ASI Controls

Object Definitions

By ASI Controls

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This manual, ASI Object Definitions, DOC-1400 and Windows™ help system was last revised on 08/15/2007. ASI Controls reserves the right to make changes in this Users Manual, Software, or Standard Communications Protocol at any time without notice.

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This manual, ASI Object Definitions, DOC-1494, was last revised on 08/15/2007.

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Object Overview

ASIC/2 Object Configuration

ASI Controls ASIC/2 Configurable controllers feature pre-programmed objects that have very specific functions. They can be allocated, connected, and configured to develop specific control sequences.

This manual documents the operation and performance of each object in the ASIC/2-7540, ASIC/2-8540, ASIC/2-7040 and ASIC/2-8040 configurable controllers. Objects used by SINC/2-2000 and SINC/3-3000 are also defined.

Each object has a SUMMARY which provides an overview of the control block, a sequence of OPERATION that describes how the object works, and a GLOSSARY that gives the definition of each parameter that has been defined for the objects, and the definition of object properties or ATTRIBUTES that describes each parameter. Some objects also have a CONFIGURATION section that describes what parameters must be configured to use certain features.

Object

The configurable controller is made up of Objects which interact with each other. An Object performs a specific function and has inputs and outputs to interact with other objects. An Object also has properties. Example: The Clock object function is time keeping. The Clock object inputs are from the internal hardware clock. The Clock object outputs are the time and date. Other common objects are Input, Output, Schedule, and PID.

Instance

Each object may have multiple Instances, or copies. Each Instance of an object is functionally the same, but the user may configure each Instance individually. The index number identifies the specific Instance. No two instances of the same object can have the same index number. Each different Instance acts as a separate control block.

Properties

An Object has a unique set of Properties. Properties are stored in Attributes. A property (parameter) may consist of multiple Attributes, a single Attribute, or part of an Attribute. Properties are of two types: (1) User-configurable static parameters to control how the object operates:. (2) Dynamic information on the present state of the Object. Dynamic properties are available as outputs and are used by other objects in a control sequence of operation.

Select

Data in the controller is organized in Attributes. The Attributes of a given Object are predefined and stored internally as words or bytes. A Select is used to obtain the portion of the attribute that is needed.

Handle

The Object, Index, Attribute and Select together constitute a complete description of where to find information anywhere in the configuration. Collectively we describe this as a Handle. A Handle is the method by which one control block fetches data from another.

Connecting Objects

Objects are connected using data handles. Any piece of data in the controller may be referenced by specifying the object number, the index number, the attribute number, and the select.

Objects are functional elements (control blocks) that carry out particular operations such as reading a thermistor sensor and converting to temperature, controlling a damper with a PID loop based on Mixed Air Temperature, or driving a Chilled Water Valve with an analog output.

The function that they carry out can be used a number of times within the same controller. For example, a control scheme with Temp, Flow and Pressure inputs will require three instances of the Input Object. Each instance of the Input reads the appropriate electrical signal and produces a value in the correct units.

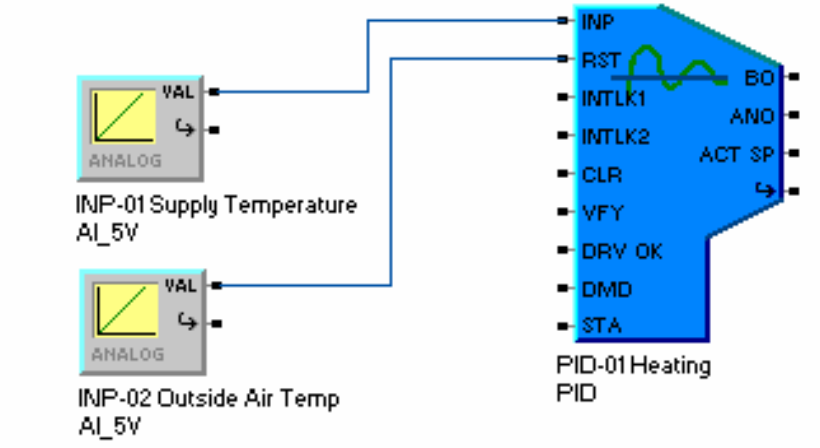
To build a sequence of operation individual object instances are linked to each other. For example, the Outside Air Temperature Input can be linked to the PID object.

Objects contain fixed and variable pieces of data that define their operation. This data is contained in the properties of the object. Setpoints, times, alarm limits, and control parameters are all examples of properties contained within an the object. The structure of the attributes is fixed by the design of the firmware. The static data attributes are configurable by the user. The dynamic attributes are changed by the control sequence as it operates. The definition and use of attributes of an object are described within this Object Definition Manual.

In order that the correct piece of information is accessed by a particular index of an Object, it is necessary to identify where the information can be found.

To uniquely identify any information within a configuration it is necessary to know

1. In which **Object** can it be found?
2. In which particular **Index** (instance) of that object can it be found?
3. Which particular **Attribute** (piece of information) is needed from the specific index?
4. How should specific information in the attribute be selected (**Select**)?



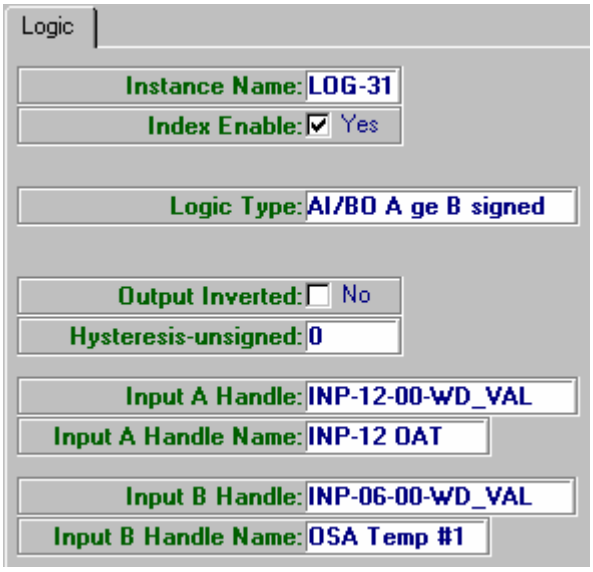
The **Object, Index, Attribute** and **Select** constitute a complete description of where to find information anywhere in the configuration and how to interpret it. Collectively we describe this as a **Handle**. It can be thought of as a set of directions to find something of interest, just as a mailing address gives clear instruction to the mail carrier about where to find your home.

A specific instance of an object uses the handle to get the present value of the information it needs for its control function from another object in the controller. The object parameter associated with the handle is updated frequently and used for control decision.

Data is always fetched from, it is not sent to an object. If our PID Loop needs Outside Air Temperature for its calculation, it fetches the data from the Input object. The PID object contains the handle for obtaining the Outside Air Temperature. One piece of information, for example Return Air Temperature, could be used by several different objects.

ASI Expert

ASI Expert Software allows selection of handles by Object, Instance, and Parameter Selection by name. For example the Logic Block has two Handles which can point to any parameter in the controller. In this case the Input A Handle points to INP-12 OAT. The handle INP-12-00-WD_VAL identifies the present value of Index 12.

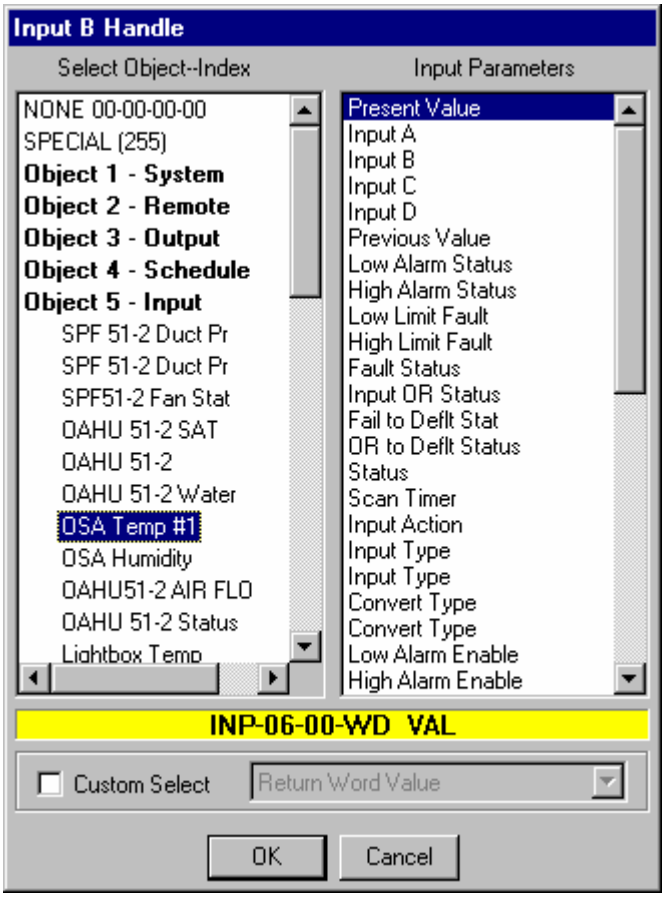


The Input A Handle has 4 elements:

INP	The Input Object
12	Index number 12
00	Attribute Number 0
WD_VAL	Select (Word Value)

ASI Expert Software takes care of this by presenting a list of parameters that are most often used as targets for handles and automatically generating the correct select. Occasionally you may wish to override this automatic selection and generate a custom select.

The Input B Handle is configured by clicking on the handle field, which brings up a dialog for Input B Handle. You may then select the object instance, and the parameter for that instance.



Object Names

The following object abbreviations and names are used with ASI Expert Software

Number	Abbreviation	Object	
0	"ALO"	"Not Assigned"	(907A,700A,740A)
1	"SYS"	"System"	(907A,700A,740A)
2	"REM"	"Remote"	(907A,700A,740A)
3	"OUT"	"Output"	(907A,700A,740A)
4	"SCH"	"Schedule"	(907A,700A,740A)
5	"INP"	"Input"	(907A,700A,740A)
6	"BLR"	"Boiler"	(907A,700A,740A)
7	"TWR"	"Cooling Tower"	(907A,700A,740A)
8	"STA"	"State"	(907A,700A,740A)
9	"AFT"	"Afterhours"	(907A,700A,740A)
10	"OPT"	"Optimum Start"	(907A,700A,740A)
11	"DEM"	"Demand"	(907A,700A,740A)
12	"CLK"	"Clock"	(907A,700A,740A)
13	"POL"	"Poll List"	(907A,700A,740A)
14	"ALR"	"Alarms"	(907A,700A,740A)
15	"LAB"	"Labels"	(907A)
15	"ANO"	"Analog Output"	(740A,840A)
16	"UTL"	"Utility"	(907A,700A,740A)
17	"MGR"	"Poll Manager"	(907A,700A,740A)
18	"PID"	"PID"	(907A,700A,740A)
19	"BRD"	"Broadcast"	(907A,700A,740A)
20	"LOG"	"Logic"	(907A,700A,740A)
21	"TIM"	"Timer"	(907A,700A,740A)
22	"CAL"	"Calculated Point"	(907A,700A,740A)
23	"TRD"	"Trend"	(907A,700A,740A)
24	"DSM"	"Display Manager"	(700I,740A,840A)

25	"DSL"	"Display List"	(700I,740A,840A)
26	"CNT"	"Count"	(700I,740A,840A)
27	"STD"	"Static Trend"	(700I,740A,840A)
28	"EVM"	"Event Manager"	(700I,740A,840A)
29	"EVL"	"Event Log"	(700I,740A,840A)
30	"FUN"	"Function"	(740A,840A)
31	"SEQ"	"Sequence"	(740A,840A)
32	"LG2"	"Logic 2"	(740A,840A)
33	"MON"	"Monitor"	(740A,840A)
34	"DIL"	"Dial Manager"	(740D,740C,840C,300B)
35	"ENC"	"Encode"	(740C,840C)
36	"CDR"	"Calendar"	(740C,840C)
37	"NOT"	"Notify"	(740E, 840E, 300B)
38	"NLG"	"Notify Log"	(740E, 840E, 300B)
39	"MBM"	“Modbus Master”	(754a1.4,854a1.4)
255	"N/A"	"Special"	

Note: With FW7/840E 1.9 and later and and FW7/854a Any handle can be a Special Handle where the Object is 255, Special, and where the Attribute and Select Bytes are used to represent a 16-bit WORD value.

Hardware Changes

SINC/3-3000 FW300B

- System Interface and Network Controller.
- RS-232 Modem and Direct Ports
- System Bus RS-485
- Local 1 and Local 2 Busses RS-485

ASIC/2-7540 FW754A

ASIC/2-7540 FW754a Ver 1.4m Release 2006-04-07
ASIC/2-8540 FW854a Ver 1.4m Release 2006-04-07

- Adds new Object 39-Modbus Master for polling devices on Local Bus

ASIC/2-7540 FW754A Rev 1.0 2005-08-10

- Flash Programmable
- 32 kbyte NVRAM

ASIC/2-7040 FW740E

ASIC/2-7040 FW740E Rev 1.0 1999-10-26

- Enhanced 34-Dial Manager implemented.
- 37-Notify and 38-Notify Log are now working.
- Hardware compatible with FW740C

ASIC/2-8040 FW840

ASIC/2-8040 FW840E Rev 1.1 Preliminary 1999-11-08

- 37-Notify and 38-Notify Log are now working.
- Hardware compatible with FW840C

ASIC/2-8040 FW840C Rev 1.0 Release 1998-06-05

- 8 kbyte EEPROM .
- Common Source Code with FW740C 2.0
- Hardware Compatible with 840B

ASIC/2-8040 FW840B Rev 1.0 Released 1996-07-08

- Adds Display and Keypad to Local Bus.

ASIC/2-7040 FW740C

ASIC/2-7040 FW740C Rev 1.0 Initial Release 1997-01-29

- o Uses faster 120 ns memory chips.
- o Adds heat sink for cooler operation.
- o Adds Connector Kit for UL Listing
- o Not Hardware Compatible with FW740B, 740D

ASIC/2-7040 FW740B, D

ASIC/2-7040 FW740D Rev 1.0 Initial Release 1996-02-26

- o Initial Release of Dial out on System Bus

ASIC/2-7040 FW740B Rev.1.0 1994-12-08 Initial Release

- o Revised circuit board.
- o Large 32 kbyte EEPROM version.
- o Jumpers to select RS-232 for Local or System Side

NOTE: FW740A boards can not be upgraded to FW740B without board modifications.

Memory Definition - ASIC/2-7040, FW740B and higher

The External Static EEPROM Memory of the ASIC/2-7040, starting with Firmware 740B, all future revisions, is now 32 kbytes. Of this 24,560 bytes can be used for static memory. To fully utilize the 32 kbytes of RAM memory, a maximum of 29,400 bytes are available now to be divided by the user between dynamic and static allocation and object data at configuration time.

ASIC/2-7040 FW740A

ASIC/2-7040 FW740A Rev 1.0 1994-05-20

- o Local Bus with Polling and Pass-through.

About this Document

This manual was produced using *Doc-To-Help*®, by Component One, LCC. This manual, ASI Object Definitions, DOC-1400 and Windows™ help system was last revised on 2007-08-09. ASI Controls is always working to improve our products. Should you have any questions, or suggestions that would help our products better meet your needs, or that would help us serve you better, please call, write, or e-mail to:

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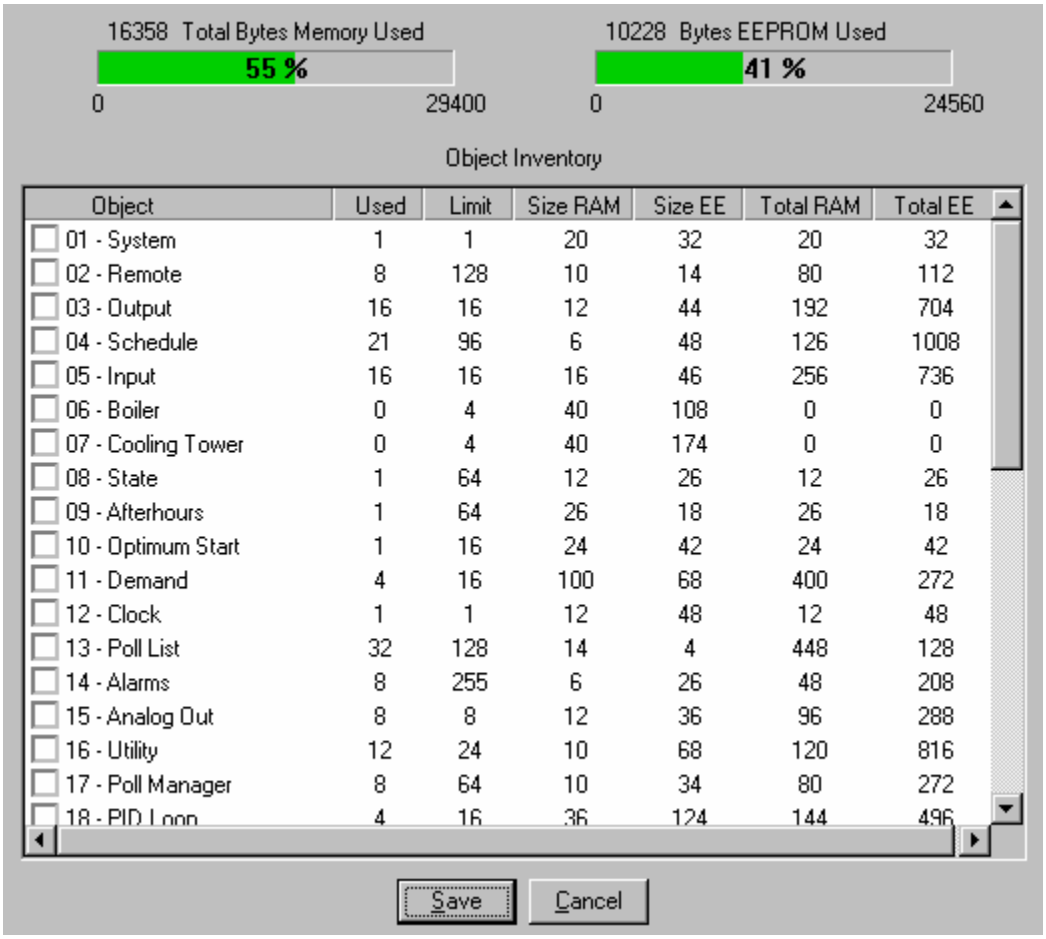
ASIC/2 Allocation

Allocation Summary

Overview: The Allocation object is used to allocate space in memory for each of the other objects. The controller comes with a pre-defined allocation that may be modified.



Configuration: The ASIC/2 Allocation object has 40 indexes, numbered 0 to 39. For each object, the number of indices for the object is determined and this value placed in the appropriate index of the Allocation object (e.g. if the Schedule object, object 4, is to have 8 indices, this value is stored in index 4 of the Allocation object). Based on this information, the Allocation object then assigns memory for each object at power up time.

Memory Assignment: The Allocation object assigns absolute locations in the Configurable controller's memory for each of the object parameters. Because of this, the Allocation object must be configured first, before any other object. After complete

configuration, if one should add an index to any object, for example the Schedule object, then the Allocation object would re-assign memory and re-calculate addresses, and the old configuration would be effectively lost.

Allocation Operation

Configuration

The allocation tells the configurable controller and the software how many instances of each object have been reserved for a given application. The controller has limited memory and the allocation allows trading off memory use.

The configurable controller is factory configured with a standard allocation for the different objects. The number of attributes and size of each attribute is fixed for each object in a firmware release and can not be changed. The allocation table is used by ASI Expert Software to determine how much data to bring up from the controller. Different configurable controllers will have different object allocations depending on the applications that will be used.

The Allocation object in the ASIC/2 has 40 indexes numbered 0 to 39. For each object, the number of indices for the object is determined and this value placed in the appropriate index of the Allocation object. Based on this information, the Allocation object code then assigns memory for each object.

The ASIC/2-7040 and ASIC/2-7540 has a standard allocation that includes the following:

Object 1 - System has 1 index allocated.
Object 3 - Binary Outputs has 16 indexes allocated.
Object 5 - Inputs has 16 indexes allocated.
Object 12 - Clock has 1 index allocated.
Object 15 - Analog Outputs has 8 indexes allocated.
Object 16 - Utility has 4 indexes allocated for description and data.

The ASIC/2-8040 has a standard allocation that includes the following:

Object 1 - System has 1 index allocated.
Object 3 - Binary Outputs has 10 indexes allocated.
Object 5 - Inputs has 8 indexes allocated.
Object 12 - Clock has 1 index allocated.
Object 15 - Analog Outputs has 4 indexes allocated.
Object 16 - Utility has 4 indexes allocated for description and data.

Changing Allocation

The allocation is usually changed when a new application is loaded into the controller. Changing the allocation must be done with care so that data is not lost in the process. ASI Expert software takes care of the details. The availability and maximum size of allocation for each object is kept in the ASI Expert database.

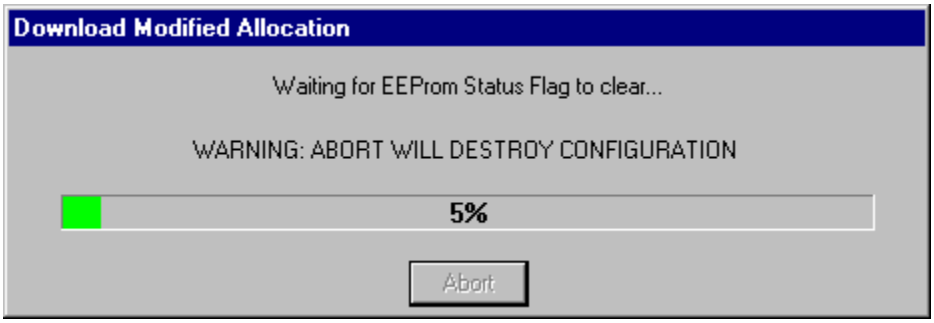
The following suggestions will help the process go smoothly:

Work on the Bench: When possible work with the controller on the bench. On the bench you have the controller in front of you. Since the controller is not on the network, you know exactly what controller you are communicating with.

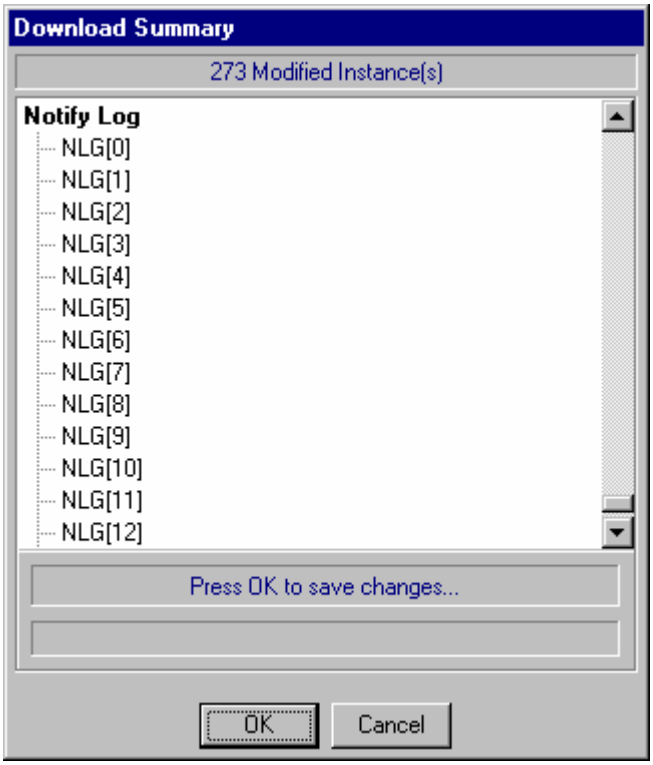
Save a Copy: Always save a copy of the application before attempting to change the allocation.

Disable All Outputs: If you change the allocation in the field, Disable All Outputs first, before changing the allocation. This will turn everything off. The allocation change process, resets to the controller. You do not particularly want to do this if connected to 50 hp fans, etc. The Output Disable is located in the system object.

ASI Expert prompts you to save the current configuration to a file, but you do not have to save it. The current configuration is kept in Expert memory. Expert writes the new allocation to the controller, and waits for the data to be written to the controller.



When the allocation data is written ASI Expert resets the controller, reads the allocation from the controller, verifies that the new data is there, and then prepares to download all of the object data into the controller. Any new instances that have been created will be initialized to zero value.



Memory Assignment

When power is first applied, the configurable controller reads the allocation table and calculates the location in memory of the various allowed data objects. If the allocation table is unchanged the non-volatile memory location assignments are not changed. It is a good idea to save the controller configuration data to floppy or hard disk before allocations are changed.

NOTE: Data may be lost when the allocation table is changed, unless saved to disk.

The Allocation object assigns absolute locations in the configurable controller's memory for each of the object parameters. Changing allocation will corrupt information in the controller. Once a configuration is set in the controller, additional indices can only be added to the allocation by following a set procedure.

The static memory available for objects is limited. The controller reserves 16 bytes at the beginning of static memory, also called non-volatile memory, for internal use. Thus if 8k of static memory (Chip U14,EEPROM) is used, as in the ASIC/2-8040, then the total object allocation is 8192-16 = 8176 bytes.

Product	**MAX Static**	**MAX Dynamic**
SINC/3-3000	24,064 bytes	24,064 bytes
ASIC/2-7540	24,560 bytes	29,400 bytes
ASIC/2-7040	24,340 bytes	29,000 bytes
ASIC/2-8040	8176 bytes	29,000 bytes
SINC/2-2000	8176 bytes	8176 bytes
ASIC/2-7000	8176 bytes	8176 bytes

. The dynamic memory available for objects is limited. 32 kbytes of RAM memory are available in the ASIC/2-7040, ASIC/2-8040and SINC/3-3000. Of the 32k Bytes of RAM, some is reserved for internal communications and other house keeping tasks.

With ASIC/2-7040-C FW740C, and the ASIC/2-8040 120 ns memory chips are required.

The ASIC/2-7540 uses Flash Memory for program storage, and Non-Volatile RAM for Static Memory.

Allocation Glossary

Allocation Parameters

Attribute Size

Attribute Size designates the memory unit size to be used for each attribute of every index of object number n. 1 = Byte Attribute, 2 = Word Attribute. Not User Configurable; This is determined by the firmware at power up. (0,n,0,WORD)

EEPROM Start Address

Designates the address in Configurable controller EEPROM memory at which the first EEPROM attribute of index 0 of object n is to be located. Not User Configurable; This is determined by the firmware at power up. Hexadecimal value. (0,n,5,WORD)

EEPROM Number of Attributes

Designates the number of attributes for each index of object n which are to be located in EEPROM memory. Not User Configurable; This is determined by the firmware at power up. Integer. (0,n,3,WORD)

Number of Indices

Designates how many indexes object n is to have. For the ASIC/2-7040 FW740A., Index 0 should always equal 40. Index 1 should always equal 1. User-configurable; integer. (0,n,6,WORD)

RAM Number Attributes

Designates the number of attributes for each index of object n which are to be located in RAM memory. Not User Configurable; This is determined by the firmware at power up. Integer. (0,n,2,WORD)

RAM Start Address

Designates the address in Configurable controller RAM memory at which the first RAM attribute of index 0 of object n is to be located. Not User Configurable; This is determined by the firmware at power up. Hexadecimal value. (0,n,4,WORD)

Allocation Properties

Each configurable controller maintains an ALLOCATION object. This object is READ ONLY by Object Messages. The Allocation Object is polled by SETSYS setup software to determine the allowable range of indices, and attributes for uploads and downloads. The number of attributes of RAM and EEPROM is fixed in code. The number of indexes assigned for each object is configurable. At power up, the available RAM and EEPROM memory is reconfigured in the controller.

The ALLOCATION object defines the present values and setup parameters used by the controller to enable the different control blocks.

ALLOCATE(i,j)

Object Number	= 0
Data Type	= Word
Indexes	= 40 (0..39)
Attributes	= 0..6
Number of RAM	= 6 (0..5)
Number of EEPROM	= 1 (6)

Allocation Firmware Revision

ASIC/2-7540 FW754a Ver 1.5m Release 2006-05-02
ASIC/2-8540 FW854a Ver 1.5m Release 2006-05-02
Updates Default Daylight Savings Dates, Clock Size Increased.

ASIC/2-7540 FW754a Ver 1.4m Release 2006-04-07
ASIC/2-8540 FW854a Ver 1.4m Release 2006-04-07
Adds new Object 39-Modbus Master for polling devices on Local Bus

ASIC/2-7540 FW754a Ver 1.3h Release 2006-02-17
- Size of System Object increased for IP parameters.

ASIC/2-7540 FW754a Rev 0.4 Released 2004-11-02
- Flash programmable field trial release

ASIC/2-7040 FW740E Rev 2.3 Released 01/07/2002 CHK 0x773A
ASIC/2-8040 FW840E Rev 2.3 Released 01/08/2002 CHK 0x58D9
- Adds message validation to reject messages that write across RAM/EE boundary, that write past end of Object EE, or that have no stop bit.

ASIC/2-7040 FW740E Rev 1.9 Unreleased 11/17/2000
ASIC/2-8040 FW840E Rev 1.9 Unreleased 11/17/2000
- Adds protection for EE Write with large RAM allocations.
- Adds Special Handles generally to objects such as Logic where the last two bytes represent a word value.

ASIC/2-7040 FW740E Rev 1.0 Oct 1999
ASIC/2-8040 FW840E Rev 1.0 Oct 1999
SINC/3-3000 FW300B Rev 1.0 Oct 1999
Adds Object 37 -Notify
Adds Object 38 - Notify Log

ASIC/2-7040 FW740C Rev 1.0 29 Jan 97
Adds Object 35 -Encode/FIFO
Adds Object 36 - Calendar

ASIC/2-8040 FW840A Rev 1.0 22 March 96
Object 33 -Monitor is last object.
Maximum Number of allowed objects is 40.

ASIC/2-7040 FW740D Rev 1.0 26 Feb 96
Adds Object 34 -Dial out

ASIC/2-7040 FW740B Rev 1.0 8 Dec 94
Static Memory 32 k EEPROM

ASIC/2-7040 FW740A Rev 1.0 20 May 94
Adds Object 33 -Monitor
Maximum Number of allowed objects is 40.

ASIC/2-7040 FW740A Rev 1.0 20 May 94
Object 32 -Logic 2 is last object.
Static Memory 8 k EEPROM
Maximum Number of allowed objects is 40.

ASIC/2-7000 FW700A Rev 1.0 4 Dec 1991
Maximum Number of allowed objects is 32.

SINC/2-2000 FW200A Rev 1.1 2 Aug 1992
Maximum Number of allowed objects is 32.

Allocation DYNAMIC Properties

Attr-0 **Object Attribute Size**

1 = Byte Attribute
2 = Word Attribute

Attr-1 **Object Number of Indices**
Allocated from Attr-6 at reset or power-up.

Attr-2 **Object Number of RAM Attributes**

Attr-3 **Object Number of EEPROM Attributes**

Attr-4 **Object RAM Start Address**
Absolute Starting Address for RAM attributes

Attr-5 **Object EEPROM Start Address**
Absolute Starting Address for EEPROM attributes

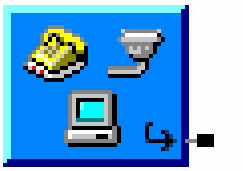
Allocation STATIC Properties

Attr-6 **Object Number of Indices**
Used to allocate memory at reset or power-up. Object 0, index 0 has the total number of possible objects in the controller. These do not necessarily all have to be allocated. Object 0, index 1 is the system object and must have its index allocated.

For an object to be active the number of indices must be greater than zero, and it must be enabled in the system object.

Object 1 - System (ASIC/2)

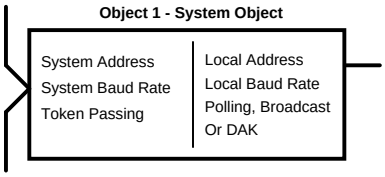
System Summary (ASIC/2)



Overview: The System object is used to set-up communications related parameters and enable/disable other functions. This description applies to the ASIC/2-7540, ASIC/2-7040 and ASIC/2-8040 configurable controllers.

System Bus: The device address, baud rate, and group addresses are provided for the controller. The ASIC/2-7540, ASIC/2-7040 and ASIC/2-8040, have a system bus that communicates at 1200, 4800, 9600, or 19,200 baud.

Token Passing: The controller may be configured as a player on the token passing bus. The High and Low Token Addresses and the Token Enable are set in the system object.



Local Bus: The ASIC/2-7540, ASIC/2-7040 and ASIC/2-8040 FW840C.. have a separate local bus with a Local Bus Address. The ASIC/2 allows pass-thru of messages from the system bus to the local bus. The local bus can be at a different baud rate from the system bus. Messages addressed to controllers on the local bus in the poll list or within a specified address range are passed through from the System Bus to the Local Bus. The ASIC/2-7040 and ASIC/2-8040 can communicate on the local bus at up to 9600 baud and the ASIC/2-7540 at up to 19,200 baud.

Note: The ASIC/2-8040 FW840A has a system bus with a system bus address only, and no Local Bus. FW840B includes support for a DAK on the Local Bus.

Local Bus Polling: The ASIC/2 controller may be configured to request information from controllers on the local bus under the control of the Poll Manager Object. The data is saved in the Poll List Object. Local bus polling may be disabled from the system object.

Local Bus Broadcast: The ASIC/2 controller may be configured to broadcast information to controllers on the local bus under the control of the Broadcast Object. Broadcast may be disabled from the system object.

USB Bus: The ASIC/2-7540 has a USB Bus that can autodetect and support specific USB Ethernet adapters, USB Modems, and USB Memory

DAK Support: The ASIC/2 System Object contains the ASIC/2 Service Address which is used by the DAK to request information from the controller.

RS-232 Monitor: The ASIC/2-7540 and ASIC/2-7040 has an RS-232 connector which can monitor either the System Bus or Local Bus depending on jumper settings. The ASIC/2-8040 has an RS-232 connector which can monitor the System Bus.

Function Disable: Function Disable flags have been added to the ASIC/2-7540, ASIC/2-7040, and ASIC/2-8040 in order to disable Remote Points on the system bus, and to disable the outputs.

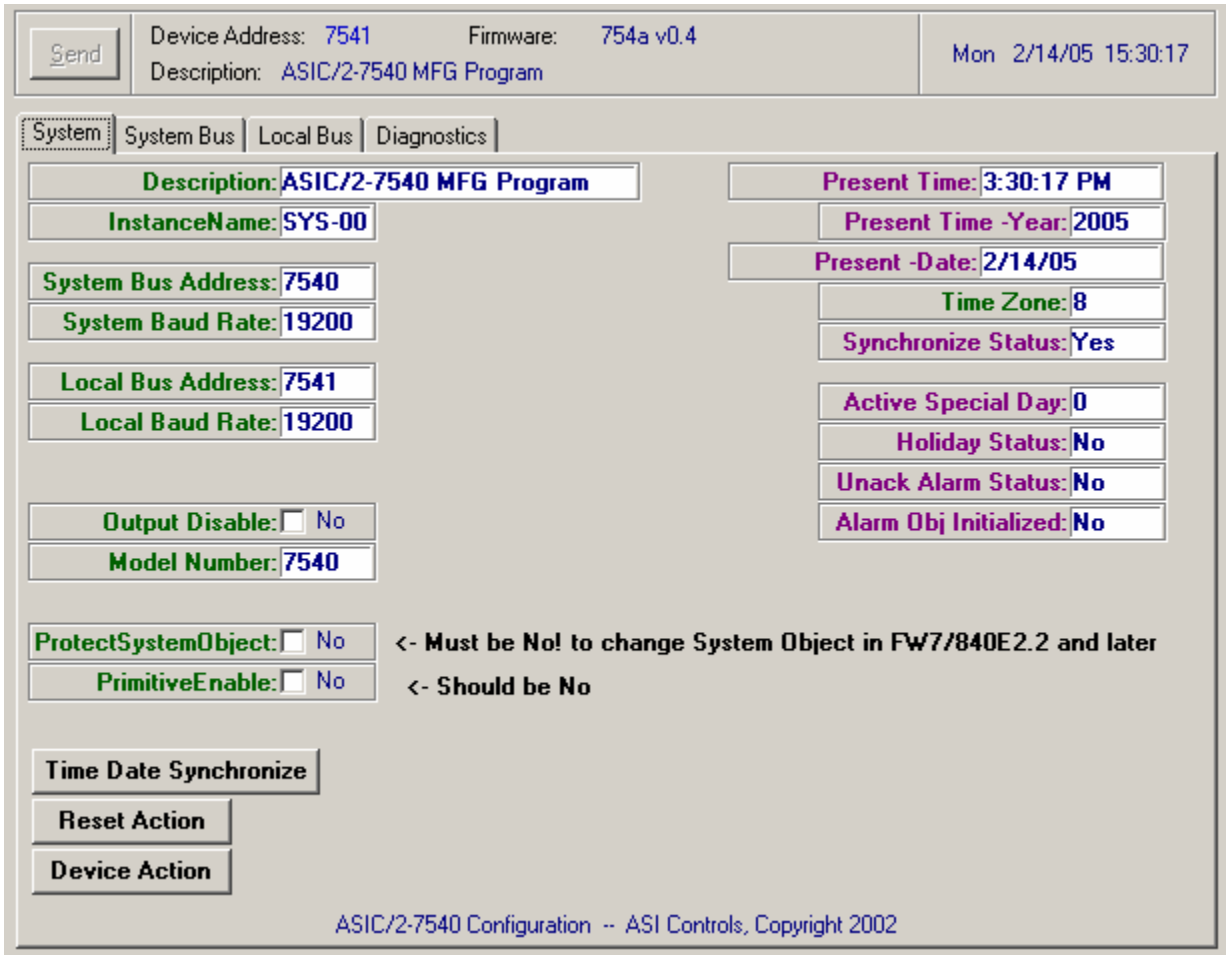
Unacknowledged Alarms: The System object keeps track of whether there are currently any unacknowledged alarms in the Alarm object. The highest level of priority of unacknowledged alarms is also recorded here.

Health Test: A self test is performed at power-up to determine if the controller is operating properly.

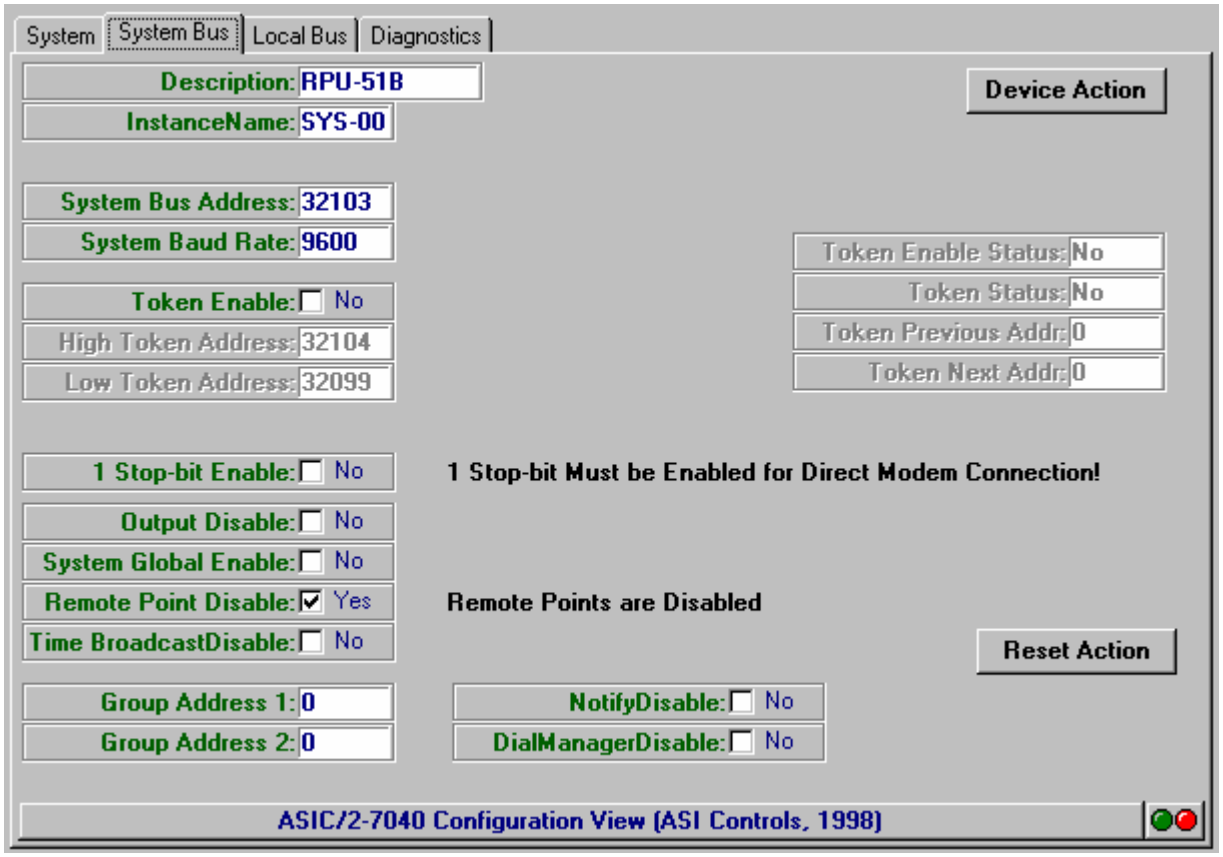
Note: With ASIC/2-7040 FW740C 2.0, and ASIC/2-8040 FW840C 1.0 and later releases, both products are generated from the same source code and have the same features.

System Operation (ASIC/2)

The System object is used to set-up communications related parameters and enable/disable other functions. The System object has the system and local bus communication parameters, and the Function Disable Flags. The order of calculation is also discussed in this section.



System Bus (ASIC/2)



The ASIC/2 controllers have an RS-485 System communication bus which may participate in token passing.

The System Bus can receive and transmit messages at the **System Baud Rate** of 1200, 2400, 4800, 9600, or 19200 baud. If the baud rate is changed the new baud rate becomes active on reset of power.

If Token passing is not used then **Token Enable** must be set to No, and any unique Device Address may be used. The **System Bus Address** is typically 32101. Each controller address in a system must be unique. If it is not a token player, then it may have any valid device address not divisible by 256.

If the controller is a token player, then its **System Bus Address**, Attr-12, **must** be in the range 32001 to 32255 and the Token Enable must be set to Yes.

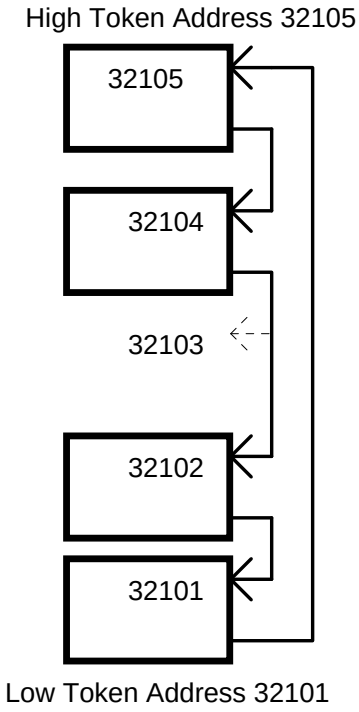
RS-232 Monitor

The ASIC/2-8040 has an RS-232 Monitor connection that can be used to communicate with the controller and is always connected to the System Bus.

With ASIC/2-7040 FW740A the RS-232 Monitor always connects to the Local Bus. With ASIC/2-7040 FW740B and ASIC/2-7540 there are jumpers that allow the RS-232 port to be connected to either the Local Bus or System Bus.

Note: the ASIC/2-7040 and ASIC/2-8040 RS-232 Monitor is not able to drive a long communication line. The ASIC/2-7540 **can** drive a long communication line.

Token Passing



Controllers that participate in the token passing process must have a System Bus Address in the range 32001 to 32255 and the Token Enable must be set to Yes. Furthermore the address should be within the High Token Address and Low Token Address range.

Each controller which has Token Enable acknowledges the token passing message when it is addressed to it and then passes the token to the next lower controller until the Low Token Address is reached. The token is then passed to the controller with the High Token Address. The decision to pass the token is based on passing all remote points or time messages or on the expiration of the Token Hold Timer.

Upon passing token to the next controller, the controller listens for the next controller to acknowledge that the token was successfully passed. If it hears a valid response, it assumes that the token has been successfully passed and reverts to listening mode.

If it does not hear a valid response, it assumes the token message was garbled and reissues the PASS TOKEN message up to 3 times. After three failures, the controller then issues a PASS TOKEN message to the controller with an address one lower until the Token Low Address fails to respond. It will then begin with Token High Address and continue until it reaches its own address. If unable to successfully pass the token, it then drops the token and goes into a listening mode. The token passes more quickly if the system bus addresses are right next to each other in sequence. If controllers are missing, then time is spent trying to pass the token to non-existent controllers.

Note: For best response of the token network it is important that token devices are addressed in sequence. There should be no missing device addresses between the Low Token Address and the High Token Address.

If the token holder hears any other message on the communication line, it immediately drops the token and goes to listening mode. If the token is lost, so that it is no longer being passed from controller to controller, each controller listens to the system bus until its Token Lost Timer times out. The first controller to time out claims the token and begins transmitting. The Token Lost Time is calculated based on the System Bus Address, so that the controller with the highest address times out first.

