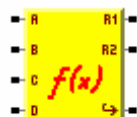# Object 30 - Function

Function Summary

FUN-05

The function object is designed to support different functional calculations.

Type 1   Enthalpy Function

Type 2   Airflow Calculation where Velocity Pressure is used to calculate airflow using an internal square root table.

Type 3   Table Look-up based on pairs of values. For example this could be used for a non linear Reset Schedule with Min Max Limits. Utility Start Attribute allows more than one lookup. FW7/854A1.4

Type 4   Energy Meter takes a flow and two temperatures and computes an energy rate applying a heat capacity and scale factor. FW7/840E 1.9.

Type 5   Integrator samples a value at regular intervals and integrates it to provide a total. FW7/840E 1.9

Type 6 – Float to Integer takes 32-bit floating point number and converts it to a 32-bit integer. FW7/854A1.5

Enthalpy Function
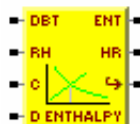
FUN-01 Enthalpy
Enthalpy

The enthalpy function is based on knowing the **Dry Bulb Temperature**, T_{db}, the **Relative Humidity**, RH, and the **Barometric Pressure**, BP. The algorithm should works in either SI (C, kPa, kJ/kg) or Inch-Pound, I-P (oF, in-Hg, BTU/lbm) units. The core calculations are done in SI and are converted to I-P engineering units as needed.

The method of calculation depends on the Enthalpy Calculation Units: 0 = SI (kJ/kg), 1 = MKS (kcal/kg), and 2 = I-P (BTU/lbm).

Enthalpy Algorithm

From the Dry Bulb Temperature the **Saturated Vapor Pressure**, P_{sat}, can be calculated using a simple look-up interpolation over the range from 0.00 C to 50.00 C. If I-P units

are used then the Dry bulb temperature must be converted to Celsius before performing the interpolation. All Temperatures are in 0.01 C or 0.01 F.

Temperature: $T(F) = 1.8 * T(C) + 32$

If the dry bulb temperature is less than 0.00 C, then the **Low Limit Alarm** (Attr-9 LO bit 6) is set, and the temperature of 0.00 C is used. If the dry bulb temperature is greater than 50.00 C then the **High Limit Alarm** (Attr-9 LO bit 7)is set, and the temperature of 50.00 C is used

$$P_{sat} = P_{sat} (T_{db})$$

T(C)	Psat (kPa)	Wsat (kg/kg)
0.00	0.611	0.00377
5.00	0.873	0.00540
10.00	1.228	0.00763
15.00	1.706	0.01065
20.00	2.339	0.01470
25.00	3.169	0.02008
30.00	4.246	0.02721
35.00	5.628	0.03658
40.00	7.384	0.04889
45.00	9.594	0.06505
50.00	12.350	0.08634

P_{sat} ranges from 0.60 kPa to 12.35 kPa over 0 ^{o}C to 50 ^{o}C. are represented in units of 0.01 kPa.

Knowing the Saturated Vapor Pressure, Psat, and the Barometric Pressure, BP, the **Saturated Humidity Ratio**, W_{sat}, can be calculated.

$$W_{sat} \quad 0.62198*P_{sat}/(BP-P_{sat})$$

BP ranges from 101.12 kPa at sea level to 70.10 kPa at 3000 m. If I-P units are used, then the Barometric pressure is represented in units of 0.01 in-Hg and varies from 29.92 in-Hg at sea level to about 20.74 in at 9843 ft, and must be converted to kPa before being used in the calculation.

Pressure: 101.325 kPa = 29.92 in-Hg

At sea level the saturated humidity ratio ranges from 0.003 kg/kg at 0 ^{o}C to 0.086 kg/kg at 50 ^{o}C. The units of humidity ratio are the same in SI and I-P units.

Knowing the Relative Humidity, RH, and the Saturated Humidity Ratio, Wsat, the Humidity Ratio, W, can be calculated. The RH is in units of 0.1% and is the same in SI and I-P units.

$$W = RH*W_{sat}$$

From the Dry Bulb Temperature and the Humidity Ratio, W, can be calculated the enthalpy. The Enthalpy is in units of 0.01 kJ/kg in SI and in units of 0.01 BTU/lbm in I-P units.

SI> $H(kJ/kg) = 1.00*T_{db} + W*(2501 + 1.805*T_{db}(C))$ kJ/kg

I-P> $H(BTU/lbm) = 0.24*T_{db}(F) + W*(1061 + 0.444*T_{db}(F))$ BTU/lbm

At sea level under saturated conditions the enthalpy ranges from 9.4 kJ/kg at 0 ^{o}C to 267.8 kJ/kg at 50 ^{o}C.

Note: that the Enthalpy in SI and I-P units have different zero references. The Enthalpy(SI) is zero at a temperature 0.0 C and zero humidity ratio. That corresponds to 32 F and zero humidity ratio.

Standard Atmosphere

BP ranges from 101.12 kPa at sea level to 70.10 kPa at 3000 m. If I-P units are used, then the Barometric pressure is represented in units of 0.01 in-Hg and varies from 29.92 in-Hg at sea level to about 20.74 in at 9843 ft, and must be converted to kPa before being used in the calculation.

Pressure: 101.325 kPa = 29.92 in-Hg

At sea level the saturated humidity ratio ranges from 0.003 kg/kg at 0 C to 0.086 kg/kg at 50 C and calculated to nearest 0.001 kg/kg. The units of humidity ratio are the same in SI and I-P units.

Pressure Units :   1 mm-Hg = 133.32 Pa
                   1 in-Hg = 25.4 mm-Hg = 3.386328 kPa
(See *Ashrae Fundamentals-SI,1985, p.6.8*)

Altitude (m)	Altitude (ft)	Temp (C)	Temp (F)	Pressure (kPa)	Pressure (in Hg)
-500	-1640	18.2	64.8	107.478	31.742
0	0	15.0	59.0	101.325	29.925
500	1640	11.8	53.2	95.461	28.193
1000	3281	8.5	47.3	89.874	26.543
2000	6562	2.0	35.6	79.495	23.478
3000	9843	-4.5	23.9	70.108	20.705
4000	13123	-11.0	12.2	61.640	18.204
5000	16404	-17.5	0.5	54.020	15.954
6000	19685	-24.0	-11.2	47.181	13.934
7000	22966	-30.5	-22.9	41.061	12.127
8000	26247	-37.0	-34.6	35.600	10.514
9000	29528	-43.5	-46.3	30.742	9.079
10000	32808	-50.0	-58.0	26.436	7.807

Enthalpy Function

Enthalpy Calculation	

Instance Name: FUN-01 Enthalpy	
Index Enable: ☑ Yes	Enthalpy: 24.28
Function Type: Enthalpy	
Calculate Units: ☐ sec	Calculation Error: No
Calculation Interval: 2	Calculation Timer: 1
	Function Action
Enthalpy Units: Raw	
Enthalpy Calc Units: BTU/lbm	Humidity Ratio: 0.007300
Enth HumRatioUnits: 0.1 %RH	Humidity Ratio: 730
	DB Temp: 68.00
Barometric Pressure: 29.92	Relative Humidity: 50.0
Dry Bulb Temp Handle: INP-03-00-WD_VAL	
Dry Bulb Temp Han Name: OAHU 51-2 SAT	
Rel Humid Handle: SPECIAL	Variable B Constant: 500
Rel Humid Handle Name: SPECIAL	Sat Humidy Ratio: 0.0146
	Sat Humidy Ratio: 146
	Sat VPress: 23.39

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Handles

The enthalpy object needs two handles:

Handle A - Dry Bulb Temperature 0.01 C or 0.01 F units
Handle B - Relative Humidity 0 to 1000 = 0 to 100 %RH

> Note: If a Special Handle B is selected, then a Variable B Constant will appear to allow testing of the algorithm.

