and inflexible to future needs.

The Excel 50/100/500/600 have a modular structure, so they can be tailored to match the plant they are controlling. The individual Excel controllers are able to communicate with one another, so that the configuration of one section of your system does not limit the overall size of your building management system.

LONWORKS communication (V2.04.xx or higher)

Excel 50 and Excel 500 controllers equipped with 3120E5 Neuron chips (date code 0044 or higher) are capable of communicating with devices on an Echelon® LONWORKS® network. For more information, see Excel 50/500 LONWORKS Mechanisms Description, EN0B-0270.

System Bus

Up to 30 Excel controllers can be connected to one another via a System Bus (C-bus). Other C-bus compatible components can be substituted for any of the 30 Excel controllers. Examples of C-bus compatible components are Excel IRC Multi-controllers, the Excel EMC, and Excel Building Supervisors. The C-bus allows controllers and devices to exchange data such as measured values, alarms log, and

trends. This means that values from one controller or device can be sent to the entire system.

Besides allowing communication between controllers and devices, the C-bus also enables the entire system to be connected to PC centrals.

When a controller does not have a modem directly connected, the C-bus also allows controllers to communicate with other controllers that do have a modem connected, so that data can be transmitted via the public telephone network.

Access

The C-bus supports multi-master communication using the token passing procedure. A bus master is a controller governing communication between bus devices. The master asks for data and then distributes the data on the bus. Controllers transmit data only when asked for it by the master or when they assume the function of the master.

Multi-master communication means that all controllers in the system can function as the master, so the right to request and transmit data is not permanently assigned to a specific controller.

This has the advantage that a part of the system can still continue working even if one of the controllers is defective.

The flow of data between devices can be structured hierarchically as part of the software in the user program. Structuring data exchange means defining what information can be exchanged between which bus devices. Communication is still carried out on the multi-master principle, but bus access time is reduced by concentrating specific data in specific controllers.

Bus Initialization

When your system first starts up, the software runs a check to see what devices are connected to the C-bus. This process is called initialization. The software stores the information as the Device Type List in the controllers.

During initialization, the bus master requests information about global data-points from each controller. At the same time, the controllers store the address of the device making the request so that the controllers can subsequently transmit the appropriate data to the appropriate device.

After initialization, each controller knows the address of the next controller with the right to transmit data. If a controller now stops communication, the bus master recognizes that this controller is no longer online and interrupts token passing. As a result, the C-bus reinitializes automatically and also updates the Device Type List, excluding controllers that are no longer online. This ensures continuous bus communication even when individual controllers go off line.

Bus Communication

The Excel 50/100/500/600 controller does not transmit any plant-specific data before the C-bus has been initialized. Controller communication depends on the user program stored in each controller. Bus-wide communication occurs when global data-points have been defined in the user program.

See "Global Data-Points" on page 7 for details on defining global data-points.

During normal operation, the bus master transmits active values. The bus master only transmits a value that has changed or that is requested by another device on initialization or when a device has been off line.

This method of exchanging data reduces the load on the bus and means controllers only store the data they need for their own communication.

I/O Runtime Synchronization

XF525

After application download and after a power failure a runtime synchronization takes place which takes the complete runtime as defined in the data-point description plus an additional 10%.

Calculated Runtime	Actual Runtime
>100%	permanently open
>96%	96% plus 100% of defined runtime (Excel 500)
	96% plus 200% of defined runtime (Excel 50)
<2%	2% minus 100% of defined runtime (Excel 500)
	2% minus 200% of defined runtime (Excel 50)
<0%	permanently closed

Internal hysteresis is 2 to 3.125% and 95 to 96% of defined runtime.

Initialization of Distributed I/O Modules

XFL52x V1.02 with Excel 500 V2.01.03

During and after initialization of the Distributed I/O modules, the output of the Remote Override Modules XFR522/XFR522A and XFR524/XFR524A will remain unchanged. This means that the output status will always remain unchanged as long as the 24 Vac power supply is applied and as long as there is no manual change at the XFRxxxx modules.

New Bus Devices

The system automatically detects new devices. When it has detected a new device, the system reinitializes so the new device is included in the Device Type List.