For a configurable controller to become a token player on the system bus it is necessary to configure the High and Low Token Address Range. For most rapid token passing the configurable controllers should have addresses covering the smallest range possible. The System Bus Address must be in the range must be between 32001 and 32255. For the controller to pass the Token, the Token Enable must be set to yes.

High Token Address	[Typical, 32100]
Low Token Address	[Typical, 32105]
Token Enable	[Typical, Yes]
Token Hold Default	[Typical, 5 seconds]

System Bus Disable Flags

Disable flags are provided in the ASIC/2 to allow disabling of certain functions that affect outputs or broadcast messages on the System Bus. They are used when changing allocation to prevent unexpected switching of outputs, or sending inappropriate messages on the system bus.

Remote Point Disable

The broadcast of remote points on the system bus by indexes of the remote point object are suppressed. The code will continue to execute, but no messages are sent.

Time Broadcast Disable

The broadcast of time on the system bus the clock object are suppressed. The code will continue to execute, but no messages are sent.

Output Disable

The outputs are disabled and set to off or zero value to allow testing of the sequence without energizing equipment. The code will continue to execute, but nothing is sent to the output. If interlocks are used in the sequence, the associated inputs will indicate that the system is not operating and should operate correctly.

> CAUTION: Care must be taken in restoring the outputs since they will come on abruptly at the value give by the sequence.

Notify Disable

With FW740E 2.1 and 840E 2.1, if Notify Disable is yes then the Notify object will stop sending notify messages on the system bus.

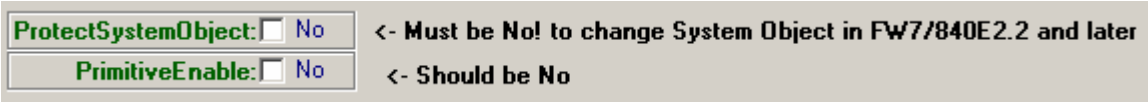
Dial Manager Disable

With FW740E 2.1 and 840E 2.1, if Dial Manager Disable is yes then the Dial Manager object will stop attempting to dial out.

Protect System Object

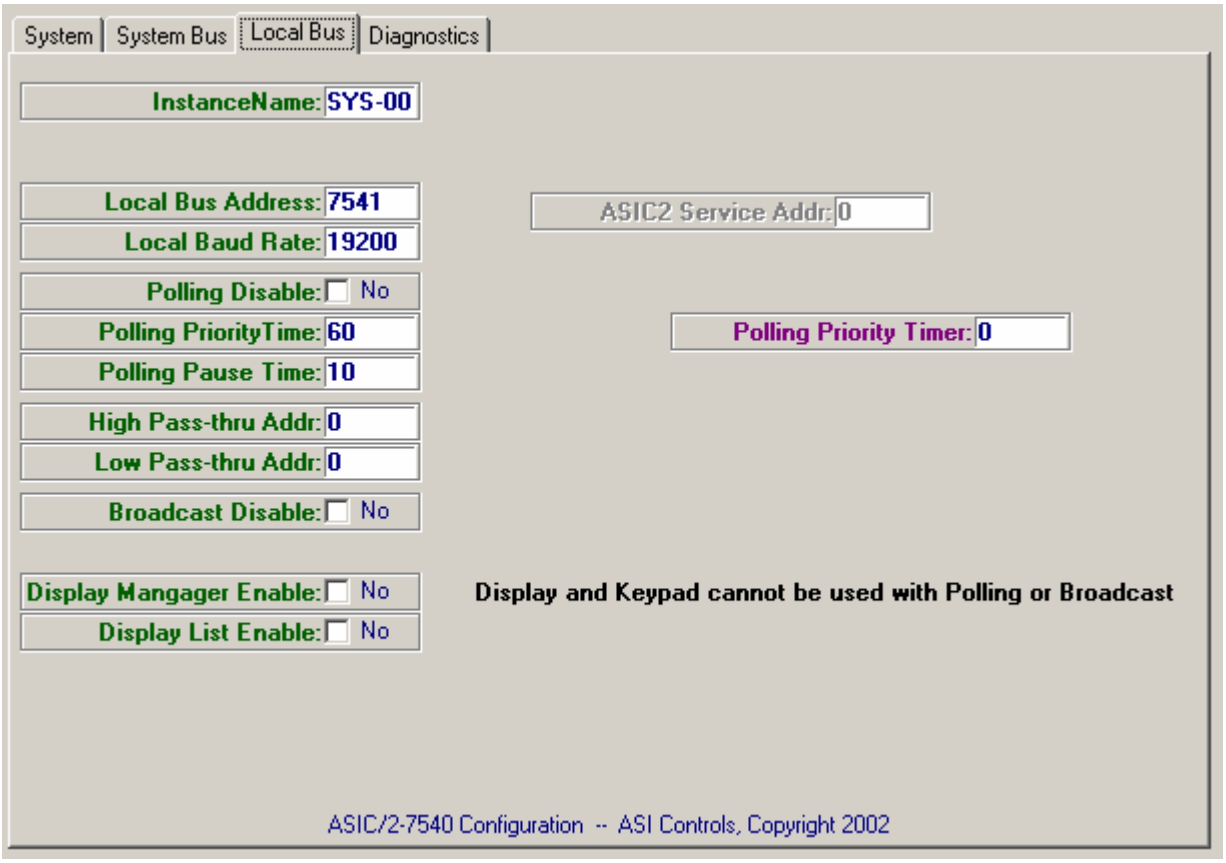
With Firmware Versions 740E2.2, 840E 2.2 and 754A a Protect System Object flag has been added. If Protect System Object is “Yes” then it is not possible to change data values in the system object. This prevents accidental changing of the controller address or baud rate.

A Primitive Enable flag prevents accidental use of certain diagnostic messages.



Local Bus Communication (ASIC/2)

The ASIC/2-7540, ASIC/2-7040 and ASIC/2-8040 FW740C and later may be configured to communicate with other ASIC/1 and ASIC/2 controllers on the local bus. The local bus is used for pass through of messages from the system bus, broadcast of message originating in the controller, and/or polling controllers on the local bus for data. Alternately, the local bus may be used to support a DAK, Display and Keypad.



The ASIC/2 has a **Local Bus Address**, Attr-13, that is used to communicate with the controllers on the Local Bus side of the controller. The Local Bus Address is typically 7040 decimal. Each controller address in a system must be unique.

The ASIC/2 has an RS-485 Local Bus which can transmit and receive messages at the **Local Baud Rate** of 1200, 2400, 4800, or 9600 baud. If the baud rate is changed the new baud rate becomes active immediately. The ASIC/2-7540 can communicate at **19,200 baud** on the local bus.

Local Bus Polling (ASIC/2)

The controller may be configured to request information from controllers on the local bus under the control of the Poll Manager Object. The data is saved in the Poll List Object.

The poll list must be enabled, and addresses of controllers on the local bus must be entered in the poll list if messages are to be automatically passed from the system bus to the local bus.

Poll Disable	[Typical, No]
Polling Pause Time	[Typical 10 s]

If **Polling Disable** is set to yes, then all polling of controllers on the local bus is stopped, and the data in the poll list is no longer updated. Pass through of messages from the system bus still works even though polling is disabled.

Local Bus Broadcast

The controller may be configured to broadcast information to controllers on the local bus under the control of the Broadcast Object. Local bus broadcast may be disabled from the system object.

If **Broadcast Disable** is set to yes, then the broadcast of messages on the local bus by indexes of the broadcast object are suppressed. The code will continue to execute, but no messages are sent.

Pass-thru

The ASIC/2 has a **Highest** and **Lowest Pass-thru Addresses** for pass through of messages from the system bus to the local bus. The Highest and Lowest Pass-thru Address range can be set to allow pass-though of messages for a range of addresses.

Lowest Pass-thru Address	[Example, 1]
Highest Pass-thru Address	[Example, 61]

If the source or destination address of the controller is either within the Highest to Lowest Pass-thru Addresses range, or in the poll list, then the message will be passed through from system to local bus and the response messages will be transmitted back. Because the entire message is received before it is re-transmitted, the System and Local Buses may operate at different baud rates.

> Note: Pass-thru messages must originate on the System bus.

SYS_Global Pass-Thru Disable and SYS_Group Pass-Thru Disable options have been added to prevent pass-thru of Group or Global Messages to addresses that are not explicitly in the Poll List (FW7/854a1.4)

Display and Keypad (ASIC/2)

The ASIC/2-7540, ASIC/2-7040 local bus may be used for Polling and Broadcast, or it may be used to support a DAK-002, but not both. The **ASIC/2 Service Address** must be set (0..63) to match the service address of the DAK which initiates the request. The Display and Keypad is available on the ASIC/2-8040 FW840B and later, however a separate power supply is required for the DAK-002. The **Display Manager Enable, Display List Enable**, **Broadcast Disable** and **Polling Disable** must be set to Yes.

ASIC/2 Service Address	[0..63]
Display Manager Enable	[Yes]
Display List Enable	[Yes]
Broadcast Disable	[Yes]
Polling Disable	[Yes]

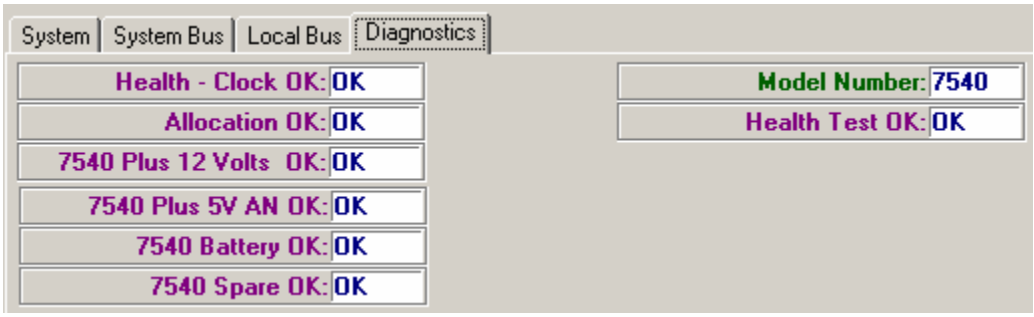
Diagnostics (ASIC/2)

A Health Test has been added to dynamically test the controller hardware at power up time. This self test verifies the status of the following hardware.

1. Determines presence of Clock
2. Measures +12 and +15 volt power
3. Checks for presence of proper zero-crossings
4. Checks for presence of Static and Dynamic memory

If all health conditions are satisfied then the Health Test Status Attr-3 HI Bit 7 is set.

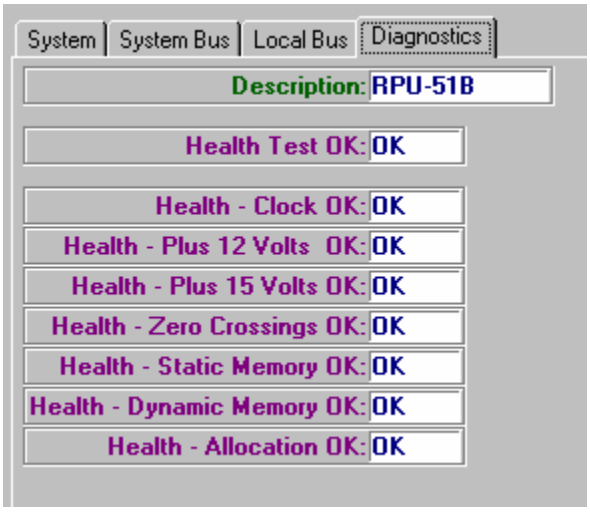
Health Test (ASIC/2-7540)



The Health Test Conditions are displayed on the LEDs: for about 2 seconds at startup.

Top RED:	Clock OK
Top GREEN:	+12 Power OK
Bottom RED:	+5 Analog Reference OK
Bottom GREEN:	Battery OK
AMBER LED 1	Spare OK
AMBER LED 2	Dynamic Memory OK,
AMBER LED 3	Allocation OK
AMBER LED 4	All Tests OK

Health Test (ASIC/2-7040)



The Health Test Conditions are displayed on the LEDs: for about 2 seconds at startup.

Top RED:	Clock OK
Top GREEN:	+12 Power OK
Bottom RED:	+15 Power OK
Bottom GREEN:	Zero-Crossing OK
AMBER LED 1	EEPROM OK
AMBER LED 2	RAM OK,
AMBER LED 3	Allocation OK
AMBER LED 4	All Tests OK

Health Test (ASIC/2-8040)

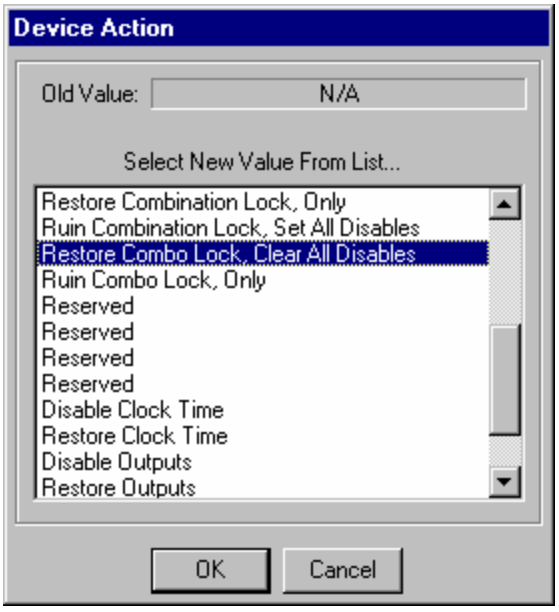
The Health Test Conditions are displayed on the LEDs: for about 2 seconds at startup.

Top RED: Pwr	Power
AMBER LED A1	Clock OK
AMBER LED A2	Zero-Crossing OK
Bottom RED: Rx	EEPROM OK
GREEN: Tx	RAM OK

Combination Lock

A two byte combination lock is provided in EEPROM memory as a protection against memory corruption for the ASIC/2-7000 and SC/1-9040 controllers. The Setup Software ruins this combination lock whenever a new allocation is downloaded. After resetting the controller and downloading a new configuration to the controller, the combination lock is restored through the Setup Software.

In the ASIC/2-7040 or ASIC/2-8040 when the combination lock is corrupted the Function Disable flags for remote point, clock broadcast, and outputs are set and take effect immediately. The sequence continues to execute but no outputs are generated. Once the new configuration data is downloaded to the controller, the function Disable flags may be cleared by sending an Action to the System Object. Alternatively, the Disable flags may be cleared one at a time.



Order of Calculation (ASIC/2)

NOTE: The passing of data and status information between objects CAN be influenced by the sequence of execution.

The control sequences are executed once each second, performing any actions that are required. The order of calculation of the objects is fixed. It goes from lowest index to highest index for each object. Pay particular attention to interlocks and logic sequences.

Calculations are done once each second. If the output of an object is used by an object occurring earlier in the calculation list, or to the same object with a smaller index, a change in value will be delayed in time by 1 second.

NOTE: The passing of data and status information between objects CAN be influenced by the order of calculation. Pay particular attention to interlocks and logic sequences.

Certain objects have handles that are used as triggers which cause an event to occur on change of value. These objects have special code which is executed only at power-up time, prior to the execution of any other code. This code stores an "old" trigger level which is a zero in almost all cases. This means at the end of the 1st second after power-up transitions to non-zero value may well be detected. This causes triggering of events expecting non-zero transitions. If this is a serious problem, this operation can be locked out using a logic block and the First Time Flag (SYSTEM, Attr- 0, HI bit 0).

Note: With FW740A Rev 1.2 the standard calculation order is re-established.

FW740A Rev 1.0 and Rev 1.1 are in a different calculation order: Clock, Remote, Demand, Afterhours, Inputs, Output, Analog Output, Logic, Logic2, Calc Pt, Schedule, PID, Tower, Boiler, Alarm, Timer, Dynamic Trend, Counter, Static Trend, Event Function, Sequence, Display, Optimum Start, State, Monitor.

Because outputs are executed before logic, there may be a one second delay in the outputs coming on. Timers are executed after Logic

Once Each Second the following objects are executed in the following order:

Time Information

12-CLOCK - Check if it is time to do calculations.
23-TREND - Check if any trends required.
27-STATIC TREND - Check if any trends required.
04-SCHEDULE - Refresh all schedules if it is time.
11-DEMAND - Check if time to do calculations, if so, get input count and clear.

Input Information

05-INPUT - Read all input Channels at 10 bit resolution.
Clear counter on pulse inputs if required.
09-AFTER-HOURS - Check for changes in interlocks to STATE
10-OPTIMUM START - Check for Interlocks State
08-STATE - Uses Schedule, After-hours and Optimum Start to establish new State .
30-FUNCTION - Perform function calculations (FW740A Rev 1.2)

Applications

18-PID - Calculate PID Algorithm and Status
07-CT - Calculate Cooling Tower Status (if available)
06-BOILER - Calculate Boiler Status (if available)

Modify Information

22-CALCULATED POINT- Calculate intermediate values.
21-TIMER - Increment and Check Timer Status
20-LOGIC - Calculate Logic Status
32-LOGIC2 - Calculate Logic2 Status (FW740A Rev 1.2)
26-COUNTER - Counter and Run Time is updated.
31-SEQUENCE - Calculate Sequence Status (FW740A Rev 1.2)

OUTPUT Information

14-ALARM - Status of configured alarms is updated.
03-BINARY OUTPUT - Binary Outputs are Updated.
15-ANALOG OUTPUT - Analog Outputs are Updated. (FW740A Rev 1.2)
01-SYSTEM - Update Unacknowledged Alarms .
17-POLL MANAGER - Update Manager Functions
02-REMOTE - Remote points are updated if required.
24-DISPLAY MANAGER - and 25-DISPLAY LIST
28-EVENT MANAGER and 29-EVENT LIST
33-MONITOR - Obtain Monitor Data (FW740A Rev 1.2)
35-ENCODE - Encode Data
36-CALENDAR - Determine Calendar Events
37-NOTIFY and 38-NOTIFY LOG
34-DIAL MANAGER

System Glossary (ASIC/2)

System Parameters

Action

Writing the following values to this parameter (1,0,4,WORD) causes the corresponding actions to occur.

Alarm Object Initialized

Indicates that following power-up the Last State of COS Target parameter in the Alarm object was subsequently initialized. (Necessary so that the COS Alarm may be properly used.) "Yes", "No"; not user-changeable. (1,0,3,LOW BYTE BIT 0)

ASIC/2 Service Address

Address used by ASIC/2 to service request for data from the ASIC/2-7040 on local bus.

Broadcast Disable

The broadcast of messages on the local bus by indexes of the broadcast object are suppressed. The code will continue to execute, but messages are not sent. (1,0,10,HI bit 1)

Clock Time Disable

The broadcast of time on the system bus by the clock object are suppressed. The code will continue to execute, but messages are not sent. (1,0,10,HI bit 3)

Dial Manger Disable

The Dial Manger is disabled and will not attempt to dial out. SYS Attr-10,HI bit 6. (FW740E2.1, 840E 2.1)

EEPROM Written Status

Set to "Yes" if an EEPROM memory location in the configurable controller has been written to. May be reset to "No" by the user via Action 1. "Yes", "No". (1,0,0,LO BIT7)

ETH-8540 Enable

Enables ASIC/2-8540 Ethernet Adapter.(1,0,25 LO Bit4) 854a1.7

ETH-8540 Status

Indicates if ASIC/2-8540 Ethernet Adapter is installed and active.(1,0,0 HI Bit5) 854a1.7

First Time Flag

The First Time Flag can be used to lockout functions for a period after power reset. Modified Binary Outputs to not come on until after the Second time Flag has fallen. This allows logic and timers to be set up to inhibit operation.(1,0,0,HI BIT 0) (FW740A1.7.., 840C)

Global Pass-Thru Disable

Prevents pass-thru of global messages to local bus (1,0,25,Lobit2)(7/854a1.4)

Group Address 1,2

The controller will react to messages sent to a destination address with the high byte give by a group address, and the low byte equal to zero. Up to 2 group addresses may be identified for the unitary controller. If a single group address is used then Group Address 1 is used. Group Address 1(1,0,17, LO Byte) Group Address 2 (1,0,17, HI Byte)

Group Pass-Thru Disable

Prevents pass-thru of group messages to local bus (1,0,25,Lobit3)(7/854a1.4)

High Token Address

Applies only to systems using a Token Passing Bus. Designates the upper boundary address of Token Range. Token Range designates the range of addresses of configurable controllers which this controller sequentially attempts to pass the token to. Only the lowest two digits of the 4-digit hexadecimal address are given here; the high digits are

assumed to be "7D", so that the highest possible token address is 32,000 + High Token Address. (1,0,14,HIGH BYTE)

Highest Pass-thru Address

The ASIC/2-7040 has a Highest and Lowest Pass-thru Address for passing messages from the system bus to the local bus. If the source or destination address of the controller is either in the poll list, or between the Highest and Lowest Pass-thru Addresses, then the message will be passed through from system to local bus and the response messages will be transmitted back.(1,0,23,WORD)

IP Address

IP Address for Ethernet Communication Double Word XXX.XXX.XXX.XXX (1,0,26, Double Word) (FW754A1.1)

IP Gateway Address

Double Word XXX.XXX.XXX.XXX (1,0,31, Double Word) (FW754A1.1)

IP Monitor Address

Double Word XXX.XXX.XXX.XXX XXX (1,0,33, Double Word) (FW754A1.1)

IP Monitor Port

IP Port for Monitor Ethernet Notify Communication (FW754A1.1) (1,0,35,WordU)

IP Port

IP Port for Ethernet Communication (1,0,28,WordU) (FW754A1.1)

IP Subnet Mask

Double Word XXX.XXX.XXX.XXX(1,0,29, Double Word) (FW754A1.1)

Large EEPROM Status

Tests for the presence of 32k EE in ASIC/2-8040, if found then it is available. (FW840E 1.6) SYS-0,Attr-0 HiBit7

Local Baud Rate

Default baud rate for operation of the local bus 1200,2400,4800,9600 [Typical 9600 baud] (1,0,16, WORD) (FW740, 840C)

Low Token Address

Applies only to systems using a Token Passing Bus. Designates the upper boundary address of Token Range. Token Range designates the range of addresses of configurable controllers which this controller sequentially attempts to pass the token to. Only the lowest two digits of the 4-digit hexadecimal address are given here; the high digits are assumed to be "7D", so that the lowest possible token address is 32,000 + Low Token Address. (1,0,14,LOW BYTE)

Lowest Pass-thru Address

The ASIC/2-7040 has a Highest and Lowest Pass-thru Address for passing messages from the system bus to the local bus. If the source or destination address of the controller is either in the poll list, or between the Highest and Lowest Pass-thru Addresses, then the message will be passed through from system to local bus and the response messages will be transmitted back.(1,0,24,WORD) (FW740)

Modbus Enable

A System object flag, to Enable the Modbus Function. If set, the Local bus is ONLY a Modbus master. All other ASI communication functions are disabled. (1-SYS,0,10,LoBit5) 754a1.4.
Modbus Two Stop Bits Enable (1,0,10, LO bit 0) - (754a14)
Modbus Parity Enable(1-SYS,0,10, LO bit 6) (754a14)
Modbus Even Parity (1-SYS,0,10, LO bit 7) (754a14)

Model Number

Indicates the model number "7040", or “8040”,designation for this configurable controller. User-configurable (but not recommended). Integer. (1,0,11,WORD)

Notify Disable

The Notify Messages are disabled and messages are not broadcast or posted to the Notify Log. SYS Attr-10,HI bit 5. (FW740E2.1, 840E 2.1)

Object X Enable

Object Enable Flags are not used in ASIC/2-7040. Enable object X for operation. X is from 0 to the maximum object number for firmware prototype and revision number of this configurable controller. (The Number of Objects parameter in the Allocation object designates this maximum object number.) Objects 0 and 1 must always be enabled. (1,0,20,LOW BYTE BITS 0..7)

One-stop Bit Enable

Used by FW740Cand FW840 to allow system bus to communicate using one-stop bit on system bus. This is necessary for use with modems. (1,0,10,LOW BIT 0) (FW740C,840)

Output Disable

The outputs are disabled and set to off or zero value. The code will continue to execute, but nothing is sent to the output. (1,0,10,HI bit 4)

Polling Disable

If Polling Disable is set to yes, then all polling of controllers on the local bus is stopped, and the data in the poll list is no longer updated. Pass through of messages to controllers whose addresses are in the poll list still works. (1,0,10,HI bit 0) (FW740,840C)

Polling Pause Time

At the end of a polling round it will wait a Poll Pause Time. If zero the normal gap between polls is maintained. before beginning the next polling round. This can be set to give higher priority to pass through polling from a host. Used to force a pause on the local bus to enable other users access to the communication line. (1,0,22,LO Byte) (FW740B1.7.., 840C).

Previous Status

The value of Present Status prior to the most recently performed Action. Not user-changeable. (1,0,1,WORD)

Primitive Enable

Allows certain primitive write messages MT= 0x09, ..., 0x0E Otherwise these messages are DISABLED.SYS, Attr-25 bit1 [default 0] (740/840E2.4)

Protect System Object

If set then inhibits all MT=90 writes to System Object Attr-0..24. It protects against accidental writes from message collisions. SYS, Attr-25 LoBit0 (740/840E2.4)

Remote Point Disable

The broadcast of remote points on the system bus by indexes of the remote point object are suppressed. The code will continue to execute, but messages are not sent. (1,0,10,HI bit 2)

Second Time Flag

Binary Outputs do not come on until after the Second time Flag has fallen. This allows logic and timers to be set up to inhibit operation.(1,0,0,HI BIT 4) (FW740A1.7..,840C)

Synchronize Status

Indicates that the controller time has been synchronized with a "Time Synchronization" message broadcast on the communications bus. "Yes", "No". (1,0,0,LOW BYTE BIT 0)

System Baud Rate

Default baud rate for operation of the system bus: 1200,2400,4800,9600, 19200. [Typical 19200 baud] (1,0,15, WORD)

System Bus Address

Designates the source address the configurable controller is to use when broadcasting messages on the system communications bus. User-configurable; If the ASIC/2 is to be a token player, then its device address must be in the range 32001 to 32255 (7D01h to 7DFFh).and the Token Enable must be set to Yes. If it is not to be a token player, then it may have any valid device address. (1,0,12,WORD)

System Global Enable

Enables response to messages to 5AFFh system bus global address. Note: the controller will always respond to the device global address 5A70h. (1,0,10,LOW BIT 1)

Token Enable

Applies only to configurable controllers participating on a token passing bus. Enables this configurable controller to Token passing upon reset from power-outage, or upon recovery from communication errors. The controller will take the token itself first; when finished it will attempt to pass the token on to another controller. The first address it will try is the address equal to its own address minus 1. If this controller is unresponsive, then an attempt is made to pass to the controller with the next highest address. User-configurable; "Yes", "No". (1,0,10,LOW BYTE BIT 2)

Token Hold Default

Applies only to configurable controllers participating in a token passing bus. This default value is loaded into Token Hold Interval upon receipt of the token by the configurable controller. User-configurable; integer number of seconds. [Typical 5 sec] (1,0,19,WORD)

Token Hold Interval

Applies only to configurable controllers participating on a token passing bus. This is the amount of time for which the controller will govern bus communications upon receiving the token before passing the token on to another controller. Token Hold Interval is loaded with Token Hold Default upon receipt of the token; the user may alter the value of Token Hold Interval while bus access is in effect. (In this case, the user typically desires additional bus access time for his desired messages.) Not user-changeable; integer. (1,0,9,WORD)

Token Hold Timer

Used to track Token Hold Interval. Not user-changeable; reads in seconds. (1,0,8,WORD)

Token Next Address

Applies only to configurable controllers participating on a token passing bus. This is the address of the controller which this controller most recently successfully passed the token to. Not user-configurable; hexadecimal 7D00 to FFFF. (1,0,6,WORD)

Token Previous Address

Applies only to configurable controllers participating on a token passing bus. This is the address of the controller from which this controller most recently received the token from. Not user-configurable; hexadecimal 7D00 to FFFF. (1,0,5,WORD)

Token Status

Applies only to configurable controllers participating on a token passing bus. Indicates whether this controller currently holds the token. Will be equal to "Yes" not only while Token Hold Interval is elapsing, and also shortly afterwards, while attempting to pass the token. User-configurable; "Yes", "No". (1,0,0,LOW BYTE BIT 1)

Unacknowledged Alarm Priority

Designates the highest alarm priority for those alarms present in the Alarm object which have not yet been acknowledged by the user. Not user-changeable; "Lowest", "Middle", "Highest". (1,0,0,LOW BITS 5,6)

Unacknowledged Alarm Status

Indicates if any unacknowledged alarms exist in the Alarm object. "Yes", "No"; not user-changeable. (1,0,0,LOW BYTE BIT 4)

USB Device Type

Attr-38 LO BYTE – (FW754A1.3)
0=Autodetect, 1=Ethernet, 2=Modem, 3=Memory

USB Ethernet Device

Attr-36 HI BYTE - (Read Only) (FW754A1.2)
1 = Autodetect -
Hawking Technology HUF11; Hawking Technology HUF11;
LinkSYS USB100M

USB Memory Device

Attr-37 LO BYTE- (FW754A1.2)

USB Modem Device

Attr-36 LO BYTE - (FW754A1.2)
1= Autodetect - Best Data 56USB-P

USB Modem Enable

If Enabled all Dial Manager Dial outs will be redirected to the USB Modem. It must be enabled for the USB Modem to answer. (1,0,10,LoBit4)

Writing EEPROM Status

Indicates that the controller is writing data to non-volatile memory. (1,0,0,HIBit 3)

System Properties (ASIC/2)

The SYSTEM object defines the present values and setup parameters used by the controller to enable the different control blocks.

SYSTEM
Object Number = 1
Data Type = Word
Index = 0
Attributes = 0..25
DYNAMIC Attributes = 10 (0..9)
STATIC Attributes = 16 (10.25)
= 30(10..39) 7540

System Firmware Revision (ASIC/2)

Please see product read754A.txt, read740e.txt, etc. file for latest details.

Note: If you are using Remote Point or Notify messages on system bus you should upgrade your firware to this version.

ASIC/2-7540 FW754a Ver 2.2xl Release 2007-06-xx PN70025-07 ECO-408
ASIC/2-8540 FW854a Ver 2.2x Release 2007-06-xx PN70027-05 ECO-409

- Fixes problem that infrequently caused errors in Calculated Point or other objects.when sending or receiving Remote Point messages or receiving Notify messages
- Fixes 17-MGR Manager Function 118, ..., 121, Average Word value when Average Word value is greater than 65535.
  Now computes average correctly and displayes number of Values.
- Fixes problem with Notify Log. Self Posts would overwrite System Bus posts.

ASIC/2-7540 FW754a Ver 2.1d Release 2007-03-23
ASIC/2-8540 FW854a Ver 2.1d Release 2007-03-26

- Adds Decimal Fraction value to Function Float-to-Integer calculation.
  Decimal Fraction, FUN Attr-2 Signed Word, is in units of 0.0001.
  Will convert any signed 32-bit floating point number from 16777215 to 0.0001

ASIC/2-7540 FW754a Ver 2.0k Release 2007-02-08 PN70025-06 ECO-406
ASIC/2-8540 FW854a Ver 2.0k Release 2007-02-08 PN70027-04 ECO-407

- Updates Power-up Health Test sequence of lights.
- Fixes calculation overflow for PWM, Modulated, and Tristate Outputs.
- Boiler OAT Reset now works for negative Outside Air Temperatures.
- Fixes DAK Parameter 2_Byte download to Logic object.
- Adds 7540 USB/Ethernet support for USB200M Version 2.
  USB Ethernet Device = 1. Hawking HUF11 & HUF20, LinkSYS USB100M
  USB Ethernet Device = 2. LinkSYS USB200M

ASIC/2-7540 FW754a Ver 1.9e Release 2007-01-26
ASIC/2-8540 FW854a Ver 1.9f Release 2007-01-30

- Fixes occasional reset associated with system to local bus pass-thru

ASIC/2-7540 FW754a Ver 1.8 NOT Released 2006-10-20
ASIC/2-8540 FW854a Ver 1.8d Release 2006-10-20 ECO-405 70027-03

- Only Updates ASIC/2-8540 Firmware to match ETH-8540 Rev A.
- Adds System Action 28, Reset Ethernet/USB to reinitialize ETH-8540
- Software Reset MT=0x48 causes a delay of about 30 seconds
  before Ethernet communication is restored

ASIC/2-7540 FW754a Ver 1.7r Release 2006-09-05

- Fixes IP Notify when not using gateway.
- Adds periodic reset of USB if it does not see any messages in 120 seconds

ASIC/2-8540 FW854a Ver 1.7r Release 2006-09-05 ECO-405 70027-03

- Has Support for ETH-8540 Ethernet Adapter
  Uses static IP Setup from System Object
  Adds ETH-8540 Enable (SYS Attr-10 LO Bit3)
  and ETH-8540 (SYS Attr-0 HI Bit5)

ASIC/2-8540 FW854a Ver 1.7r Release 2006-09-05 ECO-405 70027-03
ASIC/2-7540 FW754a Ver 1.7r Release 2006-09-05

- Fixes Notify Log rollover problem that self posted twice to instance 0.
- Fixes minor Bug in Alarm object.
  Always used ALR Attr-11 Trigger Attribute - Hi/Lo Alarm
  rather than ALR Attr-13 Trigger Attribute - COS/Fault for COS/Fault.

ASIC/2-7540 FW754a Ver 1.6a Release 2006-06-09
ASIC/2-8540 FW854a Ver 1.6a Release 2006-06-12 70027-02

- Fixes problem with Remote Point originate that caused occasional spurious output overrides.

ASIC/2-7540 FW754a Ver 1.5m Release 2006-05-02
ASIC/2-8540 FW854a Ver 1.5m Release 2006-05-02 70027-01

- Improves Ethernet ARP, Address Resolution Protocol
- Blocks pass thru of Group or Global if Modbus Master is used.
- Improves operation of Modbus Master gate, message sent when timer goes true.
- Updates Default Daylight Savings Dates
- Adds Custom Daylight Savings Date feature.

Note: The Clock size has changed so you must reload your application.

ASIC/2-7540 FW754a Ver 1.4m Release 2006-04-07
ASIC/2-8540 FW854a Ver 1.4m Release 2006-04-07

- Adds new Local Bus Modbus Enable, Parity and Stop Bit parameters
- Adds System options SYS_Global Pass-Thru Disable and
  SYS_Group Pass-Thru Disable

ASIC/2-7540 ASIC/2-7540 FW754a Ver 1.3h Release 2006-02-17

- Adds USB setup parameters.

ASIC/2-7040 FW740E Rev 2.7h Released 2005-01-14 CHK 0xD2F6 PN70002-16
ASIC/2-8040 FW840E Rev 2.7h Released 2005-01-18 CHK 0xAE98 PN70006-13

- Fixes occasional problem with writes to Hardware Clock when polling.
  Makes Daylight Savings update more reliable.
- Fixes MT=0x27, 0x28 pass-through to Local bus
- Fixed problem with the poll manager clearing the poll list COM Error(bit 5)

ASIC/2-7040 FW740E Rev 2.6 Released 2003-12-10 CHK 0x 0x46E1

- Modify Self test to work with New Transformer 14313-D which
  puts out higher voltage.

ASIC/2-7040 FW740E Rev 2.4a Released 01/15/2002 CHK 0x4911
ASIC/2-8040 FW840E Rev 2.4a Released 01/15/2002 CHK 0x19C1

- Adds **Primitive Enable** flag SYS, Attr-25 bit1 [default 0]
  to allow certain primitive write messages MT= 0x09, ..., 0x0E
  Otherwise these messages are DISABLED.

ASIC/2-7040 FW740E Rev 2.3 Released 01/07/2002 CHK 0x773A
ASIC/2-8040 FW840E Rev 2.3 Released 01/08/2002 CHK 0x58D9

- Adds message validation to reject messages that write across RAM/EE boundary, that write past end of Object EE, or that have no stop bit.

ASIC/2-7040 FW740E Rev 2.2c Evaluation 06/07/2001 CHK 0x75E4
ASIC/2-8040 FW840E Rev 2.2c Evaluation 05/23/2001 CHK 0x6D6D

- Adds inhibits all MT=0x40 Change Address writes to System Bus Address.
- Adds flag **Protect System Object**, SYS Attr-25 LoBit0 which if set then inhibits all MT=90 writes to System Object

ASIC/2-8040 FW840E Rev 2.1 Released 03/30/2001 CHK 0x8E1F
ASIC/2-7040 FW740E Rev 2.1 Released 03/30/2001 CHK 0xA389
PN70002-13 ECO-368

- Adds **Notify Disable** SYS Attr-10, HIBit5 and **Dial Manager Disable** SYS Attr-10, HIBit6 to System Object. These are now set when allocation is changed, so that when the allocation is change, Notifies are not sent and it does not attempt to dial until the configuration has been restored.
- Fixes Local Port Lockup on 840E with DAK.

ASIC/2-7040 FW740S Rev 1.0 Released 10/12/2000 CHK 0x673D

- Special for ServiControl Based on FW740E1.7
- Adds ability to communicate at 110 & 300 Baud on System Bus.

ASIC/2-7040 FW740C Rev 2.7 Released 12/11/2000 CHK 0x69A6
ASIC/2-8040 FW840C Rev 1.7 Released 12/11/2000 CHK 0x66F7

- Improves Token Passing.

ASIC/2-8040 FW840E Rev 1.6 Released 09/19/2000 CHK 0xC431

- Adds **Large EEPROM Status** (FW840E 1.6) SYS-0,Attr-0 HiBit7

ASIC/2-7040 FW740E Rev 1.5 Released 04/19/2000 CHK 0x15DB

- Modified Health Test for new transformer.

ASIC/2-7040 FW740E Rev 1.5 Released 04/19/2000 CHK 0x15DB
ASIC/2-8040 FW840E Rev 1.5 Released 04/19/2000 CHK 0x14BF

- Pass-thru of Global Messages, 5Axxh, and group messages nn00h now automatic.

ASIC/2-8040 FW840E Rev 1.4 Released 02/15/2000 CHK 0x34BA

- Fixes pass through communication at 1200 baud.
- Fixes Local bus polling at 1200 baud.

ASIC/2-7040 FW740E Rev 1.2 Released 12/07/99 CHK 0x46F6
ASIC/2-8040 FW840E Rev 1.2 Released 12/07/99 CHK 0x4620

- Token passing much improved and 90h and 92h reception improved

ASIC/2-8040 FW840C Rev 1.6 Released 09/15/99 CHK 0x69EE
ASIC/2-7040 FW740C Rev 2.6 Released 09/15/99 CHK 0x6AB1

- Fixes minor problem with remote points and token passing at 9600 baud.
- Allows hardware clock to be read at power-up when the Polling Pause Time is 0. Worked OK if Pause Time is 1.

ASIC/2-7040 FW740C Rev 2.2 Released 09/18/98 CHK 68E9h
ASIC/2-8040 FW840C Rev 1.2 Released 09/18/98 CHK 6931h

- Fixes Synchronize Flag in System Object SYS-0,Attr-0,LObit0
  Does not get set when clock is read on reset in 740C 2.0, 2.1 and 840C 1.0,1.1
  This keeps State from working. Schedules work fine.
  740C 1.9 and earlier is OK, 840B 1.6 and earlier is OK

ASIC/2-7040 FW740C Rev 2.1 Released 08/20/98
ASIC/2-8040 FW840C Rev 1.1 Released 07/22/98

- Fixes problem with accidental Token Passing while uploading

ASIC/2-7040 FW740C Rev 2.0 Released 06/05/98
ASIC/2-8040 FW840C Rev 1.0 Released 06/05/98

- The operation of the ASIC/2-7040 FW740C 2.0 and ASIC/2-8040 FW840C 1.0 are now unified and conditionally assembled from the same source files. They now offer the same feature set and will be upgraded together.

ASIC/2-7040 FW740C Rev 1.9 Released 04/15/98

- Fixes problem with Pass back of response messages on the local bus. Caused SET8355 to fail for address 113.
- Global messages "5A5A" or "5A55" are passed through automatically.

ASIC/2-7040 FW740C Rev 1.7 Released 11/07/97

- Improves power-up test routines under multiple power interruptions.
- Fixes problem with initialization of DAK Interlock Type indexes after reset of power.

ASIC/2-7040 FW740C Rev 1.6 Released 09/18/97

- Fixes problem with pass through of messages to local bus at 1200 baud.

ASIC/2-7040 FW740C Rev 1.5 Released 08/12/97

- Fixes problem with lockup on reset or MT=48h message with communication on the line.

ASIC/2-8040 FW840A Rev 1.2 Released 4 Feb 1997

Fixes problem with one stop bit on System Bus. Adds One Stop bit Enable flag to SYS-0,Attr-10 LoBit0 To allow communication over a modem.

ASIC/2-7040 FW740C Rev 1.0 Released 01/29/97
ASIC/2-7040 FW740D Rev 1.2 15 Aug 1996
Added 19.2 kBaud on System Bus

ASIC/2-8040 FW840A Rev 1. 0 Released 22 March 1996
Revised for single port communication.
Added 19.2 kBaud on System Bus

ASIC/2-7040 FW740A Rev 1.9 Released 04/24/95
Added First Time Flag SYS-0,Attr-0 HIbit0
and Second Time Flag SYS-0,Attr-0 HIbit4

ASIC/2-7040 FW740A Rev 1.7 8 March 1995
Add Writing EEPROM Status Attr-0,HI Bit 3

ASIC/2-7040 FW740b Rev 1.7 8 Dec 1994
Added to System-0,Attr-22 LO Byte, Poll Pause Time.

ASIC/2-7040 FW740A Rev 1.5 15 Sept 94
Refined Local Bus Communication to reduce communication errors at 1200, 2400, 4800, and 9600 baud.

ASIC/2-7040 FW740A Rev 1. 2 June 1994
Standard Calculation Order now Used

ASIC/2-7040 FW740A Rev 1.1 27 May 1994
Add Health Test Conditions Attr-3 HI Byte
Calculation Order not Standard.

ASIC/2-7040 FW740A Rev 1.0 , 31 March 1994
Added Health Test to dynamically test hardware at power up time.
1. Determines presence of Clock,
2. Measures +12 and +15 volt power.
3. Checks for presence of proper zero-crossings.
4. Checks for presence of EEPROM and RAM.

ASIC/2-7000 FW700F 11 Jan 1993
Add ASIC/2 Service Address

ASIC/2-7000 FW700A 5 Dec 1991
Add Baud Rate
Add Group Addresses

System DYNAMIC Properties

Attr-0 Present Status
LO bit 0 - **Synchronize Status**
1 = Synchronized, 0 = Unsynchronized
LO bit 1 - **Token Status**
1 = Have Token, 0 = No
LO bit 2 - Reserved RS-232 Request Status (SC/1 and SINC/2 Only)
1 = RS-232 Access has been requested
0 = No RS-232 Access
LO bit 3 - Reserved Spy Status (SC/1 and SINC/2 Only)
0 = No Spy; 1 = Spy Mode,
Close relay and pass system bus messages to local bus.
LO bit 4 - **Unacknowledged Alarm Status**
1 = Yes, Unacknowledged Alarms
0 = No, Unacknowledged Alarms
LO bit 5,6 - **Unacknowledged Alarm Priority**
Highest Priority of Unacknowledged Alarms (0,1,2,3)
LO bit 7 - **EEPROM Written Status**
1 = EEPROM Written since last clear
0 = EEPROM has not been Written since last clear.

Attr-0 HI Byte

HI bit 0 - **First Time Flag**

1 = First pass through code for initialization at power-up.

0 = After 1st second.

HI bit 1 - Reserved (Combination Lock Status)

Not used by ASIC/2-8040, ASIC/2-7040

1 = Combination Lock OK, Normal Operation

0 = Combination Ruined, Do not execute algorithms

HI bit 2 - T**oken Enable** FW740,840

HI bit 3 -Writing EEPROM Status (FW740A1.7..)

HI bit 4 - Spare

HI bit 5 – **ETH-8540 Status** (FW854a1.7)

HI bit 6 - Spare

HI bit 7 - **Large EEPROM Status** (FW840E 1.6)

Attr-1 Previous Status

Rotates present value on any action

Attr-2 Timers

LO Byte - Spare

HI Byte Reserved -

Attr-3 System Alarm Word

LO Byte

LO bit 0 - **Alarm Object Initialized**

Change of State initialized in alarm object on power Up.

LO bit 1 - Spare

LO bit 2 - Spare

LO bit 3 - Spare

LO bit 4 - Spare

LO bit 5 - Spare

LO bit 6 - Spare

LO bit 7 - Spare

Attr-3 HI Byte - Health Test Conditions (1= OK, 0 = Fault) FW740

HI Bit 0 - **Health Clock OK**

HI Bit 1 - **7040 Plus 12 Volts OK**

HI Bit 2 - **7040 Plus 15 Volts OK**

HI Bit 3 - **7040 Zero Crossings OK**

HI Bit 4 - **7040 Static Memory OK**

HI Bit 5 - **7040 Dynamic Memory OK**

HI Bit 6 - **7040 Allocation OK**

HI Bit 7 - **7040 Health Test OK** (1= OK, 0 = Fault)

The Health Test Conditions are displayed on the LEDs: for about 2 seconds at startup. If Vunreg is out of limits then both the Plus 12 Volt and Plus 15 Volt indicate failed.