Parameters

Function Type - 1 = Enthalpy
Enthalpy Calculation Units: : Which Engineering units to use (FW740A Rev 1.1)
      0 = SI (kJ/kg)
      1 = MKS (kcal/kg)
      2 = I-P (BTU/lbm)

Barometric Pressure 101.12 kPa (29.92 in-Hg)at sea level to 70.10 kPa (20.74 in-Hg) in 0.01 kPa (0.01 in-Hg) units

Outputs

Enthalpy 9.40 to 267.80 kJ/kg or 7.80 to 49.00 BTU/lbm
Humidity Ratio: 0 to 100.0 % in 0.1%
Saturated Humidity Ratio: 0 to 0.0330kg/kg or lbm/lbm
Saturated Vapor Pressure 0 to 12.35 kPa.

Enthalpy Examples

Enthalpy Calculation (SI)

Inputs and Parameters
Function Type -   1 = Enthalpy
Enthalpy Calculation Units: :   0 = SI (kJ/kg)

Handle A - Dry Bulb Temperature   25.00 C
Handle B - Relative Humidity   50.0 %RH
Barometric Pressure   101.32 kPa

Results
Saturated Vapor Pressure   3.169 kPa.
Saturated Humidity Ratio: 0.0200 kg/kg
Humidity Ratio: 0.01000 kg/kg
Enthalpy   50.46 kJ/kg

Enthalpy Calculation (MKS)

Inputs and Parameters
Function Type -   1 = Enthalpy
Enthalpy Calculation Units: 1 = MKS (kcal/kg)
Handle A - Dry Bulb Temperature   25.00 C
Handle B - Relative Humidity   50.0 %RH
Barometric Pressure   101.32 kPa

Results
Saturated Vapor Pressure   3.169 kPa.
Saturated Humidity Ratio: 0.0200 kg/kg
Humidity Ratio: 0.01000 kg/kg
Enthalpy   12.05 kcal/kg

Enthalpy Calculation (I-P)

Inputs and Parameters
Function Type -   1 = Enthalpy
Enthalpy Calculation Units: :   2 = I-P (BTU/lbm)
Handle A - Dry Bulb Temperature   85.00 F
Handle B - Relative Humidity   70.0 %RH
Barometric Pressure   29.92 in-Hg

Results
Saturated Vapor Pressure   4.125 kPa.
Saturated Humidity Ratio: 0.0263 lbm/lbm
Humidity Ratio: 0.01841 lbm/lbm
Enthalpy   40.62 BTU/lbm

Airflow Calculation

FUN-04 Airflow
Airflow
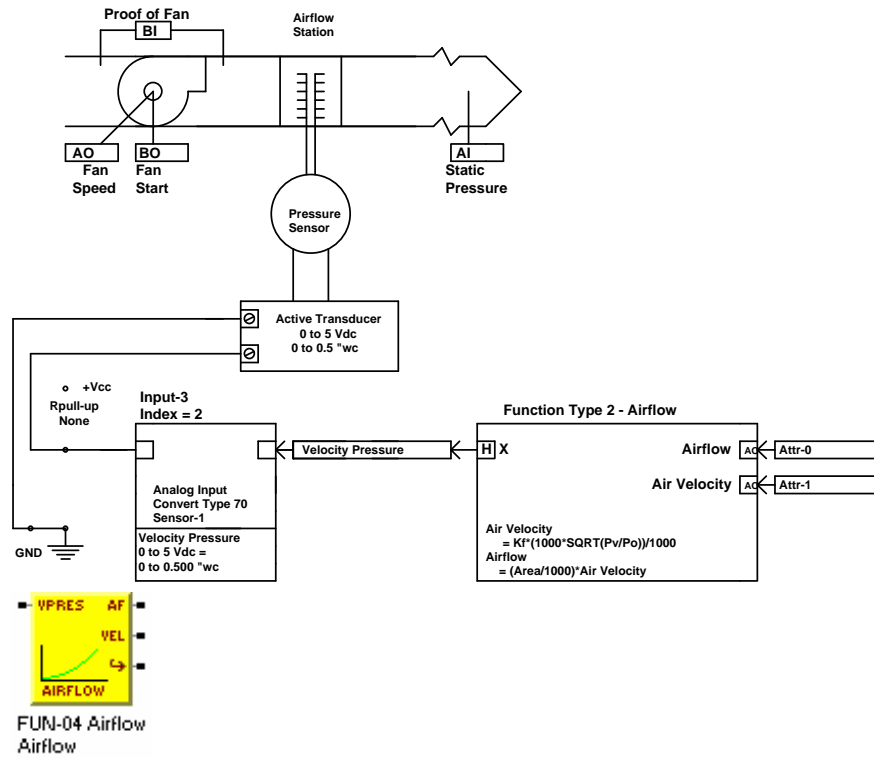
An Airflow Function is used to convert the velocity pressure to Air Velocity and Airflow. Air velocity is given by

$$\text{Air velocity} = Kf*1000*SQRT(P_V/P_O)\ /1000$$

where $1000*SQRT(P_V/P_O)$ is given by an internal table look-up that is valid from 0 to P_O. If $P_V > P_O$, then P_O is used and it returns the value Kf.

The air velocity has the units of Kf and represents the air velocity that is achieved when the velocity pressure, P_V, is equal to the reference velocity pressure, P_O.

In I-P units the air velocity is in units of 0.01 ft/sec. In SI units the air velocity is in units of 0.01 m/s.

Note: The airflow K-factor is in units of 0.01 ft/sec or 0.01 meter/sec. K-factors for VAV terminals are typically given in feet/minute.

Airflow Calculation Units

The airflow is calculated based on the value of Airflow Calculation Units, $0 = m^3/\text{min}$, $1 = \text{liter/sec}$, $2 = 0.01\ m^3/\text{sec}$, $3 = ft^3/\text{min}$ (CFM). The area is in SI units it is in 0.001 m^2. The Area in P-I units it is in 0.001 ft^2.

Airflow Units = 0	Airflow = 60*(Area/1000)*Air Velocity (m^3/min)
Airflow Units = 1	Airflow = (Area)*Air Velocity/100 (liter/s)
Airflow Units = 2	Airflow = (Area/1000)*Air Velocity $(0.01\ m^3/\text{sec})$
Airflow Units = 3	Airflow = 60*(Area/1000)*Air Velocity (ft^3/min)

Airflow Calculation

Instance Name: FUN-00 Airflow		**Airflow:** 1382	
Index Enable: ☑ Yes		Cubic feet/minute	
Function Type: Airflow		**Calculation Error:** No	
Calculate Units: ☐ sec	**Function Action**	**Calculation Timer:** 3	
Calculation Interval: 5			
		Velocity: 3.67	
Air Velocity Units: Raw		Raw	
Velocity K-factor(fpm): 1950		**Velocity Press:** 20	
Velocity K-factor(ps): 32.50			
Ref Velocity Press: 0.999		**Low Limit Alarm:** No	
Duct Area: 6.280		**High Limit Alarm:** No	
Airflow Calc Units: 3			
Lower Limit SP: 0	**Low Limit Enable:** ☐ No	0	
I-P Units Enable: ☑ Yes	**High Limit Enable:** ☐ No	999	
Velocity Press Handle: SPECIAL	**Variable A Constant:** 20		
Velocity Press Han Name: SPECIAL			

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Square Root Look-up Table

33 Entries $1000*SQRT(P_V/P_O)$

Entry 0 - 0/32	0		Entry 17 - 17/32	729
Entry 1 - 1/32	177		Entry 18 - 18/32	750
Entry 2 - 2/32	250		Entry 19 - 19/32	771
Entry 3 - 3/32	306		Entry 20 - 20/32	791
Entry 4 - 4/32	354		Entry 21 - 21/32	810
Entry 5 - 5/32	396		Entry 22 - 22/32	829
Entry 6 - 6/32	433		Entry 23 - 23/32	848
Entry 7 - 7/32	468		Entry 24 - 24/32	868
Entry 8 - 8/32	500		Entry 25 - 25/32	884
Entry 9 - 9/32	530		Entry 26 - 26/32	903
Entry 10 - 10/32	559		Entry 27 - 27/32	919
Entry 11 - 11/32	586		Entry 28 - 28/32	937
Entry 12 - 12/32	612		Entry 29 - 29/32	952
Entry 13 - 13/32	637		Entry 30 - 30/32	970
Entry 14 - 14/32	661		Entry 31 - 31/32	984
Entry 15 - 15/32	685		Entry 32 - 32/32	1000
Entry 16 - 16/32	707			

Airflow Function

Handles

Handle A - Velocity Pressure Value

Parameters

Function Type - Airflow

K-factor, Kf - Air velocity at Reference Velocity Pressure in units of 0.01 ft/s or 0.01 m/s

Reference Velocity Pressure, P_V - the maximum Velocity Pressure in same units as Velocity Pressure. If the Velocity pressure goes above this value, the velocity pressure is limited to this value.