Network-Wide Controller Time Synchronization

Network-wide time synchronization is carried out automatically once each hour by the designated synchronization master. Each controller with firmware V2.0.xx or higher can act as a synchronization master. If the time is manually changed on any of the connected system bus controllers, then this time is adopted for synchronization. If the controller on which the time was changed is eligible as a synchronization master, then it will become the synchronization master on the bus.

Synchronization is based on date, hours, minutes, and seconds to an accuracy of ± 120 seconds across the system bus (detected after no more than 1 hour). If this time is exceeded, an alarm is generated. Daylight saving time is included in the synchronization process. Any new device added to the system bus will adopt the bus system time.

NOTE: If you enter the time on the local MMI of an older device (prior to V2.0.xx), synchronization will not be carried out. Even the locally entered time might be overwritten by a synchronization coming from a newer device (V2.0.xx or higher).

Point Refreshing

Excel controllers provides a refresh mechanism (that is adapted to the Token timing) for sending the values of the attributes "Value", "Manual Value", "Operating Mode", and "Alarm Status" to either an MMI interface or to a control central.

(A maximum of two point refresh messages can be sent while the controller is holding the Token.)

PC Communication

An Excel 50/100/500/600 system can also accommodate a PC connected to the C-bus. Multi-master communication is still supported and token passing continues between the individual bus devices. The C-bus treats controllers as being equal in rank to a PC.

Excel IRC

Excel controllers support communication with the Excel IRC control system. This system monitors and controls individual rooms within a building. The Excel IRC system communicates on the C-bus via its Multicontroller (MC). The Application control functions for Excel IRC, called ACFs, are all processed by the MC.

See EXCEL 5000 IRC Integration System Overview and Application Guide, EN3R-1182, for additional information.

Remote Communication

Excel 50/100/500/600 controllers are all able to communicate to remote building supervisors via an analog, ISDN, or GSM modem connected to them. This allows two-way communication between the building supervisors and the controllers. The Excel 100/500 controllers can store the numbers and passwords for up to three supervisors and can call them in response to critical alarms or other programmed triggers, or the supervisor can call at any time for status, trend, or alarm information. By default, the Excel 100/500 controllers can store up to 100 trend values per supervisor.

Disable dial-out (V2.04.xx or higher)

Automatic upload of the remote trend buffer can be disabled by a remote central (XBS 1.6.0 or higher). In this case, remote trend values are stored in the buffer with newest values overwriting oldest when the buffer is full, but the controller does not dial out to send remote trend buffer level alarms or to flush the buffer. The controller will still dial out for critical and uncritical alarms.

Excel 100 and 600 controllers and Excel 500 controllers with V1.5.xx firmware or earlier can, when operating as stand-alone controllers, make use of the XDM506 modem submodule mounted on the CPU board. The XDM506 can perform all of the functions of the XM100A in providing remote communication capability with up to three building supervisors.

Direct modem connection (V2.01.xx or higher)