Top Red - Health Clock OK

Top Green - 7040 Plus 12 Volts OK

Bottom Red - 7040 Plus 15 Volts OK

Bottom Green - 7040 Zero Crossings OK

Top Amber - 7040 Static Memory OK

2nd Amber -7040 Dynamic Memory OK

3nd Amber - 7040 Allocation OK

4nd Amber - 7040 Health Test OK

Attr-3 HI Byte - Health Test Conditions (1= OK, 0 = Fault) FW754

HI Bit 0 - **Health Clock OK**
HI Bit 1 - **7540 Plus 12 Volts OK**
HI Bit 2 - **7540 Plus 5 Volts Analog Reference OK**
HI Bit 3 - **7540 Battery OK**
HI Bit 4 - **7540 Spare OK**
HI Bit 5 - **7540 Dynamic Memory OK**
HI Bit 6 - **7540 Allocation OK**
HI Bit 7 - **7540 Health Test OK** (1= OK, 0 = Fault)

The Health Test Conditions are displayed on the LEDs: for about 2 seconds at startup..

Top Red – 7540 Clock OK
Top Green - 7540 Plus 12 Volts OK
Bottom Red - 7540 Plus 5 Volts Analog Reference OK
Bottom Green - 7540 Battery OK
Top Amber - 7540 Spare OK
2nd Amber -7540 Dynamic Memory OK
3nd Amber - 7540 Allocation OK
4nd Amber - 7540 Health Test OK

Attr-3 HI Byte - Health Test Conditions (1= OK, 0 = Fault) FW840

HI Bit 0 - **Health Clock OK**
HI Bit 1 - **8040 Zero Crossings OK**
HI Bit 2 - **8040 Static Memory OK**
HI Bit 3 - **8040 Dynamic Memory OK**
HI Bit 4 - **8040 Allocation OK**
HI Bit 5 - **8040 Health Test OK** (1= OK, 0 = Fault)
HI Bit 6 - Spare
HI Bit 7 - Spare

The Health Test Conditions are displayed on the ASIC/2-8040 LEDs: for about 2 seconds at startup.

Top Red - Health Clock OK
Top Amber - 8040 Zero Crossings OK
2nd Amber -8040 Static Memory OK
Green - 8040 Dynamic Memory OK
Bottom Red - 8040 Allocation OK

Attr-4 **Action** Word

0 - No Action
1 - Clear EEPROM Written Status
Attr-0,LoBit7 = 0
2 - System Global Enable (ASIC/2 Only)
2 - Reserved - Set RS-232 Access Enable (SINC/2 Only)
3 - System Global Disable (ASIC/2 Only)
3 - Reserved - Clear RS-232 Access Enable (SINC/2 Only)
4 - Set Token Enable
Attr-0,LoBit1& Attr-10,LoBit2= 1
5 - Clear Token Enable
Attr-0,LoBit1& Attr-10,LoBit2= 0
6 - Reserved -
7 - Reserved -
8 - Reserved -
9 - Reserved -
10- Restore Combination Lock, Only
11 - Ruin Combination Lock, Not OK ; Set All Disables

12 - Restore Combo Lock, Clear All Disables
13 - Ruin Combo Lock, Only
14 Reserved - Disable Polling on Local Bus (FW740,840C)
15 Reserved - Restore Polling on Local Bus (FW740,840C)
16 Reserved - Disable Broadcast on Local Bus (FW740,840C)
17 Reserved - Restore Broadcast on Local Bus (FW740,840C)
18 Disable Clock Time (FW740,840)
19 Restore Clock Time (FW740,840)
20 Disable Outputs (FW740,840)
21 Restore Outputs (FW740,840)
22 Disable Remote Points (FW740,840)
23 Enable Remote Points (FW740,840)
24 Disable Notify (FW740E2.1,840E2.1)
25 Enable Notify (FW740E2.1,840E2.1)
26 Disable Dial Manager (FW740E2.1,840E2.1)
27 Enable Dial Manager (FW740E2.1,840E2.1)
28 Reset USB/Ethernet State (754a1.7,854a1.7)

Object Enables have been eliminated in the ASIC/2-7040&8040.

Object Enable Action - They are used in ASIC/2-7000 FW700A..I

O BYTE = 80h,

I BYTE = N (0..32) Set Object N Enable

Object Disable Action

O BYTE = 81h,

I BYTE = N (0..32) Clear Object N Enable

Attr-5 **Token Previous Address**

Address from which token has been received most recently.

Attr-6 **Token Next Address**

Address to which the token has been successfully passed most recently.

Attr-7 **LO Byte** – **Reserved** (FW754a13)

HI Byte - Spare

Attr-8 **Token Hold Timer**

The Token Hold Timer is loaded with Token Hold Interval, each time the configurable controller receives the token.

Attr-9 **Token Hold Interval**

The RAM value that is the length of time that the controller is permitted to hold the token on each rotation of the token.

System STATIC Properties

Attr-10 ASIC/2 Configuration (FW740,840,754,854)

These Enable Flags are used by the configurable controller to enable functions.

LO Byte

LO bit 0 - **One-Stop Bit Enable** (FW740C,840C)
Modbus Two Stop Bits Enable (854a1.4,754a14)

LO bit 1 - **System Global Enable** (5AFFh) (ASIC/2 Only)
Enables response to messages to 5AFFh system global address.
Note: the controller will always respond to the device global address 5A70h. for ASIC/2-7000, 5A20h for SINC/2

LO bit 2 - **Token Enable**
Required to pass token or initiate Token after a token inactive time.

LO bit 3 – **ETH-8540 Enable** (854a1.7)

LO bit 4 – **USB Modem Enable** (FW754A1.1)

LO bit 5 – **Modbus Enable** (7/854a14)

LO bit 6 – **Modbus Parity Enable** (/8754a14)

LO bit 7 – **Modbus Even Parity** (7/854a14)

HI Byte - Disable Flags (FW740,840)

HI bit 0 - **Polling Disable** (FW740,840C)
HI bit 1 - **Broadcast Disable** (FW740,840C)
HI bit 2 - **Remote Point Disable**
HI bit 3 - **Time Broadcast Disable**
HI bit 4 - **Output Disable**
HI bit 5 - **Notify Disable** (FW740E2.1,840E2.1)
HI bit 6 - **Dial Manager Disable** (FW740E2.1,840E2.1)
HI bit 7 -

Attr-11 **Model Number**

This contains the decimal value representing the hardware model number of the product:

7040 (1B 80 hex) - ASIC/2-7040

Attr-12 **System Bus Address**

Note: If the ASIC/2 or SC/1 is to be a token player, then its device address **must** be in the range 32001 to 32255 and the Token Enable must be set to Yes. If it is not a token player then it may have any valid device address not divisible by 256, and the Token Enable must be set to No.

Attr-13 **Local Bus Address** (FW740,840C)

Attr-14 Token Address Range

Assumes that HI Token Address Byte is 7D hex (32,000)
LO Byte = **Low Token Address**

The lowest address of token range is 32000 + **Low Token Address**

HI Byte = **High Token Address**

The highest address of token range is 32000 + **High Token Address**
Note: If High Token Address = 0, then my System Bus Address is the highest token address.

Attr-15 **System Baud Rate**

ASIC/2-7040 system bus :Baud Rate 1200,2400,4800,9600,19200. [Typical: 9600 baud]
SINC/2-2000 System bus baud rate:
ASIC/2-7000 LO Byte ASIC/2 Service Address
SC/1 Spare

Attr-16 **Local Baud Rate**

ASIC/2-7040 local bus Baud Rate:1200,2400,4800,9600. [Typical: 1200 baud]

Attr-17 Group Addresses

The controller will react to messages sent to a destination address with the high byte give by a group address, and the low byte equal to zero. Up to 2 group addresses may be identified for the unitary controller. A single group address is placed in Group Address 1 location. Only on System Bus.
LO Byte - **Group Address 1**
HI Byte - **Group Address 2**

Attr-18 (ASIC/2)

LO Byte **ASIC/2 Service Address**

Address used by DAK to communicate on the local bus. (0..64)
Moved from Attr-16 LO Byte FW700F. .

HI Byte - Reserved

Attr-19 **Token Hold Default**

The EEPROM value that is the length of time that the controller is permitted to hold the token on each rotation of the token. . [Typical: 5 s] It is loaded into Token Hold Interval in RAM on reset and when a new access is requested with an 87h message to the local communication bus.

Attr-20 Object Enable 1 - These are no longer used in ASIC/2-7040. FW740A..

These Enable Flags are used by the ASIC/2-7000 controller to enable the functioning of each object.

LO bit 0 - Object 0 Enable - Allocation

...

HI bit 7 - Object 15 Enable -

Attr-21 Object Enable 2

Display Manager and List flags are still used.

HI bit 0 - Object 24 **Display Manager Enable**

HI bit 1 - Object 25 **Display List Enable**

Attr-22

LO Byte **Polling Pause Time** (seconds) (FW740C,840C)

HI Byte Spare

Attr-23 **Highest Pass-thru Address**

Attr-24 **Lowest Pass-thru Address**

Attr-25

Lo Bit 0 **Protect System Object** (840E/740E 2.2)
if set then inhibits all MT=90 writes to System Object

Lo Bit 1 **Primitive Enable** (840E/740E 2.4)
Allows certain primitive write messages MT= 0x09, ..., 0x0E
Otherwise these messages are DISABLED

Lo Bit 2 **Global Pass-Thru Disable** (7/854a1.4)
Prevents pass-thru of global messages to local bus.

Lo Bit 3 **Group Pass-Thru Disable** (7/854a1.4)
Prevents pass-thru of group messages to local bus.

Lo Bit 4 **ETH-8540 Enable(8540)** (854a1.7)

Lo Bit 5 **Backdoor Enable (8540)** (854a1.7)

Lo Bit 6

Lo Bit 7

Hi Byte - **Reserved**

Attr-26,27 **IP Address**

Double Word XXX.XXX.XXX.XXX (FW754A1.1)

Attr-28,29 **IP Gateway Address** (FW754A1.1)

Double Word XXX.XXX.XXX.XXX

Attr-30,31 **IP Subnet Mask** (FW754A1.1)

Double Word XXX.XXX.XXX.XXX

Att-32 **IP Port** (FW754A1.1)

Attr-33,34 **IP Monitor Address** (FW754A1.1)

Double Word XXX.XXX.XXX.XXX

Atrt-35 **IP Monitor Port** (FW754A1.1)

Attr-36 HI BYTE - USB Ethernet Device (Read Only) (FW754A1.2)

1 = Autodetect -
Hawking Technology HUF11; Hawking Technology HUF11;
LinkSYS USB100M

Attr-36 LO BYTE - USB Modem Device (FW754A1.2)

1= Autodetect - Best Data 56USB-P

Attr-37 LO BYTE- USB Memory Device (FW754A1.2)

Attr-37 HI BYTE Spare

Attr-38 LO BYTE – USB Device Type (FW754A1.3)

0=Autodetect, 1=Ethernet, 2=Modem, 3=Memory

Attr-38 HI BYTE - Spare

Attr-39 Spare

Attr-40 Spare

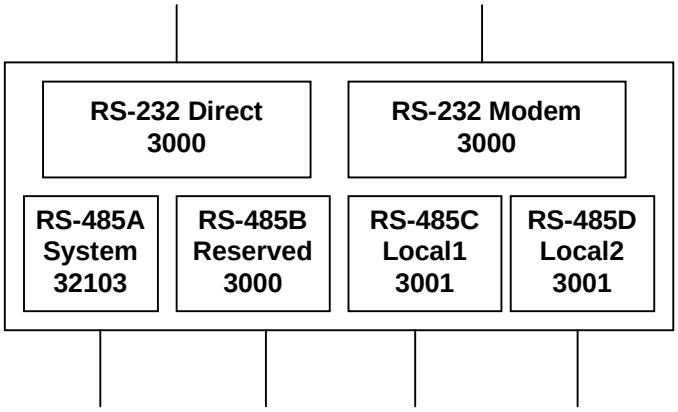
Attr-41..Attr-44 - **Reserved** (FW754A1.3)

Attr-45 Spare

Object 1 - System (SINC/3)

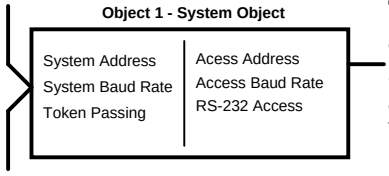
System Summary (SINC)

Overview: The System object is used to set-up communications related parameters and enable/disable other functions. This description applies to the SINC/3-3000 Multi-port System Interface controller.



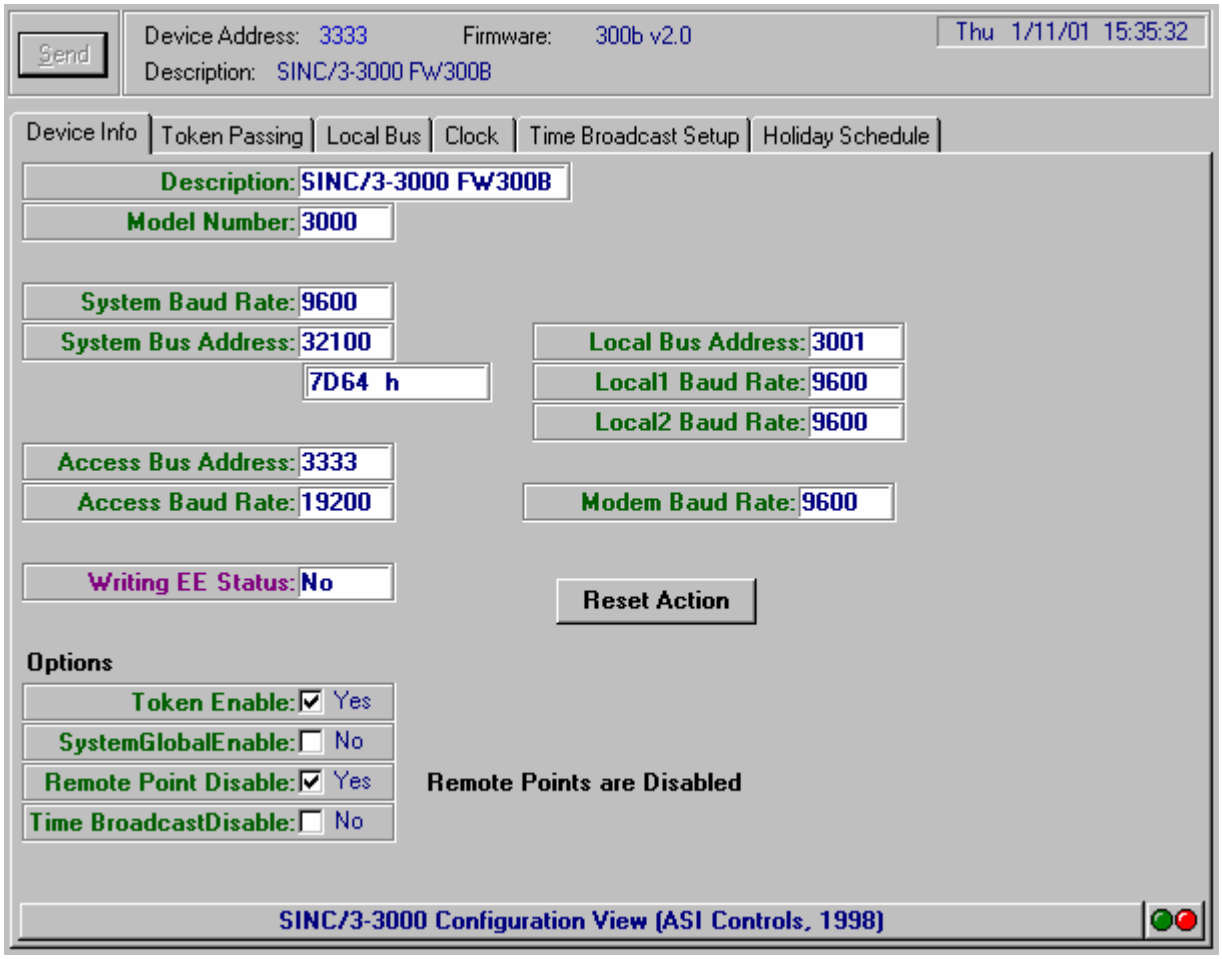
The SINC/3 is similar to the SINC/2 with additional functionality. Access and System bus parameters will have the same function. New parameters are added to support the additional communication ports.

The SINC/3-3000 always receives 1 or 2 stop bits always transmits with 2 stop bits on all ports.



The SINC/2-2000 has a system bus with a system bus address. The SINC/2-2000 also has an RS-232 Access bus which can receive and transmit messages at 1200, 2400, 4800, or 9600 baud. It has an RS-485 Output which can which can transmit and receive messages at 1200, 2400, 4800, or 9600 baud. Because of message buffering the communication speeds do not need to be the same speed.

SINC/3 Operation



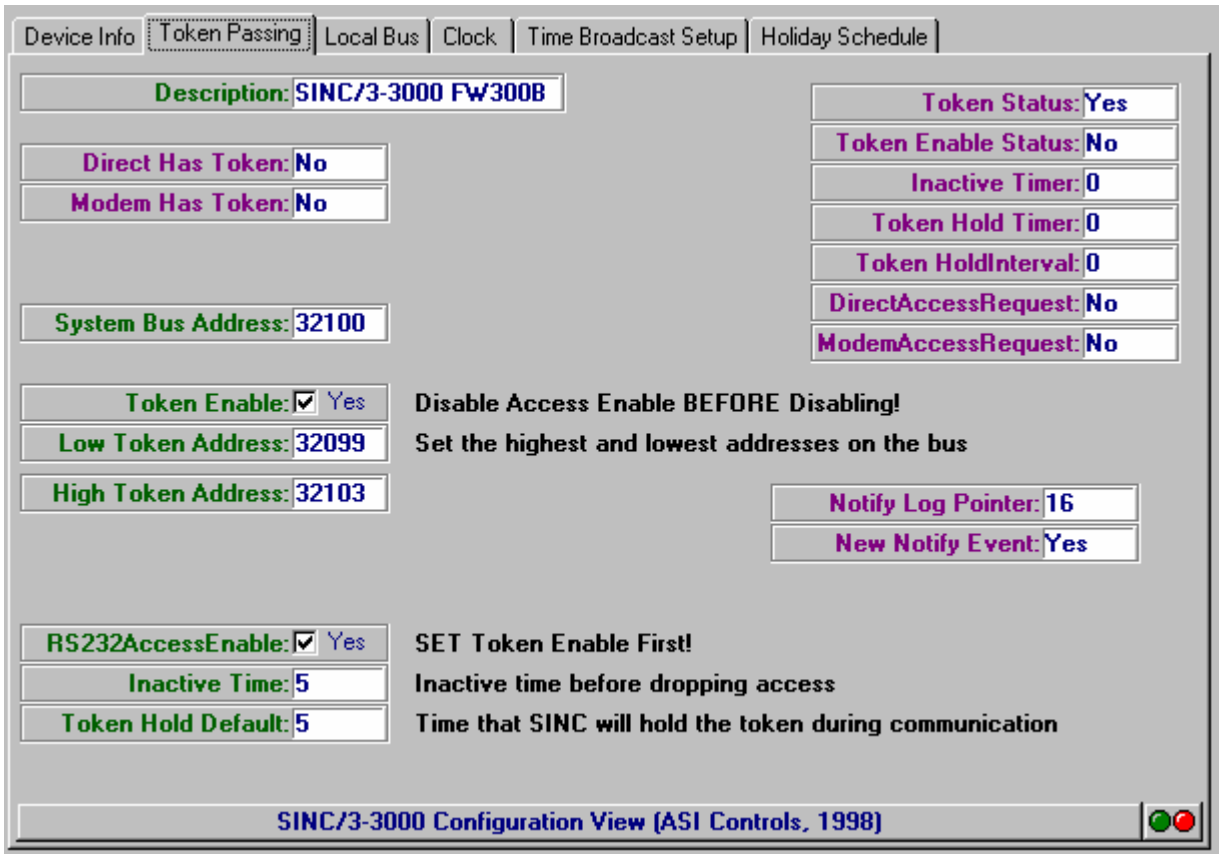
The SINC/3 has two RS-232 busses: Direct Access and Modem Access

The SINC/3 has an **Access Address** that is used to communicate with the controller from the RS-232 Access side of the controller. The Access Address is typically 3000 decimal. The Access Address is used for both Direct Access and Modem Access.

The Direct RS-232 Access bus which can receive and transmit messages at 1200, 2400, 4800, 9600, 19,200 or 38,400 baud. The **Direct Baud Rate** is used by the Access side of the controller, as in SINC/2. If the baud rate is changed the new baud rate becomes active immediately.

The Modem RS-232 Access bus which can receive and transmit messages at 1200, 2400, 4800, 9600, 19,200 or 38,400 baud. The **Modem Baud Rate** is used by the Access side of the controller. If the baud rate is changed the new baud rate becomes active immediately.

System Bus (SINC/3)



The SINC/3 has one RS-485 System Bus which may be token passing. Messages will be passed from the Direct or Modem Access to the system bus, provided that the Destination Address is not in the Poll List, the Pass- thru Address, range, or an ASIC/1 Global message.

System Bus Address

The SINC/3 has a **System Bus Address** that is used to communicate with the controller from the RS-485 System side of the controller. The System Bus Address is typically 32103 decimal.

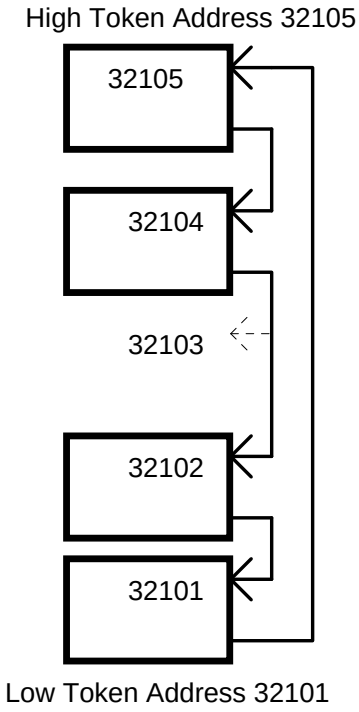
System Bus Baud Rate

The RS-485 System Bus which can receive and transmit messages at the **System Baud Rate**, at 9600 or 19,200 baud, as in SINC/2. If the baud rate is changed the new baud rate becomes active immediately.

Non-Token Mode

If **Token Enable** is No, then it does not attempt to pass the token and it responds as if it always has the token. Any broadcasts on the system bus will wait for a gap in communications before initiating communication.

Token Passing



Controllers that participate in the token passing process must have a System Bus Address in the range 32001 to 32255 and the **Token Enable** must be set to Yes. Furthermore the address should be within the **High Token Address** and **Low Token Address** range.

Each controller which has Token Enable acknowledges the token passing message when it is addressed to it and then passes the token to the next lower controller until the Low Token Address is reached. The token is then passed to the controller with the High Token Address. The decision to pass the token is based on passing all remote points or time messages or on the expiration of the Token Hold Timer.

Upon passing token to the next controller, the controller listens for the next controller to acknowledge that the token was successfully passed. If it hears a valid response, it assumes that the token has been successfully passed and reverts to listening mode.

If it does not hear a valid response, it assumes the token message was garbled and reissues the PASS TOKEN message up to 3 times. After three failures, the controller then issues a PASS TOKEN message to the controller with an address one lower until the Token Low Address fails to respond. It will then begin with Token High Address and continue until it reaches its own address. If unable to successfully pass the token, it then drops the token and goes into a listening mode. The token passes more quickly if the system bus addresses are right next to each other in sequence. If controllers are missing, then time is spent trying to pass the token to non-existent controllers.

Note: For best response of the token network it is important that token devices are addressed in sequence. There should be no missing device addresses between the Low Token Address and the High Token Address.

To become a token player on the system bus it is necessary to configure the High and Low Token Address Range. For most rapid token passing the configurable controllers should have addresses covering the smallest range possible. The System Bus Address must be in the range must be between 32001 and 32255. For the controller to pass the Token, the Token Enable must be set to yes.

High Token Address	[Typical, 32100]
Low Token Address	[Typical, 32105]
Token Enable	[Typical, Yes]
Token Hold Default	[Typical, 5 seconds]

If the token holder hears any other message on the communication line, it immediately drops the token and goes to listening mode. If the token is lost, so that it is no longer being passed from controller to controller, each controller listens to the system bus until its Token Lost Timer times out. The first controller to time out claims the token and begins transmitting. The Token Lost Time is calculated based on the System Bus Address, so that the controller with the highest address times out first.

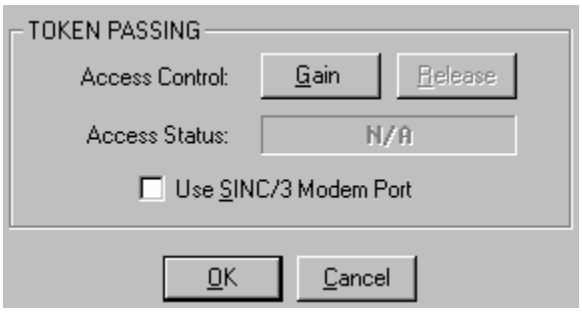
Request Access

If **RS-232 Access Enable** is yes and access has been requested, then communication is passed between the RS-232 Direct or Modem Access and the System Bus as if it always has the token.

When the Request Access message is directed from the Direct Access Bus to the Access Address, the SINC/3 sets the **Direct Access Request** to Yes and initiates RS-232 Direct Access. If request access is received on the Modem Access Bus, then the SINC/3 sets the **Modem Access Request** to Yes and initiates RS-232 Modem Access.

If both direct and modem access have been requested when the SINC/3 receives the token, it will alternate giving access to the direct port and the modem port passing the token around between each access.

In the ASI Expert System Communication Options dialog, you can select Gain Access. We have added flags for **Direct Has Token** Attr-0 HIBit6 and **Modem Has Token** Attr-0 HIBit7 are looked at by the ASI Expert software. Check "Use SINC/3 Modem Port" if gaining access through the Modem Port.



There is one one Token Status flag Attr0,LOBIT1, that is used by the ASI Data Server and ASI Expert to determine when it may resume communication. The ASIDDE Server should only be use the direct port.

The **Token Hold Interval** is loaded with the **Token Hold Default** value when the Request Access Message is first received. The Token Hold Interval may be changed by the host to allow greater access time.

Once access has been requested, the access controller accepts the token when offered, loads the **Token Hold Timer** with the Token Hold Interval, and grants access from the access bus to the token bus. When the Token Hold Timer times out, the token must be passed to the next controller. RS-232 access is suspended until the controller again receives the token.

Communication Access from RS-232 to the ASI Communication network is through a SINC/3-3000. RS-232 Access is achieved by sending a Request Access to the Access Address.

Token Hold Default	[Typical, 15 sec]
Inactive Time	[Typical, 15 minutes]

Only the direct or modem access will be holding the token at any one time so only one set of token hold timers are needed.

When waiting for token access, the Access Bus responds normally to messages directed to the Access Address.

The host software requesting access continuously polls the Access Address of the SINC/2 for the Token Status and waits until the controller has the token. It will then conduct communications until the Token Hold Timer times out.

The RS-232 Request will be maintained until there is a Release Access message or until there has been no RS-232 activity for a user-changeable Inactive Time.

When the **Release Access** message is directed to the Access Address, both Direct and Modem as needed, the system bus terminates RS-232 access and resumes normal token passing.

System Bus Disable Flags (SINC/3)

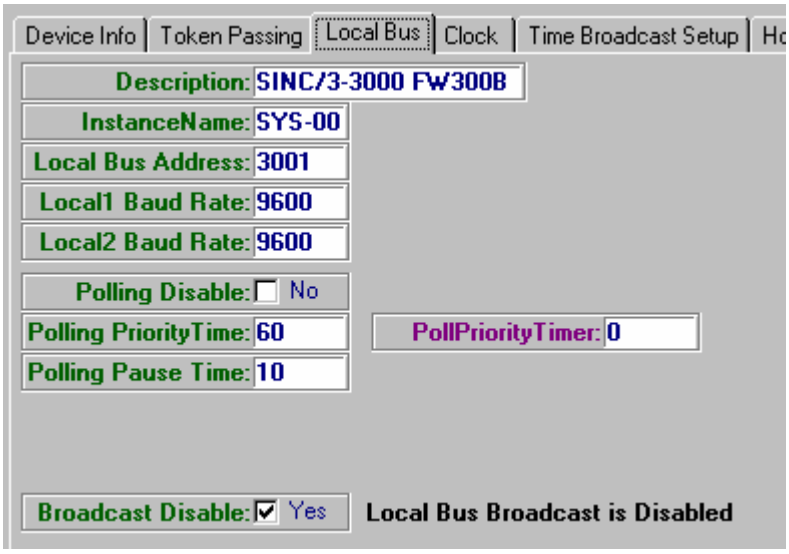
Disable flags are provided in the ASIC/2 to allow disabling of certain functions that affect outputs or broadcast messages.

If **Remote Point Disable** is set to yes, the broadcast of remote points on the system bus by indexes of the remote point object are suppressed. The code will continue to execute, but no messages are sent.

If **Time Broadcast Disable** is set to yes, the broadcast of time on the system bus by the clock object are suppressed. The code will continue to execute, but no messages are sent.

Local Bus Communication (SINC/3)

The SINC/3 has two independent local busses, Local Bus 1 and Local Bus 2 which may be at different baud rates.



The SINC/3 has a **Local Bus Address** that is used to communicate with the controller from the RS-485 System side of the controller. The Local Bus Address is typically 3001 decimal.. The same local bus address is used by either local bus.

The Local 1 Bus which can receive and transmit messages at the **Local 1 Baud Rate** at 1200, 9600, or 19,200 baud. If the baud rate is changed the new baud rate becomes active immediately.

The RS-485D Local 2 Bus which can receive and transmit messages at the **Local 2 Baud Rate**, at 1200, 9600, or 19,200 baud. If the baud rate is changed the new baud rate becomes active immediately.

Local Bus Pass-thru

The Highest and Lowest Pass-thru Address range can be set to allow pass-though of messages for a range of addresses.

Lowest Pass-thru Address	[Example, 1]
Highest Pass-thru Address	[Example, 61]

Pass through will be to both local busses. Global addresses, 5A 55h, (but not 5A 70h and 5A FFh) will automatically passed through.

Local Bus Polling

Poll List, and Poll Manager are enabled. The addresses of controllers on the local bus must be entered in the poll list if messages are to be automatically passed from the system bus to the local bus.

Poll Disable	[Typical, No]
Broadcast Disable	[Typical, No]
Polling Priority Time	[Typical, 60 s]
Polling Pause Time	[Typical 10 s]

The SINC/3 controller may be configured to request information from controllers on the local bus under the control of the Poll Manager Object. The data is saved in the Poll List Object. The system object has a Polling Priority Time and Timer that is used to insure that polling takes place even in the face of pass through messages from a Host System. Local bus polling may be disabled from the system object.

Local Bus Polling can be used to concentrate data, and convert baud rates, on systems with many ASIC/1 controllers.

The poll list function has been expanded so that polling and Pass-thru can be done to different RS-485 Local Bus ports! Each Poll List entry has a **Local Bus Assignment**, POL Attr-14 Bits23, which identifies the port where the controller can be found; 0 or 1 = Local 1, 2 = Local 2. The Poll Manager also has a **Local Bus Assignment** MGR, Attr-5 HI bits23 that identifies what which local bus to use for polling; 0 or 1 = Local 1, 2 = Local 2

If **Polling Disable** is set to yes, then all polling of controllers on the local bus is stopped, and the data in the poll list is no longer updated. Pass through of messages from the system bus still works even though polling is disabled.

Local Bus Broadcast

The SINC/3 controller may be configured to broadcast information to controllers on the local bus under the control of the Broadcast Object.

Broadcast may be disabled from the system object. If **Broadcast Disable** is set to yes, then the broadcast of messages on the local bus by indexes of the broadcast object are suppressed. The code will continue to execute, but no messages are sent.

Diagnostics (SINC/3)

Health Test Conditions

A Health Test has been added to dynamically test the controller hardware at power up time. This self test verifies the status of the following hardware.

1. Determines presence of Clock
2. Measures +12 and +15 volt power
3. Checks for presence of proper zero-crossings
4. Checks for presence of EEPROM and RAM memory

If all health conditions are satisfied then the Health Test Status Attr-3 HI Bit 7 is set.

Health Test (SINC/3)

The Health Test Conditions are displayed on the LEDs: for about 2 seconds at startup.

GREEN 1:	Clock OK
GREEN 2:	+12 Power OK
GREEN 3	+15 Power OK
GREEN 4	Zero-Crossing OK
AMBER LED 1	EEPROM OK
AMBER LED 2	RAM OK,
AMBER LED 3	Allocation OK
AMBER LED 4	All Tests OK

Unacknowledged Alarms

The System object keeps track of whether there are currently any unacknowledged alarms in the Alarm object. The highest level of priority of unacknowledged alarms is also recorded here.

Order of Calculation (SINC/3)

NOTE: The passing of data and status information between objects CAN be influenced by the sequence of execution.

The control sequences are executed once each second, performing any actions that are required. The order of calculation of the objects is fixed. It goes from lowest index to highest index for each object. Pay particular attention to interlocks and logic sequences.

Calculations are done once each second. If the output of an object is used by an object occurring earlier in the calculation list, or to the same object with a smaller index, a change in value will be delayed in time by 1 second.

NOTE: The passing of data and status information between objects CAN be influenced by the order of calculation. Pay particular attention to interlocks and logic sequences.

Certain objects have handles that are used as triggers which cause an event to occur on change of value. These objects have special code which is executed only at power-up time, prior to the execution of any other code. This code stores an "old" trigger level which is a zero in almost all cases. This means at the end of the 1st second after power-up transitions to non-zero value may well be detected. This causes triggering of events expecting non-zero transitions. If this is a serious problem, this operation can be locked out using a logic block and the First Time Flag (SYSTEM, Attr- 0, HI bit 0).

Once Each Second the following objects are executed in the following order:

Time Information

12-CLOCK - Check if it is time to do calculations.
23-TREND - Check if any dynamic trends required.
27-STATIC TREND - Check if any trends required.
4-SCHEDULE - Refresh all schedules if it is time.
36-CALENDAR

Modify Information

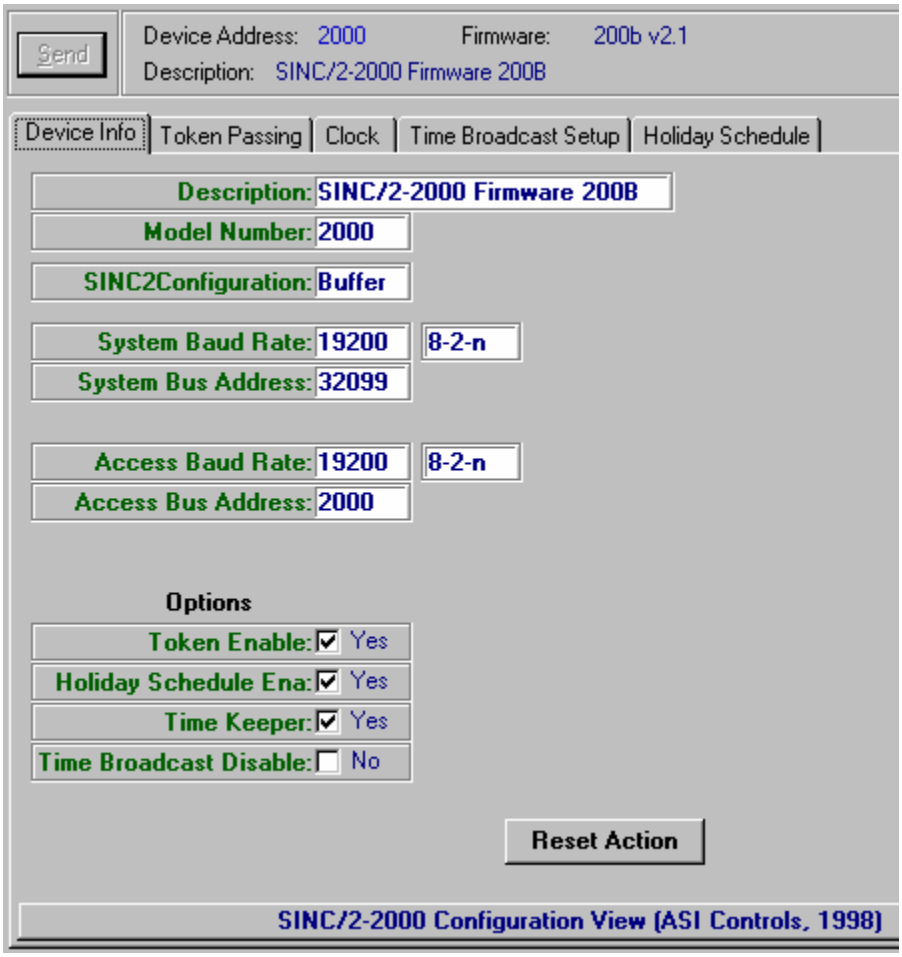
22-CALCULATED POINT- Calculate intermediate values.
21-TIMER - Increment and Check Timer Status
20-LOGIC - Calculate Logic Status
32-LOGIC2 - Calculate Logic2 Status
26-COUNTER - Counter and Run Time is updated.
14-ALARM - Status of configured alarms is updated.
28-EVENT MANAGER and 29-EVENT LIST
33-MONITOR - Obtain Monitor Data
35-ENCODE
36-CALENDAR

OUTPUT Information

1-SYSTEM - Update Unacknowledged Alarms .
2-REMOTE - Remote points are updated if required.
17-POLL MANAGER
19-BROADCAST
37-NOTIFY – Status of new alarm manager
34-DIAL MANAGER – Initiate Dial-out if needed.

SINC/2 Operation

The SINC/2 with release 200B provides RS-232 Access to a token passing system.



The SINC/2 has an **Access Address**, Attr-13, that is used to communicate with the controller from the RS-232 Access side of the controller. The Access Address is typically 2000 decimal.

The SINC/2-2000 has an RS-232 Access bus which can receive and transmit messages at 1200, 2400, 4800, or 9600 baud. The **Access Baud Rate**, Attr-16, is used by the Access side of the controller. If the baud rate is changed the new baud rate becomes active immediately. Note: FW200A the Access Baud Rate was Attr-15!

Repeater Mode

In the repeater mode data from the access bus is relayed electrically, bit for bit, to the System Bus. In this mode the SINC/2 is a direct replacement for the SINC/1-1000, however the specific baud rate must be set in the SINC/2. The SINC/2 monitors each request and response message and switches the direction of transmission as needed. Communication takes place at the Access baud rate and with the data format of the communicating devices. The Access Format must agree with the transmitted data.

Buffer Mode

In the buffer mode data from the access bus is received into a communication buffer at the Access baud rate and with the Access Data format. Upon receipt of a valid checksum, the request message is retransmitted on the System Bus at the System Bus baud rate and with the System Data Format. The response message is then received on the system bus, and retransmitted on the access bus.

Note: Request messages must originate on the Access bus.

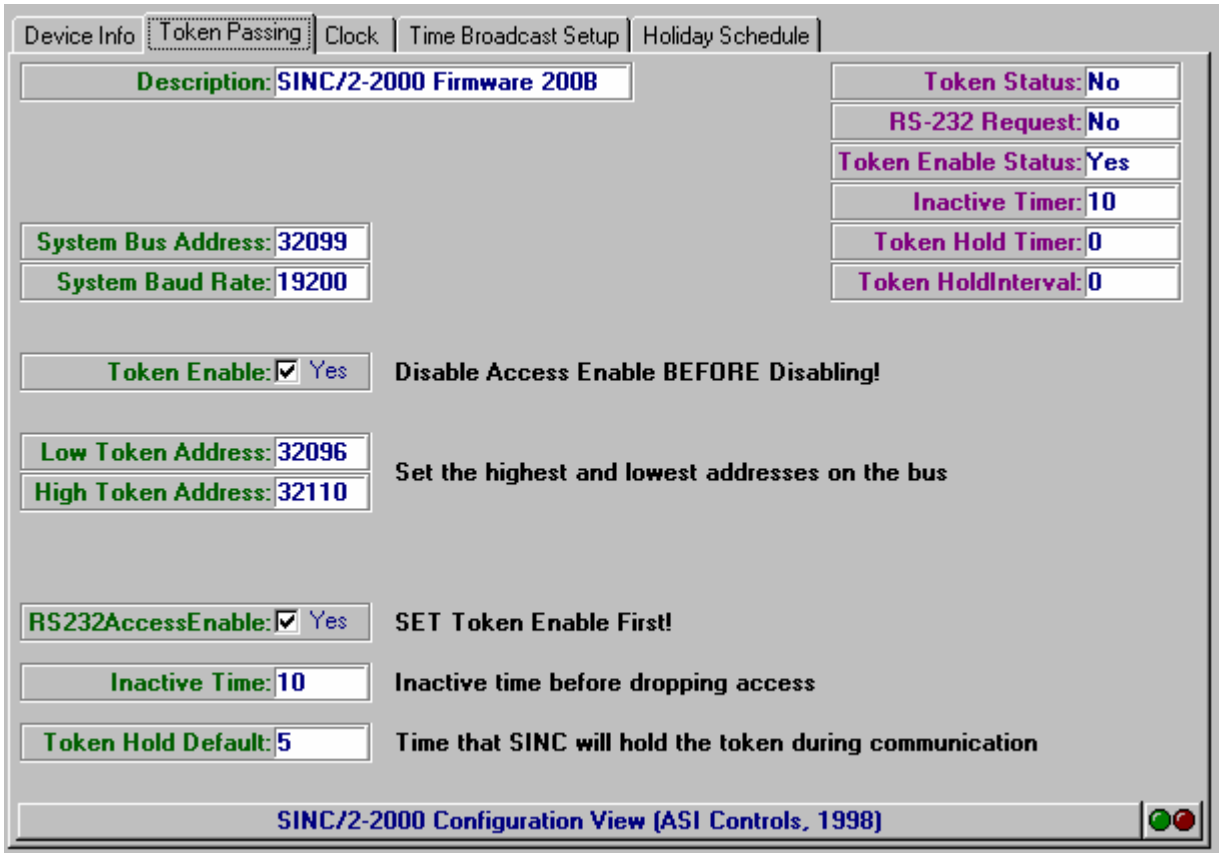
RS-232 Monitor (SINC/2-2000)

The SINC/2 has an RS-232 Monitoring port to allow communicating with the network or with the SINC/2. The Monitor Port is located on the side furthest from the power connections.

This monitoring port can be switched between the System side and the Access side of the SINC/2 to monitor communications using the local/remote toggle of ASI Setup Software. This feature is not supported by ASI Expert.

Token Passing (SINC/2)

The SINC/2 in release FW200B may be configured as the primary access device on the token network.



Communication Access from RS-232 to the ASI Communication network is through a SINC/2-2000. RS-232 Access is achieved by sending a Request Access to the Access Address.

Request Access

When the Request Access message is directed from the RS-232 Access Bus to the Access Address, the SINC/2 sets the **RS-232 Access Request** to Yes and initiates RS-232 Access. The **Token Hold Interval** is loaded with the **Token Hold Default** Value when the Request Access Message is first received. The Token Hold Interval may be changed by the host to allow greater access time.

Token Hold Default	[Typical, 15 sec]
Inactive Time	[Typical, 15 minutes]

Once access has been requested, the access controller accepts the token when offered, loads the **Token Hold Timer** with the **Token Hold Interval**, and grants access from the access bus to the token bus. When the Token Hold Timer times out, the token must be

passed to the next controller. RS-232 access is suspended until the controller again receives the token.

When waiting for token access, the Access Bus responds normally to messages directed to the Access Address.

The host software requesting access continuously polls the Access Address of the SINC/2 for the Token Status and waits until the controller has the token. It will then conduct communications until the Token Hold Timer times out.

The RS-232 Request will be maintained until there is a Release Access message or until there has been no RS-232 activity for a user-changeable Inactive Time.

Release Access

When the Release Access message is directed to the Access Address , the system bus terminates RS-232 access and resumes normal token passing.

System Glossary (SINC/3)

Access Address

Designates the address the configurable controller is to use when responding to messages from the access side. User-configurable; (1,0,13,WORD)(FW200B)

Access Baud Rate

Default baud rate for operation at reset: 1200,2400,4800,9600. [Typical: 1200 baud] (1,0,16, WORD) (FW200B)

Access Format

UART Data Format on Access Side for buffer operation (Attr-10 HI_LS_NBL) (FW200B)

Action

Writing the following values to this parameter (1,0,4,WORD) causes the corresponding actions to occur.