Low Limit SP - if the Velocity Pressure falls below this the Air Velocity is 0.

Airflow Units - $0 = m^3/min$, $1 = liter/sec$, $2 = 0.01\ m^3/s$, $3 = CFM$

Outputs

Airflow Value - I-P: CFM or SI. : liter/s or 0.01 cubic meter per sec

Air Velocity Value - I-P: 0.01 ft/s or SI. : 0.01 m/s

Hi-Limit Alarm - Set if in Velocity Pressure > Reference Velocity Pressure, then Pv = Po

Lo-Limit Alarm - Set if in Velocity Pressure < Low Limit SP then Pv = 0

Airflow Example

An airflow monitor reads the velocity pressure associated with supply or return air. A 0 to 5 Vdc pressure transducer that reads a Velocity Pressure from 0 to 0.500 " wc. The flow station has 2.25 ft^2 area and flow velocity of Kf = 2500 ft/min = 41.67 ft/s at a Reference Velocity Pressure of $P_O = 1.000$ "wc .

An input is configured to read the velocity pressure where 500 = 0.500 " wc. where Po is the pressure at full scale = 5 Vdc = 255 raw = 0.500 "wc.

Air velocity is given by

$$\text{Max Air velocity} = Kf*1000*SQRT(P_V/P_O)\ /1000$$
$$= 41.67\ ft/s*SQRT(0.50) =$$
$$= 29.45\ ft/s = 1767\ ft/min$$

The Airflow is given by

$$\text{Max Airflow} = (Area/1000)*Air\ Velocity$$
$$\text{Max Airflow} = (2250ft^2/1000)*29.45ft/s*60\ s/min$$
$$= 3976\ ft^3/min$$

	P-I	SI.
Kf	41.67 ft/s = 2500 ft/min	12.70 m/s
Max Pv	0.500 " wc =500	124 Pa
Po	1.00 " wc = 1000	249 Pa
Max Velocity	29.45 ft/s = 1767 ft/min	8.98 m/s =539 m/min
Area	2.250 ft^2 = 2250	0.210 m^2= 210
Max Airflow	3976 CFM	1886 liter/s 113.00 m3/min

Table Look-up Function

Table Look-up Algorithm
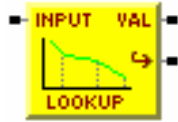
FUN-00 Lookup
Look-up

The Table Look-up function is based on knowing the pairs of values that represent different points on the look-up table. The algorithm eliminates the need for even distribution of points. Lookup uses signed arithmetic.

This function can be used to convert or scale values, or for reset or limit.

In the limiting case of two pairs of points (X_1,Y_1) and (X_2,Y_2) it gives a simple reset function.

Each value X_i, Y_i are signed integer values which are kept in an index of the utility object. Up to 16 pairs of values (X_1,Y_1) and (X_{16},Y_{16}) are allowed. The **Number of Pairs**, UTL Attr-5, is first EE parameter in the utility object and tells how many pairs are used 2..16.

Starting with FW7/854a1.4 the **Utility Start Attribute** identifies the starting data element for the look-up table. This allows multiple look-ups in a single utility instance. If not set, defaults to attribute 5. Attr-17

The requirement of the algorithm is that it is continuous and increasing in Xi.

For any value $X_i < X < X_{i+1}$, the output value Y is given by the linear interpolation between Y_i and Y_{i+1}

$$Y = (Y_{i+1} - Y_i)*(X - X_i)/(X_{i+1}-X_i) + Y_i$$

If $X < X_1$ then it is extrapolated below the first value. If **Low Limit Enable** is set. then the Y_1 value is used if X is less than X_1 (**Low Limit SP**).

If $X > Xn$ then it is extrapolated beyond the last value. If Hi Limit Enable is set. then the Y_n value is used if X is greater than X_n. (**High Limit SP**)

Note: Y_i does not have to be continuous or increasing with i, but X_i does!

Look-up Function

Handles

The look-up function needs one handle
Handle A - Look-up Input Value

Parameters

Utility Index Number - index of the utility object containing the pairs of values.
Utility Start Attribute - 5 for 16 value lookup. If you have shorter look-up tables, different Function instances can share the utility instance.

High limit Enable
Low Limit Enable

Utility Object Table
　　　Attr-5 **Number of Pairs**, n
　　　Attr-6,7 X_1,Y_1
　　　...
　　　Attr-36,37 X_{16},Y_{16}

Outputs

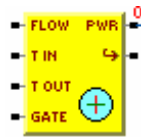Look-up Output Value
Hi-Limit Alarm - Set if in hi limit Input $X < X_1$
Lo Limit Alarm - set if in lo-limit. Input $X > X_n$

Energy Meter Function

FUN-02 Energy
Energy Meter

Energy Meter, Function Type 4 , takes a flow and two temperatures and computes an energy rate applying a heat capacity and scale factor. It assumed that the temperature and flow inputs are smoothed.(FW740E 1.9, 840E 1.9)

Flow Rate is always clamped at zero (not allowed to go negative) 0..32767

If **Positive Only Enable** is yes**,** then the temperature difference (Tin - Tout) is clamped at zero.

If **Gate Enable** Attr-9 LO bit 4 is yes, then the calculation is done when, the gate handle is true. The **Scaled Power** value is set to zero when the gate handle is false.

If **Low Limit Enable** is Yes, then the Scaled Power (signed) is clamped at Attr-16 **Lower Limit Setpoint** (signed).

If High Limit Enable is Yes, then the Scaled Power (signed) is clamped at Attr-15 **Upper Limit Setpoint** (signed).

Parameters

Attr-14 Parameter 1 - **Heat Capacity** - Unsigned
Attr-15 Parameter 2 - **Upper Limit SP**
Attr-16 Parameter 3 - **Lower Limit SP**
Attr-17 Parameter 4 - **Scale Factor** Unsigned
Attr-18 Parameter 5 - - Unsigned
Attr-19 Parameter 6 - Spare

Calculation

The energy meter does the following signed calculation: In the case of thermal storage the power can be positive or negative. The unscaled calculation is based on Flow, Heat Capacity, and Temperature difference.

Power-Unscaled = Flow*Cs*(Tin - Tout)
Power-Scaled = Power (Unscaled)/Scale Factor

Results

Attr-0 Function Result 1- **Scaled Power**
Attr-1 Function Result 2 - Spare
Attr-2 Intermediate Data 1 - **Flow (unsigned)**
Attr-3 Intermediate Data 2 **- Temperature Difference (signed)**
Attr-4 Intermediate Data 3 Spare
Attr-5 Intermediate Data 4 Spare
Attr-6,7 Intermediate Data 5,6   **Unscaled Power (signed)**

Handles

Attr-20,21 Variable A Handle - **Flow Rate**
Attr-22,23 Variable B Handle- **Temperature In**
Attr-24,25 Variable C Handle - **Temperature Out**
Attr-26,27 Variable D Handle - **Gate Handle**

Miscellaneous Constants

1 gal = 8.23 lbm
1 Ton of cooling = 20,000 BTU/hr

Heat Capacity Water

32 F 1.007 BTU/lbm-F 0 C 4.219 kJ/kg-C
50 F 1.003 BTU/lbm-F 10C 4.203 kJ/kg-C
68 F 0.999 BTU/lbm-F 20C 4.186 kJ/kg-C

Density Water

34 F 62.422 lbm/ft^3 1.2 C 998.76 kg/m^3
44 F 62.423 lbm/ft^3 6.7 C 998.77 kg/m^3
54 F 62.395 lbm/ft^3 12.2 C 998.31 kg/m^3
64 F 62.34 lbm/ft^3 17.8 C 997.48 kg/m^3
72 F 62.29 lbm/ft^3 22.2 C 996.6 kg/m^3