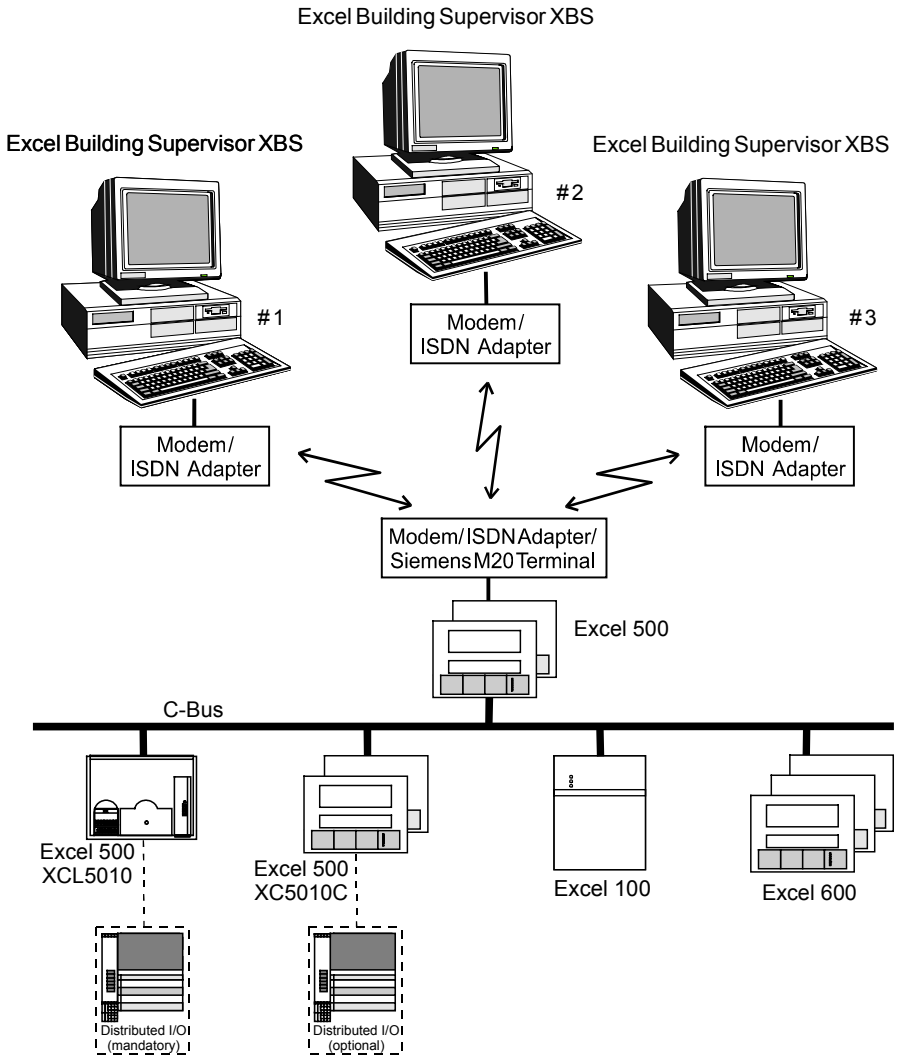
Excel 50/500 controllers with firmware version V2.01.xx or higher and Excel 100C controllers have the advantage of allowing direct connection of a modem (V2.3.xx also GSM modem) or ISDN terminal adapter to the controller for either C-Bus systems or stand-alone controller applications. No additional hardware is necessary. Excel 50, Excel 100, and Excel 500 controllers can store 100 trend values (by default) for each of up to three different building supervisors in addition to handling normal building control functions. Data transmission rates up to 38.4 Kbaud are supported when used with XBS 1.4.1 or later with modem/ISDN terminal adapter attached.

If no special modem behavior is needed, there is no need to set up or initialize the modem/ISDN terminal adapter. The Excel 50/100/500 CPU will detect the modem attached to the serial port and set the communication speed to the default value of 9.6 Kbaud. The Excel 50/100/500 CPU will also detect whether the modem/ISDN terminal adapter is initialized in auto-answer or manu-answer mode, and it will initialize the modem for manu-answer mode (S0=0).

NOTE: Remote communication to XBSi building supervisors is not supported by direct modem connection.

NOTE: IRC alarming can only be accomplished indirectly with firmware version V2.01.xx by using a separate Excel 500 controller with special operating

system firmware (XL IRC V1.03.x) which allows mapping between it and an IRC Multicontroller. In that situation, the IRC alarms are treated like normal C-Bus data.



GSM Communication (V2.03.x)

With firmware 2.03.xx or higher, data communication via the GSM 900 MHz network is supported. GSM 900MHz is the Global System for Mobile communication, also referred to as the mobile phone network or cellular phone network.

At the remote site, the cellular engine SIEMENS M20T (T for terminal) is connected to the RS232 port of the XC5010C or XCL5010 or XL50 or XL100C. On its serial port, the M20T behaves like a Hayes-compatible modem to the EXCEL 5000 controller. On its GSM port, the M20T behaves like a cellular (mobile) phone. The M20T translates EXCEL CPU data received in transparent mode into the GSM standard.