Alarm Object Initialized

Indicates that following power-up the Last State of COS Target parameter in the Alarm object was subsequently initialized. (Necessary so that the COS Alarm may be properly used.) "Yes", "No"; not user-changeable. (1,0,3,LOBIT0)

Broadcast Disable

The broadcast of messages on the local bus by indexes of the broadcast object are suppressed. The code will continue to execute, but messages are not sent. (1,0,10,HI bit 1)

Direct Access Baud Rate

The baud rate for Direct Access

9600, 19,200, or 38,400 [Typical: 19,200 baud] (1,0,16, WORD)

Direct Has Token

Indicates that the Direct RS-232 Port currently has access to the token bus. "Yes", "No". (1,0,0,HIBIT6)

Direct Request Status

RS-232 Access has been requested from Direct Port. Set with Request Access, 87h message. "Yes", "No". (1,0,0,LO BIT2)

EEPROM Written Status

Set to "Yes" if an EEPROM memory location in the configurable controller has been written to. May be reset to "No" by the user via Action 1. "Yes", "No". (1,0,0,LO BIT7)

First Time Flag

The First Time Flag can be used to lockout functions for a period after power reset. Modified Binary Outputs to not come on until after the Second time Flag has fallen. This allows logic and timers to be set up to inhibit operation.(1,0,0,HI BIT 0) (FW740A1.7..)

Group Address 1,2

The controller will react to messages sent to a destination address with the high byte give by a group address, and the low byte equal to zero. Up to 2 group addresses may be identified for the unitary controller. If a single group address is used then Group Address 1 is used. Group Address 1(1,0,17, LO Byte) Group Address 2 (1,0,17, HI Byte)

High Token Address

Applies only to systems using a Token Passing Bus. Designates the upper boundary address of Token Range. Token Range designates the range of addresses of configurable controllers which this controller sequentially attempts to pass the token to. Only the lowest two digits of the 4-digit hexadecimal address are given here; the high digits are assumed to be "7D", so that the highest possible token address is 32,000 + High Token Address. (1,0,14,HIGH BYTE)

Highest Pass-thru Address

The ASIC/2-7040 has a Highest and Lowest Pass-thru Address for passing messages from the system bus to the local bus. If the source or destination address of the controller is either in the poll list, or between the Highest and Lowest Pass-thru Addresses, then the message will be passed through from system to local bus and the response messages will be transmitted back.(1,0,23,WORD) (FW740)

Inactive Time

(FW200B) If RS-232 access has been requested, but the PC is not actively pursuing bus communications, the controller will only support access to the communications bus for this amount of time before abandoning the attempt. Once the attempt is abandoned, RS-232 Access Request is reset to "No". User-configurable; in minutes. [Typical: 15 minutes] (1,X,18,WORD)

Inactive Timer

(FW200B) Used to time Inactive Time. User-configurable; reads in minutes. (1,X,7,WORD)

Local 1 Baud Rate

Baud rate for local bus 1: 1200,2400,4800,9600,19,200, or 38,400 [Typical: 19,200 baud] (1,0,28, WORD)

Local 2 Baud Rate

Baud rate for local bus 2: 1200,2400,4800,9600,19,200, or 38,400 [Typical: 19,200 baud] (1,0,29, WORD)

Low Token Address

Applies only to systems using a Token Passing Bus. Designates the upper boundary address of Token Range. Token Range designates the range of addresses of configurable controllers which this controller sequentially attempts to pass the token to. Only the lowest two digits of the 4-digit hexadecimal address are given here; the high digits are assumed to be "7D", so that the lowest possible token address is 32,000 + Low Token Address. (1,0,14,LOW BYTE)

Lowest Pass-thru Address

The ASIC/2-7040 has a Highest and Lowest Pass-thru Address for passing messages from the system bus to the local bus. If the source or destination address of the controller is either in the poll list, or between the Highest and Lowest Pass-thru Addresses, then the message will be passed through from system to local bus and the response messages will be transmitted back.(1,0,24,WORD) (FW740)

Model Number

Indicates the model number "7000" or "7040", “8040”,”2000” designation for this configurable controller. User-configurable (but not recommended). Integer. (1,0,11,WORD)

Modem Baud Rate

Baud Rate for RS-232 Modem Bus: 1200,2400,4800,9600, 19,200, or 38,400 [Typical: 19,200 baud] (1,0,26, WORD)

Modem Has Token

Indicates that the Modem RS-232 Port currently has access to the token bus. "Yes", "No". (1,0,0,HIBIT7)

Modem Request Status

. RS-232 Access has been requested from Modem Port. Set with Request Access, 87h message. "Yes", "No". (1,0,0,LO BIT3)

Polling Disable

If Polling Disable is set to yes, then all polling of controllers on the local bus is stopped, and the data in the poll list is no longer updated. Pass through of messages to controllers whose addresses are in the poll list still works. (1,0,10,HI bit 0) (FW740)

Polling Pause Time

At the end of a polling round it will wait a Poll Pause Time. If zero the normal gap between polls is maintained. before beginning the next polling round. This can be set to give higher priority to pass through polling from a host. Used to force a pause on the local bus to enable other users access to the communication line. (1,0,22,LO Byte) (FW740B1.7..).

Polling Priority Time

The Polling Priority Time and Timer are used to insure that polling takes place even when controllers on the local bus are being polled by a host system. When the Polling Priority Time is exceeded then local bus polling takes highest priority until the end of the current polling round. During this time messages will not be passed-through from the system bus. In seconds. User-changeable. (1,0,18,HI Byte) (FW740)

Polling Priority Timer The Polling Priority Timer is initialized at the end of a polling round and counts down whenever polling is interrupted by Pass-thru communications. In seconds. Not User-changeable. (1,0,2,HI Byte)(FW740)

Previous Status

The value of Present Status prior to the most recently performed Action. Not user-changeable. (1,0,1,WORD)

Remote Point Disable

The broadcast of remote points on the system bus by indexes of the remote point object are suppressed. The code will continue to execute, but messages are not sent. (1,0,10,HI bit 2)

RS-232 Request Status

(FW200B) . Once an Access Request has been made, the s controller will obtain control of the communications bus at the next opportunity and allow the user send and receive messages on the bus. Set with Request Access, 87h message. "Yes", "No". (1,X,0,LO BIT2) (FW200B)

Second Time Flag

Modified Binary Outputs to not come on until after the Second time Flag has fallen. This allows logic and timers to be set up to inhibit operation.(1,0,0,HI BIT 4) (FW740A1.7..)

SINC/2 Configuration

Configuration of the SINC/2 for Repeater, or ASI Message Buffer (Attr-10, LO_MS_NBL)(FW200B)

SINC/3 Configuration

Configuration of the SINC/3 for Token and Polling (Attr-10, LO_MS_NBL)

Synchronize Status

Indicates that the configurable controller has had its time synchronized in accordance with a "Time Synchronization" message broadcast on the communications bus. Not user-changeable; "Yes", "No". (1,0,0,LOBIT0)

System Bus Address

If the ASIC/2 or SC/1 is to be a token player, then its device address must be in the range 32001 to 32255 (7D01h to 7DFFh).and the Token Enable must be set to Yes. If it is not to be a token player, then it may have any valid device address. (1,0,12,WORD)

System Baud Rate

(ASIC/2-7040) Default baud rate for operation of the system bus: 9600,19,200, or 38,400 [Typical: 19,200 baud] (1,0,15, WORD)

System Global Enable

Enables response to messages to 0x5A70 system bus global address. Note: the controller will always respond to the device global address 5A20h. (1,0,10,LOBIT 3)

Time Broadcast Disable

The broadcast of time on the system bus by the clock object are suppressed. The code will continue to execute, but messages are not sent. (1,0,10,HI bit 3)

Token Hold Default

Applies only to configurable controllers participating in a token passing bus. This default value is loaded into Token Hold Interval upon receipt of the token by the configurable controller. User-configurable; integer number of seconds. [Typical: 5 sec] (1,0,19,WORD)

Token Hold Interval

Applies only to configurable controllers participating on a token passing bus. This is the amount of time for which the controller will govern bus communications upon receiving the token before passing the token on to another controller. Token Hold Interval is loaded with Token Hold Default upon receipt of the token; the user may alter the value of Token Hold Interval while bus access is in effect. (In this case, the user typically desires additional bus access time for his desired messages.) Not user-changeable; integer. (1,0,9,WORD)

Token Hold Timer

Used to track Token Hold Interval. Not user-changeable; reads in seconds. (1,0,8,WORD)

Token Enable

Applies only to configurable controllers participating on a token passing bus. Enables this configurable controller to Token passing upon reset from power-outage, or upon recovery from communication errors. User-configurable; "Yes", "No". (1,0,10,LOBIT 2)

Token Next Address

Applies only to configurable controllers participating on a token passing bus. This is the address of the controller which this controller most recently successfully passed the token to. Not user-configurable; hexadecimal 7D00 to FFFF. (1,0,6,WORD)

Token Previous Address

Applies only to configurable controllers participating on a token passing bus. This is the address of the controller from which this controller most recently received the token from. Not user-configurable; hexadecimal 7D00 to FFFF. (1,0,5,WORD)

Token Status

Indicates whether this controller currently holds the token. "Yes", "No". (1,0,0,LOBIT1)

Unacknowledged Alarm Priority

Designates the highest alarm priority for those alarms present in the Alarm object which have not yet been acknowledged by the user. Not user-changeable; "Lowest", "Middle", "Highest". (1,0,0,LOW BITS 5,6)

Unacknowledged Alarm Status

Indicates if any unacknowledged alarms exist in the Alarm object. "Yes", "No"; not user-changeable. (1,0,0,LOBIT4)

Writing EEPROM Status

Indicates that the controller is writing data to non-volatile memory. (1,0,0,HIBit 3)

System Properties (SINC)

The SYSTEM object defines the present values and setup parameters used by the controller to enable the different control blocks.

SYSTEM

Object Number	= 1
Data Type	= Word
Index	= 0
Properties	= 0..31
DYNAMIC Attribures	= 10 (0..9)
STATIC Attributes	= 16 (10.25) (ASIC/2, SINC/2)
STATIC Attriburtes	= 22 (10.31) (SINC/3)

System Firmware Revision (SINC/3)

SINC/3-3000 FW300B Rev 3.1a Released 2007-03-02 CHK 0xE51E

- Adds Long Connect DIL-Attr 14, Lo Bit 6.
  Waits 60 seconds after dialing for a connection.

SINC/3-3000 FW300B Rev 3.0c 2006-04-27 CHK 0xE5E6 ASI PN 70015-05

- Updates Default Daylight Savings Dates
- Adds 12-Clock Custom Daylight Savings Date feature.

Note: The Clock size has changed so you must reload your application.

SINC/3-3000 FW300B Rev 2.9d Released 05/29/2003 CHK 0xA80A PN 70015-04

- Fixed 23-Trend and 27-Static Trend broken in 300b2.8
- Fixed 23-Trend rollover that added extra entry.
- Fixed 27-Static Trend Date Stamp at rollover.

SINC/3-3000 FW300B Rev 2.8g Released 12/24/2002 CHK 0xADC2

- Decreased Expert Max Total Memory Allocation to 23808 to eliminate overflow of RAM
- Increases Maximum Notify to 192 Instances
- Fixed problem with Word Size objects over 128 instances.
- Fixed Ethernet Notify messages without rempote points or direct communication.
- Fixes Pass-through of MT=0x27, Override Analog Output Value, and MT=0x28, Clear Analog Output Override

SINC/3-3000 FW300B Rev 2.7 Released 11/06/2002

- Increases Maximum Broadcast to 255
- Fixes Notify messages are now sent correctly without remote points.

SINC/3-3000 FW300B Rev 2.6 Released 03/27/2002 CHK 0xADAE

- Increases Maximum Notify to 128.
  Note: Maximum memory for SINC/3 is ONLY 24064.
  Make sure the EE Memory for the last object does not go past 8000h.
  EEStart Address + EE Size for last object.
- System Global Address. If System Global Enable is Yes, then the SINC/3 will process messages addressed to the System Global Address, 0x5A70 (23152 decimal).

SINC/3-3000 FW300B Rev 2.5 Released 01/14/2002 CHK 0xC23B

- Fixes problem with Direct and Modem Ports locking up when polling on local bus.

SINC/3-3000 FW300B Rev 2.4c Released 09/21/2001 CHK 0xDBCF PN 70015-02

- Fixes problem with pass-through communication to system bus when both Direct and Modem ports are requesting data. Now they take turns.
  In Token passing Direct and Modem ports are held for the entire token turn, so use Token Hold time of 10 s if simultaneous access is required.
- NOTE: 8-STATE is not supported in SINC/3.
  31-Sequence is not supported in SINC/3.

SINC/3-3000 FW300B Rev 2.3b Limited 09/05/2001 CHK 0xC985

Fixes problem with communication lockup on system bus.

SINC/3-3000 FW300B Rev 2.1 06/18/2001 CHK 0xD16A -- ASI PN 70015-01

- Moves SINC/3 System Global Enable to SYS Attr-10 Lobit0
  This allows the SINC/3 to take action on 0x5A70 global messages.
- Adds Notify Disable/DialManager Disable to System Object
  SYS Action 11 sets Notify Disable/DialManager Disable
  SYS Action 12 Clear clears Notify Disable/DialManager Disable
- Adds Notify Disable SYS Attr-10, HIBit5
  and Dial Manager Disable SYS Attr-10, HIBit6 to System Object.
  These are now set when allocation is changed, so that
  when the allocation is change, Notifies are not sent and it does not attempt to dial until the configuration has been restored.
- Improves Modem/Direct Contention for System Bus.

SINC/3-3000 FW300B Rev 2.0 Released 12/15/2000 CHK 0xDDAD

Adds gap to Pass-thru of MT=92 Messages to Dial Port

SINC/3-3000 FW300B Rev 1.9 Released 10/30/2000 CHK 0xD8D9

- Adds Special Notify Global 0x5AE0 which is passed out modem port.
  For use with ASI EtherLink. 0x5AE0
  Globals will compete with modem port communication.

SINC/3-3000 FW300B Rev 1.8 Released 10/05/2000 CHK 0xCB3B

- Global Messages, 0x5A55, 0x5A25, 0x5A35 pass through to Local Bus Only
  Need to also be passed to System Bus. Will be fixed in next rev.
- Global Message 0x5a70 now passes through to System Bus
- Fixes Local Bus pass-thru lockup after Global message
- Fixes Local Bus Polling at 1200 baud.
- System Bus 9600, 19,200 baud only (Not 1200 baud).

SINC/3-3000 FW300B Rev 1.7 Released 09/21/2000 CHK 0xCE1D

- SYS Have Token flag is now accurate in Token passing.

SINC/3-3000 FW300B Rev 1.3 Released 03/15/2000 CHK 0x625E

- Poll Instruction depends on Local Bus Assignment
- Improves polling speed on local busses.
- Polling Pause now 1 to 4 seconds after each scan.
- Token passing much improved and 90h and 92h reception improved
- Adds five second guard time to avoid dial-in/dial-out conflict.

SINC/3-3000 FW300B Rev 1.0 Released 10/06/1999

- Add Attr-2 LO Byte **Notify Log Pointer**
- Add Attr-3 LO Bit 2 **New Notify Event**

SINC/3-3000 FW300A Rev 1.0 Released 07/27/99 CHK 0xFA3F

- Initial Release as RS-232 Access Device. (SINC/2-2000 Replacement)

SINC/2-2000 FW200B Rev 1.0 Released 6 Dec 93

Updated firmware release including Token Passing, Token Access.
Attr-15 System (Field) Baud Rate
Attr-16 Access Baud Rate

SINC/2-2000 FW200A Rev 1.3 Released 30 Sept 93

Including Hardware Clock, Holiday Schedule, and Improved EEPROM write.
Attr-16 System (Field) Baud Rate
Attr-15 Access Baud Rate

System DYNAMIC Properties (SINC/3)

Attr-0 Present Status

LO bit 0 - **Synchronize Status**
1 = Synchronized, 0 = Unsynchronized

LO bit 1 - **Token Status**
1 = Have Token, 0 = No

LO bit 2 - **Direct Request Status** (SC/1 and SINC/2 ,SINC/3)
1 = RS-232 Access has been requested
0 = No RS-232 Access

LO bit 3 - **Modem Request Status** (SINC/3)
1 = RS-232 Access has been requested
0 = No RS-232 Access

LO bit 3 - **Spy Status** (SINC/2 Only)
0 = No Spy; 1 = Spy Mode,

LO bit 4 - **Unacknowledged Alarm Status**
1 = Yes, Unacknowledged Alarms
0 = No, Unacknowledged Alarms

LO bit 5,6 - **Unacknowledged Alarm Priority**
Highest Priority of Unacknowledged Alarms (0,1,2,3)

LO bit 7 - **EEPROM Written Status**
1 = EEPROM Written since last clear
0 = EEPROM has not been Written since last clear.

Attr-0 HI Byte

HI bit 0 - **First Time Flag**
1 = First pass through code for initialization at power-up.
0 = After 1st second.

HI bit 1 - Reserved (Combination Lock Status)
Not used by ASIC/2-8040, ASIC/2-7040, SINC/3
1 = Combination Lock OK, Normal Operation
0 = Combination Ruined, Do not execute algorithms

HI bit 2 - T**oken Enable** FW740,840 SINC/3, SINC/2

HI bit 3 -Writing EEPROM Status (FW740A1.7..)

HI bit 4 – Second Time Flag (FW740A1.7)

HI bit 5 - Spare

HI bit 6 - **Direct Has Token** (SINC/3)

HI bit 7 - **Modem Has Token** (SINC/3)

Attr-1 Previous Status

Rotates present value on any action

Attr-2 Timers

LO Byte - Spare

HI Byte Reserved - **Polling Priority Timer** FW740, SINC/3

Attr-3 System Alarm Word

LO Byte

LO bit 0 - **Alarm Object Initialized**
Change of State initialized in alarm object on power Up.

LO bit 1 - Spare

LO bit 2 - Spare

LO bit 3 - Spare

LO bit 4 - Spare

LO bit 5 - Spare

LO bit 6 - Spare

LO bit 7 - Spare

Attr-3 HI Byte - Health Test Conditions (1= OK, 0 = Fault) FW740,840, SINC/3

HI Bit 0 - **Clock OK**
HI Bit 1 - **Plus 12 Volts OK**
HI Bit 2 - **Plus 15 Volts OK**
HI Bit 3- **Zero Crossings OK**
HI Bit 4 - **EEPROM Memory OK**
HI Bit 5 - **RAM Memory OK**
HI Bit 6 - **Allocation OK**
HI Bit 7 - **Health Test Status** (1= OK, 0 = Fault)

The Health Test Conditions are displayed on the LEDs: for about 2 seconds at startup.

Attr-4 **Action** Word

0 - No Action
1 - Clear EEPROM Written Status
Attr-0,LoBit7 = 0
2 - System Global Enable (SINC/3 Only)
2 - Set RS-232 Access Enable (SINC/2 Only)
3 - System Global Disable (SINC/3 Only)
3 - Clear RS-232 Access Enable (SINC/2 Only)
4 - Set Token Enable
Attr-0,LoBit1& Attr-10,LoBit2= 1
5 - Clear Token Enable
Attr-0,LoBit1& Attr-10,LoBit2= 0
6 - Reserved -
7 - Reserved -
8 - Reserved -
9 - Reserved -
10- Restore Combination Lock, Only
11 - Ruin Combination Lock, Not OK ; Set All Disables
12 - Restore Combo Lock, Clear All Disables
13 - Ruin Combo Lock, Only
14 Reserved - Disable Polling on Local Bus (FW300B)
15 Reserved - Restore Polling on Local Bus (FW300B)
16 Disable Broadcast on Local Bus (FW300B)
17 Restore Broadcast on Local Bus (FW300B)
18 Disable Clock Time FW300B)
19 Restore Clock Time FW300B)
20 Reserved - Disable Outputs
21 Reserved - Restore Outputs
22 Disable Remote Points (FW300B)
23 Enable Remote Points (FW300B)
24 Reserved - Disable Notify
25 Reserved - Enable Notify
26 Reserved - Disable Dial Manager
27 Reserved - Enable Dial Manager

Attr-5 **Token Previous Address**

Address from which token has been received most recently.

Attr-6 **Token Next Address**

Address to which the token has been successfully passed most recently.

Attr-7 **Inactive Timer**

Used to time lack of activity on the RS-232 access port. (SINC/2,SINC/3)

Attr-8 **Token Hold Timer**

The Token Hold Timer is loaded with Token Hold Interval, each time the configurable controller receives the token. (SINC/2,SINC/3)

Attr-9 **Token Hold Interval**

The RAM value that is the length of time that the controller is permitted to hold the token on each rotation of the token. (SINC/2,SINC/3)

System STATIC Properties (SINC/3)

Attr-10 SINC/3 Configuration

These Enable Flags are used by the configurable controller to enable functions.

LO bit 0 – Reserved (SINC3)

LO bit 1 - **RS-232 Access Enable** SC/1 and SINC/2 , SINC/3

Enables Access for Modem and Direct Access.

Required for 87h message to make access request

LO bit 2 - **Token Enable** (SINC/2,SINC/3)

Required to pass token or initiate Token after a token inactive time.

LO bit 3 - **System Global Enable** (FW300)

Enables response to messages to 0x5A70 system bus global address.

Note: the controller will always respond to the device global address 0x5A20.

LO_MS_NBL - **SINC/3 Configuration** (FW300)

Reserved for Future Use.

Attr-10 HI Byte - Disable Flags (SINC/3)

HI bit 0 - **Polling Disable** (FW740)

HI bit 1 - **Broadcast Disable** (FW740)

HI bit 2 - **Remote Point Disable**

HI bit 3 - **Time Broadcast Disable**

HI bit 4 - Reserved - Output Disable

HI bit 5 - Reserved - Notify Disable

HI bit 6 - Reserved - Dial Manager Disable

HI bit 7 -

Attr-10 SINC/2 Configuration (FW200)

These Enable Flags are used by the configurable controller to enable functions.

LO Byte

LO bit 0 - Spare

LO bit 1 - **RS-232 Access Enable** (SINC/2,SINC/3)

Required for 87h message to make access request

LO bit 2 - **Token Enable** (SINC/2,SINC/3)

Required to pass token or initiate Token after a token inactive time.

LO bit 3 - Reserved - (Spy Enable SC/1 Only)

LO_MS_NBL - **SINC/2 Configuration** (FW200)

0 = Repeater Straight through using System (field) baud Rate for all.

1 = Reserved -

2 = ASI Message Buffer operation

3 = Repeater Straight through using System (field) Baud Rate for all.

LO bit 7 - **System Global Enable**

Enables response to messages to 0x5A70 system bus global address.

Note: the controller will always respond to the device global address 0x5A20.

HI_LS_NBL - **Access Format**

UART Data Format on Access Side for buffer operation

Access always transmits 2 stop bits, but can receive 1 or 2 stop bits.

0 = 8 data bits, one stop bit, no parity

1 = (FW200A only) 7 data bits, one stop bits, even parity

Used only by ASCII Message Buffer

2 = (Reserved)

3 = ASI Standard, 8 data bits, two stop bits, no parity

[Default ASI Standard]

HI_MS_NBL - **System Format**

UART Data Format on System Side for buffer operation

0 = 8 data bits, one stop bit, no parity

1 = (Not Used on System Bus)

2 = (Reserved)

3 = ASI Standard, 8 data bits, two stop bits, no parity

[Default ASI Standard]

Attr-11 **Model Number**

This contains the decimal value representing the hardware model number of the product: 3000 (0BB8 hex) – SINC/3-3000

Attr-12 **System Bus Address**

Note: If the SINC/2 or SINC/3 is to be a token player, then its System address **must** be in the range 32001 to 32255 and the Token Enable must be set to Yes.

Attr-13 **Access Address** SINC/3

The Access Address is the controller address as found from the RS-232 access side of the controller. (Typical Access Address 3000) The same access address is used for both the Direct and Modem Access. (SINC/3)

Attr-14 Token Address Range

Assumes that HI Token Address Byte is 7D hex (32,000)

LO Byte = **Low Token Address**

The lowest address of token range is 32000 + **Low Token Address**

HI Byte = **High Token Address**

The highest address of token range is 32000 + **High Token Address**

Note: If High Token Address = 0, then my System Bus Address is the highest token address.

Attr-15 **System Baud Rate**

SINC/3 system bus :Baud Rate 9600, 19,200, or 38,400 [Typical: 9600 baud]

Attr-16 **Direct Baud Rate** (SINC/3)

This is the controller Baud Rate used by the RS-232 Access Port. If the baud rate is changed the new baud rate becomes active immediately . (1200,2400,4800?) 9600, 19,200, or 38,400 . [Default : 9600 baud]

Attr-17 Group Addresses

The controller will react to messages sent to a destination address with the high byte give by a group address, and the low byte equal to zero. Up to 2 group addresses may be identified for the unitary controller. A single group address is placed in Group Address 1 location. Only on System Bus.

LO Byte - **Group Address 1**

HI Byte - **Group Address 2**

Attr-18 **Inactive Time** (FW200B)

The amount of time in minutes that an RS-232 Access device will keep trying to support access with no activity. [Typical: 15 minutes]

Attr-19 **Token Hold Default**

The EEPROM value that is the length of time that the controller is permitted to hold the token on each rotation of the token. . [Typical: 5 s] It is loaded into Token Hold Interval in RAM on reset and when a new access is requested with an 87h message to the local communication bus.

Attr-20 Object Enable 1 - Not Used

Attr-21 Object Enable 2 - Not Used

Attr-22

LO Byte **Polling Pause Time** (seconds) (FW740C,SINC/3)

HI Byte **Polling Priority Time** (ASIC/2-7040,SINC/3)

Attr-23 **Highest Pass-thru Address**

Attr-24 **Lowest Pass-thru Address**

Attr-25 Reserved - Special SINC/2-2000

Attr-26 **Modem Access Baud Rate** (SINC/3)

Attr-27 **Local Bus Address** (SINC/3)

Attr-28 **Local 1 Baud Rate** (SINC/3)

SINC/3 Local 1 Baud Rate:1200,2400,4800,9600, 19,200, or 38,400 [Typical: 19,200 baud]

Attr-29 **Local 2 Baud Rate** (SINC/3))

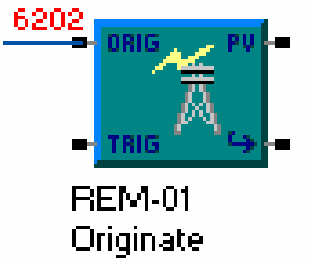
SINC/3 Local 2 Baud Rate:1200,2400,4800,9600, 19,200, or 38,400 [Typical: 19,200 baud]

Attr-30 Spare

Attr-31 Spare

Object 2 - Remote Point

Remote Point Summary



Overview: Remote points are used by ASIC/2 controller to share up to 256 data values between configurable controllers. If token passing is used on the bus, the remote points are passed when the controller has the token. If token passing is not used, then the remote points are passed when the communication line is quiet. The remote point feature is only available on the system bus.

If the System bus is continuously polled by a user interface, minimize the use of remote points. Make sure that gapping is turned on to minimize collisions.

Remote Point Number: Each remote point is identified with a unique **Remote Point Number**. The Remote Point Number and the index number need not be the same.

Remote Point Type: Each index of a Remote Point object is of one of two types: originate, or listen.

Originate Type: Originate indexes obtain data from another object within the controller using an Originate Handle. They transmit this data as a remote point using the Remote Point Number to other controllers on the system bus. The data may be sent to an individual device address, or to a group or global address. An originate type remote point may be configured to perform triggered transmission, based on the value of the **Trigger/Gate Handle**, or to transmit periodically at a user-defined Update Interval.

Note: Make sure that only one device has an originate remote point for each Remote Point Number

Listen Type: Listen indexes intercept data transmitted globally or to their System Bus Address from another controller originating the same Remote Point Number. Listen indexes inspect all data transmissions on the system bus. If the message is directed to its device, group, or global address, the controller will process the message. If the received data has a Remote Point Number which matches one of its own remote points , then the **Present Value** of the index with the matching Remote Point Number is updated.. A **Fresh Data** flag is set, marking this data as new. If the data is not received on the system bus within the user-defined **Update Interval**, then the **Fresh Data** flag is cleared.

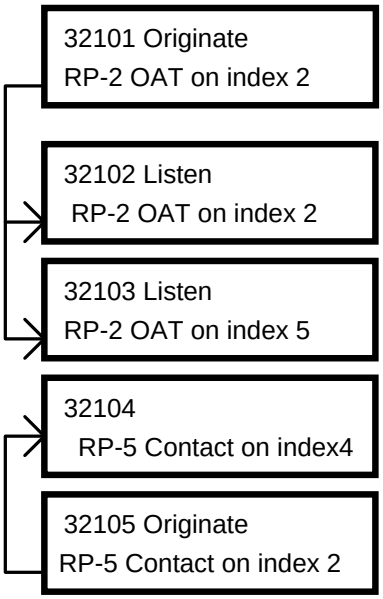
Destination Address: The data may be sent to a individual device address, or to a group or global address.

Note: Earlier versions FW700A..F and FW907A..E) used Address Type to identify the type of address. With FW700G and FW740A.. the Destination address is always used in originating remote point messages.

Originate Handle: Each originate index has an Originate Handle pointing to the data it provides to the system bus. Originate indexes get the data value and transmit this data using the Remote Point Number.

Trigger/Gate Handle: A Trigger/Gate Handle is used to initiate the remote point passing for that index when its value is true. If **Trigger Once Enable** is set, then it only transmits the message once (three times if group or global).

Example: Remote Point Passing



There are 5 configurable controllers on the system bus that pass Remote Points. Their addresses are 32101, 32102, 32103, 32104, and 32105.

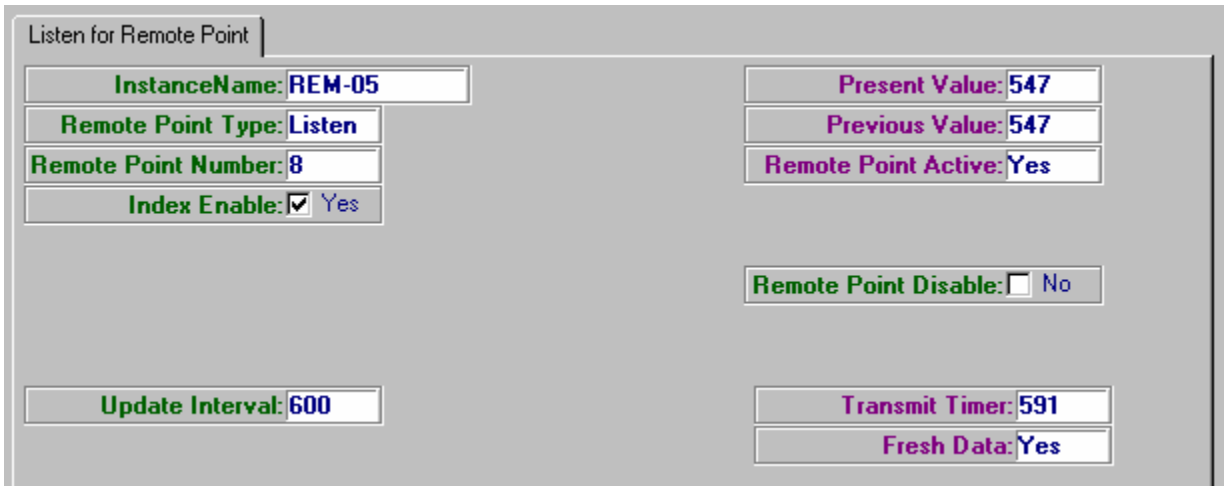
Configurable controller 32101 reads the outdoor air temperature (OAT) and wishes to share it with 32102, and 32103. Remote point #2 is set-up to accomplish this. Remote Point Index 2 of 32101 is configured to be an originate remote point #2. Remote Point index 2 of 32102 and index 5 of 32103 are configured to be a listen remote point #2.

Remote Point Index 2 of 32101 gets a new OAT every 5 minutes from its Input object. Index 2 then globally transmitted its remote point #2 and the OAT value on the system bus. Remote Point index 3 of 32102 and index 5 of 32103 listen to the system bus and collect the OAT (because it originated from a remote point #2).

Configurable controller 32105 reads a contact closure on the third floor and wishes to share it with 32104. Remote Point Index 2 of 32105 is configured to originate remote point #5. Remote Point index 4 of 32104 is configured to be a listen for remote point #5.

Remote Point Index 2 of 32105 gets a new contact closure status ever two minutes from its input object. Index 2 transmits its Remote Point Number 5 to address 32104. Remote Point Index 4 of 32104 listens to the system bus and collects the contact closure information because the message is addressed to 32104 and the remote point number matches.

Remote Point - Listen

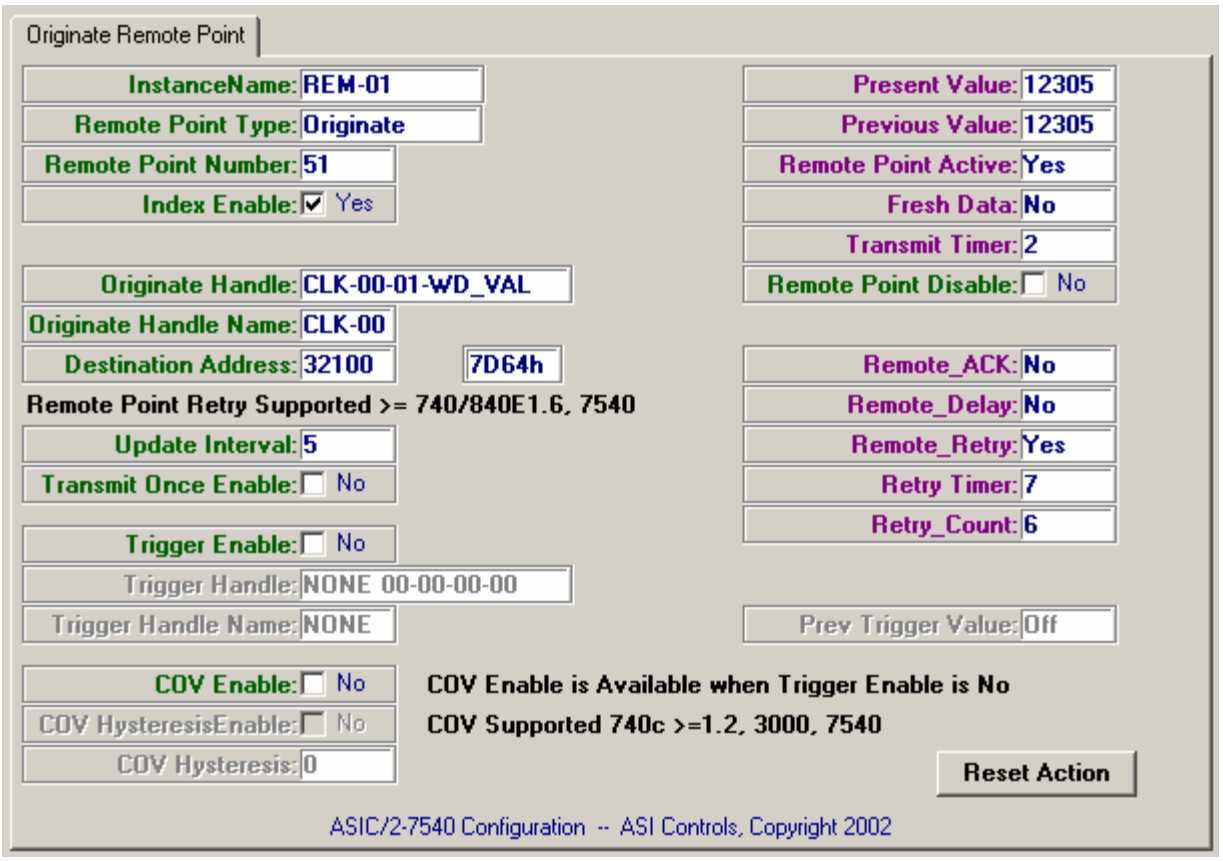


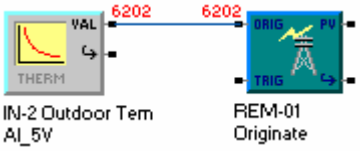
The controller listens on the system bus for remote data of interest to it. If it hears a direct message, it will acknowledge it appropriately. Group and Global messages are not acknowledged. It does not initiate any requests, and will set Fresh Data to "No", if it is not updated within the Update Interval.

Listen Remote Points are configured by setting **Index Enable** to Yes, selecting **Remote Point Type** Listen, and assigning a **Remote Point Number** and **Update Interval**. The **Transmit Timer** is reloaded whenever the Remote point is received. If the Transmit Timer counts to zero, then the **Fresh Data** flag is set to No.

Note: Remote Point Disable (in the System Object) must be No for Remote Points to be processed. The field is also on the Remote Point View.

Remote Point - Originate





Remote points are used to originate the passing of status or other information on the System Bus.

When the **Remote Point Type** is Originate, then the **Originate Handle** points to the specific data to be used to update its **Present Value** and be sent out on the system bus.

When the Remote Point is sent, the controller generates a special object write, MT=90h, message on the system bus to the Remote Point Present Value, using the Remote Point Number for the index number. The controller receives the message and examines the Remote Point Number. If the written index matches the remote point number, then the Listen Remote Point updates its Present Value with the New Data.

When the remote point has timed out, the controller transmits the requested data to the **Destination Address** on the System Bus. The Destination Address may be a specific Device Address, a Group Address, or the ASIC/2 global address, 5A 70h. If the Destination Address is a specific Device Address, then message acknowledgement is expected. Global and Group messages are sent three times and not acknowledged.

With FW740E1.6, 840E1.6 and later, it will retry up to 9 times until the message is acknowledged. Note: Repeats are not implemented in FW300B.

If Token Passing is used, the message is sent during its token holding time. If Token Passing is not used, it sends the remote point when the communication line is quiet.

Originate Remote Points are configured by setting **Index Enable** to Yes, selecting **Remote Point Type** Originate, assigning a **Remote Point Number** and **Update Interval**, and configuring the **Originate Handle** to point at the data to be transmitted.

Note: If many remote points are sent to specific devices which are off line, a lot of message traffic can be generated which can affect communication with the controller.

Trigger/Gate

If the **Trigger Enable** is not set, then the **Trigger/Gate Handle** is ignored and the Originate remote point type will periodically broadcast at the **Update Interval**.

If Trigger Enable is set, then the status of the Trigger Gate Handle is examined. The status of **Transmit Once Enable** determines how the Trigger/Gate Handle is to be used.

If Transmit Once Enable if not set, then the trigger acts as a gate and the remote point is broadcast periodically when the Trigger/Gate Handle is true.

If Transmit Once Enable if set, then the Trigger/Gate Handle acts as a trigger and the remote point is broadcast in a single burst when the Trigger/Gate Handle goes true.

Change of Value

With FW740C remote point broadcast on change of value (COV) is implemented.

COV Enable Attr-5, HI Bit 4
COV Hysteresis Enable Attr-5, HI Bit 6
COV Hysteresis Attr-10, WORDU

If **Change of Value Enable** is yes and Trigger Enable is No, then the originate remote point will be broadcast on the system bus periodically, or if the Present value changes. If **COV Hysteresis Enable** is yes, then the present value must change by more than the **COV Hysteresis** value before it is broadcast.

Note: The COV Hysteresis can not be used with triggered remote points because the COV Hysteresis uses the same location as the Trigger/Gate Handle.

Remote Point Glossary

Remote Point Parameters

Action

Writing the following values to this parameter (2,X,5,LOW BYTE) causes the listed actions to occur:

0	No effect
1	Enable this index for operation
2	Disable this index from operation

Address Type

Address Type is No Longer Used. (FW700A..F and FW907A..E, Only) Indicates the type of address to be used in sending an Originate, or Request message on the system bus. User-configurable; integer. (2,X,5,HIGH BITS 3,4) Each index of a Remote Point object is of one of three address types: With FW700G.. Address Type 1 is assumed: My address as source; Attr-6 as Destination Address.

COV Enable

When COV Enable (Attr-5, HI Bit 4) is yes, then the remote point is broadcast on any value change. (FW740C Rev 1.1)

COV Hysteresis

When COV Hysteresis Enable (Attr-5, HI Bit 6) is yes and COV Enable is yes, the COV Hysteresis (Attr-10) is examined to determine how much the Present Value must change before the remote point is broadcast. (FW740C Rev 1.1)

COV Hysteresis Enable

When COV Hysteresis Enable (Attr-5, HI Bit 64) is yes, then the remote point is broadcast on any value change by the Hysteresis amount.. (FW740C Rev 1.1)

Destination Address

The controller address that is used as the destination address for originate remote point messages User-configurable. (2,X,6,WORD)

Fresh Data

Applies to Request and Listen type indexes only: Indicates if the data in Present Value was received within the most previous Update Interval time period. "Yes", "No"; not user-changeable. (3,X,2,LOW BIT 1)

Index Enable

Indicates if this index is enabled for operation. User-configurable. "Yes", "No". (2,X,5,HIGH BIT 2)

Remote Point Type

Indicates if this index is to be of the Originate, or Listen type. User-configurable; integer. Each index of a Remote Point object is of one of two types: originate, or listen,. (2,X,5,HIGH BIT 0,1)

Originate remote point types obtain data from another object in their configurable controller and transmitted this data to other configurable controllers as a remote point on the system bus.

Listen remote point types intercept data transmitted to their configurable controller address from an originate index belonging to the same remote point number.

Originate Handle

Applicable to Originate type indexes only: Points to the location from which the value for this index's remote point is to be obtained from. User-configurable. (2,X,8,4 BYTES)

Present Value

The current value of the remote point to which this index is tied. Not user-changeable. (2,X,0,WORD)

Remote Point Active

Indicates that this index has been enabled for operation. User-changeable via the Action word. (2,X,2,LOW BIT 0)

Remote Point Number

The identification number for this remote point. User-configurable; integer. (2,X,5,LOW BYTE)

Remote Acknowledge

Set when a remote point originate is acknowledged. REM Attr-2 HIBit0 (FW740E1.6, 840E1.6)

Remote Retry

Set when remote point is in retry mode. REM Attr-2 HIBit1 (FW740E1.6, 840E1.6)

Remote Delay

Set when remote point is waiting to retry. REM Attr-2 HIBit2 (FW740E1.6, 840E1.6)

Retry Timer

Counts down when waiting to retry. (REM Attr-4 HILSNBL)

Retry Count

Incremented on each attempt. (REM Attr-4 HIMSNBL)

Time-out Fault

Applicable to Listen remote point types only: Indicates that a Listen remote point type has timed-out within Update Interval and has stale data. It is the complement of Fresh Data. Not user-changeable; "Fail", "OK". (2,X,2,LOW BIT 2)

Time-out Status

Applicable to listen remote point types only

Indicates that Update Interval has elapsed since the last reception of data, with no new reception being made. Not user-changeable; "Yes", "No". (2,X,2,LOW BIT 7)

Transmit Timer

Used to time Update Interval. Not user-changeable; (FW700A..F and FW907A..E, Only) reads in minutes. With FW700G.. this is now in seconds. (2,X,3,WORD)

Trigger Once Enable

(FW740A..) Determines how the enabled Trigger/Gate Handle is to be used. 0 = Gate - Broadcast remote point periodically when the trigger is true. , 1 = Yes, Broadcast a single remote point burst when the trigger goes true. (FW700G..) Determines if the remote point transmission should trigger periodically or only once. 0 = No, periodic Transmission, 1 = Yes, Transmit Once.(2,X,5,HI bit 3)

Trigger Enable

New Use (FW740A..) Determines if the Trigger/Gate Handle is examined. 0 = No, Trigger not enabled, always use periodic broadcast; 1 = Yes, Trigger/Gate is enabled Not used in FW700G.. Used in FW700A..F and FW907A..E. (2,X,5,HI bit 5)

Trigger/Gate Handle

Applies to Originate-type indexes only: Trigger/Gate Handle points to the trigger for remote point passing. Whenever the trigger value changes from zero to non-zero, the index will passing its remote point's Present Value at the next token time.

Update Interval

For Originate type indexes: the time period in seconds between successive passes of remote point data. User-configurable. (FW700G, 740A, 840A, 300B) Note:(FW700A..F and FW907A..E, Only) reads in minutes. REM Attr-7, WORD - For Listen type indexes: If new data is not received within Update Interval of the last reception, Fresh Data is set to No.

Remote Point Properties

The REMOTE POINT object defines the present values and setup parameters used by the remote point communication block.

REMOTE

Object Number	= 2
Data Type	= Word
Index	= 0..n (RP-0..RP-n) as allocated
Attribute	= 0..9
DYNAMIC Attributes	= 5 (0..4)
STATIC Attributes	= 7 (5..11)

Firmware Revision - Remote Point

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005

- Improves Remote Point gapping on System Bus

ASIC/2-7040 FW740E Rev 1.6 Released 09/19/2000 CHK 0xDBDE
ASIC/2-8040 FW840E Rev 1.6 Released 09/19/2000 CHK 0xC431

- Remote Points to Device Address will retry up to 9x until acknowledged.
  REM Attr-2 HIBit0 Remote Acknowledge
  REM Attr-2 HIBit1 Remote Retry
  REM Attr-2 HIBit2 Remote Delay
  REM Attr-4 HILSNBL Remote Retry Timer
  REM Attr-4 HIMSNBL Remote Retry Count

SINC/3-3000 FW300B Rev 1.0 Released 10/06/1999 CHK 0x8FB7

- Includes Remote Points

ASIC/2-8040 FW840C Rev 1.0 Release 06/05/98 Chk 0D55h
ASIC/2-7040 FW740C Rev 1.1 Preliminary 04/14/97

- Fixes Remote Point broadcast.
- Change of Value Enable Attr-5, HI Bit 4
  COV Hysteresis Enable Attr-5, HI Bit 6
  COV Hysteresis Attr-10, WORDU

ASIC/2-8040 FW840A Rev 1. 0 Released 22 March 1996

- Includes Remote Points

ASIC/2-7040 FW740A Rev. 1.0 Release 31 March 1994

Address Type is no longer used.
Eliminate Request Type Remote Point
Trigger Once Enable and Trigger Enable work together.