Power (Water)

Power = Flow*Cs*(Tin - Tout)

BTU/min= (1 BTU/lbm-F)*(8.23lbm/gal)*Flow[gpm]*DT[F]
BTU/min = = 8.23 BTU/min-F-gpm* Q[gpm]*DT[F]
BTU/hr = 493.8 BTU/hr-F-gpm* Q[gpm]*DT[F]
kW = (4.19 kJ/kg-C)*Q[liter/s]*(1m^3/1000liter)*998kg/m^3*DT[C]
kW = 4.19 kW/C*Q[liter/s]*DT[C]

Power (Air)

Power = Flow*Cs*(Tin - Tout)

Air BTU/hr= (0.24 BTU/lbm-F)*(1lbm/14 ft^3)*FlowCFM*DTF*(60min/hr)
Air BTU/hr = 1.08 (BTU/hr-CFM-F)* Q(CFM)*DT(F)

Integrator Function
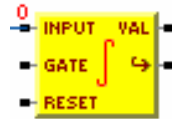
FUN-03 Integrate
Integrate

The integrator function, type 5, is designed to integrate some value, for example the ton-hours of cooling in thermal storage system. It can be gated to only accumulate when certain conditions are met. It can be reset by a **Reset Handle**.

Every **Calculation Interval** the Integrator calculates an Unscaled Increment, Divides it by a Scale Factor to generate a signed **Increment** value. The Increment value is added to the Integrated Value.

Integrator		
Instance Name: FUN-03 Integrator		Present Value: -29119
Index Enable: ☑ Yes 5		Result 2: 16
Function Type: Integrate		Scaled Increment: 49
Calculate Units: ☐ sec	Integrated Value DBL: 1084993	Inter Data 3: 0
Calculation Interval: 7	Calculation Timer: 4	Inter Data 4: 52
PositiveOnlyEnable: ☐ No	Unscaled Power: 49	Inter Data 5: 49
IntegrationConstant: 1		Inter Data 6: 0
ScaleFactor: 1		Calculation Error: No
Reset Value DBL: 0	Parameter 5: 0	
	Parameter 6: 0	Calculation Timer: 4
		Gate State: Yes
Function Action		
	Input Handle: CLK-00-01-LB_ONLY	
	Variable B Handle: SPECIAL	Variable B Constant: 0
Reset Enable: ☑ Yes	ResetHandle: SPECIAL	Variable C Constant: 0
Gate Enable: ☑ Yes	Gate Handle: SPECIAL	Variable D Constant: 1

ASIC/2-7040 Configuration View (ASI Controls, 1998)

Increment = Input Value * Integration Constant/Scale Factor.

Integrated Value = Previous Value + Increment

If **Positive Only Enable** is Yes then the Increment is clamped at zero.

If **Gate Enable** Attr-9 LO bit 4 is yes, then the calculation is done when, the gate handle is true. The **Scaled Increment** value is set to zero when the gate handle is false.

If **Reset Enable** Attr-9 LO bit 3 is yes, when the Reset Handle is true, the Double Word Integrated Value is reset to the Double Word Reset Value. When the reset handle is false, no action is taken.

Parameters

Attr-14 Parameter 1 - **Integration Constant** - Unsigned
Attr-15 Parameter 2 - Spare
Attr-16 Parameter 3 - Spare
Attr-17 Parameter 4 - **Scale Factor** - Unsigned
Attr-18,19 Parameter 5,6 - **Reset Value** -

Calculation

Unscaled Increment = Input Value * Integration Constant

Scaled Increment = Unscaled Increment /Scale Factor

Integrated Value = Integrated Value + Scaled Increment

The Calculation Interval is in minutes or seconds.

Results

Attr-0,1 Function Result 1,2- **Integrated Value**
Attr-2 Intermediate Data 1 - **Scaled Increment (signed)**
Attr-3 Intermediate Data 2 **-**
Attr-4 Intermediate Data 3
Attr-5 Intermediate Data 4
Attr-6,7 Intermediate Data 5,6 **Unscaled Increment (signed)**
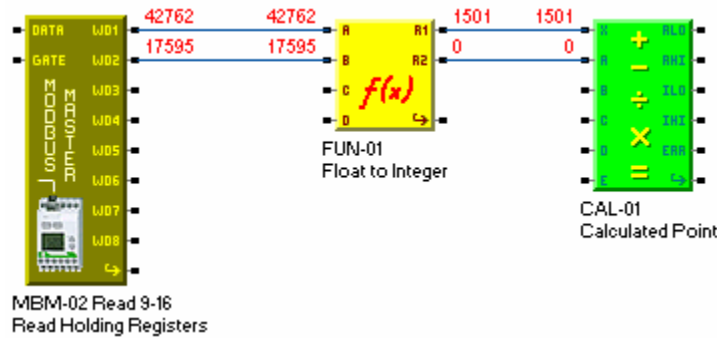
Handles

Attr-20,21 Variable A Handle - **Input Value**
Attr-22,23 Variable B Handle- Spare
Attr-24,25 Variable C Handle - **Reset Handle**
Attr-26,27 Variable D Handle - **Gate Handle**

Float to Integer Function

MBM-02 Read 9-16
Read Holding Registers

FUN-01
Float to Integer

CAL-01
Calculated Point

Function Type 6, Float to Integer allows conversion of 32-bit floating point numbers to 32-bit integer values. The Decimal Fraction, FUN Attr-2 Signed Word, is in units of 0.0001 was added in FW7/854a2.1. It will convert and display any signed 32-bit floating point number from 16,777,215 to 0.0001

This is useful in connection with the Object 39, Modbus Master which may be returning floating point numbers from a Modbus slave device.

Examples:

Decimal: 1501.2200 is represented as floating point 1.5012200e3 .
        Hex: "0x44BBA70A" HI Word 17595 Lo Word 42762
        Float to Integer converts this to 1501. Fraction 0.2199

Decimal:0.00345 is represented as floating point 3.4500000e-3
        Hex: "0x3B621965" HI Word 15202 Lo Word 6501
        Float to Integer converts this to 0.; Fraction 0.0034

Decimal:3.14159 is represented as floating point 3.1415900e-0
        Hex: "0x40490FDB" HI Word 16457 Lo Word 4059
        Float to Integer converts this to 3.; Fraction 0.1416

Function Glossary

Function Parameters

Gate Enable

For Function Type 4, Energy Meter, or 5, Integrator, If Gate Enable is yes, then the calculation is done when, the gate handle is true. The Scaled Power value is set to zero when the gate handle is false.Attr-11 LO bit 4 - (FW740E1.9)

For Function Type 5, Integrator, If Gate Enable is yes, then the calculation is done when the gate handle is true. The Scaled Increment value is set to zero when the gate handle is false. Attr-11 LO bit 4 - (FW740E1.9)

Heat Capacity

For Function Type 4, Energy Meter, used to determine the Unscaled Power. - Attr-14 Parameter 1 - Unsigned

Integration Constant

For Function Type 5, Integrator used to multiply the current sample value to calculate the unscaled Increment. Attr-14 Parameter 1 - Unsigned.

Lower Limit Setpoint

For Function Type 4, Energy Meter, If Low Limit Enable is Yes, then the Scaled Power (signed) is clamped at Attr-16 Lower Limit Setpoint (signed).

Positive Only Enable

For Function Type 4, Energy Meter, or 5, Integrator, if Enable Positive Only is yes, then the temperature difference (Tin - Tout), or increment, is clamped at zero. Attr-11 LO bit 5 (FW740E1.9)

Reset Enable

For Function Type 5, Integrator, If Reset Enable is yes, then when the Reset Handle is true, the Double Word Integrated Value is reset to the Double Word Reset Value. When the reset handle is false, no action is taken. Attr-11 LO bit - (FW740E1.9)

Reset Value

For Function Type 5, Integrator the Reset Value Double word is used to initialize the Integrated Value when the reset handle is true. Attr-18,19

Scale Factor

For Function Type 4, Energy Meter and for Function Type 5, Integrator, used to divide the Unscaled Power to calculate the Scaled Power Attr-17 Parameter 4 - Unsigned

Upper Limit Setpoint

For Function Type 4, Energy Meter, If High Limit Enable is Yes, then the Scaled Power (signed) is clamped at Attr-15 Upper Limit Setpoint (signed).