The maximum communication speed is determined by the current GSM standard, which is 9600 baud. Due to a special transmission mechanism, the effective communication throughput is lower than 9.6 Kbaud, however this is be noticeable only when high data volumes are transmitted, e.g., when application download is performed.

Adjustable Remote Trend Buffer (V2.03.xx or higher)

With firmware V.2.03.00 or higher, memory that is not used by the application can be used as additional remote trend buffer for XBS Central A. By maximizing the trend buffer size, the number of times the controller must dial-up the central is minimized as is the risk of trend samples being overwritten due to a full buffer.

By exploiting this feature, it is possible, when no application is downloaded, to use the EXCEL controller as a pure trending device.

The amount of additional memory available for the remote trend buffer is determined by the value for “Application Memory Size” entered with the MMI during the start-up sequence of the controller. This number is subtracted from the total application memory, and the resulting number, in Kbytes, is the additional remote trend buffer size. Fig. 25 illustrates the adjustable remote trend buffer.

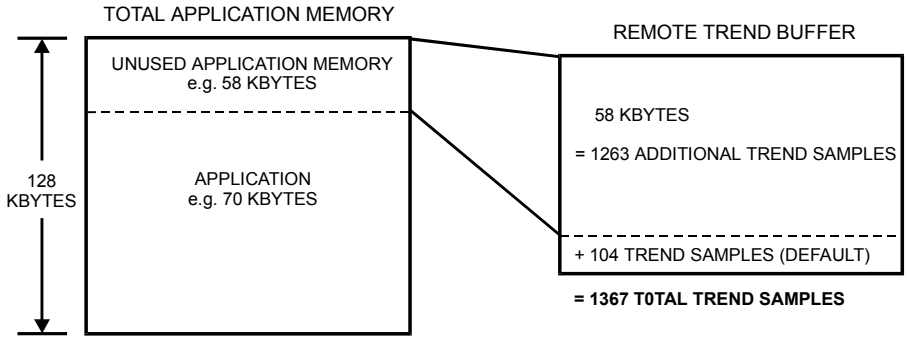


Fig. 25. Adjustable remote trend buffer example

The maximum number of trend samples will be displayed on the MMI once a value for application memory size is entered.

The adjustment range for the application memory size is the following:

Table 18. Adjustment range for application memory size

Application memory size	Trend samples in remote trend buffer
Default: 128 Kbyte	104 per central
Maximum: 128 Kbyte	104 per central
Minimum: 38 Kbyte	104 per central; PLUS “N” for central A

Large RAM controllers (V2.04.xx or higher)

For XD52-FC, XD52-FCS and XC5210C controller (512 Kbytes of RAM):

N = (128 Kbytes - appl. size (in Kbytes) + 384 Kbytes) * 1024 bytes / 47 bytes

For all other controllers equipped with Flash EPROMS:

N = (128 Kbytes - appl. size (in Kbytes)) * 1024 bytes / 47 bytes

Hence, the maximum value of N is 10,327 trend samples for Large RAM controllers and 1,960 trend samples for all others containing Flash memory. This means that for all Flash memory-equipped modules with a minimum application size of 38 Kbytes, there will be 2,064 (1,960 + 104) trend samples for central A and 104 trend samples each for central B and central C.

If an application being downloaded exceeds the application memory size, a warning message will be displayed on the MMI, and the download will not be executed.

MODEMFAQ

Detailed information and guidance can be obtained from the MODEMFAQ document, which can be found on the following servers:

http://web.ge51.honeywell.de/dep/mc/HVAC_Products/Automation_and_Control/CentralPlantControls/Modem-Interface/MODMFAQ4.DOC

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Honeywell

Control Products
Honeywell Inc.
Honeywell Plaza
P.O. Box 524
Minneapolis, MN 55408-0524
USA
http://www.honeywell.com

Control Products
Honeywell Limited-Honeywell Limitee
155 Gordon Baker Road
North York, Ontario
M2H 3N7
Canada
http://www.honeywell.ca

Control Products
Honeywell AG
Böblinger Straβe 17
D-71101 Schönaich
Germany

http://europe.hbc.honeywell.com

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