ASIC/2-7000 FW700G Rev. 1.0 (03/09/93)

- Modified to immediately passed and to pass periodically whenever the trigger goes true. Remote Points always passed to the Destination Address.
- Trigger Once Enable must be no for periodic transmission. If Trigger Once Enable is yes, then it transmits only on going true. There is no Trigger Enable flag in FW700G.. . If the handle is invalid then it the trigger is assumed to be always true and it will transmit periodically.
- Update Interval and the Transmit Timer are now in seconds.

Remote Point DYNAMIC Properties

Attr-0 **Present Value** (Signed Integer)

Attr-1 **Previous Value** (Signed Integer)

Attr-2 Data Status RAM (word)

LO bit 0 - **Remote Point Active**

1= Index Enabled; 0, Inactive ,

Attr-2, LO bit 0, is set at power up time. If the remote point Index Enable has been previously set(Attr-5, HI bit 2 = 1). It is also set if Attr-4 Action = 1 is taken.

LO bit 1 - **Fresh Data**

1 = Fresh Data; 0, stale data Fresh Data, LO bit 1, is set whenever the controller receives new data for the Listen type remote point. It is cleared when the listener fails to get data within the Update Interval.

LO bit 2 - **Time-out Fault**

Time-out Fault is set whenever a Listening controller times out. It is cleared when fresh data is received.

LO bit 3 - Spare
LO bit 4 - Spare
LO bit 5 - Spare

LO bit 6 - **Previous Trigger Value**

Used to determine if logical value has changed.

LO bit 7 - **Time-out Status**

Time-out Status, bit 7, is set whenever the active remote point timer times out. A Listening controller then declares a time-out fault immediately.

Attr-2 HI Byte - Remote Retry

HI bit 0- **Remote Acknowledge** (FW740E1.6, 840E1.6)
Set when a remote point originate is acknowledged.

HI bit 1- **Remote Retry** (FW740E1.6, 840E1.6)
Set when remote point is in retry mode.

HI bit 2- **Remote Delay** (FW740E1.6, 840E1.6)
Set when remote point is waiting to retry.

HI bit 3- Spare
HI bit 4- Spare
HI bit 5- Spare
HI bit 6- Spare
HI bit 7- Spare

Attr-3 **Transmit Timer** (unsigned word, RAM)

Time since last reading in seconds. Transmit interval time in seconds.

Note: FW700G.. the Transmit Timer is in seconds. For FW700A..F and FW907A..E, the Transmit Timer is in minutes.

Attr-4 **Action**

0 = No Operation
1 = Set Index Enable (Attr-5,HI bit 2)
2 = Clear Index Enable (Attr-5,HI bit 2)
3.. = No Operation

Attr-4 LO Byte **Action** (FW740E1.6, 840E1.6)

Attr-4 HILSNBL **Retry Timer** (FW740E1.6, 840E1.6)

Counts down when waiting to retry.

Attr-4 HIMSNBL **Retry Count** (FW740E1.6, 840E1.6)

Incremented on each attempt.

Remote Point STATIC Properties

Attr-5 Setup

LO Byte - **Remote Point Number**

This value (0..255) is used by this index when updating Attr-0 Present Value based on a remote point message. It is used both when originating remote point, and when saving the value of other remote points. All other Properties are updated based on index of the remote point.

HI bit 0,1 - **Remote Point Type**

0, Disable Remote Point
1, Listen - Listen for data and update.
2, Originate - originate data if timed out

HI bit 2 - **Index Enable**;

1 = Enabled; 0 = Disable

HI bit 3,4 = Address Type (FW700A..F and FW907A..E, Only)

No Longer Used
0, My_address source, Attr-6 Destination (Disable do not use)
1, My_address source, Attr-6 Destination
2, Global source, Attr-6 Destination (Special, Do Not Use)
3, My_address source, Global Destination

Note: With 700G.. Address Type = 1 is assumed. The remote point is always sent to Destination Address in Attr-6.

HI bit 3 - **Transmit Once Enable** (FW740A..,FW700G..)

Determines how the enabled Trigger/Gate Handle is to be used.

0 = No, Gate - Transmit at update interval when Trigger True
1 = Yes, Trigger - Transmit only on Trigger going true.

HI bit 4 - **Change of Value Enable** FW740C Rev 1.1

Spare (FW700G..)

HI bit 5 -**Trigger Enable**

(FW740A..) Determines if the Trigger/Gate Handle is examined.
0 = No, Trigger not enabled, always use periodic broadcast;
1 = Yes, Trigger/Gate is enabled **(**FW700A..F and FW907A..E, Only) Not Used in FW700G.

0 = No, Trigger not enabled
1 = Yes, Trigger enabled (see HI bit 3)

HI bit 6 - **COV Hysteresis Enable** FW740C Rev 1.1

HI bit 7 – Spare

Attr-6 **Destination Address** (unsigned integer)

Contains Destination Address, used for remote point messages for Index Address Type (Attr-5, HI bits 3,4) = 0..2 . For Originate Type remote points it typically the system bus global address, 5A FFh (23,295 decimal), or the ASIC/2 global address 5A 70h.

CAUTION: If a Global Address is used then the System Global Enable in the other controllers must be set to Yes in the System object for all controllers using the remote point. Otherwise the controller does not take action on the message.

Attr-7 **Update Interval** (unsigned word, EEPROM)

Update Interval time in seconds.
Note: For FW700A..F and FW907A..E, the Update Interval is in minutes.

Attr-8,9 **Originate Handle**

The originate handle is used to fetch the data to be transmitted as a remote point. This controller originates the point when the Remote Point Type = 2, and the Transmit Timer has timed out. When the Present Value Attr-0 is transmitted or received, the Remote Point Number for this index, Attr 5, LO Byte is used, regardless of the RP index.

When originating a Remote point, the object pointed to by the handle is examined. If it has a data type BYTE, then the Hi Byte of the returned value is set to zero. If it has data type WORD, then the returned value is the entire word.

Attr-10 **COV Hysteresis** (FW740C Rev 1.1)

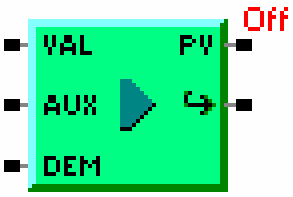
If COV Hysteresis Enable is yes, the COV Hysteresis is examined to determine how much the Present Value must change before the remote point is broadcast. If COV Hysteresis Enable is no, but COV Enable is yes, then the remote point is broadcast on any change. Note: Conflicts with Trigger/Gate Handle.

Attr-10,11 **Trigger/Gate Handle**

The Trigger/Gate Handle is used to initiate passing of remote point immediately in the non-token mode or at the next token time following any change in the trigger value from zero to non-zero. The remote point will be transmitted at the update interval as long as the trigger is true.

Object 3 - Binary Output

Binary Output Summary



OUT-6 Triac
Verify - Maintained

Object 3 - Binary Output object provides the ability for the ASIC/2-7540, ASIC/2-7040 and ASIC/2-8040 to convert calculated output values into any of several electrical formats used in various kinds of equipment. Analog outputs in the ASIC/2 are controlled by object 15 - Analog Output.

Binary Outputs: For the ASIC/2-7540 and ASIC/2-7040 Indexes 0 through 11 are used for binary type outputs BO-01 to BO-12. Indexes 12 through 15 are used for Amber LEDs 1 through 4. For the ASIC/2-8040 indexes 0 through 7 are used for binary type outputs BO-01 to BO-8. Indexes 9 through 10 are used for Amber LEDs 1and 2. Binary Type Outputs include: Standard, Duty-Cycled, Verified, Interlocked, or Sequenced.

Enable/Disable : Each index of the binary outputs must be separately enabled. In addition to prevent uncontrolled operation of equipment, an Output Disable option is included in the System object which is set whenever there is a download of a new allocation to the controller. An Outputs Disabled flag is set in each binary output index if the outputs have been disabled in the system object. The physical binary output will then be OFF even though the sequence appears to operate.

Maintained vs. Pulsed On/Off: The binary outputs may be used as maintained outputs, or as pulsed-pairs of outputs. A pulsed-pair type output consists of 2 physical outputs which are used to drive latching relays. One physical output turns on for 1 second when the output is turned on. The next output turns on for 1 second when the output is turned off.

Handles: Three binary handles are used: the Output Value Handle points at the Output Value used to drive the output; The Auxiliary Input Handle returns an Auxiliary Value which is used for interlocking or feedback; and Demand Limit Handle returns a value that is optionally used for demand management and/or to reset the Verify Alarm.

Standard Outputs: Standard outputs are on when the output value is non-zero and off when zero. If Minimum On/Off is enabled, minimum on- and off-times are enforced.

Duty-Cycled Outputs: Duty-Cycled outputs are on when the output value is non-zero and off when zero. The duty-cycled output goes on for cycle on-time, off for cycle off-time, etc. If Minimum On/Off enabled, minimum on- and off-times are enforced.

Verified Outputs: Verified outputs are on when the output value is non-zero and off when zero. After turning on, the auxiliary value is examined to verify that the output has actually caused a mechanical output. If verification is not received within a Verify Delay Time, retries are attempted up to a maximum number of tries, at which point a Verify Alarm is set. The output is forced to zero and the user must reset the Verify Alarm via the communications or using the Demand Limit Handle before normal operations can resume.

Interlocked Outputs: Interlocked outputs use a binary interlock on the auxiliary input. Interlocked outputs are on when the output value is non-zero and the Auxiliary Input Is Enabled and the auxiliary value is greater than zero. Interlocked outputs are off when the auxiliary value is zero or when output value is zero.

Note: FW754A, FW740A and FW840A simplify the operation of the Interlock and Sequence making it a simple binary interlock. FW700A.. and FW907A.. use an Interlock Setpoint, Compare Sense, and Interlock Hysteresis to show that the interlock is true.

Sequenced Outputs: Sequenced outputs are identical to interlocked outputs and use a binary interlock on the auxiliary input.

Demand Limit Option: Each binary type output may be configured to follow the demand limit parameters, Shed Level, Rotate Level, and Rotate group. The source of the demand management information, the Active Demand Level and Rotate Group is identified by the Demand Limit Handle.

Binary Output Demand Limit. Uses Default Value for Demand Limit to turn ON the output under demand limit conditions rather than Off. Needed for Normally On outputs. (FW740C)

Output Reversed Enable: If set then the state of the output relay is reversed. When the maintained output is On the relay is De-energized. When the maintained output is Off, the relay is energized. (FW740E1.9, 840E1.9)

Analog Type Binary Outputs: The binary outputs may be configured to respond to an analog value. A binary output may be used as an Analog Type Output. Analog Type Binary Outputs include: Tri-state Outputs using a Base Time; Tri-state Outputs using Feedback, and Pulse Width Modulated Outputs.

Tri-state Outputs: Tri-state outputs use a pair of binary outputs to represent an analog value. An drive-open signal drives the first assigned binary output toward open position. A drive-closed signal drives the next assigned binary output toward the closed position. A stop signal has both outputs off.

Tri-state Output Using Feedback: The desired setpoint or position of the actuator is given by the Output Value. A linearized feedback signal is used on the Auxiliary value. If the Auxiliary value does not correspond to the Output Value then the tri-state output will drive open or closed until the set point is reached. Once the setpoint has been achieved, the feedback signal must vary from setpoint by the hysteresis value before it will drive-open or drive-closed again.

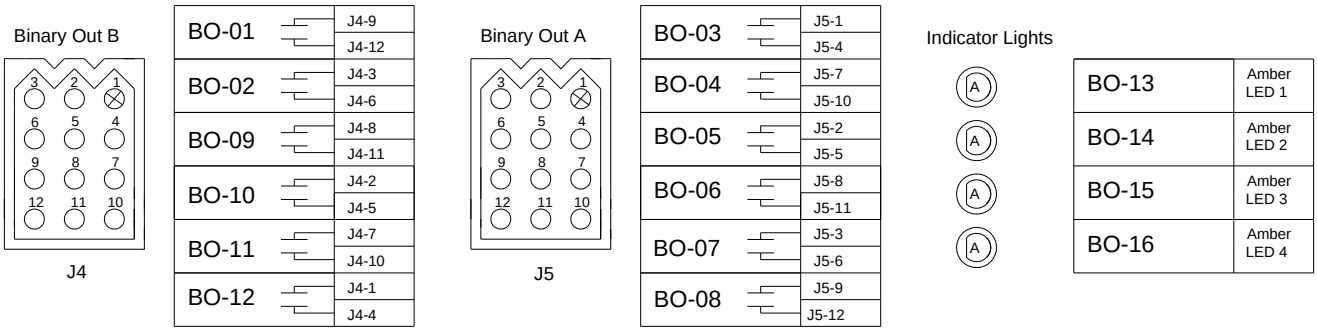
Tri-state Output Using Time Base: Under the time-base option, the target drive time of the actuator is calculated using the Output Value and a Tri-state Base Time. The Base Time is equal to the time needed to drive from fully closed to fully open. A drive-timer keeps track of the net number of seconds the output has been driven open. When the output is driven closed, the timer is decremented. As the target drive time changes the drive-open or drive-closed outputs are energized until the drive-timer matches the target value. The auxiliary value may optionally be used as an interlock to drive the output completely closed, drive the output completely open, prevent the output from going further open, or prevent the output from going further closed. For Example; the interlock may be used with a limit switch to stop the drive motion.

Pulse-width modulated: A new pulse-width binary output type has been added to the ASIC/2 to convert an analog output value to a pulse-width analog type output with 0.1 sec resolution. Under the pulse-width option, the Pulse Width On-time is calculated

using the Output Value, a Pulse Width Maximum Value, and Pulse Width Base Time in units of 0.1 seconds. When the output value is non-zero, the output is energized for a Pulse Width On-time and then de-energized for the remainder of the Pulse Width Base Time.

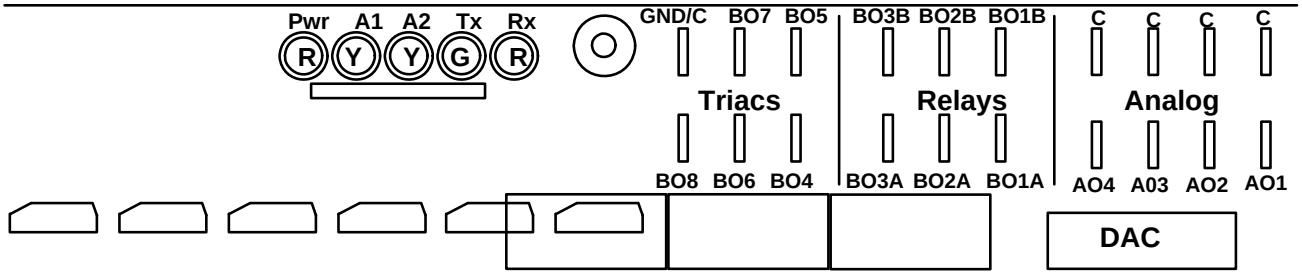
Binary Output Hardware (ASIC/2-7540, ASIC/2-7040)

The ASIC/2-7040 has 12 binary outputs which drive relays and 4 binary outputs which drive amber LEDs. Index 0 through 11 of the Binary Output object controls the relays BO-01 through BO-12. Index 12 through 15 of the Binary Output object controls the amber LED-1 through LED-4 to use as indicator lights.

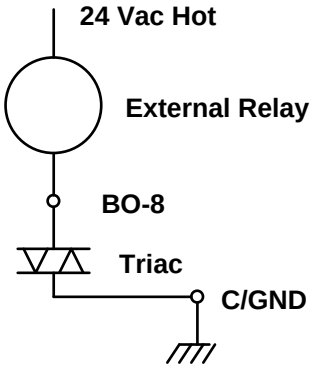


Binary Output Hardware (ASIC/2-8040)

The ASIC/2-8040 has 8 binary outputs which drive 3 relays and 5 triac outputs and 2 binary outputs which drive amber LEDs. Index 0 through 2 of the Binary Output object controls the relays BO-01 through BO-03. Index 3 through 7 drive triacs BO-04 through BO-08 and Index 8 and 9 controls the amber LEDs-A1 and A2.



Triacs switch 24 Vac to Ground/Common,C/GND. These must be wired to the appropriate contactors for unit operation.



Note: 24 Vac Common is isolated from Common/Ground. If the 24 Vac HOT is to be used to energize relays, 24 Vac Common must be connected to Ground.

Binary Output Operation

Each binary output configuration has a Output Value which controls its function and may have a Auxiliary value which modifies its function. There are true binary type outputs including Verify, Interlock, Sequence, Duty Cycle, and Standard where the output is on or off depending on a binary output value. There are Analog Type Binary Outputs including tri-state and pulse-width modulated where the output is on or off depending on an analog output value.

Binary Output Types

The following Output Types are supported:

0 - Not used

Binary Type Outputs

1 - Maintained - Verify
2 - Pulsed On - Verify
3 - Pulsed Off - Verify
4 - Maintained - Interlock
5 - Pulsed On - Interlock
6 - Pulsed Off - Interlock
7 - Maintained - Sequence
8 - Pulsed On - Sequence
9 - Pulsed Off - Sequence
10 - Maintained - Duty Cycle
11 - Pulsed On - Duty Cycle
12 - Pulsed Off - Duty Cycle
17 - Maintained - Standard
18 - Pulsed On - Standard
19 - Pulsed Off - Standard

Analog Type Outputs - Tri-state

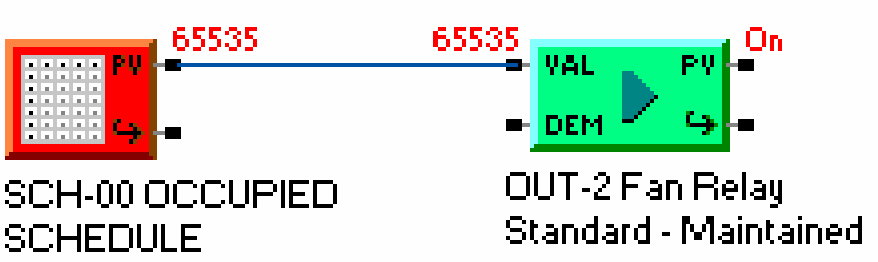
13 - Tri-state Open - Feedback
14 - Tri-state Closed - Feedback
15 - Tri-state Open - Time Base
16 - Tri-state Closed - Time Base

Analog Type Outputs - Modulated Outputs

20 - Pulse-Width Modulated
21 - Base Time Modulated

Binary Type Outputs

For binary type outputs, the output value is examined for a binary value: It is OFF if it is zero; it is ON if it is non-zero. A full Output Value Handle allows pointing at any word, or bit to return the Output Value.

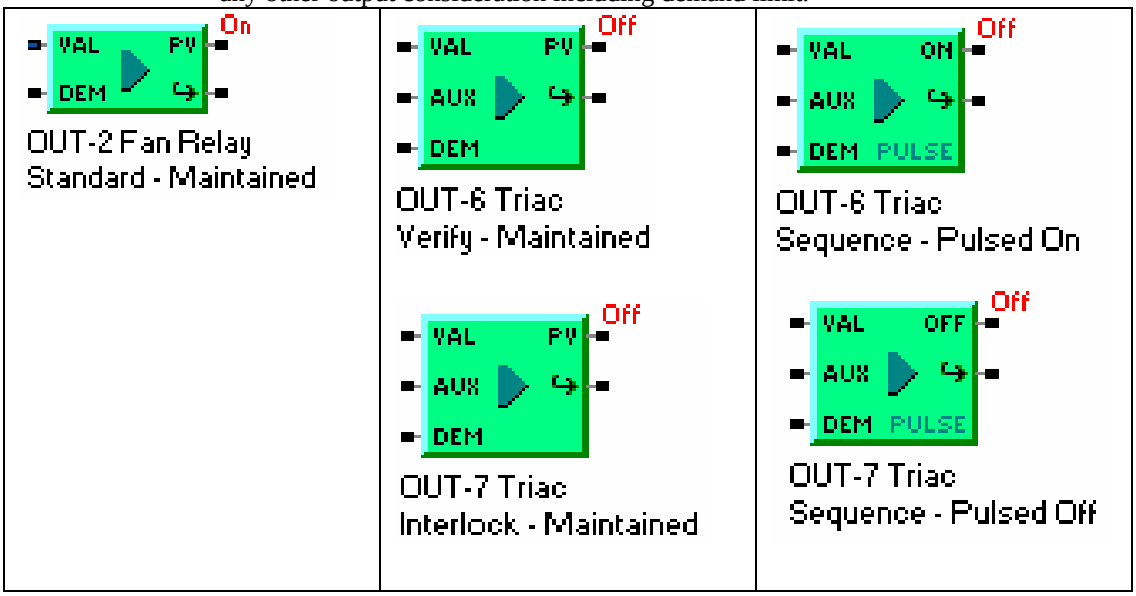


There are two classes of Binary Type Outputs: Maintained Outputs and Pulsed Outputs. Maintained and Pulsed Outputs have the same options and only differ in the final output. The options include verify, interlock, sequence, duty cycled, and standard outputs. Only one of the options may be used with a given instance.

Maintained Outputs hold the value ON or OFF continuously.

Pulsed-Pair Outputs have a pair of outputs, ON and OFF, that pulse on for 1 second when there is a transition to that output state. Pulsed outputs always occur in pairs: the first output is Pulse ON. The next binary output is Pulse OFF. Only the configuration data for Pulse ON is used. The configuration data for pulse OFF is ignored. Upon transition between On and Off the active output is energized for 1 second.

Overrides: Binary Type Outputs may be overridden ON or OFF. This takes priority over any other output consideration including demand limit.



Default Values : In the event of invalid data for the Output and Auxiliary values, or if the index enable has not been set, or under certain fault conditions, the Default Values, ON or OFF, are used to determine the output state.

Demand Limit : Demand Limit if enabled will turn Maintained or Pulsed Outputs OFF when demand limit conditions are met. It supersedes all conditions, except output overrides.

Standard Binary Output

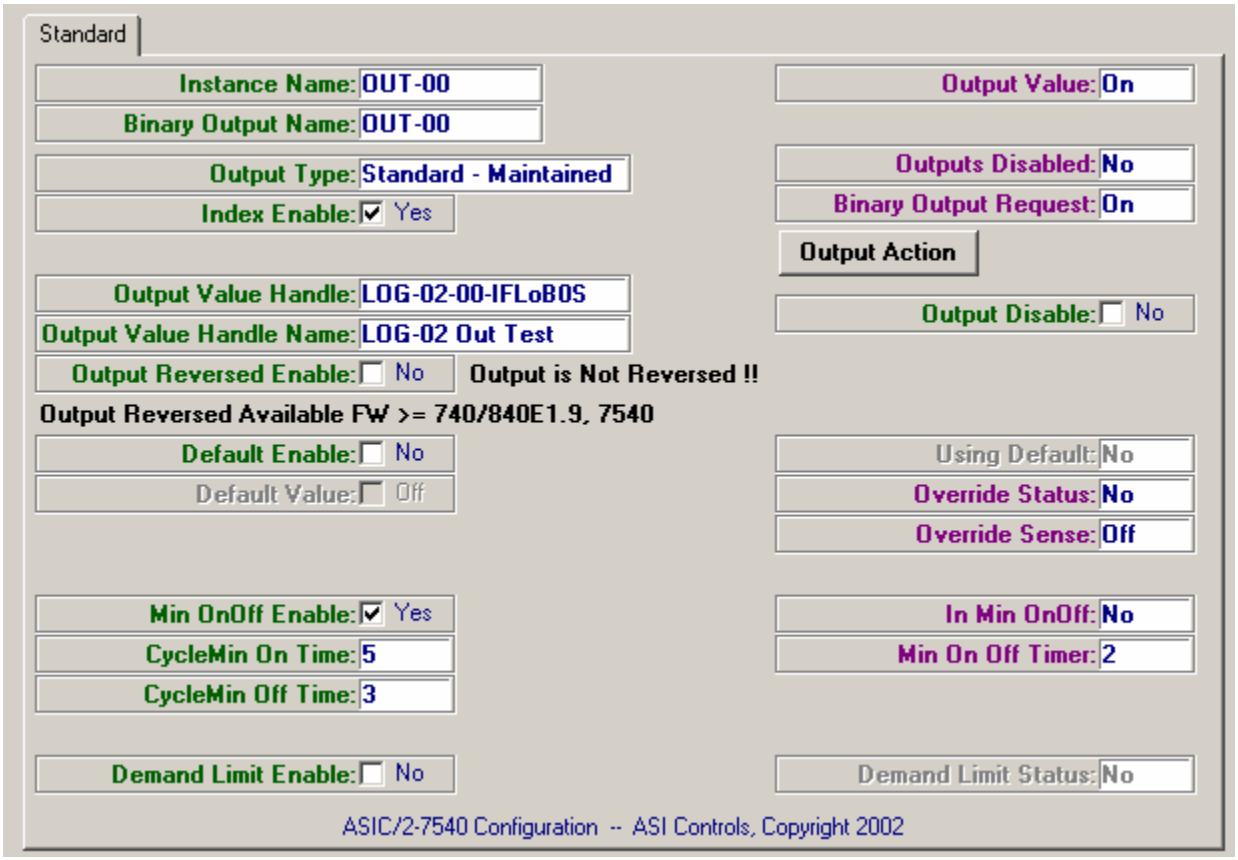
When a Maintained Standard Output, type 17, or a Pulsed -Pair Standard Output , Pulse-On Type 18, Pulse-Off Type 19, is energized, the Output Value is examined. If the Output Value is ON, the output will be on. If the Output Value is OFF, the output will be OFF.

If the **Minimum On/Off Enable** is yes, then the output will remain on until the end of the Minimum On-Time, and will remain off until the end of the Minimum Off-Time.

If **Output Reversed Enable** is yes**,** then the state of the output relay is reversed, when the maintained output is On the relay is De-energized. Applies to Maintained Binary output types 1, 4,7,10,& 17. When the maintained output is Off, the relay is energized. Attr-9 HI bit 7 (FW740E1.9, 840E1.9)

The Auxiliary Value is not used for standard outputs.

If Demand Limit Enabled is set, the value returned by the Demand Limit Handle is examined. The output will be turned off immediately if demand limit conditions are satisfied. Demand Limit supersedes minimum on/off conditions.



Duty Cycle Binary Output

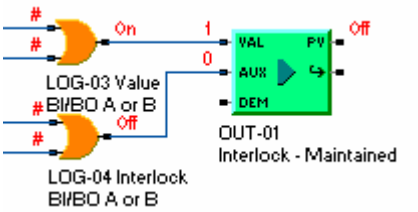
When Maintained Duty Cycle Output, type 10, or a Pulsed -Pair Duty Cycle Output, Pulse-On type 11, Pulse-Off type 12, is energized, the Output Value is examined. If the Output Value is ON, the output will be on for a Cycle On Time. At the end of the Cycle On Time, it will turn off for a Cycle Off Time. At the end of the Cycle Off Time it will turn on for a Cycle On Time, etc. If the Output Value is OFF, the output will be OFF.

The Auxiliary value is not used for duty cycled outputs.

If Demand Limit Enabled is set, The value returned by the Demand Limit Handle is examined. The output will be turned off immediately if demand limit conditions are satisfied. Demand Limit supersedes cycle on/off conditions.

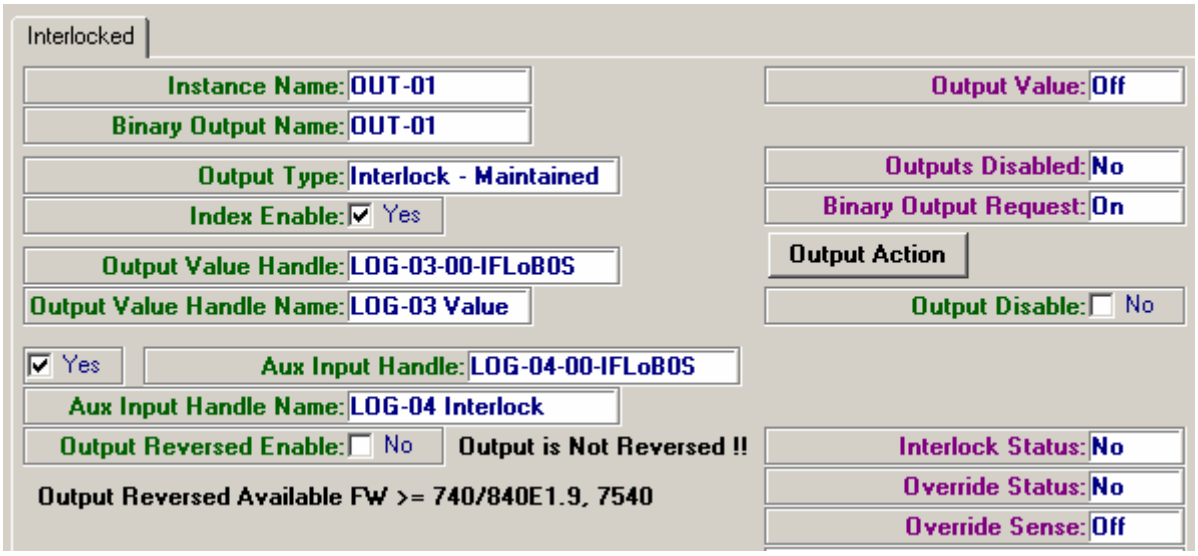
Binary Output with Interlock or Sequence

When Maintained Interlock Output, type 4, or a Pulsed -Pair Interlock Output, Pulse-On Type 5, Pulse-Off Type 6, is energized, if the Auxiliary value has been enabled, the status of the Auxiliary input is examined. Both the Output Value and the Interlock Value must be true for the output to be on.



When Maintained Sequence Output, type 7, or a Pulsed -Pair Sequence Output, Pulse-On Type 7, Pulse-Off Type 9, is energized, if the Auxiliary value has been enabled, the status of the Auxiliary input is examined. Both the Output Value and the Interlock Value must be true for the input to be on.

Note: FW740A and FW840A simplify the operation of the Interlock and Sequence making it a simple binary interlock. FW700A.. and FW907A.. use an Interlock Setpoint, Compare Sense, and Interlock Hysteresis to show that the interlock is true.



If the interlock input is true, then the output will be determined by the Output Value. If the interlock is false, then the output is OFF.

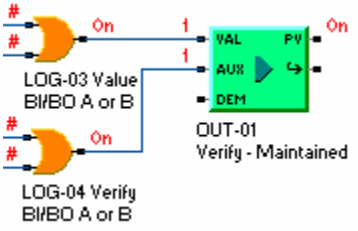
Truth Table for Interlock and Sequence Binary Outputs

Output Value	Auxiliary Value	Result
ON	True	ON
ON	False	OFF
OFF	True	OFF
OFF	False	OFF

If Demand Limit Enabled is set, the value returned by the Demand Limit Handle is examined. The output is turned off immediately if demand limit conditions are satisfied.

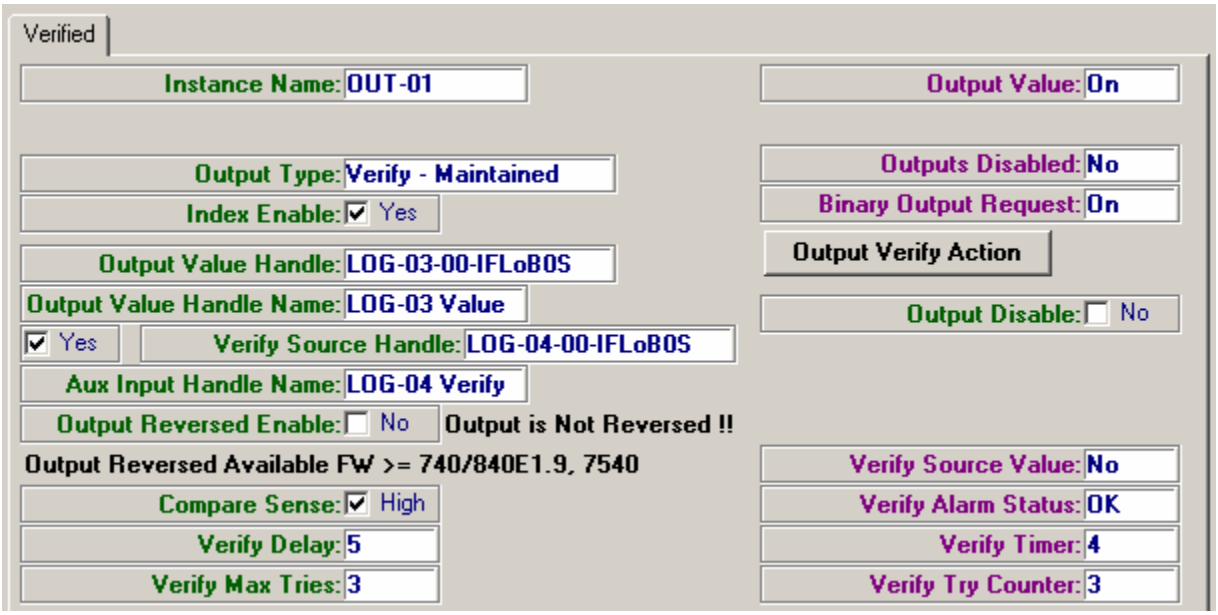
Binary Output with Verify

When Maintained Verify Output, type 1, or a Pulsed -Pair Verify Output, Pulse-On Type 2, Pulse-Off Type 3, is energized, if input verification has been enabled, the status of the Auxiliary input is examined.



After turning the output on it will wait a Verify Delay for the Auxiliary value to become true. The Compare Sense, (Verify Open or Verify Closed) can be selected. If the auxiliary input goes true within the Verify Delay, the output stays on.

If verify fails to become true, it will turn off the output and increment the Verify Try Counter. If the counter is less than the Verify Maximum Tries, it will then wait an additional Verify Delay time and then retry.



The Compare Sense determines whether the Aux Input is High or Low to verify that the output has actually turned on.

If the counter is equal to the Verify Maximum Tries, it will declare a output verify fault, goes OFF, set the Verify Alarm, and lock-out the output from further tries. The output must be reset by communication before additional starts are allowed. The Verify Alarm and Verify Try Counter can be cleared by writing to the attribute, Attr-4 Action = 4 .

If Demand Limit Enabled is set, the value returned by the Demand Limit Handle is examined. The output will be turned off immediately if demand limit conditions are satisfied.

The Demand Limit Handle may also be used to clear a Verify Alarm and Verify Try Counter. If the Verify Alarm is set, it can also be cleared by the enabled Demand Limit Handle which points at an attribute with LO Byte value = 255. Select logic can be used to switch a word value of 255, to reset the Verify Alarm. Otherwise the Demand Limit value is passed. Make sure that the Demand Limit Handle does not point at a static value of 255, or the Verify Alarm will always be cleared.

Demand Limit

Demand Limit is available for all Binary Type of Outputs. Types 1..12, and 17..19.

Each index of the Binary Output has five parameters the Demand Limit Enable, Demand Shed Level, The Demand Rotate Level, the Demand Rotate Group and the Default Value. If the Demand Limit is enabled then the values returned by the demand limit handle are examined.

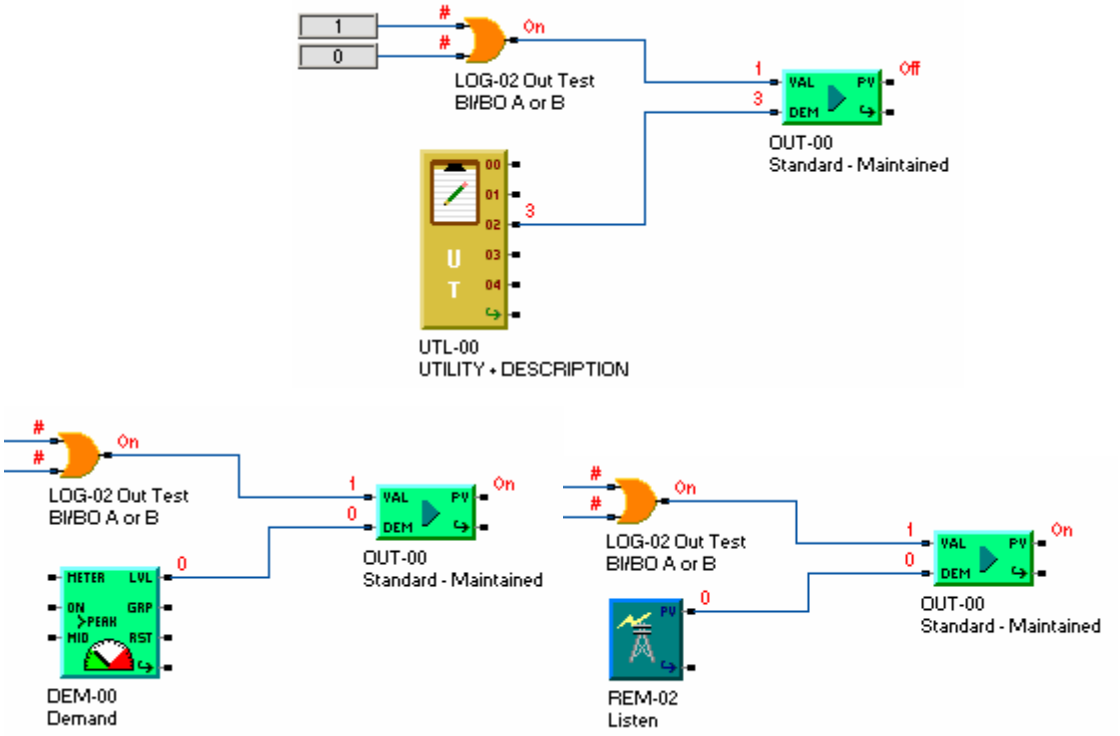
If the Active Demand Level is greater than or equal to the Demand Shed Level, the output is set to the Default Value, typically Off.. (FW740C)

If the Active Demand Level is greater than or equal to the Demand Rotate Level and the Active Rotate Group is equal to the Demand Group, then the output set to the Default Value, typically Off.

Otherwise the output is controlled by the binary output sequence.

The demand Limit Handles points at a location in the controller which returns two values LO Byte = Active Demand Level, HI Byte = Active Rotate Group.

The Demand Limit Handle can point to the demand limit value of the Demand Object, a Remote Point that is passed from another controller, or UTL-0 Attr-2, Demand Limit Value which is set with a Demand Limit Message, MT=0x16 on the system bus. .



Parameter	Typical Value	Attribute
Demand Limit Enable:	If used, Yes	Attr-6, HI Bit 7
Demand Rotate Level:	Typical, 2 (0..6)	Attr 9, LOMSNBL
Demand Shed Level:	Typical, 6 (0..6)	Attr 9, LOLSNBL
Demand Rotate Group:	Typical, 1	Attr 9, HILSNBL
Demand Limit Handle:	Example: DEM-0-0-WD_VAL, or REM-3-0-WD_VAL, or UTL-0-2-WD_VAL	Attr-14,15

Analog Type Binary Outputs

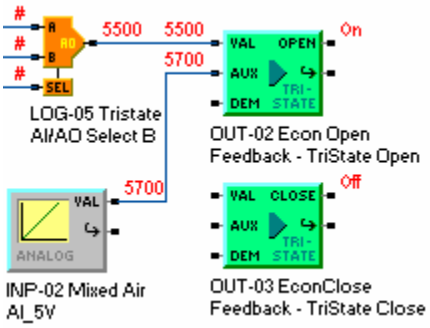
For analog type outputs the output is on or off depending on an analog output value. There are two classes of Analog Type Binary Outputs: tri-state and pulse-width modulated.. The output value is examined for an analog value. A full Application Handle allows pointing at any word, or bit to give the output value.

There are two classes of Analog Type Binary Outputs: Tri-state and Pulse Width Modulated. Demand Limit has no affect on Analog Type Binary Outputs.

Tri-state Outputs have a pair of outputs, OPEN and CLOSE, that will turn on as needed to drive the output to an analog input value based on either a drive time base, or feedback from a sensor. Tri-state outputs always occur in pairs: the first output is Drive Open. The next binary output is Drive Closed. Only the configuration data for drive open is used. The configuration data for drive closed is ignored.

Pulse-width modulated outputs have a single binary output that is on or off depending on analog output value. The analog output value is converted to a pulse-width binary output with 0.1 sec resolution.

Tri-state Binary Output with Feedback



In Tri-State with Feedback the index is configured as the Drive Open Output, Type 13, and the next index is Drive Closed, which may be configured as type 14 for information only. The **Output Value Handle** returns the **Feedback Source** value, for instance the value of Discharge Air Temperature, or a Feedback Potentiometer.

The **Auxiliary Input Handle** returns the **Feedback Reference Value**, for example the Discharge Air Temperature Setpoint, or Potentiometer Setpoint. If the **Auxiliary Input Enable** is No, then the **Tri-state Feedback SP** is used for the Feedback Reference Value.

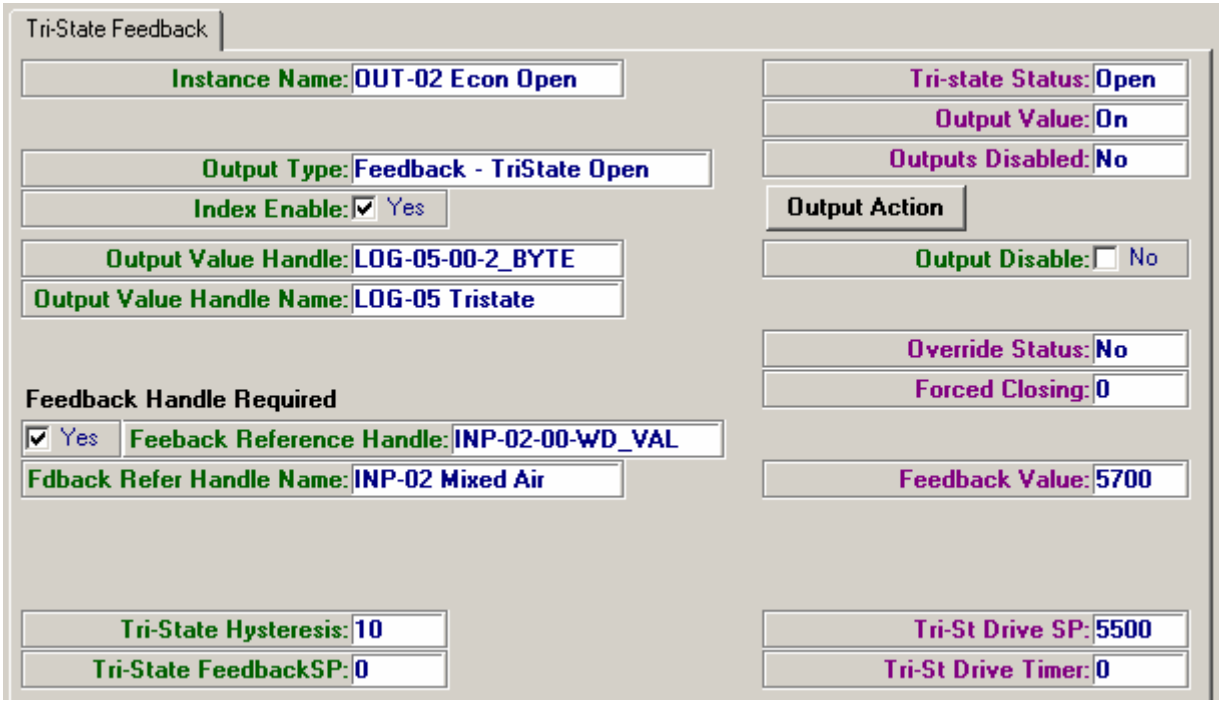
Note: Make sure that the Feedback Reference Handle Enable is “Yes”.

If the Feedback Source Value is greater than the Reference Value, it drives closed. If the Feedback Source Value is less than the Reference Value, it drives open.

The Auxiliary value is examined and compared with the Output Value. For Example; the Analog output can be the result of a PID calculation for damper position. The Auxiliary value can be the result of a linearized feedback potentiometer

The output is driven open or closed as necessary to force Tri-state Feedback to become equal to Tri-state Reference. All values are in the same units as the Feedback input.

Once the Auxiliary value matches the Output Value, then no further action takes place until the difference between the Auxiliary value and Output Value exceeds the **Interlock Hysteresis.**



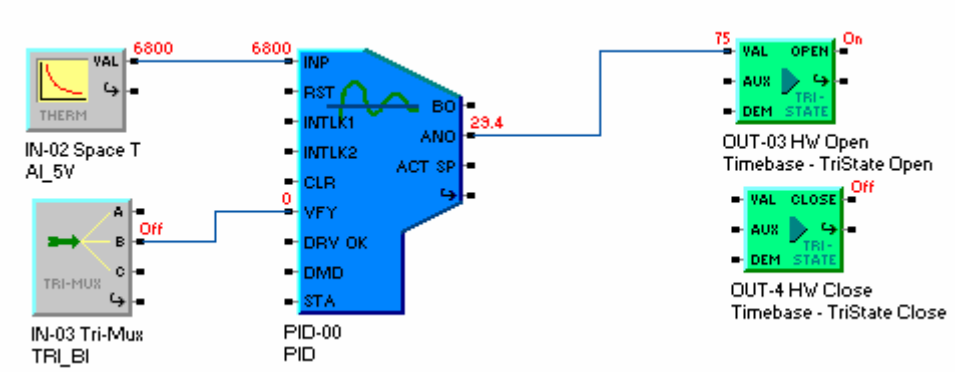
If the output has overridden open or closed ,it will drive continuously in the appropriate direction.