Utility Start Attribute

For Function Type 3, Look-up, the Utility Start Attribute identifies the starting data element for the look-up table. This allows multiple look-ups in a single utility instance. If not set, defaults to attribute 5. Attr-17 (FW7/854a1.4)

Function Properties

The Function Object has Data Type WORD; It is used to perform arithmetic to calculate points which combine data from different objects. The Function Object uses Double Word precision arithmetic.

Object Name	FUNCTION
Object Number	30
Data Type	WORD
Index	0..n as allocated
Attribute	28 (0..27)
DYNAMIC	11 (0..10)
STATIC	17 (11..27)

Function Firmware Revision

ASIC/2-7540 FW754a Ver 2.1d Release 2007-03-23
ASIC/2-8540 FW854a Ver 2.1d Release 2007-03-26
o   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 16,777,215 to 0.0001

ASIC/2-7540 FW754A Rev 1.4 2006-04-07
ASIC/2-8540 FW854A Rev 1.4 2006-04-07
o   Improves FUN Look-up Conversions, by adding Attr-17 Utility Start Attribute,
        so that multiple conversions can use the same utility instance.
o   Adds FUN Function Type 6, Float to Integer for conversion of 32-bit floating
        point Modbus numbers to integer .

. SINC/3-3000 FW300B Rev 2.0 Released 12/15/2000 CHK 0xDDAD
o   Object-30 Function not supported in SINC/3

ASIC/2-7040 FW740E Rev 1.9 Unreleased 11/17/2000
ASIC/2-8040 FW840E Rev 1.9 Unreleased 11/17/2000
o   Adds New 30-Function Types: Energy Meter and Integrator.

ASIC/2-8040 FW840A Rev 1.0 (1996-March)
ASIC/2-7040 FW740A Rev 1.1 (1994-05-27)
        Add MKS(kcal/kg) to Enthalpy Calculation Units
        Enthalpy (kcal/kg) = Enthalpy(kJ/kg)* 1.000 kcal/4.187 kJ.
        Add Attr-12 HI_MS_NBL Enthalpy Units ;
                0 = SI (kJ/kg); 1 = MKS (kcal/kg);
        and 2 = I-P (BTU/lbm);
        Add CFM to Airflow Calculation Units
        Attr-12 HI_LS_NBL Airflow Units: 0 = m3/min, 1 = liter/sec,
                2 = 0.01 m3/s, 3 = CFM (I-P Units)
        I-P Units Enable not used by Enthalpy or Airflow Function
        Fix High Limit on Lookup Function

ASIC/2-7040 FW740A Rev 1.0 (1994-03-31)
        New Object

Function DYNAMIC Properties

Attr-0 **Function Result 1-**

    Type 1, Enthalpy   Enthalpy, H
          SI, 0.01 kJ/kg; MKS kcal/kg; I-P, 0.01 BTU/lbm
    Type 2, Airflow   Airflow
          SI, liter/s or 0.01 m^3/s; I-P ft^3/min ,
          see Airflow Calculation Units
    Type 3, Look-up   Present Value
          As defined in look up table
    Type 4, Energy Meter - **Scaled Power** (740E1.9, 840E1.9)
    Type 5, Integrator - **Integrated Value** (Low Word)(740E1.9, 840E1.9)
    Type 6, Float to Integer – **Present Value Double** (Low Word) (7/854a1.4)

Attr-1 **Function Result 2**

    Type 1, Enthalpy   Humidity Ratio, W
          0.00001 kg/kg or lbm/lbm
    Type 2, Airflow   Air Velocity
          Same Units as Kf
          SI, 0.01 m/s; I-P, 0.01 ft/s
    Type 3, Look-up   Input Value
          As defined by Input
    Type 4, Energy Meter - Spare
    Type 5, Integrator - **Integrated Value** (High Word) (740E1.9, 840E1.9)
    Type 6, Float to Integer – **Present Value Double** (High Word) (7/854a1.4)

Attr-2 **Intermediate Data 1**

    Type 1, Enthalpy   Dry Bulb Temperature, Tdb
          0.01 C or 0.01 F
    Type 2, Airflow   Velocity Pressure, P_v
          Same Units as Reference Velocity Pressure
    Type 3, Look-up   Spare
    Type 4, Energy Meter - **Flow (unsigned)** (740E1.9, 840E1.9)
    Type 5, Integrator - **Scaled Increment (signed)** (740E1.9, 840E1.9)
    Type 6, Float to Integer – **Decimal Fraction** (*0.0001)(7/854a2.1))

Attr-3 **Intermediate Data 2**

    Type 1, Enthalpy   Relative Humidity, RH, 0.1%
    Type 2, Airflow   Spare
    Type 3, Look-up   Spare
    Type 4, Energy Meter - **Temperature Difference (signed)** (740E1.9, 840E1.9)
    Type 5, Integrator - Spare

Attr-4 **Intermediate Data 3**

    Type 1, Enthalpy   Saturated Vapor Pressure, P_{sat} (0.001 kPa only)
    Type 2, Airflow   Spare
    Type 3, Look-up   Spare
    Type 4, Energy Meter - Spare
    Type 5, Integrator - Spare

Attr-5 **Intermediate Data 4**

    Type 1, Enthalpy   Saturated Humidity Ratio, W_{sat}
          0.0001 kg/kg or lbm/lbm
    Type 2, Airflow   Spare
    Type 3, Look-up   Spare
    Type 4, Energy Meter - Spare
    Type 5, Integrator - Spare

Attr-6,7 **Intermediate Data 5,6**

    Type, 1,2,3, Spare
    Type 4, Energy Meter - **Unscaled Power (signed)** (740E1.9, 840E1.9)
    Type 5, Integrator - **Unscaled Increment (signed)** (740E1.9, 840E1.9)

Attr-8 Function Status
> LO BYTE
>> LO bit 0 - **Index Enabled**
>>> 1 = Yes; 0 = No
>> LO bit 1 - **Calculation Error**
>>> Over/Underflow Error, 1 = Yes; 0 = No
>> LO bit 2 - **Bad Handle Error**
>>> 1 = Yes; 0 = No
>> LO bit 3 **Gate Delay** (FW740E1.9, 840E1.9)
>> LO bit 4 **Gate State** (FW740E1.9, 840E1.9)
>>> 0 = Gate Closed (OFF), 1 = Gate Open (ON).
>> LO bit 5 **Sign Flag** (FW740E1.9, 840E1.9)
>>> set to indicate input was negative before unsigned operations
>> LO bit 6 - **Low Limit Alarm**
>> LO bit 7 - **Hi Limit Alarm**
> HI BYTE - **Calculation Timer (FW740A..)**

Attr-9 Action
> None Defined

Attr-10 Spare

Function STATIC Properties

Attr-11 Setup 1
> LO BYTE
>> LO bit 0 - **Index Enable**
>> LO bit 1 - **Calculate Units**
>>> 1, in minutes
>>> 0, in seconds
>> LO bit 2 - I-P Units Enable (Not Used by FW740 Rev1.1)
>> LO bit 3 - **Reset Enable** (FW740E1.9)
>> LO bit 4 - **Gate Enable** (FW740E1.9)
>> LO bit 5 - **Enable Positive Only** (FW740E1.9)
>> LO bit 6 - **Low Limit Enable**
>>> used by Type 3, Look-up
>>> should these always be enabled?
>> LO bit 7 - **High Limit Enable**
>>> used by Type 3, Look-up
> HI BYTE - **Calculation Interval** (FW740A..)

Attr-12 Setup 2
> Attr-12 LO Byte **Function Type** (0..15)
>> 0 = Not Used
>> 1 = Enthalpy
>> 2 = Airflow
>> 3 = Look-up
>> 4 = Energy Meter (740E1.9, 840E1.9)
>> 5 = Integrator (740E1.9, 840E1.9)
>> 6 = Float to Integer (754a14,854a1.4)
>> 7..255 Not Used

> Attr-12 HI_LS_NBL **Airflow Calculation Units**
>> 0 = m^3/min
>> 1 = liter/sec
>> 2 = 0.01 m^3/sec
>> 3 = CFM (FW740A Rev 1.1)

> Attr-12 HI_MS_NBL - **Enthalpy Calculation Units** (FW740A Rev 1.1)
>> 0 = SI (kJ/kg)
>> 1 = MKS (kcal/kg)
>> 2 = I-P (BTU/lbm)

Attr-13 Units

Attr-13 LO Byte **Units for Function Result 1**

Type 1, Enthalpy Enthalpy, H
SI, 0.01 kJ/kg; MKS 0.01kcal/kg; I-P, 0.01 BTU/lbm

Type 2, Airflow Airflow
SI, m^3/min, liter/s or 0.01 m^3/s; I-P ft^3/min , see Airflow Units

Type 3, Look-up Present Value
As defined in look up table

Attr-13 HI Byte **Units for Function Result 2**.

Type 1, Enthalpy Humidity Ratio, W
0.00001 kg/kg or lbm/lbm

Type 2, Airflow Air Velocity
Same Units as Kf
SI, 0.01 m/s; I-P, 0.01 ft/s

Type 3, Look-up Input Value
As defined by Input

Attr-13 Type 4, Energy Meter **Gate Delay Time** (FW740E1.9, 840E1.9)
Type 5, Integrator **Gate Delay Time** (FW740E1.9, 840E1.9)

Attr-14 **Parameter 1**

Type 1, Enthalpy **Barometric Pressure**
0.01 kPa or 0.01 in-Hg

Type 2, Airflow **Velocity K-factor** unsigned
0.01 m/s or 0.01 ft/sec Note: 2338 ft/min = 38.97 ft/s = 11.87 m/s

Type 3, Look-up **Utility Index Number**

Type 4, Energy Meter - **Heat Capacity** (Unsigned) (740E1.9, 840E1.9)

Type 5, Integrator - **Integration Constant** (Unsigned) (740E1.9, 840E1.9)

Attr-15 **Parameter 2**

Type 1, Enthalpy Spare

Type 2, Airflow Reference Velocity Pressure, P_O
Same units as Velocity Pressure, P_V

Type 3, Look-up Upper Limit (Xn)
Same Units as Input Value (Result 2)

Type 4, Energy Meter - **Upper Limit SP** (Signed) (740E1.9, 840E1.9)

Type 5, Integrator - Spare

Attr-16 **Parameter 3**

Type 1, Enthalpy Spare

Type 2, Airflow Lower Limit SP
Same units as Velocity Pressure, P_V

Type 3, Look-up Lower Limit SP (X1?)
Same Units as Input Value (Result 2)

Type 4, Energy Meter - **Lower Limit SP** (signed) (740E1.9, 840E1.9)

Type 5, Integrator - Spare

Attr-17 **Parameter 4** -

Type 1, Enthalpy Spare

Type 2, Airflow Duct Area
0.001 ft^2 or 0.001 m^2 unsigned
Note: 16"x20" = 2.220 ft^2 = 0.206 m^2
6" round = 0.200 ft^2 = 0.018 m^2

Type 3, Look-up **Utility Start Attribute** (7/854a1.4)

Type 4, Energy Meter - **Scale Factor** (Unsigned) (740E1.9, 840E1.9)

Type 5, Integrator **- Scale Factor** (Unsigned) (740E1.9, 840E1.9)

Attr-18,19 **Parameter 5,6** - Spare

Type 1,2,3 Spare

Type 4, Energy Meter - Spare

Type 5, Integrator - **Reset Value** (Unsigned Double Word) (740E1.9, 840E1.9)

Attr-20,21 **Variable A Handle**

    Type 1, Enthalpy   Dry Bulb Temperature

    Type 2, Airflow   Velocity Pressure, P_v

    Type 3, Look-up   Look-up Input

    Type 4, Energy Meter - **Flow Rate** (740E1.9, 840E1.9)

    Type 5, Integrator - **Input Value** (740E1.9, 840E1.9)

Attr-22,23 **Variable B Handle**

    Type 1, Enthalpy   Relative Humidity

    Type 2, Airflow   - Spare

    Type 3, Look-up   - Spare

    Type 4, Energy Meter - **Temperature In** (740E1.9, 840E1.9)

    Type 5, Integrator - Spare

Attr-24,25 **Variable C Handle**

    Type 1,2,3 Spare

    Type 4, Energy Meter - **Temperature Out** (740E1.9, 840E1.9)

    Type 5, Integrator - **Reset Handle** (740E1.9, 840E1.9)

Attr-26,27 **Variable D Handle** -

    Type 1,2,3 Spare

    Type 4, Energy Meter - **Gate Handle** (740E1.9, 840E1.9)

    Type 5, Integrator - **Gate Handle** (740E1.9, 840E1.9)

Object 31 - Sequence

Sequence Summary

SEQ-01
Sequence

The Sequence object is designed to provide the control of up to 6 stages of a multiple stage device. It includes minimum on and off times, stage setpoints and hysteresis, interlocks and interstage timer between previous and next stage. Two sequence indexes may be cascaded to provide up to 12 stages.

Sequence Input Handle: An analog value used to determine the number of stages to be on.

Reset Input Handle: An analog value used to adjust the Active Setpoint up or down.

Cascade Handle: If enabled, allows cascade of two sequence blocks. Identifies that the first stage of the next block is still on. Or that the last stage of previous stage is now on.

Interlock Handle: If the interlock is enabled, then the value returned by this handle must be true for the output to be on. If this master Interlock. goes false, then all outputs go off immediately. Minimum On timers are ignored and set to zero. Minimum off timers are started.

Outputs : Output n On - the stage is on. Delayed Stop n Output - the stage has been off for so many seconds. Used to Interlock to the previous stage on until the timer expires

Parameters

    Delayed Start Time n and Timer n - timers depend on physical output
    Minimum On Time n and Timer n
    Minimum Off Time n and Timer n
    Delayed Stop Time n and Timer n
    Stage n Setpoint - Brings stages n on in sequence depending on the Active Setpoint
    Stage n Hysteresis
    Stage n Enable -

Sequence Operation

Sequence | Reset |

			Min On/Off	Delay
Instance Name: SEQ-00				
Index Enable: ☑ Yes	Output 1 On: On		0	0
Reset Enable: ☑ Yes	Output 2 On: On		0	0
Interlock Enable: ☐ No	Output 3 On: Off		0	24
Cascade Enable: ☐ No				
Previous Stg On Enab: ☐ No				
Compare Sense: ☐ Low				

Timer Units: ☐ sec		Minute Timer: 0	
Input Handle: PID-00-01-WD_VAL		Input Value: 0	
Input Handle Name: 0-SPF51-2 Bypass	Raw	Reset Input Value: -3969	
Delayed Start Time: 10			
Delayed Stop Time: 45			

		Hysteresis	Min On	Min Off	
☑ Yes	Stage 1 Setpoint: 64	12	15	10	Sequence Action
☑ Yes	Stage 2 Setpoint: 128	12	15	10	
☑ Yes	Stage 3 Setpoint: 196	12	15	10	
☐ No	Stage 4 Setpoint: 0	0	0	0	
☐ No	Stage 5 Setpoint: 0	0	0	0	
☐ No	Stage 6 Setpoint: 0	0	0	0	

ASIC/2-7040 Configuration View (ASI Controls, 1998)

Staging

Sequence Staging: If the Sequence Input is greater than the Stage Sequence n Setpoint then the output will be on. If the Sequence Input falls below the Stage Sequence Setpoint by more than the hysteresis then the output will be off. The stages are assigned numbers 1, 2, ..., 6.

If Sequence Input Value >= Active Stage 1 SP, Then Request Stage 1.
If Sequence Input Value >= Active Stage 2 SP, Then Request Stage 2.
If Sequence Input Value >= Active Stage 3 SP, Then Request Stage 3.
If Sequence Input Value >= Active Stage 4 SP, Then Request Stage 4.
If Sequence Input Value >= Active Stage 5 SP, Then Request Stage 5.
If Sequence Input Value >= Active Stage 6 SP, Then Request Stage 6.