Compare Sense is not used. If it is necessary to reverse the action, then the Output Value and Auxiliary Value must be switched. Default Enable, Default Value, Min-On/Off Enable and Miscellaneous Enable are not used. The Demand Limit Handle is not used by the Tri-state output types.

Tri-state Binary Output with Time Base

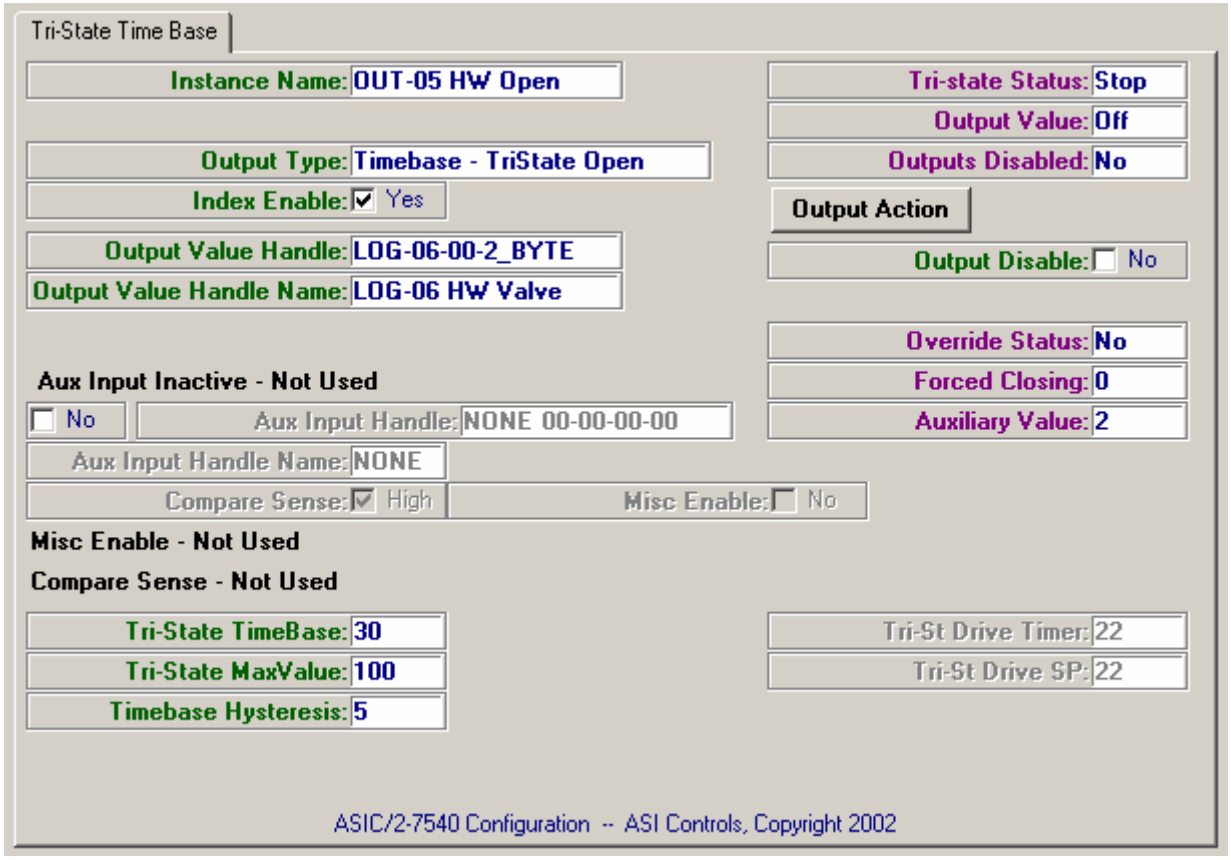
The Tri-state with Time Base Output returns the Output Value and calculates a drive setpoint. The index is configured as the Drive Open Output, Type 15,. the next index is Drive Closed which may be configured as Type 16 for information purposes. Only the Drive Open configuration is used by the controller.

The Output Value is examined and **Tri-state Drive Setpoint** in seconds is calculated based on the Tri-state Base Time and the fraction of the **Tri-state Maximum Value.** If Tri-state Maximum Value = 0 , then 255 is used.

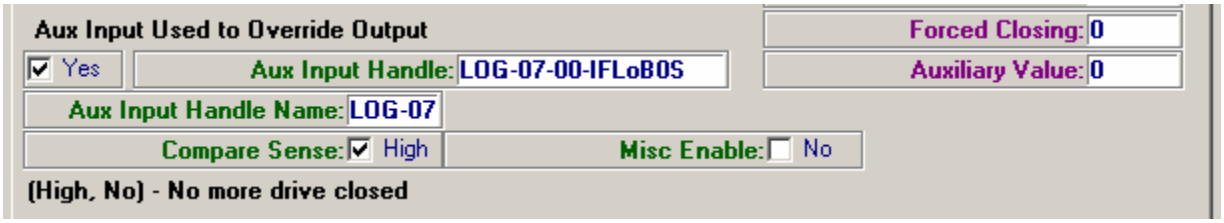


The calculated **Tri-state Drive SP** is compared with the **Tri-state Drive Timer**. If the drive timer is greater than or equal to the drive time, the close output is energized, and the drive timer is decremented. If the drive timer is less than or equal to the drive time, the open output will be energized and the drive timer will be incremented.

Once the drive timer matches the drive time, then no further action takes place until the difference between the Tri-state Drive Timer and drive time becomes non-zero. The output is then driven open or closed until the Tri-state Drive Timer equals to the Tri-state Drive SP.



If the Auxiliary value is enabled, the Auxiliary value is examined. If False, then the output functions normally. If true, the output functions depending one of four modes selected based on the Compare Sense High and Misc Enable



Truth Table for Tri State Time Base Outputs

Auxiliary value	Compare Sense	Miscellaneous Enable	Action
False	-	-	Normal Tri-state Time Base Operation
True	Low	Yes	Drive to closed for a base time.
True	Low	No	Drive to open for a base time.
True	High	Yes	No more drive open (Drive open limit)
True	High	No	No more drive closed (Drive closed limit)

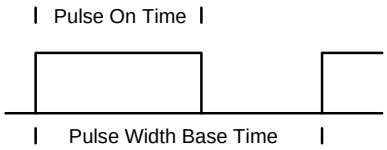
The Demand Limit Handle is not used by the Tri-state output types.

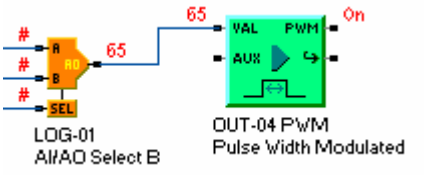
Pulse Width Modulated

The Pulse Width Modulated Binary Output, Type 20, returns the Output Value and calculates a Pulse Width On-Time and Off-Time depending on the analog output value.

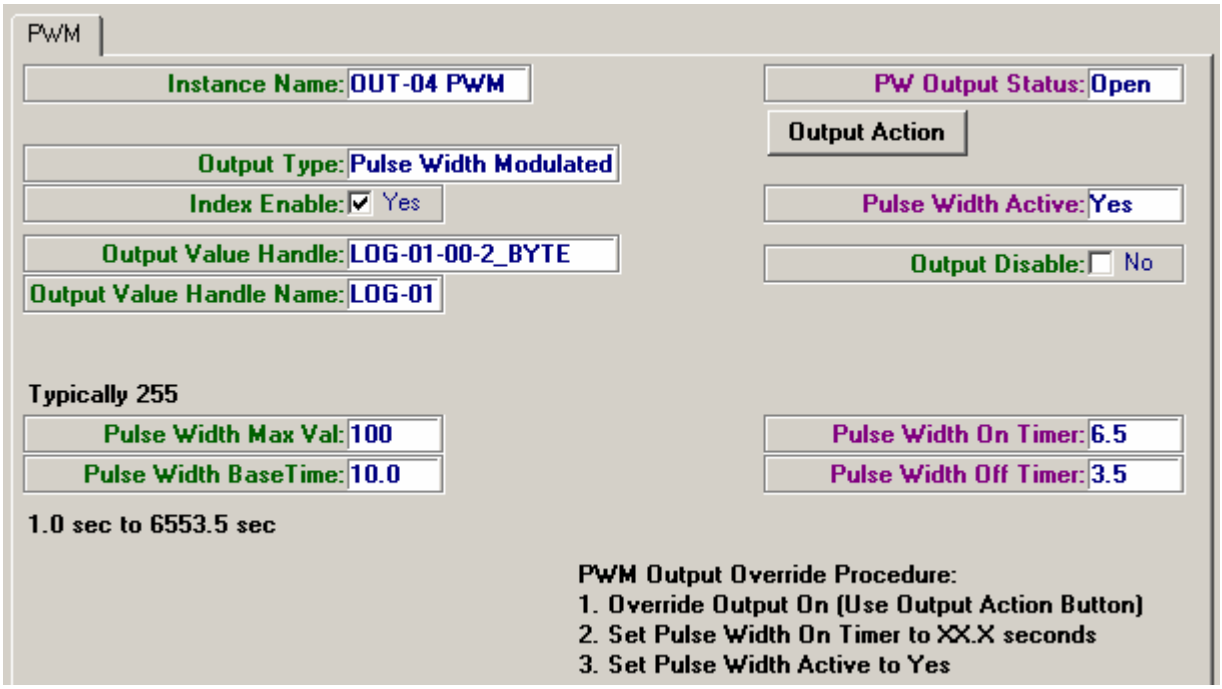
The analog output value is converted to a Pulse-On Time with 0.1 sec resolution. The **Pulse Base Time** always starts at the one second mark.

$$\text{Pulse On Time} = \frac{\text{Output Value}}{\text{Maximum Value}} * \text{Pulse Width Base Time}$$





The Pulse On-Time is updated every second. The output remains on until the Pulse On-Timer is greater than the Pulse On-Time.



The **Pulse Width Maximum Value** is a word value which is used for calculating percentage of **Pulse Width Base Time**. Typically 255. If Max Value = 0, use 255. It could be larger.

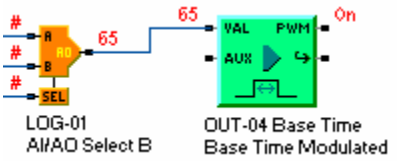
The Pulse Width Base Time is a word value. The maximum base time is 6553.5 seconds.

The Auxiliary Input Handle is not used by the Pulse Width Binary Output.

The Demand Limit Handle is not used by the Pulse Width Binary Output.

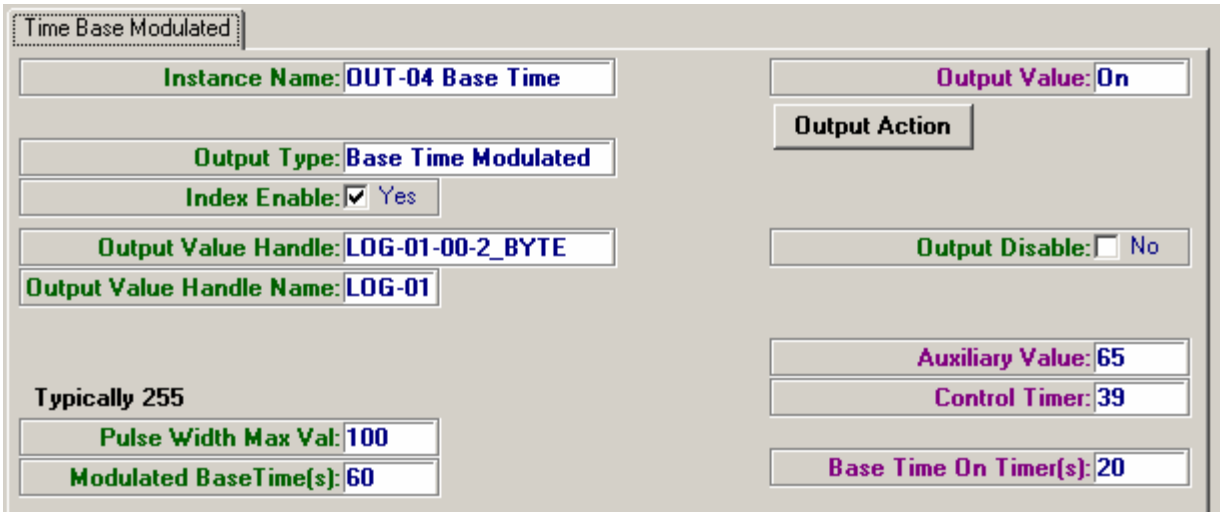
Base Time Modulated

The Base Time Modulated Binary Output, Type 21, returns the Output Value as Auxiliary Value, Attr-1, and calculates a Base Time On, Attr-3,-Time depending on the Auxiliary Value. . The analog output value is converted to a Base Time-On Time with 1 sec resolution..



Base Time On Time = ((Auxiliary Value)/(Maximum Value))*Modulated Base Time.

The Modulated Base Timer, Attr-3, is loaded at power up and counts down to zero when it reloads the Modulated Base Time. If the Modulated Base Time is changed it take effect at the beginning of the new base time. Once off it stays off until the beginning of the next base time. No Pulse Pairs or Minimum On/Off times. The Output Value, Attr-0, indicates whether the output is on or off.



Default Value

Default Value may be used by Binary Output types. If Default Enable is true, then the Default Value is used when the index is not enabled or when the Output Value Handle is bad. This allows the user to force the output on even though the sequence is not complete.

If the output is running and the output is disabled, then the output will be placed in a safe condition:

1) Maintained binary outputs if Default Enable is yes then use the Default Value. Otherwise they are turned off.
2) Pulse-Pair binary outputs use the Default Value if Default Enable is yes or else are turned off. If it is on , it will be pulsed off.
3) Tri-state outputs go to Stop.
4) Pulse-width outputs turn off immediately.

Maintained binary outputs also use the Default Value to determine the normal state of the output when in Demand Limit conditions.

Binary Output Glossary

Binary Output Parameters

Action

Applies to all types of outputs. Writing the following values to Override Action (3,X,4,WORD) causes the corresponding event to occur:

Analog Type Binary Outputs:

0	No effect.
1	Override Output - Allow the user to write to Output Value.
2	No effect.
3	Clear Override

All Other Binary Outputs

0	No effect.
1	Override Output Value to "On". Disable application.
2	Override Output Value to "Off". Disable application.
3	Clear override. Re-enable application.
4	Clear the Verify Alarm.

Auxiliary Input Enable

Applies to all binary and analog outputs. Enables the Auxiliary Input feature for operation. User-configurable; "Yes", "No". (3,X,6,HI BIT 1)

Auxiliary Value

Not user-changeable; integer. (3,X,1,WORD)

Compare Sense

Applies to all binary outputs. Used in conjunction with Auxiliary value. For all binary outputs. Interlock Setpoint is subtracted from Auxiliary value. For Compare Sense = "High", a positive result interlocks the output; for Compare Sense = "Low", a negative result interlocks the output. To lose an established interlock, Auxiliary value must move back over Interlock Setpoint by at least Interlock Hysteresis. Non-interlocked outputs are forced to zero. User-configurable; "High", "Low". (3,X,6,HI BIT 2) -

Cycle Off-Time

The off-period for duty-cycle type outputs. Duty-cycle type outputs go on and off sequentially in accordance with Cycle On-Time and Cycle Off-Time. (3,X,8,WORD)

Cycle On/Off Timer

Used to time Cycle-On Time and Cycle-Off Time. Duty-cycled type outputs only. (3,X,3,WORD)

Cycle On-Time

The on-period for duty-cycle type outputs. Duty-cycle type outputs go on and off sequentially in accordance with Cycle On-Time and Cycle Off-Time. (3,X,7,WORD)

Default Enable

Applies to all binary outputs except the tri-state type. If set to "Yes", then Output Value will be forced to Default Value in the cases of a disabled index or a meaningless output handle. User-changeable; "Yes", "No". (3,X,6,HI BIT 3)

Default Value

Applies to all binary outputs except tri-state. The value used for Output Value when the index is disabled or when an invalid Output Handle has been specified. "Yes" = High, "No" = Low; user-configurable. (3,X,6,HI BIT 4)

Demand Limit Enable

Applies to all binary outputs. Enables the Demand Limit feature for operation. User-configurable; "Yes", "No". (3,X,6,HI BIT 7)

Demand Limit Handle

Applies to all binary outputs. Points to the locations which hold Demand Level and Current Demand Group. Used in conjunction with the Demand Limit feature. User-configurable. (3,X,14,2 WORDS)

Demand Limit Status

Applies to all binary outputs. Indicates if the Demand Limit feature has currently forced Output Value to zero. "OK", "Off"; not user-changeable. (3,X,2,HI BIT 3)

Demand Rotate Group

Applies to all binary outputs. If the Demand Limit feature is enabled using rotating load shedding, then Output Value is forced to zero whenever Current Demand Group is equal to Demand Rotate Group and Demand Level is greater than or equal to Rotate Level. User-configurable; integer 1 to 6. (3,X,9,HILSNBL)

Demand Rotate Level

Applies to all binary outputs. If the Demand Limit feature is enabled using rotating load shedding, then Output Value is forced to zero whenever Current Rotate Group matches Demand Rotate Group and Demand Level is greater than or equal to Rotate Level. User-configurable; integer 1 to 6. (3,X,9,LOMSNBL)

Demand Shed Level

Applies to all binary outputs. If the Demand Limit feature is enabled using continuous load shedding, then whenever Demand Level is greater than Shed Level, Output Value will be forced to zero. User-configurable; integer 1 to 6. (3,X,9,LOLSNBL)

Feedback Reference Enable

Used by Tri-State Feedback Type outputs. Enables the Auxiliary Input feature for operation. User-configurable; "Yes", "No". (3,X,6,HI BIT 1)

Feedback Reference Handle

Used by Tri-State Feedback Type outputs. Points to the Auxiliary Input value used as feedback reference. User-configurable. (3,X,12,2 WORDS)

Feedback Source Handle

Used by Tri-State Feedback Type outputs. Points to the Output Value to use as feedback source. User-configurable. (3,X,10,2 WORDS)

Forced Closing

Applies to Tri-state Binary Outputs. Indicates if the output has been forced closed for any reason. "Yes", "No", "Disable"; user-configurable. (3,X,6,HI BIT 0,1)

In Minimum On/Off

Applies to Standard and Duty-Cycled type outputs only. Indicates if currently in a minimum-on period or a minimum-off period. (3,X,2,HI BIT 4)

Index Enable

Applies to all types of outputs. Enables this index of the Output object for operation. User-configurable; "Yes", "No". (3,X,6,HI BIT 0)

Interlock Hysteresis

Applies to interlocked and sequenced binary outputs: Not used in FW740A and FW840A. (3,X,8,WORD)

Interlock Setpoint

Applies to interlocked and sequenced binary outputs: : Not used in FW740A and FW840A. . (3,X,7,WORD)

Interlock Status

Applies to interlocked and sequenced binary outputs. Denotes whether this output currently is interlocked. In the absence of an interlock, Output Value is forced to zero. User-configurable; integer. (3,X,2,LO BIT 2)

Maximum Value

Maximum Value used for calculating percentage of Base Time Modulate Output. Typically 255. if Max Value = 0, use 255. (3,X,16,WORD)

Minimum Off-Time

Applies to standard binary outputs: This is the minimum amount of time for which the output must be off. User-configurable; in seconds. (3,X,8,WORD)

Minimum On/Off Enable

Enables the Minimum On-Time and Minimum Off-Time features for operation. (3,X,6,HIGH BYTE BIT 5)

Minimum On/Off Timer

Applies to duty cycled binary outputs

Used to measure Minimum On-Time and Minimum Off-Time. Not user-changeable; reads in seconds. (3,X,3,WORD)

Minimum On-Time

Applies to standard binary outputs: This is the minimum amount of time for which the output must be on. User-configurable; in seconds. (3,X,8,WORD)

Miscellaneous Enable

Used together with Compare Sense in the Time Base Type Tri-state interlock to determine the interlock drive conditions.

Modulated Base Time

Base Time for Modulated Base Time outputs. (3,X,8,WORD)

Output Reversed Enable

If set then the state of the output relay is reversed, when the maintained output is On the relay is De-energized. Applies to Maintained Binary output types 1, 4,7,10,& 17. When the maintained output is Off, the relay is energized. Attr-9 HI bit 7 (FW740/840E2.1)

Output Type

This code specifies how this output index is to function. See the Output Definition for a listing of the possible types. User-configurable; integer. (3,X,6,LOW BYTE)

Output Value Handle

Applies to all types of outputs. Points to the location which contains the value to use as Output Value. User-configurable. (3,X,10,2WORDS)

Output Value

Applies to all types of outputs. The present value of this index's output. This value controls the physical output. Not user-changeable; integer. (3,X,0,WORD for analog and tri-state outputs; LOW BYTE BIT 0 for binary outputs)

Override Sense

For all binary type outputs except tri-state. If equal to "On", then the output has been overridden "ON". If equal to "Off" then the output overrides has been overridden "Off" force the physical output off. "On", "Off"; user-configurable. (3,X,2,LO BIT 5)

Override Status

Applies to all types of outputs. Indicates whether an output override is presently in effect. "Yes", "No"; user-configurable. (3,X,2,LO BIT 6)

Previous Output Value

Applies to binary type outputs. The value contained in Output Value immediately previous to the loading of its present value. Not user-changeable. (3,X,2,LO BIT 7)

Pulse On Now

For pulsed type binary outputs: Signifies that an output pulse is being sent now. Whether the pulse pulls the line low or high is dependent on the Output Type. Not User-changeable; "Yes", "No". (3,X,2,HI BIT 2)

Pulse On Time

Percentage of Pulse Width base time. (Output value /Max Output Value)*Pulse Width Base Time Value)

Pulse Width Base Time

maximum pulse width time in units of (0.1 s) (3,X,8,WORD)

Pulse Width Max

Maximum Value used for calculating percentage of Pulse Width base time. Typically 255. if Max Value = 0, use 255. (3,X,16,WORD)

Pulse Width Off Timer

The output is Off if the Pulse Width Timer is > Pulse On Time. (0.1 s)(3,X,5,WORD)

Pulse Width On Timer

The output is On if the Pulse Width Timer is < Pulse On Time. (0.1 s) (3,X,1,WORD)

Tri-state Base Time

For tri-state time-base type outputs, designates the amount of time needed to move from completely closed to completely open position. User-configurable; in seconds. (3,X,9)

Tri-state Drive Setpoint

Applies to time-base type tri-state binary outputs. This location contains the target value for the output, in terms of percentage of the time-base. The time-base is the time needed to drive the output from completely closed position to completely open position. The output is driven open or closed for the amount of time necessary to force Tri-state Drive Timer to become equal to Tri-state Drive Setpoint. (3,X,5,WORD)

Tri-state Drive Timer

Applies to time-base type tri-state binary outputs. Indicates the present value of the output, in terms of percentage of base time. Base time is the time needed to drive the output from completely closed position to completely open position. User-configurable; reads in seconds. (3,X,3,WORD)

Tri-state Feedback Reference

Applies to feedback type tri-state outputs when the auxiliary handle is not enabled. This location contains the reference based on the value returned by the Auxiliary Input Handle. If the Auxiliary Input Handle is not enabled then the Tri-State Feedback Setpoint is used. If the Feedback Source value from the Output Value Handle is less than the Tri-State Feedback Reference value obtained from the Auxiliary Input Handle the Open output is energized.. The output is driven open or closed as necessary to force Tri-state Feedback Reference to become equal to Tri-state Feedback Source. Once it reached the Tri-state Hysteresis is applied before it drives further. All values are in the same units .as the Feedback input. (3,X,3,WORD)

Tri-State Feedback Setpoint

Applies to feedback type tri-state binary outputs .This location is used for the Tri-State Feedback Reference if the Auxiliary Input Handle is not enabled. All values are in the same units .as the Feedback input. (3,X,7,WORD)(FW740A..)

Tri-State Feedback Source

Applies to feedback type tri-state binary outputs .This location contains the source based on the value returned by the Output Value Handle. The Feedback Source is compared with the Feedback Reference. If the Feedback Source value from the Output Value Handle is less than the Tri-State Feedback Reference value obtained from the Auxiliary Input Handle the Open output is energized.. The output is driven open or closed as necessary to force Tri-state Feedback to become equal to Tri-state Reference. All values are in the same units .as the Feedback input. (3,X,5,WORD)(FW740A..)

Tri-state Hysteresis

Applies to feedback type tri-state outputs. For feedback type the auxiliary value (feedback) value must fall above or below the current reference value by the hysteresis before the output continues to drive. For Timebase Type the Drive Timer deviate from the Tri-state Drive Setpoint by the Tri-state hysteresis. (3,X,16,WORD)

Tri-state Maximum Value

For time-base type tri-state binary outputs. The maximum allowable position for the output, in terms of percentage of the time-base. The time-base is the time needed to drive the output from completely closed position to completely open position. User-configurable; 0% to 100%. (3,X,8,WORD)

Tri-state Status

For all tri-state type binary outputs. Indicates whether the output is presently being driven open, being driven closed, or is stopped. "Open", "Close", "Stop"; user-configurable. (3,X,2,LO BITS 0,1)

Using Default

Applies to all binary outputs: Indicates that Output Value is presently equal to the Default Value. User-configurable; "Yes", "No". (3,X,2,LO BIT 3)

Verify Alarm Status

Applies to binary outputs. Indicates if a Verify Alarm is presently is in effect. A Verify Alarm is set if after a number of attempts equal to Verify Maximum Tries, output on verification is not able to be attained. "OK", "Alarm"; not user-changeable. (3,X,2,LO BIT 4)

Verify Delay

Applies to binary outputs. For an output to be verified on, the verify input must read positive for at least Verify Delay. User-configurable; in seconds. (3,X,7,LOW BYTE)

Verify Maximum Tries

Applies to binary outputs. The maximum number of attempts at starting an output and attaining verification which may be made before abandoning the attempt and declaring an output fault and setting. User-configurable; integer. (3,X,7,HIGH BYTE)

Verify Timer

Applies to binary outputs. Used for measuring Verify Delay. Not user-changeable; reads in seconds. (3,X,3,LOW BYTE)

Verify Try Counter

Applies to binary outputs' Keeps track of the number of attempts to start the output which have been made. Not user-changeable; integer. (3,X,3,HIGH BYTE)

Binary Output Properties

The OUTPUT object defines the present values and setup parameters used by the controller to enable the output control block.

BINARY OUTPUT	
Object Number	= 3
Data Type	= Word
ASIC/2-8040	= 0..2 (BO-01..BO-03) Relays FW840A
	= 3..7 (BO-04..BO-08) Triacs FW840A
	= 8..9 (BO-09..BO-10) LED-1A,2A FW840A
ASIC/2-7040, -7540	= 0..11 (BO-1..BO-12) FW740A
	= 12..15 (Indicator LED-1..LED-4) FW740A
ASIC/2-7000	=0..3 (AO-01..AO-04) FW700
	= 4..15 (BO-1..BO-12) FW700
DYNAMIC Attributes	= 6 (0..5)
STATIC Attributes	= 10 (6..15) FW700i
	= 14 (6..19) FW740A., FW840A.
	= 21 (6..26) FW740C., FW840C.

Binary Output Firmware Revision

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005

- Same as ASIC/2-7040.

ASIC/2-8040 FW840E Rev 2.1 Released 03/30/2001 CHK 0x8E1F
ASIC/2-7040 FW740E Rev 2.1 Released 03/30/2001 CHK 0xA389

- Fixes Binary Outputs broken in 740E2.0. Outputs 9-12 did not work. **Output Reverse Enable** Attr17-LOBit0 now works correctly.

ASIC/2-7040 FW740E Rev 1.9 Unreleased 11/17/2000
ASIC/2-8040 FW840E Rev 1.9 Unreleased 11/17/2000

- Adds **Output Reversed Enable** for Maintained Binary Output Types. If enabled, then the relay will be energized when the output shows off.

ASIC/2-8040 FW840C Rev 1.0 Release 06/05/98 Chk 0D55h

- Instance Name Labels for OUT

ASIC/2-8040 FW840A Rev 1.3 Released 15 May 1997
ASIC/2-8040-DK FW840B Rev 1.3 Released 13 April 1997 CHK E6D3h

Fixes problem with triac outputs which occasionally pulse off for 100 ms.

ASIC/2-7040 FW740C Rev 1.0 Released 01/29/97

Adds Binary Output Name, Instance Name Label, PID
Adds Tri-state Hysteresis, Timer/SP difference to drive.

ASIC/2-8040 FW840A Rev 1.0, Forthcoming March 1996

Initial Release with Hardware Clock.
Holiday schedule including month, date,
and number of days and deletes predefined holidays.

ASIC/2-7040 FW740B Rev 1.2 08/18/95
ASIC/2-7040 FW740A Rev 2.1 08/16/95

- Fixed Binary Output Overrides on index 0..3 from DAK
- Fixed Sequence Min On/Off = 0 problem
- Fixed Binary Output Handle to System Object

ASIC/2-7040 FW740A Rev 1.9 Released 04/24/95

Added Second Time Flag SYS-0,Attr-0 HIbit4 Binary Outputs to not come on until after the Second time Flag has fallen. This allows logic and timers to be set up to inhibit operation.

ASIC/2-7040 FW740A/B Rev 1.8 Released 12 April 95

- Fixed Output disable so that all types of outputs turn off immediately when outputs are disabled. Earlier some outputs if on would only pulse off

momentarily.

- Added New Binary Output Type 21, Base Time Modulated

ASIC/2-7040 FW740A Rev 1.5 15 Sept 94

- Fixed Pulse Width Output problem.

ASIC/2-7040 FW740A Rev 1.0 17 May 94

- If the Binary Output Index is Enabled and the Output Value Handle is 0-0-0-0, it returns a value 2 which is non zero. This has been fixed so that if the Output Value handle is not configured it will return 0.

ASIC/2-7040 FW740A Rev 1.0 Alpha Test (03/31/94)

- Add Pulse Width Modulated Output (0.1 sec)
- Move Analog Output Configuration to Object 15
- Change Interlock Type to Simple Binary Interlock
- Change Sequence Type to Simple Binary Interlock
- Output Disabled flag in system object.

ASIC/2-7000 FW700A.. 12/05/91
SC/1-9040 FW907A 07/25/91

Binary Output DYNAMIC Properties

Attr-0 Present **Output Value** (word)

Present Output Value shows actual output status for all Output Types. It should reflect the actual condition of the relay output. Unless Output Reversed is enabled.

LO BYTE LO bit 0 - Binary Output Value
0 = OFF; 1 = ON

Note: The status of pulse width modulated outputs, tri-state and pulse pairs is shown in Attr-2, LO Bit0,1 The Binary Output Request , non-zero output value handle is shown in Attr-2 HI Bit 6.

Attr-1 **Auxiliary Value**

Contains value returned by Auxiliary Input Handle
Pulse Width On Timer (0.1 s)
BaseTime Modulation Value
Feedback Value

Attr-2 Output Status

Attr-2 LO bit 0,1 - Output Pair Status
Tri-state Output Status (Tri-state Output Types)
0. STOP, pair stopped
1, OPEN, if pair opening
2, CLOSE, if pair closing
3, ERROR, illegal value.
Pulse Pair Output Status (Pulse-Pair Output Types)
Shows status of the pulse pair.
0 Off
1 Pulse On
2 Pulse Off
3 - ERROR, illegal value
Pulse Width Output Status (Pulse-Width Output Types)
0 Off
1 Pulse is On
2 Pulse is Off
3 - ERROR, illegal value

Attr-2 LO bit 2 - **Interlock Status** (OUT_LOCK_ON)
1, YES, if Interlock true
0, NO, if Interlock false

Attr-2 LO bit 3 - **Using Default** (OUT_DFALT)
1, YES, if using default value
0, NO, if not using default

Attr-2 LO bit 4 - **Verify Alarm Status** (OUT_V_FAIL)
1, ALARM, Verify has failed.
0, OK, No Verify alarm

Note: Action 4 Clear Verify Alarm should both clear the Verify alarm flag(Attr-2,LO Bit 4) and also clear the Verify Try Counter (Atr-3, Hi Byte). They can also be cleared by the enabled Demand Limit Handle with a value returned by the handle of LO Byte = 255.

Caution: Make sure that the value returned by the handle has not been set to the value 255 or else the Verify Alarm is cleared continuously.

Attr-2 LO bit 5 - **Override Sense** (OUT_OR)
Not Used by Analog Outputs. If the output is overridden, Override Sense determines whether it is overridden ON or OFF.
1, O/R ON, on if in override ;
0, O/R OFF, off if in override

Attr-2 LO bit 6 - **Override Status** (OUT_OR_EN)
Override Status indicates if the Output has been overridden. If overridden for Binary Outputs, the Override Sense gives the whether the output is overridden ON or Off.
1, Output Override - Disable application, .
0, AUTO, No Output Override - Enable Application

Attr-2 LO bit 7 - **Previous Output Value** (OUT_LAST)
Used internally to determine change of binary output
1, ON, if previous output was ON
0, OFF, if previous output was OFF

Attr-2 HI bit 0,1 - **Forced Closing**
Internal status which indicates if Tri-state are forced closed for any reason. Synchronizing flags. Bit 0 is set by an external force and Drive Closed is started for a base time. Bit 1 is set internally. Both stay set inhibiting all else until the drive time has expired. (OUT_CLOSE_1,OUT_CLOSE_2)
0 - Forced Closing disabled and not active
1 - Not Valid
2 - Forced Closing enabled and not active
3 - Forced Closing enabled and active

Attr-2 HI bit 2 - Reserved Internal (Pulse ON Now)
This is used by Pulse On/Off Output Types.
Internal flag set during 1 second output pulse. (OUT_TWIXT)
0, NO, not in pulse period
1, YES in pulse period

Attr-2 HI bit 2- Reserved Internal (Pulse Width Active)
This is set by Pulse Width Output Type = 20 and Output Value <> 0.
Internal flag set during when pulse width is actively operating
Continuous and either ON or OFF or 1 shot and On (OUT_PWM)
0, NO, not active
1, YES active

Attr-2 HI bit 3 - **Demand Limit Status** (OUT_IN_DEMAND)
1, OFF because of demand limit.
0, OK demand limit not active.

Attr-2 HI bit 4 - **In Min On/Off** (OUT_MIN)
1 = In Minimum On/Off Period, 0 = Not

Attr-2 HI bit 5 -**Binary Output State** (OUT_STATE)
Same as Present Value. Actual state of relay.
0 = Off; 1 = On

Attr-2 HI bit 6 - **Binary Output Request** (OUT_INPUT)
Shows status of Output Value Handle
0 = Off; 1 = On

Attr-2 HI bit 7 - **Outputs Disabled** (OUT_DISABLED)
This flag is set if the outputs have been disabled in the system object. The physical binary output will be OFF even though the sequence will appear to operate.

Attr-3 **Output Timer** (OUT_TIMER)
This timer runs while performing various operations. Its operation depends on the Binary Output Type (OUT_TIMER, OUT_MOD_TIMER)

Binary Type Outputs
(Binary Verify - type 1 & 2) Verify Parameters
LO Byte - **Verify Timer in Seconds**
HI Byte - **Verify Try Counter**
(Binary Interlock - type 4 & 5) Not Used
(Binary Sequence - type 7 & 8) Not Used
(Binary Duty Cycle - type 10 & 11) **Cycle On/Off Timer**
(Binary Standard - type 17 & 18) **Min On/Off Timer**

Analog Type Binary Outputs
(Tri-state Feedback - type 13) **Tri-state Feedback Reference**
Obtained from the Auxiliary Input Handle
(Tri-state Time Base - type 15) **Tri-state Drive Timer**
(Pulse-Width - type 20) **Pulse-width Timer**
(Base Time Modulated - type 21) **Base Time On Timer**

Attr-4 **Action**
Writing value to this variable initiates an action. Action is cleared when action is completed. The output is overridden ON by writing Attr-4 = 1. The output is overridden OFF by writing Attr-4 = 2. The output is re-enabled by writing Attr-4 = 3. If override is enabled, then the application is ignored. (OUT_ACTION)

0 = No Operation
1 = Override Output ON
2 = Override Output OFF
3 = Clear RAM Override flag. Resume Application.
4 = Clear Verify Alarm Command

Note: Action 4 Clear Verify Alarm should both clear the Verify alarm flag(Attr-2,LO Bit 4) but also clear the Verify Try Counter (Atr-3, Hi Byte)

Attr-5 **Control Timer**
This timer runs while performing various control operations. Its operation depends on the Output Convert Type (OUT_DESTIN, OUT_OFF_COUNT, OUT_MOD_COUNT)

Binary Type Outputs Not Used
(Binary Verify - type 1 & 2)
(Binary Interlock - type 4 & 5)
(Binary Sequence - type 7 & 8)
(Binary Duty Cycle - type 10 & 11)
(Binary Standard - type 17 & 18)

Analog Type Binary Outputs
(Tri-state Feedback - type 13) **Tri-State Feedback Source** (FW740A..)
returns reference value from Output Value Handle
(Tri-state Time Base - type 15) Tri-state Drive SP
(Pulse-Width - type 20) **Pulse-width Off Timer**

Binary Output STATIC Properties

Attr-6 Setup 1
LO Byte - **Output Type**

The Output Types and Configurations are:

0 - Not used

1 - Maintained - Verify
2 - Pulsed On - Verify
3 - Pulsed Off - Verify
4 - Maintained - Interlock
5 - Pulsed On - Interlock
6 - Pulsed Off - Interlock
7 - Maintained - Sequence
8 - Pulsed On - Sequence
9 - Pulsed Off - Sequence
10 - Maintained - Duty Cycle
11 - Pulsed On - Duty Cycle
12 - Pulsed Off - Duty Cycle

13 - Tri-state Open - Feedback
14 - Tri-state Closed - Feedback
15 - Tri-state Open - Time Base
16 - Tri-state Closed - Time Base

17 - Maintained - Standard
18 - Pulsed On - Standard
19 - Pulsed Off - Standard
20 - Pulse-Width Modulated (FW740A)
21 - Base Time Modulated (FW740A 1.8)

HI Byte **Setup**

HI bit 0 - **Index Enable** (OUT_MSTR_EN)
1, Enabled;
0, Disabled.

HI bit 1 - **Auxiliary Input Enable** (OUT_AUX_EN)
1, Enabled;
0, Disabled.

If Auxiliary is enabled, the second input is examined, for the action to be taken for sequence or interlock. If Aux Not Enabled in Feedback type Tri-state outputs, then the Tri-State Feedback is used.

HI bit 2 - **Compare Sense** (OUT_SENSE)
Used by Verify, type 1 & 2,
Interlock, type 4 & 5, and Sequence, type 7 & 8, (FW700A..,907A..)
0 = No (Low) , 1 = Yes (High)
Indicates if high sense for comparisons is to be used.
Not used by Tri-State Feed-back Type

Note: FW740A simplifies the operation of the Interlock and Sequence making it a simple binary interlock. FW700A.. and FW907A.. use an Interlock Setpoint, Compare Sense, and Interlock Hysteresis to show that the interlock is true.

HI bit 3 - **Default Enable** (OUT_DEFAULT_EN)
1 = YES, 0 = NO
Used by Binary Type Outputs.

HI bit 4 - **Default Value** (if enabled)(OUT_DEFAULT)
1 = ON, 0 = OFF
Used by Binary Type Outputs. Default values are used only if index is disabled, or under certain error conditions, such as invalid handle. If Default Enable is not set, then the output will be OFF if the index is disabled.

HI bit 5 - **Min On/Off Enable** (OUT_MIN_EN)
1 = YES, 0 = NO
and Standard, type 17 & 18, outputs to enforce minimum on and off output times. When output is turned off the minimum off timer starts. when turned on the minimum on timer starts.

HI bit 6 - **Miscellaneous Enable** (OUT_MISC)
1 = YES, 0 = NO
Used by Tri-state Time Base Outputs, Type 15 Only.
If the Time base Tri-state is used with an interlock, then Miscellaneous Enable is used with Compare Sense to determine the interlock drive conditions.

If Pulse Width Output , Type 20 then enables one-shot operation.. In one-shot operation it will not pulse again until the present value returns to zero. (OUT_1_SHOT)

0 = Continuous pulse width operation
1 = 1 shot operation

HI bit 7 - **Demand Limit Enable**

Used by all Binary Type Outputs (OUT_DEM_EN)

1, YES Demand Limit Enabled for output
0, NO Demand Limit Disabled for output

If demand is enabled, then the current demand level will be examined to determine if the output should be off.

Attr-7 **Setup 2**

This attribute depends on the Output Type.

Binary Type Outputs

(Binary Verify - type 1 & 2)	Verify Parameters LO Byte - **Verify Delay** (in seconds) HI Byte - **Verify Max Tries**
(Binary Interlock - type 4 & 5)	**Interlock Setpoint** (FW700A..,907A..) Not Used (FW740A..)
(Binary Sequence - type 7 & 8)	**Interlock Setpoint** (FW700A..,907A..) Not Used (FW740A..)
(Binary Duty Cycle - type 10 & 11)	**Cycle ON Time**
(Binary Standard - type 17 & 18)	**Minimum ON Time**

Analog Type Binary Outputs

(Tri-state Feedback - type 13)	**Tri-State Feedback Setpoint** Used only if Aux Input Not Enabled
(Tri-state Time Base - type 15)	Not Used
(Pulse-Width - type 20)	Not Used

Attr-8 **Setup 3**

This attribute depends on the Output Type.

Binary Type Outputs

(Binary Verify - type 1 & 2)	Not Used
(Binary Interlock - type 4 & 5)	**Interlock Hysteresis**(FW700A..,907A..)
(Binary Sequence - type 7 & 8)	**Interlock Hysteresis**(FW700A..,907A..)
(Binary Duty Cycle - type 10 & 11)	**Cycle OFF Time**
(Binary Standard - type 17 & 18)	**Minimum OFF Time**

Analog Type Binary Outputs

(Tri-state Feedback - type 13)	Not Used
(Tri-state Time Base - type 15)	**Tri-state Maximum Value**
(Pulse-Width - type 20)	**Pulse Width Base Time**

Attr-9 **Setup 4** Binary Type Outputs — Demand Limit Parameters

(Binary Verify - type 1 & 2)
(Binary Interlock - type 4 & 5)
(Binary Sequence - type 7 & 8)
(Binary Duty Cycle - type 10 & 11)
(Binary Standard - type 17 & 18)

Demand Limit Parameters (All Binary Outputs)

LOLSNBL (LO bit 0..3) - **Demand Shed Level**

0-7, 0=ignore

LOMSNBL (LO bit 4..7) - **Demand Rotate Level**

0-7, 0=ignore

HILSNBL (HI bit 0..3) - **Demand Rotate Group**

0-7, 0=ignore

HI bit 4 - Spare

HI bit 5 - Spare

HI bit 6 - Spare

HI bit 7 **Output Reversed Enable.**(FW740E1.9, 840E1.9)

If set, then the state of the output relay is reversed, when the maintained output is On the relay is De-energized.

Attr-9 **Setup 4** Analog Type Binary Outputs

(Tri-state Feedback - type 13) Not Used

(Tri-state Time Base - type 15) **Tri-state Base Time**

Base Time (seconds) for tri-state output.

(Pulse-Width - type 20) Not Used

Attr-10,11 **Output Value Handle**

Attr-12,13 **Auxiliary Input Handle**

This function of this handle depends on the Output Type.

Binary Type Outputs

(Binary Verify - type 1 & 2) **Verify Source**

(Binary Interlock - type 4 & 5) **Interlock Source**

(Binary Sequence - type 7 & 8) **Sequence Source**

(Binary Duty Cycle - type 10 & 11) Not Used

(Binary Standard - type 17 & 18) Not Used

Analog Type Binary Outputs

(Tri-state Feedback - type 13) **Feedback Source**

(Tri-state Time Base - type 15) Not Used

(Pulse-Width - type 20) Not Used

Attr-14,15 **Demand Limit Handle**

This function of this handle depends on the Output Type.

The Demand Limit Handle can be used to clear the Verify Alarm . New!

> Caution: Make sure that the value returned by the handle has not been set to the value 255 or else the Verify Alarm is cleared continuously.

Binary Type Outputs **Demand Limit Handle**

(Binary Verify - type 1 & 2)

(Binary Interlock - type 4 & 5)

(Binary Sequence - type 7 & 8)

(Binary Duty Cycle - type 10 & 11)

(Binary Standard - type 17 & 18)

Analog Type Binary Outputs Not Used

(Tri-state Feedback - type 13)

(Tri-state Time Base - type 15)

(Pulse-Width - type 20)

Attr-16 Setup 5

This function of this parameter depends on the Output Type.

Binary Type Outputs - Not Used

Analog Type Binary Outputs

(Tri-state Feedback - type 13) **Tri-state Hysteresis** (740C..,840C..)

Timer/SP difference to drive.12/06/96.

(Tri-state Time Base - type 15) Not Used

(Pulse-Width - type 20) **Pulse Width Maximum Value**

Maximum Value used for calculating percentage of Pulse Width base time. Typically 255. if Max Value = 0, use 255.

Pulse On Time = (Output Value/PW Max Value)*PW Base Time

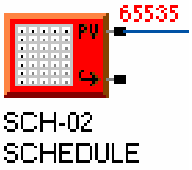
Attr-17 – LO Bit 0 - **Output Reverse Enable** (OUT_REV_EN)
(740/840E2.1) now works correctly.

Attr-18 – Spare (OUT_SPARE_3)

Attr-19..26 **Binary Output Name** (740C..,840C..)

Object 4 - Schedule

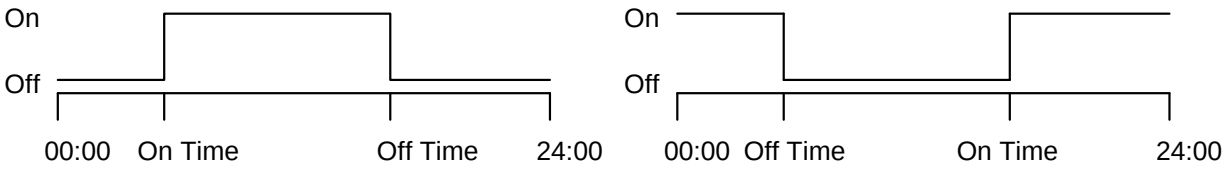
Schedule Summary



Overview: Each index of the Schedule object is used to determine when to begin some event and when to end it. The Schedule requires the clock object to be enabled. Each schedule has an On-time and an Off-time for each of 8 days, Monday through Sunday plus Holiday.

Output: A schedule has a present value that is non-zero if the schedule is on. Other objects examine this present value to determine whether to perform some action or not. For example, the State object would have an Occupied schedule to determine when the control should be in the Occupied state. If two schedules are to be used for some event, then a logic block is used to combine the schedules.

On-times and Off-times: The schedule contains designated On-times and Off-times for each day of the week plus one holiday. On-time and Off-times are expressed in multiples of 7.5 minutes. Every minute and 7.5 minutes, the schedule compares the On-times and Off-times for the current day with the current time and sets its output accordingly.



If the On-time is less than the Off-time, then the schedule output is Off, when the clock time is less than the On-time or greater than the Off-time. This case includes an On-time of 00:00 and an Off-time of 24:00.

If the Off-time is less than the On-time, then the schedule output is On if the time is less than the Off-time or greater than the On-time. This case includes an Off-time of 00:00 and an On-time of 24:00.

Note: Schedule Off-Time 24:00 and 0:00 was broken in several releases of FW740C, 840C, 740E, 840E, and 300B. See below: Firmware Revision - Schedule

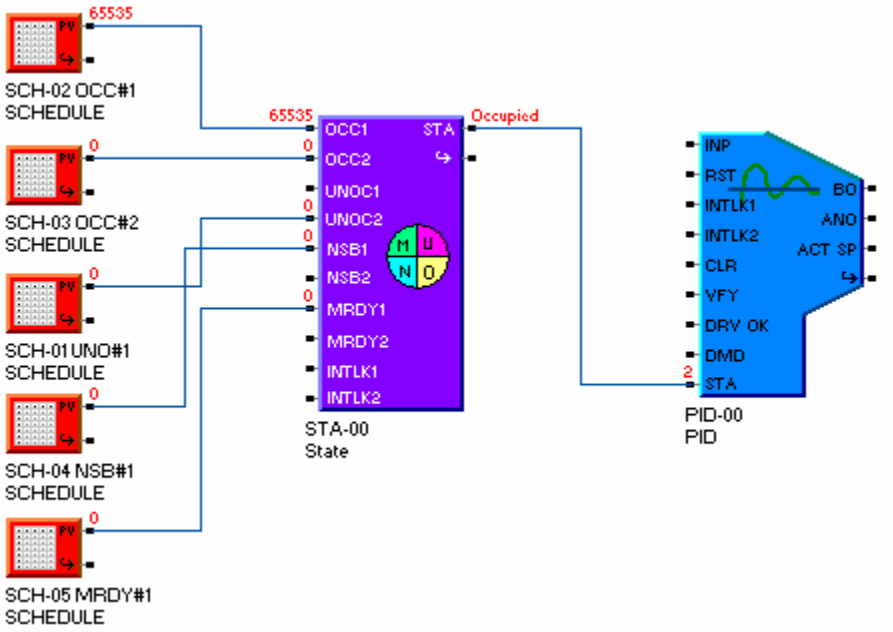
Always-On or Always-Off: With FW740C a schedule is permanently On by setting the On-time to zero and the Off-time to 24:00. With FW740C a schedule is permanently Off by setting the Off-time to zero and the On-time to 24:00.

A **Use Old Schedule** option has been added to FW740C Rev. 1.9 to make schedule work as it did in earlier product.

Override On or Off: A schedule's output may be temporarily overridden to be On or Off by writing to the action via the communications line. This override does not clear upon clock re-synchronization nor upon a new time match. It may be cleared by an action restoring to the event schedule. It is also cleared upon power reset of the controller.

Special Days: With FW740C seven special days and a 16 character description have been added to schedule. If any of these three days is enabled, and active in the clock, then the special day on and off times are used. If the special day is active in the clock, but not enabled in the schedule it follows the normal Monday through Sunday or Holiday times.

Schedule Application



Schedule is often used with State to determine choose state- sensitive setpoints in the PID loop.

Schedule Operation

Event Schedule

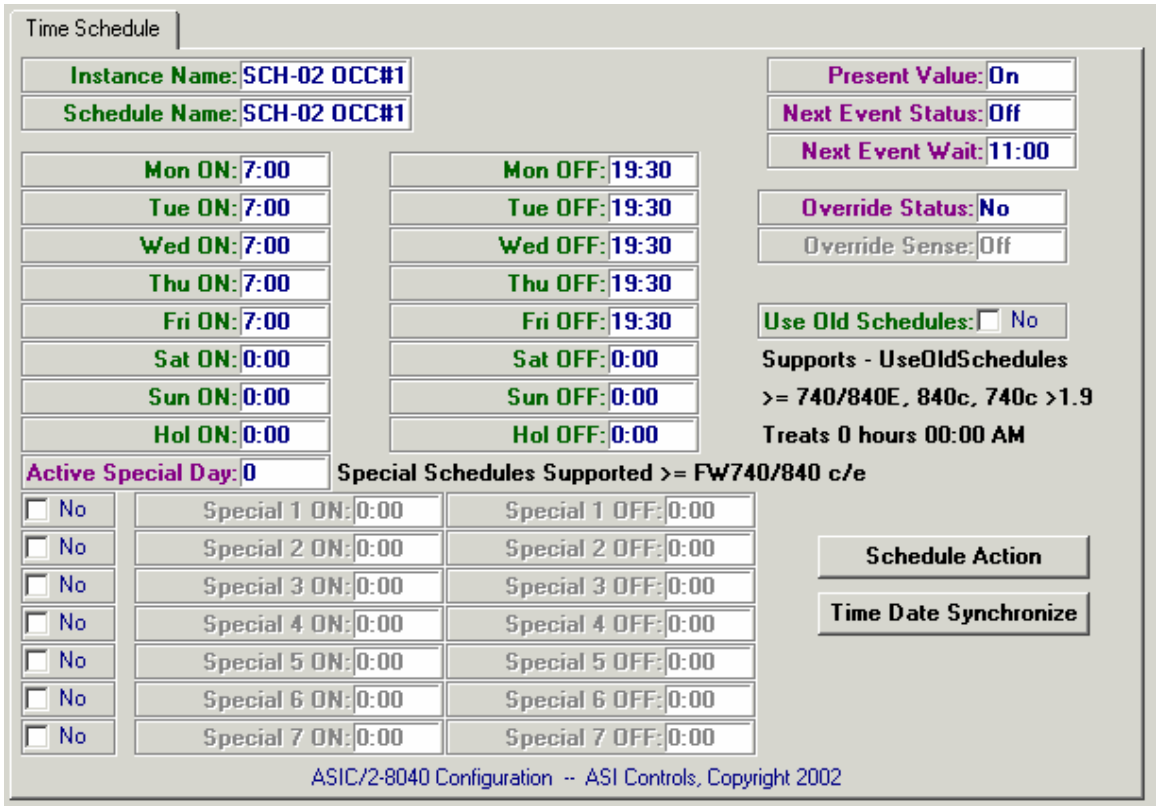
Each controller maintains Off/On Event Schedules for 8 days: holiday plus 7 days of week. Each schedule will consist of 8 - 2 byte values. The LO order byte represents the Off-time, and the high order byte represents the On-time. Each entry. 0-191 represents a time in the 1/8th hr or 7.5 minute increments. 0 represents midnight at the beginning of the day, 00:00:00 hrs. 191 represents 23:52:30 hrs. 192 represents 24:00 hrs at the end of the day and is a valid On- or Off-time.

For example: a value of 123 divided by 8 give 15 hrs with a remainder of 3. (3*7.5 minutes is 22.5 minutes) This would correspond to a time 15:22:30 hrs.

Different control blocks such as STATE, OUTPUT, PID, etc. can point to the present value of the schedule to determine if it should be ON.

Special Day Events

Based on the operation of the clock and calendar object, a day can be declared a special day 1 through 7. If that special day is enabled [Default Not Enabled] in an instance of schedule, then that special schedule will be used. Special Day enable must also be enabled in the Clock Object, and the Calendar object must be configures for a listing of special days.(FW740C,840C,300B)

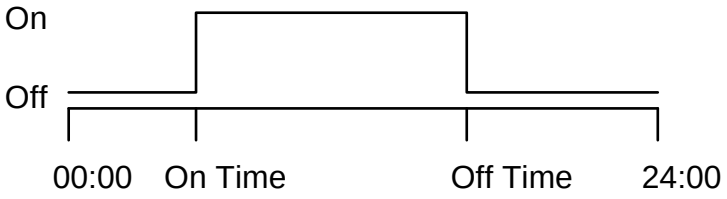


Operation

Every minute and 7.5 minutes by the software clock, each schedule is examined to determine if it should be on or off. Each schedule is examined for the appropriate day or holiday. When the schedule **Present Value** comes ON, bit 0 through bit 15 are turned On in order at two second intervals. Thus if one wishes to delay the start of an output by 24 seconds one would use the application handle to point at bit 12.

Assumed Off (On < Off)

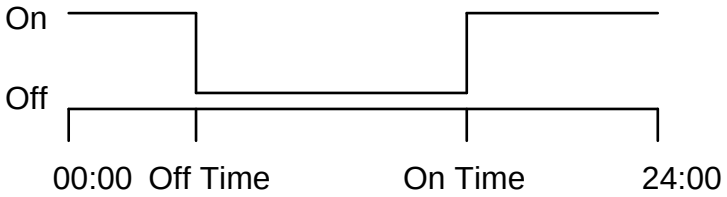
If the On-time is less than the Off-time, then the schedule output is Off, when the clock time is less than the On-time or greater than the Off-time. This case includes an On-time of 00:00 and an Off-time of 24:00.



Note: Schedule Off-Time 24:00 and 0:00 was broken in several releases of FW740C, 840C, 740E, 840E, and 300B. See below: Firmware Revision - Schedule

Assumed On (Off < On)

If the Off-time is less than the On-time, then the schedule output is On if the time is less than the Off-time or greater than the On-time. This case includes an Off-time of 00:00 and an On-time of 24:00.



Always Off (On = 0)

With FW740C a schedule is permanently Off by setting the Off-time to 00:00 and the On-time to 24:00.

If both the Off-time and On-time are zero, then the schedule is not active and its output is always Off. If both the Off-time and On-time are the same, then the schedule output is always Off.

With earlier versions a schedule is permanently On or permanently Off by setting the Off-time or On-time to zero respectively. If the On-time is zero and the Off-time is non-zero, then the schedule output is always Off.

Always On (Off = 0; On <> 0)

With FW740C a schedule is permanently On by setting the On-time to zero and the Off-time to 24:00.

With earlier versions a schedule is permanently On or permanently Off by setting the Off-time or On-time to zero respectively. If the Off-time is zero and the On-time is non-zero, the output is always on.

If both the Off-time and On-time are non-zero, then the schedule is active and its output depends On comparing the On and Off-times with the current time in the controller.

Schedule Summary

Schedule Name	Present Value	Override	Override Sense	Next Event Wait	Next Event
SCH-00	Off	No	Off	9:22	On
SCH-01 UNO#1	Off	No	Off	0:00	Off
SCH-02 OCC#1	On	No	Off	9:52	Off
SCH-03 OCC#2	Off	No	Off	0:00	Off
SCH-04 NSB#1	Off	No	Off	0:00	Off
SCH-05 MRDY#1	Off	No	Off	0:00	Off

Use Old Schedule

FW740C Rev 1.9 adds **Use Old Schedule** option to the Schedule object, SCH,Attr-11,LO bit 7. If Use Old Schedule is set then it treats 0 hours as not used and it works as it did in earlier product.:

IF On-time=0 and Off-time <> 0; then schedule is Always Off.
IF On-time=0 and Off-time = 0; then schedule is Always Off.
IF On-time = Off-time ; then schedule is Always Off.
IF On-time<>0 and Off-time 0; then schedule is Always On.
If both the Off-time and On-time are non-zero,
then the schedule is active and its output depends On comparing
the On and Off-times with the current time in the controller.

Overrides

A schedule may be overridden On or Off irrespective of the daily event schedule using the action attribute.

Writing Attr-4 Action = 1 will override the schedule ON.
Writing Attr-4 Action = 2 will override the schedule Off.
Writing Attr-4 Action = 3 restores normal schedule operation.

These overrides remain in effect until restored, or until there is a reset.

The overrides are preserved through normal synchronization of the controller, and new time of day events.

Delayed Start

The Delayed Start feature is built into the Schedule object. When the schedule comes ON, bit 0 through bit 15 are turned on in order at two second intervals. Initially bit 0 is set. Two seconds later bit 1 is set also. Another two seconds later, the next bit is set, until all 16 bits are set.

If one wishes to delay the start of an output by 24 seconds, one would use the application handle to point at bit 12.

When the output goes Off, all bits are set to zero at once.

Next Event

The time in 7.5 minute increments until the next event today is given by the - Next Event Wait (Attr-1 HI Byte). The status of the next event is given by the Next Event Status, 1 = ON, 0 = Off (Attr-1 LO bit 2). If there are no more events today the next event time is zero and the next event status is off.

Schedule Glossary

Schedule Parameters

Daily ON/Off-times

Time for daily event is measured in increments of 7.5 minutes from midnight (0).

LO BYTE - Daily Off-time ;
HI BYTE - Daily On-time

(4,X,Attr-3 Holiday, Attr-4 Monday, Attr-5 Tuesday, Attr-6 Wednesday, Attr-7 Thursday, Attr-8 Friday, Attr-9 Saturday, Attr-10 Sunday)

Next Event Status

The status of the next event., 1 = ON, 0 = Off (Attr-1 LO bit 2)..

Next Event Wait

The time in 7.5 minute increments until the next event today is given by the - (Attr-1 HI Byte). If there are no more events today the Next Event Wait is zero

Override Sense

Indicates sense of the override if the schedule has been overridden. 1 = Override ON; 0 = No Override Off (4,X,1,LO bit 1)

Override Status

Indicates if the schedule has been overridden. 1 = In Override; 0 = No Override (4,X,1,LO bit 0)

Present Value

When the schedule comes ON, bit 0 through bit 15 are turned On in order at two second intervals. Thus if one wishes to delay the start of an output by 24 seconds one would use the application handle to point at bit 12. (4,X,0,WORD)

Schedule Action

Writing to action allows setting or clearing an override of the schedule for that index. (4,X,2,WORD)

0 = no action
1 = Override Action, schedule ON
2 = Override Action, schedule Off
3 = Override Action, Restore to Event Schedule

Special n On Off Times

Time for special events is measured in increments of 7.5 minutes from midnight (0).

LO BYTE - Special Off-time ;
HI BYTE - Special On-time

Special n Enable

Enables the operation of Special schedule n for the this index. If enabled, and the special day number matches, then the special schedule n will be used to determine on off time.

Use Old Schedule

If Use Old Schedule is set then it treats 0 hours as not used and it works as it did in earlier product. SCH,Attr-11,LO bit 7. IF On-time=0 and Off-time <> 0; then schedule is Always Off. IF On-time=0 and Off-time = 0; then schedule is Always Off. IF On-time = Off-time ; then schedule is Always Off. IF On-time<>0 and Off-time 0; then schedule is Always On. If both the Off-time and On-time are non-zero, then the schedule is active and its output depends On comparing the On and Off-times with the current time in the controller. (FW740C1.9, 840C1.0)

Schedule Properties

The SCHEDULE object defines the present values and setup parameters used by the daily event schedule block.

SCHEDULE

Object Number	= 4
Data Type	= Word
Index	= 0..n as allocated
Attribute	= 0..10
DYNAMIC Attributes	= 3 (0..2)
STATIC Attributes	= 8 (3..10)
	= 24 (3..26) FW740C

Schedule Firmware Revision

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005

o Same as ASIC/2-7040.

ASIC/2-7040 FW740E Rev 1.7 Released 09/27/2000 CHK 0xE62A PN 70002-11

o Fixes Schedule - Next Event Status now Correct.

FW740E 1.4	Released 02/15/2000 OK
FW740C 2.6	Released 09/15/1999 OFF-TIME Broken 24:00
FW740C 2.4	Released 06/09/1999 OFF-TIME Broken 24:00, <- Fixed 12:00
FW740C 2.2	Released 09/18/1998 OFF-TIME Broken 0:00, 12:00

ASIC/2-7040 FW740C Rev 2.7 Released 12/11/2000 CHK 0x69A6

o Fixes Schedule OFF_TIME 24:00 and Next Event Status now Correct.
FW740C 2.6 09/15/1999 OFF-TIME Broken 24:00
FW740C 2.4 06/09/1999 OFF-TIME Broken 24:00 <- Fixed 12:00
FW740C 2.2 09/18/1998 OFF-TIME Broken 0:00, 12:00

ASIC/2-8040 FW840C Rev 1.7 Released 12/11/2000 CHK 0x66F7

o Fixes Schedule OFF_TIME 24:00 and Next Event Status now Correct.
FW840E 1.4 02/15/2000 OK
FW840C 1.6 09/15/1999 OFF-TIME Broken 24:00
FW840C 1.4 06/09/1999 OFF-TIME Broken 24:00 <- Fixed 12:00
FW840C 1.2 09/18/1998 OFF-TIME Broken 0:00, 12:00

SINC/3-3000 FW300B Rev 1.8 Released 10/05/2000 CHK 0xCB3B

o Fixes Schedule Off 24:00,

o Fixes Schedule, Next Event Status now Correct.
FW300B 1.5 08/22/2000 OFF-TIME Broken 24:00 for t < ON-TIME

ASIC/2-7040 FW740E Rev 1.7 Released 09/27/2000 CHK 0xE62A

o Fixes Schedule Next Event Status now Correct.
FW740E 1.4 02/15/2000 OK
FW740C 2.6 09/15/1999 OFF-TIME Broken 24:00
FW740C 2.4 06/09/1999 OFF-TIME Broken 24:00 <- Fixed 12:00
FW740C 2.2 09/18/1998 OFF-TIME Broken 0:00, 12:00

ASIC/2-8040 FW840E Rev 1.7 Released 09/27/2000 CHK 0xCB80

o Fixes Schedule, Next Event Status now Correct.
FW840E 1.4 02/15/2000 OK
FW840E 1.1 10/26/1999 OFF-TIME Broken 24:00 for t < ON-TIME
FW840C 1.6 09/15/1999 OFF-TIME Broken 24:00 for t < ON-TIME
FW840C 1.4 06/09/1999 OFF-TIME Broken 24:00 for t < ON-TIME
FW840C 1.3 11/23/1998 OFF-TIME Broken 0:00, 12:00

ASIC/2-8040 FW840C Rev 1.0 Release 06/05/98

Has all the features of FW740C

ASIC/2-7040 FW740C Rev 1.9 Released 04/15/98

o Adds Use Old Schedule option to Schedule object, SCH,Attr-11,LO bit 7
If Use Old Schedule is set then it treats 0 hours as not used and

it works as it did in earlier product.

IF On-time=0 and Off-time <> 0; then schedule is Always Off.

IF On-time=0 and Off-time = 0; then schedule is Always Off.
IF On-time = Off-time ; then schedule is Always Off.
IF On-time<>0 and Off-time 0; then schedule is Always On.
If both the Off-time and On-time are non-zero,
then the schedule is active and its output depends On comparing the On and Off-times with the current time in the controller.

ASIC/2-7040 FW740C Rev 1.0, Released 01/29/97

Add 7 Special Day Events with enable flags.
Add 16 character Schedule Name.

ASIC/2-8040 FW840A Rev 1.0 Released 22 March 1996

ASIC/2-7040 FW740A.. Rev 1.0 Released 03/30/94

Add Next Event Wait and Next Event Status

ASIC/2-7000 FW700A.. Rev 1.0 Released 12/05/91
SC/1-9040 FW907A Rev 1.0 Released 07/25/91

Schedule DYNAMIC Properties

Attr-0 **Present Value**

When the schedule comes ON, bit 0 through bit 15 are turned On in order at two second intervals. 0 = Off; Non-Zero = ON

Attr-1 Status

LO bit 0 - **Override Status**
1 = In Override; 0 = No Override
LO bit 1 - **Override Sense**
If the override is enabled, the 1 = ON, 0 = Off
LO Bit2 -**Next Event Status**, 1 = ON, 0 = Off (FW740A..,FW840A)
LO Bit3 - Spare
LO Bit4 - Spare
LO Bit5 - Spare
LO Bit6 - Spare
LO Bit7 - Spare

Attr-1 HI Byte - **Next Event Wait**

Minutes until next event today in 7.5 min increments. This does not look to the next day. (FW740A..,FW840A)

Attr-2 **Action**

0 = no action
1 = Override Action, schedule ON
2 = Override Action, schedule Off
3 = Override Action, Restore to Time of Day
4 = Refresh all schedules.

Note: Schedule overrides are not maintained through reset, but are maintained through re-synchronize and scheduled events. .

Schedule STATIC Properties

Schedule Times - Time is measured in increments of 7.5 minutes from midnight.
0 = 00:00 Beginning of day. (FW740C).192= 24:00 hr End of day.
LO BYTE - Daily Off-time; HI BYTE - Daily On-time

Attr-3 Holiday Off/ON

LO Byte - **Holiday Off-time**
HI Byte - **Holiday On-time**

Attr-4 Monday Off/ON

LO BYTE - **Monday Off-time**
HI BYTE - **Monday On-time**

Attr-5 Tuesday Off/ON
LO BYTE - **Tuesday Off-time**
HI BYTE - **Tuesday On-time**

Attr-6 Wednesday Off/ON
LO BYTE - **Wednesday Off-time**
HI BYTE - **Wednesday On-time**

Attr-7 Thursday Off/ON
LO BYTE - **Thursday Off-time**
HI BYTE - **Thursday On-time**

Attr-8 Friday Off/ON
LO BYTE - **Friday Off-time**
HI BYTE - **Friday On-time**

Attr-9 Saturday Off/ON
LO BYTE - **Saturday Off-time**
HI BYTE - **Saturday On-time**

Attr-10 Sunday Off/On
LO BYTE - **Sunday Off-time**
HI BYTE - **Sunday On-time**

Attr-11 Enables
LO bit 0 **Special 1 Enable**
LO bit 1 **Special 2 Enable**
LO bit 2 **Special 3 Enable**
LO bit 3 **Special 4 Enable**
LO bit 4 **Special 5 Enable**
LO bit 5 **Special 6 Enable**
LO bit 6 **Special 7 Enable**
LO bit 7 **Use Old Schedule** FW740C 1.9
HI Byte Spare

Attr-12 **Special 1 Off/On**
LO Byte - Special 1 Off-time
HI Byte - Special 1 On-time

Attr-13 **Special 2 Off/On**
LO Byte - Special 2 Off-time
HI Byte - Special 2 On-time

Attr-14 **Special 3 Off/On**
LO Byte - Special 3 Off-time
HI Byte - Special 3 On-time

Attr-15 **Special 4 Off/On**
LO Byte - Special 4 Off-time
HI Byte - Special 4 On-time

Attr-16 **Special 5 Off/On**
LO Byte - Special 5 Off-time
HI Byte - Special 5 On-time

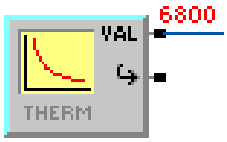
Attr-17 **Special 6 Off/On**
LO Byte - Special 6 Off-time
HI Byte - Special 6 On-time

Attr-18 **Special 7 Off/On**
LO Byte - Special 7 Off-time
HI Byte - Special 7 On-time

Attr-19 to Attr-26 **Schedule Name**
16 character schedule description.

Object 5 - Input

Input Summary



IN-02 Space T
AI_5V

Overview: The Input object is used to read the inputs to 10 bit accuracy, one part in 1023. perform necessary conversions, and make the input values available to other objects. . Each index may be configured for a binary input or for an analog input. Each index of the input object corresponds to one physical input. . The ASIC/2-8040 Configurable Controller has 8 inputs and inputs 5 through 8 (index 4 through 7) may be configured for pulse counting. The ASIC/2-7540 and ASIC/2-7040 Configurable Controllers have 16 inputs which may be configured for pulse counting. .

Both the present and previously read input value are stored in memory. The present value is updated at a user-defined interval and a timer keeps track of time since last update.

High/Low Alarms: Optionally, a high and/or low alarm may be set for inputs which stray beyond the High or Low Alarm Setpoint. The Alarm object may be configured to track these alarms and optionally to alert the user of an interactive building management system. High and Low input alarms clear automatically once the input returns within the normal range.

High/Low Limits: Optionally, each input may be configured with high and low limits. The present value will always be kept within these limits. If the input goes outside these limits, a High or Low Limit Fault is set and the present value stays at the high or low limit value.

Input Faults: Inputs which read outside user-adjustable high or low limits may be used to indicate that a sensor has failed. An input fault is set and optionally a Default Value may be used for the Present Value. The Input object may optionally be configured so that a fault alarm is set.

Overrides: The present value of any input may be overridden via the communications line. An actual override value may be specified, or the override may force the present value to some user-defined Default Value.

Analog Inputs: Analog inputs are read to 10 bit accuracy 0..1023. User defined offset and Smoothing are available. A number of different conversion methods are available:

- Pre-programmed 17 value look-up table for temperature sensors.
  (Type II thermistor, 1.82 kohm pull-up resistor, 0...212 F)
- Pre-programmed 33 value look-up table for temperature sensors.
  (Type II thermistor, 3.32 kohm pull-up resistor, -30...180 F)
- Conversion algorithm for 4 to 20 mA transducers.
  (4 to 20 mA input -> 0 to 1000)
- Conversion algorithm for 0 to 5.0 Vdc sensors.
  (0 to 5.0 Vdc input -> 0 to 1000
- Linear conversion with user-defined slope and offset.
- User-defined look-up table.
- User defined Min/Max Input Voltage and Input Value to ease configuration.

Binary Inputs: Binary inputs may be set-up as normally open or normally closed. Normally open inputs read as "zero" when the input switch is open and read as "one" when the input switch is closed. Normally closed inputs operate visa-versa. Triple and Quad Binary inputs permit multiple contacts across the same input.

Pseudo Binary Inputs: Binary information can be obtained by placing contacts in series with or in parallel with another analog sensor. When the input is open or shorted, the High or Low Limit Fault may be used to identify the contact closure.

Pulsed Inputs: Inputs 12 through 16 (index 11 through 15) may be set-up to read pulsed contact closures such as a kW meter used by the Demand Manager object.

Input Operation

Input Types

1, Analog Input : If the input type is analog, 1 (01h), then the input value depends on the Convert type discussed below. Note: All analog values are read to 10 bit accuracy.

17, Binary Input - N.O : If the input type is binary - normally open, 17 (11h), then the input is 0 if the input is open, and FFFFh if the input is closed.

18, Binary Input - N.C : If the input type is binary - normally closed, 18 (12h), then the input is 0 if the input is closed, and FFFFh if the input is open.

19, Triple Binary Input : If the input is configured with a suitable binary resistor network of 1% resistors, then LO Bit 0 is set if switch A is closed, LO Bit 1 is set if switch B is closed, and LO Bit 2 is set if switch C is closed.

20, Quad Binary Input : If the input is configured with a suitable binary resistor network of 1% resistors, then LO Bit 0 is set if switch A is closed, LO Bit 1 is set if switch B is closed, LO Bit 2 is set if switch C is closed, and LO Bit 3 is set if switch D is closed.

33, Pulse Count Input : If the input type is pulse count, (21h), then the input will count when the binary input goes high, or low as enabled. The count will be cleared to zero when the count reset goes non-zero. If the count gate is enabled, the count will stop when the count gate is zero, and will count when the count gate is non zero.

35, User Adjust Input: If the input type is user adjust, then the analog input will scale from -1000 to + 1000, as the input resistance goes from 10 kohm to 30 kohm with a 10 kohm pull-up resistor. It is designed for use with a WS-R series user adjust potentiometer (FW740E1.8,840E1.8)

Analog Input Convert Types

The convert type only has meaning for analog inputs. In the ASIC/2-7040 all inputs are read to 10 bit accuracy. The raw value is 0 to 1023.

General Analog Inputs

Raw : If the analog input type has convert type 0, Raw, then the input is read to 10 bit accuracy and, as a raw value where 0 to 5.0 Vdc is 0 ... 1023.

0 = 0 Vdc, 255 = 5 Vdc

"G15"; "General, 1 - 5vdc" : If the analog input has a convert type 17, General-1, then the 1.0 to 5.0 Vdc is converted to a value between 0 and 1000. For example, when used with a 4 to 20 mA static pressure transducer is connected across a 249 ohm resistor, then 4 mA equals 0.000 " wc and 20 mA equals 1.000 "wc.

4 to 20 mA = 1 to 5 Vdc = 0000 to 1000.
Present Value = (raw*1000)/819 - 250

For use with 0 to 1 "wc pressure, RH sensor, or other 4 to 20 mA transducer that requires 0 to 1000 input value.

"G05"; "General 0 - 5Vdc" : If the analog input has convert type 49, General-, then the 0 to 5 Vdc input is converted to a value between 00 and 1000. This is used with an active sensor, such as Relative Humidity measurements or other voltage input.

Present Value = (raw*1000)/1023 Value in 0.1%

Linear-1; Linear Conversion

If the analog input has a convert type 65, Linear-1, then the raw value (0..1023) is converted using coefficients A, B, and C . The coefficients are kept in an index of the Utility Object as identified by Utility Index (Attr-17 LO Byte). Note: Smoothing is done after conversion.

Attr-6 = A, Attr-7 = B, Attr-8 = C.
Present Value = (raw*A/B + C)

Convert type 67, Linear-3, then the minus the raw value (0..1023) is converted using coefficients A, B, and C . (2's complement)

Present Value = (-raw*A/B + C)

.Linear Conversions 66 and 68 are not implemented in the ASIC/2-7040.

66, "LN2" = "Not Implemented"
68, "LN4" = "Not Implemented"

Sensor-1; Sensor Conversion

If the analog input has a convert type 70, Sensor-1, then the raw value (0..1023) is converted using signed arithmetic using coefficients, Raw Min, Raw Max, Input Min, and Input Max. Raw Min is less than Raw Max and they are in the range 0..1023 representing 0..5 Vdc, Input Min and Input Max are signed values. Note: If the raw value is outside the range Raw Min to Raw Max then the value is extrapolated.

The coefficients are pairs of values kept in an index of the Utility Object as identified by Utility Index (Attr-17 LO Byte).

Attr-5 =4
Attr-6 =Raw Min
Attr-7 =Input Min
Attr-8 =Raw Max
Attr-9 =Input Max

$$[\text{Present Value}] = \frac{(\text{Raw} - \text{Raw Min})}{(\text{Raw Max} - \text{Raw Min})} * (\text{Input Max} - \text{Input Min}) + \text{Input Min}$$

Note: Smoothing is done after conversion.

Sensor-2; Sensor Conversion (FW740C)

Note: Sensor-2 is not implemented in the initial release.FW840A 1.0

If the analog input has a convert type 71, Sensor-2, then the raw value (0..1023) is converted using signed arithmetic using coefficients, which are kept in the Input Object. Raw Min, Raw Max, Input Min, and Input Max. Raw Min is less than Raw Max and they are in the range 0..1023 representing 0..5 Vdc, Input Min and Input Max are signed values. Note: If the raw value is outside the range Raw Min to Raw Max then the value is extrapolated.

The coefficients are pairs of values kept in the same index of the Input . The size of the Input object has been increased to accommodate the new values.

Lookup-1; Table Lookup Conversion

If the analog input has a convert type 81, Lookup-1, then the raw value 0..1023. is converted using a 33 entry lookup table that is in Utility Object. The coefficients are kept

in an index of the Utility Object as identified by Utility Index (Attr-17 LO Byte). The present value is obtained by linear interpolation of the table.

Attr-5 = 33, Number of values in table.
Attr-6 = Entry 1,
Attr-7 = Entry 2,
...,
Attr-39 = Entry 33

Note: Smoothing is done after conversion.

Convert type 83, Look-up-3, then the minus the raw value (0..1023) is converted using coefficients the 33 value table lookup.

Look Up Convert types 82 and 84, are not implemented in the ASIC/2-7040.

82, "LK2" = "Not Implemented""
84 ,"LK4" = "Not Implemented"

Thermistor Input Conversions

ASIC/2-7040 FW740C Rev 1.2 revises Analog Input Convert Types 33..36 with self heating compensation, 2 mW/C for use with WS & WT 3k thermistor temperature sensors.

"T1F"; "T1 - Thermistor (3.32K Rp)" : If the analog input has a convert type 33, Temp-1; then a Type II 3k thermistor with a 3.32 kohm pull-up resistor will read from -30.00 F to 180.00 F. Convert type, 33, Temp-1, is included for backward compatibility. The 10 bit conversion is done with the standard 33 value look-up table used by Temp-3. The present value is in units of 0.01 F.

"T2F"; "T2 - Thermistor (1.82K Rp)" : If the analog input has a convert type 34, Temp-2; then a Type II with a 1.82 kohm pull-up resistor will read from 0.00 F to 212.00 F. The 10 bit conversion is done using interpolation of a 17 entry lookup table. The present value is in units of 0.01 F.

Provides 17 entry table look up. It is not very accurate below 0 F.
Range -50 to +212 F. Value in 0.01 F
-5000, 0000, 2430, 4100, 5420, 6620, 7850, 8800, 9870,
11000,12230,13580,15090,17120,20000,25000,25555

"T3F"; "T3 - Thermistor (3.32K Rp)" : If the analog input has a convert type 50, Temp-3; then a Type II with a 3.32 kohm pull-up resistor will read from -30.00 F to 180.00 F. The 10 bit conversion is done using interpolation of a 33 entry lookup table. The present value is in units of 0.01 F.

Range -30.00 to +180.00 F. Value in 0.01 F,
Accurate to about 1 F between 0 F and 120 F
-5000,-4000,-2000, -400, 380, 1220, 1920, 2640,
3150, 3770, 4290, 4860, 5330, 5870, 6310, 6810,
7310, 7810, 8310, 8810, 9500,10070,10640,11310,
12090,13000,13890,15000,16330,18250,21200,25000,
25550

"T1C"; "T1C - Therm. (3.32K Rp) Celsius" Convert type, 35, Temp-1C, is included for backward compatibility. The 10 bit conversion is done with the standard 33 value look up table used by Temp-3. The present value is in units of 0.01 C.

"T2C"; "T2C - Therm. (1.82K Rp) Celsius" : If the analog input has a convert type 36, Temp-2C; then a Type II thermistor with a 1.82 kohm pull-up resistor will read from -17.78 C to 100.00 C. The 10 bit conversion is done with the same 17 entry table look up as Convert Type 34, Temp-2 and converted to Celsius. The present value is in units of 0.01 C.

"T3C"; "T3 - Thermistor (3.32K Rp)" : If the analog input has a convert type 51, Temp-3C; then a Type II with a 3.32 kohm pull-up resistor will read from -34.44 to 82.22 C. The 10 bit conversion is done with the standard 33 value look up table used by Temp-3 and converted to Celsius. . The present value is in units of 0.01 C.

3k Thermistor Input Conversions without Self Heating

ASIC/2-7040 FW740C Rev 1.2 adds Analog Input Convert Types 37..40 without self-heating compensation for use with insertion type 3k thermistor temperature sensors

37, T1F0 (3.32k pull-up)
38, T2F0 (1.82k pull-up)
39, T1C0 (3.32k pull-up)
40, T2C0 (1.82k pull-up)

"T1F0"; "3k - Thermistor-No Self Heating (3.32K Rp)" : If the analog input has a convert type 37, **T1F0**; then a Type II with a 3.32 kohm pull-up resistor will read from -30.00 F to 180.00 F. The 10 bit conversion is done using interpolation of a 33 entry lookup table in Celsius and converted into degF which does not correct for self heating.. The present value is in units of 0.01 F.

"T2F0"; "3k - Thermistor-No Self Heating (1.82k Rp)" : If the analog input has a convert type 38, **T2F0**; then a Type II with a 1.82 kohm pull-up resistor will read from 0 F to 212.00 F. The 10 bit conversion is done using interpolation of a 33 entry lookup table in Celsius and converted into degF which does not correct for self heating.. The present value is in units of 0.01 F.

"T1C0"; "3k - Thermistor-No Self Heating (3.32K Rp)" : If the analog input has a convert type 39, T1C0; then a Type II with a 3.32 kohm pull-up resistor will read from -30.00 F to 180.00 F. The 10 bit conversion is done using interpolation of a 33 entry lookup table in Celsius which does not correct for self heating.. The present value is in units of 0.01 F.

"T2C0"; "3k - Thermistor-No Self Heating (1.82k Rp)" : If the analog input has a convert type 40, **T2F0**; then a Type II with a 1.82 kohm pull-up resistor will read from 0 F to 100.00 C. The 10 bit conversion is done using interpolation of a 33 entry lookup table in Celsius which does not correct for self heating.. The present value is in units of 0.01 C.

10k Thermistor Input Conversions

FW740E1.8, 840E1.8 adds input conversions for Type II 10k thermistors with either 3.32kohm or 10 kohm pullup resistors. .

Convert Type 41 = T10k3F, 10K thermistor with 3.32K pullup degF.
Convert Type 42 = T10k3C, 10K thermistor with 3.32K pullup degC.
Convert Type 43 = T10k10F,10K thermistor with 10K pullup degF.
Convert Type 44 = T10k10CF,10K thermistor with 10K pullup degC.

"T10k3F"; "10 kThermistor (3.32k Rp)" : If the analog input has a convert type 41, T10k3F; then a 10 k Type II thermistor with a 3.32 kohm pull-up resistor will read from -40 to +120 C. The 10 bit conversion is done with the standard 33 value look up table in Celsius and converted into degF. . The present value is in units of 0.01 F. (FW740E1.8, 840E1.8)

"T10k3C"; "10 kThermistor (3.32k Rp)" : If the analog input has a convert type 42, T10k3C; then a 10 k Type II thermistor with a 3.32 kohm pull-up resistor will read from -40 to +120 C. The 10 bit conversion is done with the standard 33 value look up table in Celsius. The present value is in units of 0.01 C. (FW740E1.8, 840E1.8)

"T10k10F"; "10 kThermistor (10k Rp)" : If the analog input has a convert type 43, T10k3C; then a 10 k Type II thermistor with a 10 kohm pull-up resistor will read from -40 to +120 C. The 10 bit conversion is done with the standard 33 value look up table in Celsius and converted into degF. The present value is in units of 0.01 C. (FW740E1.8, 840E1.8)

"T10k10C"; "10 kThermistor (10k Rp)" : If the analog input has a convert type 44, T10k3C; then a 10 k Type II thermistor with a 10 kohm pull-up resistor will read from -40 to +120 C. The 10 bit conversion is done with the standard 33 value look up table in Celsius. The present value is in units of 0.01 C.(FW740E1.8, 840E1.8)

Smoothing

The input reading is smoothed after conversion but before alarm checking is done. The Smoothing Coefficient is Attr-17, HI Byte. The smoothing is done using

new = [(new_reading - old)/(Smoothing Coefficient)] + old

Smoothing is not done with binary or pulse counting inputs.

Input Override

All types of inputs may be overridden. The Input Override Status (Attr-2, LO bit 1) is set using Action = 1. When overridden, the input reading and conversion is disabled and the present value is not updated. This has priority over the EEPROM overrides to Default Value. If a new present value is downloaded it will be used until the controller is the controller is reset, or until the input override status is cleared using Action = 2.

If HI and LO Alarms are enabled, they are applied to the overridden value.

If HI and LO Limits are enabled, the Overridden Value is limited by the HI and Lo Limits, or are Ignored. (Which ?)..

Override Default

All types of inputs may be overridden to a Default Value. If the Override to Default Enable is set (-Action = 3), then the input is disabled and the controller will use the Default Value (10-Default) for the present value. It will be used until the Override to Default Enable is cleared.(4-Action = 4) The Override to Default inhibits data conversion and uses the Default value in place of the conversion. The default value is then subject to limits and alarms. Override to Default Status, LO bit 5 is set to indicate Override to Default. Override to Default Enable is in non-volatile memory and is maintained through loss of power.

Fail to Default

Analog inputs may Fail to Default Value. If the input value is outside High or Low Limit values and the High or Low Limit Enable has been set, the input will be in High or Low Limit Fault.

If the Fail to Default Enable (Attr-9 , LO bit 4 = 1) is set (Attr-4 Action = 5) and the input is in fault, then the input is disabled and the controller will use the default value (Attr-10 Default) for the present value. The default value is then subject to limits and alarms. If the Fail to Default Flag Enable (Attr-9 , LO bit 4 = 0) is not set (Attr-4 Action = 6) , then the controller will continue to use the limiting value to which the input failed for the present value until the input again enters the acceptable range.

Input Offset

A signed number (Attr-16 Offset Value) in the same units as present value is added to all input calculated values before the value is saved as the present value. This allows correction of temperature monitoring points in particular, but all inputs in general. The offset is not used by binary or pulsed inputs.

Units

The Units parameter is for information only. It is not used in the control algorithm. It is provided here and in other objects to allow a smart user interface or host to identify the specific units that are being used in the controller. These units are supported by SETSYS Setup Software.

Value	Raw Units
0	Raw

Value	Pressure Units	Humidity Units	
1	"wc	6	kPa
2	0.1 "wc	7	0.001 kPa
3	0.01 "wc,	8	psi
4	0.001 "wc	9	0.1 psi
5	Pa	10	0.01 psi

Value	Temperature Units		
11	1 F	16	0.01 C
12	0.1 F	17	spare
13	0.01 F	18	spare
14	1 C	19	spare
15	0.1 C	20	spare

Value	Relative Humidity Units		
21	1% ,	22	0.1 %,
23	1% RH	24	0.1 %RH,

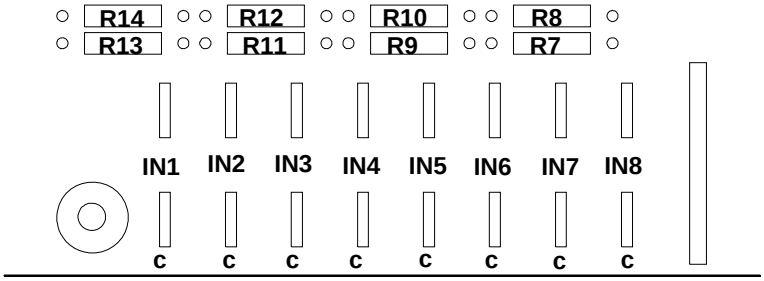
To support Enthalpy and Airflow raw units (I-P) Inch-Pound (SI) Scientific International, (MKS) Meter Kilogram Second

Value	Enthalpy and Airflow Units	
25	0.00001 kg/kg-air	Humidity Ratio (SI)
26	0.00001 lbm/lbm-air	Humidity Ratio
27	kJ/kg	Enthalpy (SI)
28	BTU/lbm	Enthalpy (I-P)
29	0.01 kPa	Barometric Pressure (SI)
30	0.01 in-Hg	Barometric Pressure (I-P)
31	0.01 ft/s	Air Velocity (I-P)
32	0.01 m/s	Air Velocity (SI)
33	0.001 ft2	Duct Area (I-P)
34	0.001 m2	Duct Area (SI)
35	kcal/kg	Enthalpy (MKS)
36	GPM	GPM Gallons per Minute
37	0.1 GPM	0.1 Gals per Minute
38	LPM	Liter per Minute.
39	0.1 LPM	0.1 Liter per Minute.
40	PPM	Parts per Million
41	Volts	Volts
42	0.01 Volts	0.01 Volts
43	mV	milliVolts
44	A	Ampere
45	mA	milliAmpere
46	Hz	Hertz
47	RPM	Rev per Minute
48	0.01 pH	0.01 pH

Input Hardware (ASIC/2-8040)

The ASIC/2-8040 are provided with pin-socketed resistors to configure inputs. The appropriate resistor must be placed in the pin sockets to configure the inputs.