An option is provided to make the comparison Greater than or equal, or less than or equal for all stages. Hysteresis is always applied in the appropriate direction when going false.

The Requested Stage will not turn on until its Minimum Off Timer is satisfied, and the Delayed Start Timer of the previous stage is also satisfied.

The Requested Stage will not turn off until its Minimum On Timer is satisfied, and the Delayed Stop Timer of the next stage is also satisfied.

Active Setpoint Calculation

Active Control Setpoint n

Reset Value

Control Setpoint n
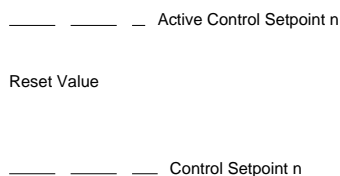
The Active Stage n Setpoint depends on Stage n Setpoint . If Reset is Enabled, then the Active Stage n Setpoint is reset based on a Reset Input Value.

Active Stage 1 SP = Stage 1 SP + Reset Input Value

...
Active Stage 6 SP = Stage 6 SP + Reset Input Value

Reset Value

Reset Value : The active Stage n Setpoint may be modified by an amount determined by the Reset Value from the Reset Handle. If the reset function is enabled, each Active Stage n Setpoint is obtained by adding the signed reset value to each Stage n Setpoint.

This reset could be used in two ways; 1) to shift each setpoint by a small amount.; or 2) as the primary setpoint where the Stage n Setpoints represent the offset from the primary setpoint.

An example; of setpoint shifting is a cooling tower application where the Control Setpoints represent the return water temperatures at which the different tower stages turn on, 78.00 F, 82.00 F, 84.00 F, etc. The reset value could be used to adjust this up and down by a small increment, perhaps -3.00 F to + 3.00 F.

An example where the Reset is the primary setpoint is boiler, where the primary hot water setpoint is given by the Reset Value, for example 140.00 F. . The Control Setpoints represent the temperature offsets at which the different stages come on: -4.00 F, -8.00 F, etc. .
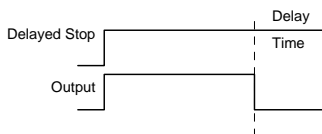
Internal Sequence Logic
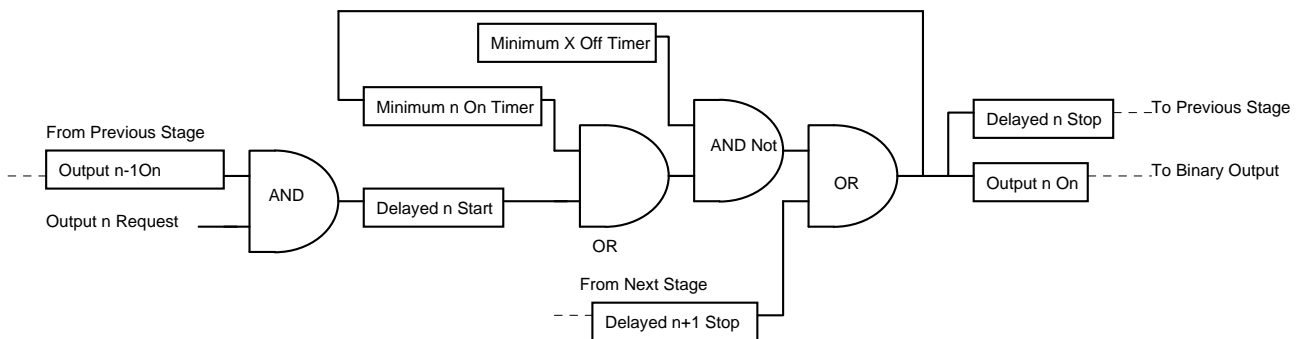
Output n Enabled.

If Output n is Requested start Delayed Start n Timer.

When Delayed Start n Timer is satisfied, turn Output n On and start Minimum On X Timer. The Delayed Stop Timer goes true.

If Output n Request goes away, and Minimum On Timer is satisfied, and Output Delayed Stop n+1 Status is not true; then turn Output n Off and start Minimum X Off Timer. The Delayed Stop n Status remains true until the Delay Stop n Status Timer times out.

When Delay n Stop Timer is times out, then Delay Stop n Status goes false.

If Stage 1, Ignore Delayed Stop X-1.

If Stage 6, Examine Cascade Handle for Delayed Stop n+1.

Output n Not Enabled.

If Output n is Not Enabled, the stage is bypassed. All necessary information is obtained from the first enabled stage in each direction including cascading.

Interlock

If the Interlock is enabled, the Interlock Value returned by the Interlock Handle is examined.

If the Interlock Value is true, then the stages sequence normally and the Lockout Status is 0, OK.

If the interlock value is false then the Lockout Status is 1, Locked, and all outputs are off immediately, and all minimum on timers are cleared. Any output that turns off has its minimum off timer started.

Cascade

If Cascade Enable is set, the value of Cascade Handle is examined to determine if the next stage is on. If true it will keep the last enabled stage on. It allows cascade of sequence blocks. For example it can be to keep SEQ-0 Stage 6 on until the Next Stage, SEQ-1 Stage 1 is off. Typically points at Delayed Stop 1 Status.

If Previous Stage On Enable are enabled the value of Cascade Handle is examined to determine if the previous stage is on. If true it will keep the allow the next enabled stage on. It allows cascade of sequence blocks. It takes priority over the Cascade Enable. For example it can be to keep SEQ-1 Stage 1 off until the Previous Stage, SEQ-0 Stage 6 is on. Typically points at Output 6 On Status.

Sequence Configuration

Example: 4 Stage Roof Top

The Sequence Object could control 4 stages of cooling in a roof top unit.

Output 1 - Compressor 1 BO-01 On
Output 2 - Compressor 2 BO-02 On
Output 3 - Compressor 3 BO-03 On
Output 4 - Compressor 4 BO-04 On
Output 5 - Not Used
Output 6 - Not Used

Sequence Input - 0 to 100%

Stage 1 SP	10%	Hysteresis 5%
Stage 2 SP	25%	Hysteresis 5%
Stage 3 SP	50%	Hysteresis 5%
Stage 4 SP	75%	Hysteresis 5%
Stage 5 SP	0	Hysteresis 0
Stage 6 SP	0	Hysteresis 0

Example: 6 Stage Cooling Tower

The Sequence Object could control 6 stages of cooling in a cooling tower.

Output 1 -Spray Pump 1   BO-01 On
Output 2 - Spray Pump 2   BO-02 On
Output 3 - Spray Pump 3   BO-03 On
Output 4 - Fan 1   BO-04 On
Output 5- Fan 2   BO-05 On
Output 6- Fan 3   BO-06 On

Sequence Input - Condenser Water Supply Temp
Compare Sense = High , Temp > SP

Stage 1 SP	80 F	Hysteresis 2.00 F
Stage 2 SP	83 F	Hysteresis 2.00 F
Stage 3 SP	86 F	Hysteresis 2.00 F
Stage 4 SP	89 F	Hysteresis 2.00 F
Stage 5 SP	92 F	Hysteresis 2.00 F
Stage 6 SP	95 F	Hysteresis 2.00 F

Example: 4 Stage Boiler

The Sequence Object could control 4 stages of a boiler

Output 1 - Boiler Stage 1 BO-01 On
Output 2 - Boiler Stage 2 BO-02 On
Output 3 - Boiler Stage 3 BO-03 On
Output 4 - Boiler Stage 4 BO-04 On

Output 5 - Not Used
Output 6 - Not Used

Sequence Input - HW Supply Temp

Reset Input - Temperature Setpoint Typical, 140.00F

Compare Sense Low , Temp < SP

Stage 1 SP	0.00F	Hysteresis 2.00 F
Stage 2 SP	-4.00 F	Hysteresis 2.00 F
Stage 3 SP	-8.00 F	Hysteresis 2.00 F
Stage 4 SP	-12.00 F	Hysteresis 2.00 F
Stage 5 SP	0	Hysteresis 2.00 F
Stage 6 SP	0	Hysteresis 2.00 F

Example: Cascade of 8 Stage

Two Sequence blocks could be used to control 8 stages of cooling in a rooftop unit.