Input Terminations



Pull-up resistors

Pull-up resistors are used to pull the input in the direction of the +5 Vdc supply voltage. The location of the pull-up resistors and other details are described in the ASIC/2-8040 Installation Manual.

All inputs have pin sockets. Inputs that are not used for sequence control can be assigned to other functions with the proper pull-up resistors installed.

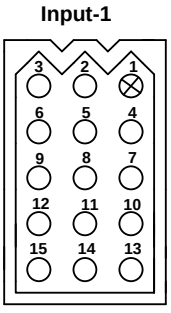
The factory pull-up resistors for the ASIC/1-8040.

IN-01 Pull-up R13 =3.32 kohm 1% 1/4
IN-02 Pull-up R14 =3.32 kohm 1% 1/4
IN-03 Pull-up R11 =3.32 kohm 1% 1/4
IN-04 Pull-up R12 =3.32 kohm 1% 1/4
IN-05 Pull-up R9 =1.82 kohm 1% 1/4
IN-06 Pull-up R10 =1.82 kohm 1% 1/4
IN-07 Pull-up R7 =1.82 kohm 1% 1/4
IN-08 Pull-up R8 =1.82 kohm 1% 1/4

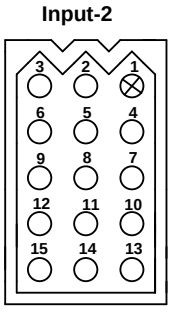
Input Hardware (ASIC/2-7540 & ASIC/2-7040)

The ASIC/2-7540 and ASIC/2-7040 have with pin socketed resistors to configure inputs. The appropriate resistor must be placed in the pin sockets to configure the inputs.

Input Terminations



IN-1 Common	J2-1
	J2-4
IN-2 Common	J2-7
	J2-10
IN-3 Common	J2-9
	J2-12
IN-4 Common	J2-2
	J2-5
IN-5 Common	J2-8
	J2-11
IN-6 Common	J2-3
	J2-6
IN-7 Common	J2-13
	J2-14
IN-8 Common	J2-15
	J2-14



IN-9 Common	J1-1
	J1-4
IN-10 Common	J1-7
	J1-10
IN-11 Common	J1-9
	J1-12
IN-12 Common	J1-2
	J1-5
IN-13 Common	J1-8
	J1-11
IN-14 Common	J1-3
	J1-6
IN-15 Common	J1-13
	J1-14
IN-16 Common	J1-15
	J1-14

Pull-up resistors

Pull-up resistors are used to pull the input in the direction of the +5 Vdc supply voltage. The location of the pull-up resistors and other details are described in the ASIC/2-7540 and ASIC/2-7040 Installation Manuals.

Factory Pull-up Resistors (ASIC/2-7040)

R24 = 3.32 kohm IN-01 Pull-up
R23 = 3.32 kohm IN-02 Pull-up
R22 = 3.32 kohm IN-03 Pull-up
R21 = 3.32 kohm IN-04 Pull-up
R20 = 3.32 kohm IN-05 Pull-up
R19 = 3.32 kohm IN-06 Pull-up
R18 = 3.32 kohm IN-07 Pull-up
R17 = 3.32 kohm IN-08 Pull-up
R16 = 1.82 kohm IN-09 Pull-up
R15 = 1.82 kohm IN-10 Pull-up
R14 = 1.82 kohm IN-11 Pull-up
R13 = 1.82 kohm IN-12 Pull-up
R12 = 1.82 kohm IN-13 Pull-up
R11 = 1.82 kohm IN-14 Pull-up
R10 = 1.82 kohm IN-15 Pull-up
R09 = 1.82 kohm IN-16 Pull-up

Factory Pull-up Resistors (ASIC/2-7540)

R80 = 3.32 kohm IN-01 Pull-up
R81 = 3.32 kohm IN-02 Pull-up
R82 = 3.32 kohm IN-03 Pull-up
R83 = 3.32 kohm IN-04 Pull-up
R84 = 3.32 kohm IN-05 Pull-up
R85 = 3.32 kohm IN-06 Pull-up
R86 = 3.32 kohm IN-07 Pull-up
R87 = 3.32 kohm IN-08 Pull-up
R88 = 1.82 kohm IN-09 Pull-up
R89 = 1.82 kohm IN-10 Pull-up
R90 = 1.82 kohm IN-11 Pull-up
R91 = 1.82 kohm IN-12 Pull-up
R92 = 1.82 kohm IN-13 Pull-up
R93 = 1.82 kohm IN-14 Pull-up
R94 = 1.82 kohm IN-15 Pull-up
R95 = 1.82 kohm IN-16 Pull-up

At the bottom of the controller is a row of pull up resistors that correspond to Inputs #1 through Input #16 respectively. There are three rows of pin sockets, so that the resistors can be removed and inserted without soldering.

The top row of pin sockets is the input voltage connections. The bottom row of pin sockets is the +Vcc connection and is used for pull-up resistors resistors. The middle row of pin sockets is the Common connection and is used for 249 ohm dropping resistor to convert 4 to 20 mA to 1 to 5 Vdc.

Required Pull-up Resistors

The required pull-up resistor depends on the Input Type as shown in the table.

Input Type	Specification
0 to 5 Vdc	No Pull-up
4 to 20 mA	No Pull-up; External 249 ohm, 0.1%, 1/4 W, MF
Thermistor, 3 kohm Type II	3.32 kohm, 1%, 1/4 W, MF
Thermistor, 3 kohm Type II	1.82 kohm, 1%, 1/4 W, MF
Binary	(Typical) 1.82 kohm, 1%, 1/4 W, MF
Triple Binary	511 ohm, 1%, 1/4 W, MF External 1.00 kohm 1%,2.00 kohm 1%, and 4.02 kohm 1%,
Quad Binary	511 ohm, 0.1%, 1/4 W, MF External 1.00 kohm 0.1%,2.00 kohm 0.1%, 4.02 kohm 0.1%, and 8.25 kohm 0.1%

Analog Inputs

Analog Convert Type (0 to 5 Vdc)

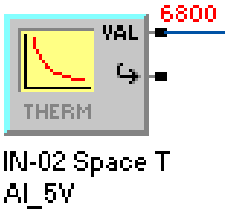
To measure voltage produced by an active input transducer, the pull-up resistor is removed. CAUTION: The common input connection is identical with the building ground. The common of the transducer MUST be referenced to building ground.

Analog Convert Type (4 to 20 mA)

A 4 to 20 mA transducer requires a 249 ohm external resistor between the input and common, and the removal of the pull-up resistor. This will generate a 1 Vdc to 5 Vdc input voltage. CAUTION: The common input connection is identical with the building ground. The common of the transducer MUST be referenced to building ground.

Analog Convert Type (Thermistor)

Type II Thermistor inputs, 3000 ohm at 77 F, require either a 3.32 kohm or 1.82 kohm pull-up resistor depending on the analog conversion type. CAUTION: The common input connection is identical with the building ground.



Pseudo Binary Inputs

In order to increase the available number of binary inputs in the ASIC/2-8040, binary inputs are often implemented as switches that are placed across or in series with other sensors. The binary inputs require some pull-up resistance.

The binary input open or closed is typically sensed by the input value going outside the normal High or Low Limit Setpoints for the input. The High or Low Limit Fault is enabled and the Status bit is used to monitor this binary input status.

For example; a normally closed proof of fan switch may be placed across the same input as the Discharge Air Temperature. When the fan is off, the contact is closed and the input will read a low resistance value which indicates an abnormally high temperature. This

will set the high limit alarm. When the fan starts, the contacts open and the input will read a normal Discharge Air Temperature. The high limit alarm will go away. Thus, the status of the high limit alarm may be used for proof of fan.

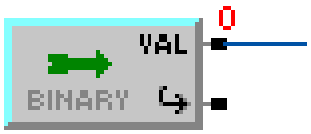
Binary Inputs

Binary Inputs - N.O.

17, Binary Input - N.O : If the input type is binary - normally open, 17), then the input is 0 if the input is open, and FFFFh if the input is closed.

Binary Inputs - N.C.

18, Binary Input - N.C : If the input type is binary - normally closed, 18, then the input is 0 if the input is closed, and FFFFh if the input is open.

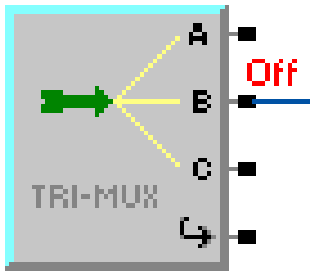


IN-8 Push Button
BI_NO

Triple Binary Input

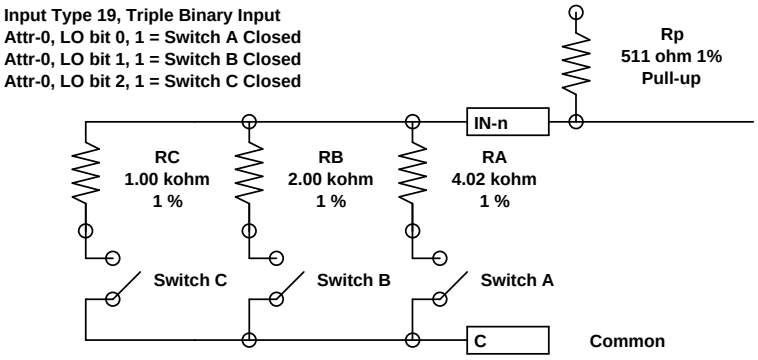
If the Input type is TRI-BI, Triple Binary Input, 19, then a bit is set depending which of three switches is closed. The three binary inputs consist of normally open switches with one side to common. It requires a pull-up resistor of 511 ohm 1%. The three inputs are:

Switch A in series with RA = 4.02 kohm, 1%, Sets Attr-0, LO bit 0
Switch B in series with RB = 2.00 kohm, 1%, Sets Attr-0, LO bit 1
Switch C in series with RC = 1.00 kohm, 1%, Sets Attr-0, LO bit 2



IN-03 Tri-Mux
TRI_BI

Note: ASIC/2-7000 inputs are on connector J7. ASIC/2-7040 inputs are on J1 and J2. The ASIC/2-8040 inputs are on blades.



The following parameters are used by the Triple Binary Input :

Index Enable	[Typical Yes]
Input Type	[19, Triple Binary]
Convert Type	[Not Used, 0]
Scan Interval	[Typical 1 s]
Input Offset	[Typical 0]
Utility Index Number	[Not Used,0]
Smoothing Coefficient	[Typical 1]
Units	[0,raw]

Table of Values - Voltage* Counts and Thresholds

Value	C	B	A	R kohm	Counts	Threshold	Threshold*
0	0	0	0		1023	counts	Voltage
1	0	0	1	4.02	904	<964	4.712 Vdc
2	0	1	0	2.00	812	<864	4.223 Vdc
3	0	1	1	1.335	736	<776	3.793 Vdc
4	1	0	0	1.000	676	<708	3.460 Vdc
5	1	0	1	0.800	624	<652	3.187 Vdc
6	1	1	0	0.667	580	<600	2.933 Vdc
7	1	1	1	0.571	540	<560	2.737 Vdc

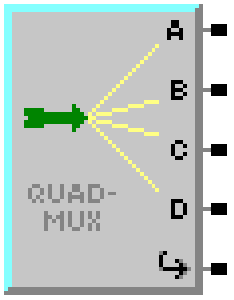
Note: 0 = Switch Open 1 = Switch Closed
Voltage thresholds are ratiometric with +Vcc. Threshold voltages may vary from controller to controller.

Testing Triple Inputs : Each triple input should be tested once the resistor tree is connected. There can be variation in the resistance values that could affect your results. It can be tested by configuring the input as an Analog Input with Convert Type = 0, raw, and comparing the value read under different conditions with the threshold counts in the Table of values shown above. Each combination of switch C and B should be tested with switch A open and closed.

For example, with all switches open the value should be greater than 904. With switch A only closed it should have a value between 864 and 964. B and C closed, it should have a value between 600 and 560. With all switches closed it should have a value below 560. etc.

Quad Binary Input

With firmware release 700F the ASIC/2-7000 can accommodate up to four binary inputs on a single input. It is designated as Input type 20, QUAD-BI, Quad Binary Input.



INP-06 Quad Mux
QUAD_BI

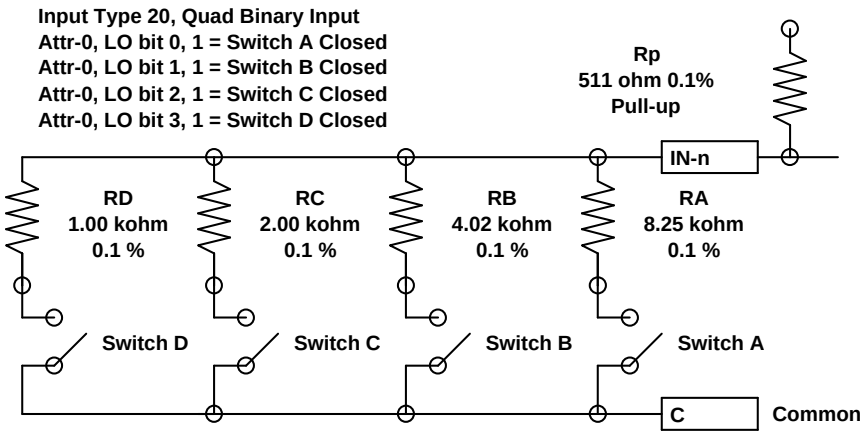
The quad binary inputs consist of normally open switches with one side to common. It requires a pull-up resistor of 511 ohm 0.1%. The four inputs are:

Switch A in series with RA = 8.25 kohm, 0.1%, Sets Attr-0, LO bit 0
Switch B in series with RB = 4.02 kohm, 0.1%, Sets Attr-0, LO bit 1
Switch C in series with RC = 2.00 kohm, 0.1%, Sets Attr-0, LO bit 2
Switch D in series with RD = 1.00 kohm, 0.1%, Sets Attr-0, LO bit 3

Note: the voltage thresholds for each resistance value are in a narrow range. Please use 0.1% resistors and test configuration thoroughly before applying this input type.

If 0.1% resistors are un-available precision values may be obtained by using two resistors in parallel and checking the value with a precision 4 digit ohm meter.

Note: ASIC/2-7000 inputs are on connector J7. ASIC/2-7040 inputs are on J1 and J2. The ASIC/2-8040 inputs are on blades.



The following parameters are used by the Input :

Index Enable	[Typical Yes]
Input Type	[20,Quad Binary]
Convert Type	[Not Used, 0]
Scan Interval	[Typical 1 s]
Input Offset	[Typical 0]
Utility Index Number	[Not Used,0]
Smoothing Coefficient	[Typical 1]
Units	[0,raw]

Testing Quad Inputs : Each quad input should be tested once the resistor tree is connected. There can be variation in the resistance values that could affect your results. It can be tested by configuring the input as an Analog Input with Convert Type = 0, raw, and comparing the value read under different conditions with the threshold counts in the Table of values shown above. Each combination of switch D, C, and B should be tested with switch A open and closed.

For example, with all switches open the value should be greater than 995. With switch A only closed it should have a value between 920 and 995. B and C closed, it should have a value between 748 and 714. With all switches closed it should have a value below 522. etc. If the resistor tree fails to reliably meet the test, try different resistors with the same values.

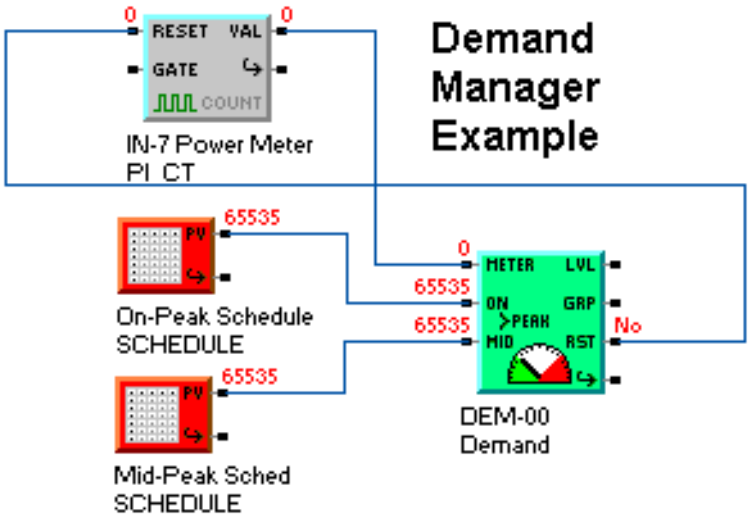
Value	D	C	B	A	R kohm	Counts	Threshold Counts	Threshold Voltage
0	0	0	0	0		1023		
1	0	0	0	1	8.25	964	<995	4.863 Vdc
2	0	0	1	0	4.00	907	<920	4.50 Vdc
3	0	0	1	1	2.69	860	<869	4.25 Vdc
4	0	1	0	0	2.00	815	<828	4.05 Vdc
5	0	1	0	1	1.61	776	<785	3.84 Vdc
6	0	1	1	0	1.336	740	<748	3.66 Vdc
7	0	1	1	1	1.150	708	<714	3.49 Vdc
8	1	0	0	0	1.000	677	<681	3.33 Vdc
9	1	0	0	1	0.820	630	<650	3.18 Vdc
10	1	0	1	0	0.800	624	<628	3.07 Vdc
11	1	0	1	1	0.730	601	<599	2.93 Vdc
12	1	1	0	0	0.667	579	<583	2.85 Vdc
13	1	1	0	1	0.617	559	<562	2.75 Vdc
14	1	1	1	0	0.571	540	<542	2.65 Vdc

15	1	1	1	1	0.545	528	<522	2.55 Vdc

Note: 0 = Switch Open 1 = Switch Closed
Voltage thresholds are ratiometric with +Vcc. Threshold voltages may vary from controller to controller.

Pulse Counting Inputs

In the ASIC/2-8040 Inputs 5 through 8 are available for pulse counting. In the ASIC/2-7040 Inputs may be configured for pulse counting up to a frequency of 10 Hz, or a pulse duration of 0.1 sec per pulse. This is designed to be used with an index of the Demand Manager for determining kW demand in the building or for a tenant. The input is connected to the pulse initiating utility meter.



The following parameters are used by the Input :

Index Enable	[Typical Yes]
Input Type	[33, Pulse Count]
Convert Type	[Not Used, 0]
Scan Interval	[Typical 1 s]
Input Offset	[Typical 0]
Utility Index Number	[Not Used,0]
Smoothing Coefficient	[Typical 1]
Units	[0,raw]
Count on Rise Enable	[Typical, Yes]
Count on Fall Enable	[Typical, No]
Count Reset Handle	[Typical, Demand, 0, Attr-2, LO Bit 3]
Count Gate Enable	[Typical, No]
Gate Reset Handle	[Typical, Not Used]

Input Glossary

Input Action

Writing the following values to the Action parameter (5,X,4,WORD) causes the following actions to occur:

1 Input :Override - Sets Input Override Status equal to "Yes".
2 Clear Input :Override - Sets Input Override Status equal to "No".
3 Override to Default: Sets Override to Default Status equal to "Yes"
4 Clear Override to Default: Sets Override to Default Status equal to "No".
5 Enable Fail to Default: Sets Fail to Default Enable equal to "Yes".
6 Disable Fail to Default: Sets Fail to Default Enable equal to "No".
7 Set Present Value to zero.
8 Calibrate offset to null present value. (FW740b Rev 1.6)
9 Calibrate offset to null present to Default Value (FW740b Rev 1.6)

Analog 10-bit Enable

Not Used by ASIC/2-7040, or ASIC/2-7040. All inputs are read to 10 bits. Used to enable 10 bit ADC for Input index 0,1,2,&3 for ASIC/2-7000 FW700E.. . User-configurable ; "Yes", "No". (5,X,9,HI BIT 4)

Convert Type

This numeric code represents the type of conversion to be done to the raw data (read from the input port) before placing it in Present Value. The method of conversion is generally determined by the type of physical input used. User-configurable; integer value. (5,X,8,LOW BYTE)

Count On Rise Enable

For pulse count type inputs: if set to "Yes" then a pulse count will be recorded upon a low to high transition of the binary input. May be in effect simultaneously with Count On Fall Enable. User-configurable; "Yes", "No". (5,X,9,LOW BIT 6)

Count On Fall Enable

For pulsed type inputs: if set to "Yes" then a pulse count will be recorded upon a high to low transition of the binary input. May be in effect simultaneously with Count On Rise Enable. User-configurable; "Yes", "No". (5,X,9,LOW BIT 7)

Count Gate Handle

For pulsed type inputs only, if Gate Enable is set to "Yes", and if the value pointed to by Gate Handle is non-zero, then pulses are currently to be counted and aggregated in Present Value. Gate Handle typically points outside to the Demand Limit Object. User-configurable. (5,X,16,2 WORDS)

Count Reset Handle

For pulsed type inputs only: the value pointed to by this handle is examined each Scan Interval; if the value is non-zero, then Present Value is set to zero. Typically, this handle points to the Demand Limit object; Present Value counts pulses on the kW meter and the Demand Limit object resets the counter to zero upon finishing a kW demand calculation. User-configurable. (5,X,12,2 WORDS)

Default Value

This is the value loaded into Present Value under the Fail to Default and Override to Default features. No conversion is done to Default Value before placing it into Present Value; however, Default Value is subject to High Limit, Low Limit, High Alarm and Low Alarm. User configurable; integer from 0 to 65535. (5,X,10,WORD)

Fail to Default Enable

If the Fault to Default feature is enabled, Present Value is forced equal to Default Value whenever an input fault is present. Without enabling this feature, Present Value is still determined via the input scan even in the presence of an input fault. User-configurable via the Action parameter; "Yes", "No". (5,X,9,LOW BIT 4)

Fail to Default Status

Indicates whether Present Value has currently been forced equal to Default Value due to an input fault, under the Fault to Default feature. Not user-changeable; "Yes", "No". (5,X,2,LOW BIT 4)

Fault Status

Indicates whether an input fault has occurred. An input fault occurs when Present Value rises above High Limit or falls below Low Limit. Not user-changeable; "OK", "Fault". (5,X,2,LOW BIT 0)

Count Gate Enable

Applies to Pulse Counting type inputs only. If Gate Enable is set to "Yes", then the value pointed to by Gate Handle is examined to determine if pulse counting is to currently be performed. User-configurable; "Yes", "No". (5,X,9,LOW BIT 3)

High Alarm Enable

Enables the High Alarm for operation. User-configurable; "Yes", "No". (5,X,9,HIGH BIT 1)

High Alarm Setpoint

The trigger setpoint for the High Alarm (described below). User-configurable; in same units as Present Value. (5,X,15,WORD)

High Alarm Status

A High Alarm occurs if Present Value rises above High Alarm Setpoint. Not user-changeable; "OK", "Alarm". (5,X,2,HIGH BIT 1)

High Limit Enable

Enables the High Limit Fault feature for operation. User-configurable; "Yes", "No". (5,X,9,HIGH BIT 3)

High Limit Fault Status

If enabled, High Limit Fault will record a fault if Present Value exceeds High Limit Setpoint. Not user-changeable; "OK", "Fault". (5,X,2,HIGH BIT 3)

High Limit Setpoint

The setpoint used in the High Limit Fault feature. User-configurable; in same units as Present Value. (5,X,13,WORD)

Index Enable

Enables this index of the Input object for operation. User-configurable; "Yes", "No". (5,X,9,LOW BIT 0)

Input Offset

Input Offset is added to the converted raw input value and the result is placed in Present Value. User-configurable; in same units as Present Value. (5,X,16,WORD)

Input Override Status

If set to "Yes", Present Value is no longer determined by scanning the input once each second. The user may now write any value to Present Value, and it will remain in place. The value will not be converted according to Convert Type, as is usually done. User-configurable via Actions 1 and 2; "Yes", "No". (5,X,2,LOW BIT 1)

Input Raw Max

If the analog input has a convert type 71, Sensor-2, then the raw value (0..1023) is converted using signed arithmetic using coefficients, which are kept in the Input Object. Raw Min is less than Raw Max and they are in the range 0..1023 representing 0..5 Vdc. , Input Min and Input Max are signed values. Note: If the raw value is outside the range Raw Min to Raw Max then the value is extrapolated. FW740C (5,X,21,WORD)

Input Raw Min

If the analog input has a convert type 71, Sensor-2, then the raw value (0..1023) is converted using signed arithmetic using coefficients, which are kept in the Input Object.

Raw Min is less than Raw Max and they are in the range 0..1023 representing 0..5 Vdc, FW740C (5,X,19,WORD)

Input Type

A numeric code representing whether the input is Analog, Binary - Normally Open, Binary - Normally Closed, Pulsed, or Momentary. See the Input Object Definition for information on each of these types of inputs. User-configurable; integer. (5,X,8,HIGH BYTE)

Input Value Max

If the analog input has a convert type 71, Sensor-2, then the raw value (0..1023) is converted using signed arithmetic using coefficients, which are kept in the Input Object. FW740C (5,X,22,WORD)

Input Value Min

If the analog input has a convert type 71, Sensor-2, then the raw value (0..1023) is converted using signed arithmetic using coefficients, which are kept in the Input Object. , Input Min and Input Max are signed values. Note: If the raw value is outside the range Raw Min to Raw Max then the value is extrapolated. FW740C (5,X,20,WORD)

Low Alarm Enable

Enables the Low Alarm for operation. User-configurable; "Yes", "No". (5,X,9,HIGH BIT 0)

Low Alarm Setpoint

The trigger setpoint for the Low Alarm (described below). User-configurable; assumed to be in same units as Present Value. (5,X,14,WORD)

Low Alarm Status

A Low Alarm is triggered if Present Value rises above Low Alarm Setpoint. Not user-changeable; "OK", "Alarm". (5,X,2,HIGH BIT 0)

Low Limit Enable

Enables the Low Limit Fault for operation. User-configurable; "Yes", "No". (5,X,9,HIGH BIT 2)

Low Limit Fault Status

If enabled, Low Limit Fault will record a fault if Present Value falls below Low Limit. Not user-changeable; "OK", "Fault". (5,X,2,HIGH BIT 2)

Low Limit Setpoint

The setpoint used in the High Limit Fault feature. User-configurable; in same units as Present Value. (5,X,12,WORD)

Override to Default Status

Indicates whether Present Value has been forced equal to Default Value via Action 6. Normally, the input port is scanned every Scan Interval to determine Present Value. Override to Default Enable must be equal to "Yes" for the Actions 5 and 6 to work. User-configurable via Actions 5,6; "Yes", "No". (5,X,9,LOW BIT 5)

Override to Default Enable

If Override to Default Enable is Yes, the Present Value is forced to the Default Value. (Actions 5 sets and Action 6 clears) User-configurable; "Yes", "No". (5,X,9,LOW BIT 5)

Present Value

For analog inputs, Present Value represents the raw input value, converted according to Convert Type, with the Input Offset added in. Subject to clamping at High Limit and Low Limit. May also be equal to Default Value under the Fail to Default and Override to Default features, or may be equal to any user-written value if the input scan has been disabled. Not user-changeable in general, unless scan has been disabled. For binary of pulse count inputs, Present Value has a value of 0000h or FFFFh. (5,X,0,WORD)

Previous Value

The value of Present Value at the time of the previous scan. Not user-changeable. (5,X,1,WORD)

Smoothing Coefficient

Applies to analog inputs only: Used to smooth out rapidly changing analog inputs. Smoothed Value = Previous Value + (Value Read - Previous Value)/Smoothing Coefficient. User-configurable; integer. (5,X,17,HIGH BYTE)

Scan Timer

Indicates the time in seconds since the input port was last read and Present Value was updated. Not user-changeable; reads in seconds. (5,X,3,WORD)

Scan Interval

Designates in seconds the interval which is to elapse between successive scans of the input port and the updating of Present Value. User-configurable; in seconds. For pulse counts it must be 1 second. (5,X,11,WORD)

Units

A code which designates the units for the value in Present Value. See Object Definitions for the key. User-configurable; integer. (5,X,18,LOW BYTE)

Utility Index Number

Designates which index of the Utility Object contains the coefficients used in conjunction with analog type input conversion, linear type inputs, and lookup type inputs. User-configurable; integer. (5,X,17,LOW BYTE)

Input Properties

The configurable controllers have 8 or 16 universal binary or analog inputs. Each INPUT object has EEPROM configuration data that defines its use. Inputs will be designated IN-1, IN-2, etc. INPUT is object number = 5. Data Type = word. Only one type of data can be collected at each input.

The INPUT object defines the present values and setup parameters used by the universal input block. The SC/1-9XXX has 16 inputs. Each index may be configured for a binary type input or for an analog type input. The ASIC/2-7000 has 8 analog inputs. Binary inputs may be read as high or low limit alarms.

INPUT	
Object Number = 5	
Data Type	= Word
Index	= 0..15 (IN-01..IN-16) SC/1
	= 0..07 (IN-01..IN-08) ASIC/2-7000,ASIC/2-8040
	= 0..15 (IN-01..IN-16) ASIC/2-7040
Attribute	= 19 (0..18) ASIC/2-7040
	= 23 (0..22) ASIC/2-8040
DYNAMIC Attributes	= 8 (0..7)
STATIC Attributes	= 11 (8..18) ASIC/2-7040
	= 15 (8..22) ASIC/2-8040
	= 23 (8..30) ASIC/2-7040-C FW740C

Firmware Revision - Input

ASIC/2-8540 FW854a Ver 1.3 Preliminary 2006-04-04 ASI PN 70027-00
ASIC/2-7540 FW754a Ver 1.3h Release 2006-02-17 PN70025-04 ECO-

- Same as ASIC/2-7040.

ASIC/2-7040 FW740E Rev 2.8b Released 2005-11-03 CHK 0xC90C
ASIC/2-8040 FW840E Rev 2.8a Released 2005-12-06 CHK 0xA6AC

- Fixes problem with Tri-MUX and Quad-Mux Inputs giving spurious intermediate reading on change of value. It must now have the new value for two successive reads before the present value is changed.
  Adds new parameter Attr-6 LO Byte Temporary Value

ASIC/2-8040 FW840E Rev 1.8 Unreleased 11/14/2000
ASIC/2-7040 FW740E Rev 1.8 Released 11/14/2000 CHK 0x2A80

- Add Input type 35 for 20k User Adjust Pot. WS-RS Series Wall Stat
  Input Type = User, 35, 10K to 30K pot with 10K pullup
- Add Input Convert Type 41,42,43,44 for 10 k Thermistor
  Convert Type 41 = 10K thermistor with 3.32K pullup degF.
  Convert Type 42 = 10K thermistor with 3.32K pullup degC.
  Convert Type 43 = 10K thermistor with 10K pullup degF.
  Convert Type 44 = 10K thermistor with 10K pullup degC.

ASIC/2-7040 FW740C Rev 2.0 Released 06/05/98 Chk0D54h
ASIC/2-8040 FW840C Rev 1.0 Release 06/05/98 Chk 0D55h

- Upgraded Pulse Counting Inputs so that all pulse inputs can be used at 19,200 baud.

ASIC/2-7040 FW740C Rev 1.9 Released 04/15/

- Pulsed Inputs Previous Value. The Previous Value for Pulsed Inputs are always updated when ever the present value is cleared.

ASIC/2-7040 FW740C Rev 1.2 04/24/97

- Revises Analog Input Convert Types 33..36 with self-heating compensation, 2 mW/C for use with WS & WT 3k thermistor sensors.
  33, T1F (3.32k pull-up), 34, T2F (1.82k pull-up)
  35, T1C (3.32k pull-up), 36, T2C (1.82k pull-up)
- Adds Analog Input Convert Types 37..40 without self heating compensation for use with insertion type 3k thermistor sensors

37, T1F0 (3.32k pull-up), 38, T2F0 (1.82k pull-up)
39, T1C0 (3.32k pull-up), 40, T2C0 (1.82k pull-up)

ASIC/2-7040 FW740C Rev 1.1 Released 04/14/97

o Allows 16 pulse counting inputs

ASIC/2-7040 FW740C Rev 1.0 Released 01/29/97

o Instance Name Labels for INP Attr-23-30

ASIC/2-8040 FW840A Rev 1.0, Forthcoming March 1996

Initial Release
Includes 4 spare attributes of future input conversion.

ASIC/2-7040 FW740A Rev 1.9 Released 04/24/95

o Added a fifth pulse counting input Inputs 12 through 16
To agree with documentation.

ASIC/2-7040 FW740b Rev 1.7 Released 8 Dec 1994

o -- Fixed Analog Input Bug
Convert type Raw, reads 256 for any value, if Smooth is 0.

ASIC/2-7040 FW740b Rev 1.6 Released 2 Dec 1994

o Conflict between Smoothing and Fail to Default has been resolved.
o Pulse Count Inputs Note: Pulse count only on inputs 13,14,15,16
The pulse count did not seem to work when the Reset Handle is not configured. This handle appears to be always evaluated. If it points at UTL-1,Attr-0 which is really zero then it counts. This now works.
o Add Action = 8, Calibrate to Zero Value.
When this action is seen. The Input Offset value is modified, so that the present value is now zero. New_offset = Present Value - Old_Offset .
o Add Action = 9, Calibrate to Default Value.
When this action is seen, the Input Offset value is modified so that the present reading after any conversion is equal to the Default Value. This can be used to calibrate a temperature sensor and mid span. New_offset = Present Value - Old_Offset - Default Value.

ASIC/2-7040 FW740A Rev 1.5 15 Sept 94

o Fail to Default, Smooth > 1 and Fail to Default seem to conflict.
Set up Raw Input with Smooth = 1. Fail to Default Value = 500 when HI Limit greater than 700.
o Pulse Count Inputs Note: Pulse count only on inputs 13,14,15,16
Do not seem to work when the Reset Handle is not configured. This handle appears to be always evaluated. If it points at UTL-1,Attr-0 which is really zero then it counts. If it points at 0-0-0-0 it returns a 2 and it is continuously reset.

ASIC/2-7040 FW740A Rev. 1.0 30 Mar 1994

16 Universal Inputs
10 Bit conversion on all inputs
Pulse Count on Input 13..16 (Index 12..15)
Sensor Convert Type

ASIC/2-7000 FW700G Rev. 1.4 Revision 4 Jun 1993

Correct Input Override Bug

ASIC/2-7000 FW700G Rev. 1.1 Released 04/21/1993

Fixed Input Convert Type 50 and 51

ASIC/2-7000 FW700F Revision 01/05/93

Added Input Type 20, Quad Binary Input
Added Input Type 19, Triple Binary Input

SC/1-9040 1.0 FW907E Revised 8 Dec 1992

Correct Input Override Bug

SC/1 Version 1.0 FW907A 25 July 1991

Input DYNAMIC Properties

Attr-0 **Present Value** (signed word)
Analog - Two byte Present Value.
Binary - 0 or FFFF hex
Triple Binary - 0 to 7
Quad Binary - 0 to 15
Pulse - counts since last reset.

Attr-1 **Previous Value** (signed word)
follows Present Value every scan interval.

Attr-2 Input Status RAM (word)

Attr-2 LO bit 0 - **Fault Status**
0 = Input OK; 1 = Fault.
Fault implies Analog Input is outside High and Low Limits

Attr-2 LO bit 1 - **Input Override Status**.
0 = No Input Override.
1 = RAM Input Override, Disables Input Scan.
Present value can be written to any value. Alarms and Limits still apply to the overridden value.

Attr-2 LO bit 2 - Spare
Attr-2 LO bit 3 - Spare

Attr-2 LO bit 4 - **Fail to Default Status**
0 = No Fail to Default
1 = Fail to Default
Set if Fault and Attr-9, bit 4 = 1.

Attr-2 LO bit 5 - **Override to Default Status**
0 = No Override to Default
1 = Override to Default
The input value is overridden to Default by writing 3 to Action, If override to Default has been Enabled. Set if Attr-9, bit 5 = 1.

Attr-2 LO bit 6 - Spare
Attr-2 LO bit 7 - Spare

Attr-2 HI bit 0 - **Low Alarm Status** (0 = No, 1 = Yes)
Attr-2 HI bit 1 - **High Alarm Status** (0 = No, 1 = Yes)
Attr-2 HI bit 2 - **Low Limit Fault Status** (0 = No, 1 = Yes)
Attr-2 HI bit 3 - **High Limit Fault Status** (0 = No, 1 = Yes)
Attr-2 HI bit 4 - Internal Flag (Pulse Count)
Attr-2 HI bit 5 - Internal Flag (Pulse Count)
Attr-2 HI bit 6 - Internal Flag (Pulse Count)
Attr-2 HI bit 7 - Internal Flag (Pulse Count)

Attr-3 **Scan Timer**
Time since last read in seconds.

Attr-4 **Input Action**
Reset to 0 after action.

Attr-5 Spare

Attr-6 Spare

Attr-7 Spare

Input STATIC Properties

Attr-8 Input Setup [Default; 01 00 hex]

Attr-8 LO BYTE - **Convert Type**
(NOT Used By Binary Input Types N.O., 17; N.C., 18 ;
Triple Binary 19; or Quad Binary, 20)
(NOT Used By Pulse Count Input - Input Type 33)

0 "RAW" = "Raw"

17 "G15" = "General 1 - 5vdc"
General-1; 1 to 5 Vdc

49 "G05" = "General 0 - 5vdc"
General-2; 0 to 5 Vdc

33 "T1F" = "T1 - Thermistor (3.32K Rp)"
Thermistor with 3.32k pull-up

34 "T2F" = "T2 - Thermistor (1.82K Rp)"
Temp-2; Thermistor with 1.82k pull-up

35 "T1C" = "T1C - Therm. (3.32K Rp) Celsius"
Temp-1C; Thermistor (Celsius) with 3.32k pull-up

36 "T2C" = "T2C - Therm. (1.82K Rp) Celsius"
Temp-2C; Thermistor (Celsius) with 1.82k pull-up

50 T3F" = "T3 - Thermistor (3.32K Rp)"
Temp-3; Thermistor with 3.32k pull-up (FW740A Same as "T1F")

51 T3C" = "T3 - Thermistor (3.32K Rp)"
Temp-3C; Thermistor (Celsius) with 3.32k pull-up

Analog Input Convert Types 37..40 without self heating compensation for use with insertion type 3k thermistor temperature sensors (FW740C Rev 1.2)

37 "T1F0" = "T1 - Thermistor (3.32K Rp)"
Thermistor with 3.32k pull-up no self heating

38 "T2F0" = "T2 - Thermistor (1.82K Rp)"
Temp-2; Thermistor with 1.82k pull-up no self heating

39 "T1C0" = "T1C - Therm. (3.32K Rp) Celsius"
Temp-1C; Thermistor (Celsius) with 3.32k pull-up no self heating

40 "T2C0" = "T2C - Therm. (1.82K Rp) Celsius"
Temp-2C; Thermistor (Celsius) with 1.82k pull-up no self heating

Analog Input Convert Types 41..44 are for Type II 10 k Thermistors (FW7/840E Rev 1.8)

41 "T10k3F, "10k thermistor (3.32 k Rp) F"
10 k Thermistor (3.32k pull-up) Fahrenheit -40 F to +160 F

42 "T10k3C, "10k thermistor (3.32 k Rp) C"
10 k Thermistor (3.32k pull-up) Celsius -40C to 72C

43 "T10k10F, "10k thermistor (10 k Rp) F"
10 k Thermistor (3.32k pull-up) Fahrenheit -40 F to +160 F

44 "T10k10C, "10k thermistor (10 k Rp) C"
10 k Thermistor (3.32k pull-up) Celsius -40C to 72C

These require utility object for Parameters

65 "LN1" = "Ln1 - 0 offset x1.0"
Linear-1; (raw)*A/B + C (FW740A uses 10 bit ADC)

67 "LN3" = "Ln3 - 0 offset x(-1.0)"
Linear-3; (-raw)*A/B + C (FW740A uses 10 bit ADC)

70 "SN1" = "Sensor 1"
Uses utility object for parameters.
Sensor 1 = y0 + (raw - x0)(y1-y0)/(x1-x0)

71 "SN2" = "Sensor 2" (FW740C)
Uses Attr-19..22 for parameters.
Sensor 2 = Value_Min
+ (raw - Raw_Min)(Value_Max-Value_min)/(Raw_Max - Raw_Min)(

These require utility object for Lookup Table (FW740A uses 10 bit ADC)

81 "LK1" = "Lk1 - 0 offset x1.0"
Lookup-1; Uses raw and 33 Value Look-up Table

83 "LK3" = "Lk3 - 0 offset x(-1.0)"
Lookup-3; Uses (-raw) and 33 Value Look-up Table..

Attr-8 HI BYTE - **Input Type**

0 "NoUse" = "Not Used" Input Not Used
1 "AI_5V" = "AI - Analog Input (0-5v)"
17 "BI_NO" = "BI - Binary Input N.O.", Normally Open
18 "BI_NC" = "BI - Binary Input N.C.", Normally Closed
19 "TRI_MUX" Triple Binary Input
20 "QUAD" Quad Binary Input
33 "PI_CT" = "PI - Pulse Count Input"
35 "User" = "User Adjust 10k to 30 k."

Attr-9 Input Enable

Attr-9 LO byte

Attr-9 LO bit 0 - **Index Enable** 1 = Active; 0 = Disable

Attr-9 LO bit 1 - Spare
Attr-9 LO bit 2 - Spare

Attr-9 LO bit 3 - **Count Gate Enable**
Used to enable the gate to turn on and off counting.

Attr-9 LO bit 4 - **Fail to Default Enable**
If enabled, on low or high limit fault override the input value to default value. Analog inputs only.

Attr-9 LO bit 5 - **Override to Default Enable**
Override input value to default value.
(Analog and binary inputs.)

Attr-9 LO bit 6 - **Count on Rise Enable**
Count Pulse on Transition to High

Attr-9 LO bit 7 - **Count on Fall Enable**
Pulse Count on Transition to Low

Attr-9 HI bit 0 - **Low Alarm Enable**
Attr-9 HI bit 1 - **High Alarm Enable**
Used to enable high and low alarm.
Not used for pulse counting input.

Attr-9 HI bit 2 - **Low Limit Enable**
Attr-9 HI bit 3 - **High Limit Enable**
Used to enable low and high input failure limits
Not used for pulse counting and binary inputs.

Attr-9 HI bit 4 - Reserved (Analog 10 bit Enable)
Not Used in ASIC/2-7040. All inputs read to 10 bits.
Used in ASIC/2-7000to enable 10 bit ADC for Input index 0, 1, 2, & 3 for FW700E.. .. for use with Convert types 0,17,65,67,81 & 83 only.

Attr-9 HI bit 5- Spare
Attr-9 HI bit 6 - Spare
Attr-9 HI bit 7 - Spare

Attr-10 **Default Value**
Value to be used if override to default is enabled or if fail to default is enabled and input is outside high and low limits.

Attr-11 **Scan Interval**

How frequently the value should be updated in seconds. [Typical: 1 second] Note: For pulse count inputs this **must** be set to 1 second.

Attr-12 **Low Limit Setpoint**
In same units as present value. Input will clamp and Alarm at this value. Used only by analog inputs when enabled. Has different meaning for pulse inputs.

Attr-13 **High Limit Setpoint**
In same units as present value. Input will clamp and High Limit Alarm at this value. Used only by analog inputs when enabled. Has different meaning for pulse inputs.

Attr-12,13 **Count Reset Handle**
Pulse count input ONLY. This handle points to a reset bit in another object. When it is goes high the pulse count is cleared to zero.

Attr-14 **Low Alarm Setpoint**

In same units as present value. Low Alarm at this value. Used by analog and binary inputs when enabled. For binary inputs should have a value of 255.

Attr-15 **High Alarm Setpoint**

In same units as present value. High Alarm at this value. Used by analog and binary inputs when enabled. For binary inputs should have a value of 255.

Attr-16 **Input Offset**

A signed number in the same units as present value. This allows correction of temperature monitoring points in particular, but all inputs in general. Used only by analog inputs. Has different meaning for pulse inputs.

Attr-17 Coefficients

Has different meaning for pulse inputs.

Attr-17 LO Byte - **Utility Index Number**

This is the index value of the utility objects that has of the coefficients for Analog Input Convert types Linear-n, and Lookup-n. Used only by analog inputs.

Attr-17 HI Byte - **Smoothing Coefficient**

This is the smoothing coefficient. Used only by analog inputs.

Smoothed Value = Old Value + (Old-New)/(Smoothing Coefficient)

Attr-16,17 **Count Gate Handle**

Pulse count input ONLY. This handle points to a gate in another object. If Pulse Gate Enable is true and the value of the gate goes true, then the pulse counting is enabled. When false, the pulse counting is stopped.

Attr-18 Units

LO Byte - **Units**

The units is a code used to identify the units to be used for converting and displaying the present value of the input with SETSYS 1.1 and later software versions. The units that are currently defined are described under Sequence of Operation.

HI Byte - Spare

Attr-19 **Input Raw Min**, FW740C

Attr-20 **Input Value Min**, FW740C

Attr-21 **Input Raw Max** , FW740C

Attr-22 **Input Value Max** , FW740C

Attr-23..30 **Input Name** FW740C