The Sequence Object index 0 could control the first 4 stages.

Cascade Enable   Yes
Previous Stage On Enable No
Cascade Handle   Delayed 1 Stop, Seq-01-Attr-2,LO BIT 0
Sequence Input - 0 to 50%

Stage 1 SP	10%	Hysteresis 5%
Stage 2 SP	20%	Hysteresis 5%
Stage 3 SP	30%	Hysteresis 5%
Stage 4 SP	40%	Hysteresis 5%
Stage 5 SP	0	Hysteresis 0
Stage 6 SP	0	Hysteresis 0

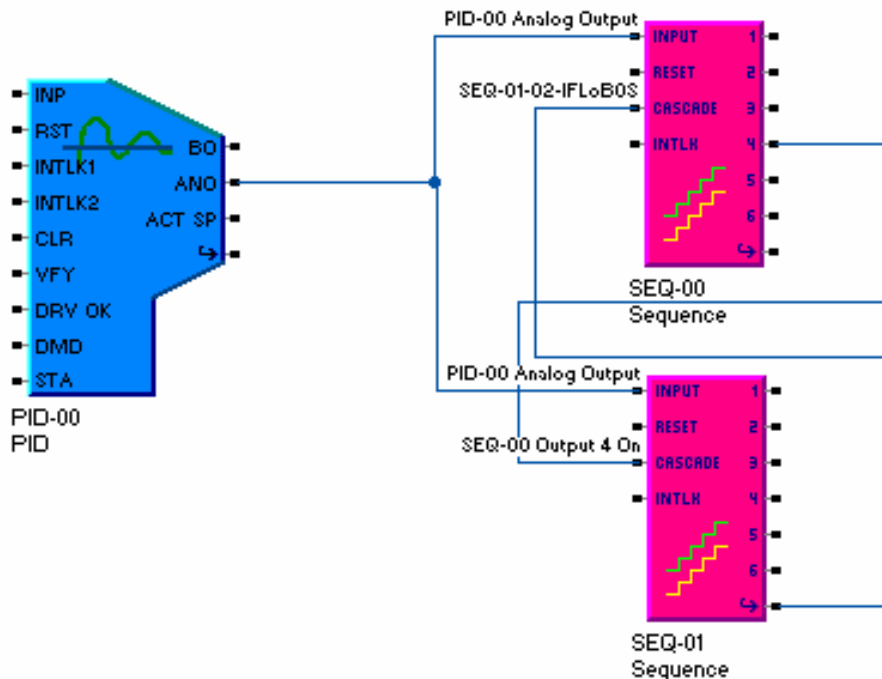Output 1 - Compressor 1   BO-01 On
Output 2 - Compressor 2   BO-02 On
Output 3 - Compressor 3   BO-03 On
Output 4 - Compressor 4   BO-04 On
Output 5 - Not Used
Output 6 - Not Used

The Sequence Object index 1 could control the last 4 stages.

Cascade Enable   Yes
Previous Stage On Enable Yes

CascadeHandle   Output 4 On, Seq-00-Attr-0,LO BIT 3
Sequence Input - 50 to 100%

Stage 1 SP	50%	Hysteresis 5%
Stage 2 SP	60%	Hysteresis 5%
Stage 3 SP	70%	Hysteresis 5%
Stage 4 SP	80%	Hysteresis 5%
Stage 5 SP	0	Hysteresis 0
Stage 6 SP	0	Hysteresis 0

Output 1 - Compressor 5   BO-05 On
Output 2 - Compressor 6   BO-06 On
Output 3 - Compressor 7   BO-07 On
Output 4 - Compressor 8   BO-08 On
Output 5 - Not Used
Output 6 - Not Used

Sequence Glossary

Sequence Parameters

Cascade Enable

If enabled examines the value of CascadeHandle to determine if the next stage is on. If true it will keep the last enabled stage on. It allows cascade of sequence blocks.(31,X,14,LO BIT 2)

Cascade Handle

If enabled allows cascade of sequence blocks. The Cascade Handle identifies that the next stage is still on. For Example: Used to keep Stage 6 on until Next Stage is off. Typically points at Delayed Stop A Status of the next Sequence index. (31,X,44,2WORDS)

Compare Sense

The Sequence Value is compared with the Setpoint. If Compare Sense = High, then the Stage is requested when the Sequence Value is Greater than or equal to the Stage Setpoint. If Compare Sense = Low, then the Stage is requested when the Sequence Value is less than or equal to the Stage Setpoint. (31,X,14,LO BIT 1)

Delayed Start n Status

When Output n Request goes on and the previous stage is also on as indicated by the Delayed Stop Status X-1, the Delayed Start n Timer starts. The Delayed Start Status does not go true until the Delayed Start n Timer has been satisfied. . (31,X,2,HI BIT 0..5)

Delayed Stop n Status

When Output n goes on the Delayed n Stop Status goes true. It remains true until the Output n goes off and the Delayed Stop Timer times out. (31,X,2,LO BIT 0..5)

Index Enable

Determines if the sequence object is operational. If the index is not enabled, then all sequence outputs are off. (31,X,14,LO BIT 0)

Interlock Enable

Enables the Interlock feature which uses the Interlock Value returned by the Interlock Handle to enable the normal sequence of stages. (31,X,14,LO BIT 3)

Interlock Handle

If enabled the Interlock Value returned by the Interlock Handle is examined. If the Interlock Value is true, then the stages sequence normally. If the interlock value is false all outputs are off immediately, and all minimum on timers are cleared. Any output that turns off has its minimum off timer started. (31,X,46,2WORDS)

Lockout Status

If the Interlock is enabled, the Interlock Value returned by the Interlock Handle is examined. If the Interlock Value is true, then the stages sequence normally and the Lockout Status is 0, OK. If the interlock value is false then the Lockout Status is 1, Locked and all outputs are off immediately, and all minimum on timers are cleared. Any output that turns off has its minimum off timer started. 0 = OK, 1 = Locked. (31,X,11,LO bit6)

Minimum Off Time

 If non-zero, Output n will remain Off for a minimum off Time.(31,X,29..34,LO BYTE)

Minimum Off Timer

 A timer used to determine if Output n will remain Off for a minimum off Time.(31,X,5..10,LO BYTE)

Minimum n On Time

 If non-zero, Output n will remain On for a minimum on Time.(31,X,29..34,HI BYTE)

Minimum n On Timer

A timer used to determine if Output n will remain On for a minimum on Time.(31,X,5..10,HI BYTE)

Minute Timer

A timer used to determine count seconds up to one minute.(31,X,5..11,HI BYTE)

Output n Enable

Each output is separately enabled. If the output is not enabled then, the un-used stages simply pass through the necessary information to sequence the stages (31,X,14,HI BIT 0..5)

Output n n Can Be On

Identifies that the minimum On and Off and other conditions are met so that it can be on if requested. , .(31,X,11,LO BIT0..5)

Output n On Status

When the stage is on then the Output n On Status is set .(31,X,0,LO BIT 0..5)

Output n Request Status

When the stage requests this output, then the Output n Request is set .(31,X,0,HI BIT 0..5)

Previous Stage On Enable

If enabled examines the value of Cascade Handle to determine if the previous stage is on. If true it will keep the allow the next enabled stage on. It allows cascade of sequence blocks. It takes priority over the Cascade Enable. (31,X,14,LO BIT 5

Reset Enable

Enables use of the Reset Function. Yes, No; user-configurable. (31,X,14,LO BIT 6)

Reset Input Handle

If Reset is enabled, the Reset Value is returned by the Reset Handle (31,X,40,2WORDS)

Reset Input Value

The signed Reset Input Value is added to each Stage n Setpoint to determine the Active Stage n Setpoint to determine the output request for each stage. Units depend on application; user-configurable. (31,X,13,WORD)

Sequence Input Handle

Returns the signed value used to compare with the active Stage n Setpoints to determine the Output n Requests. (31,X,44,2WORDS)

Sequence Input Value

The present value of the Sequence Input Handle. It is used to determine the Output Requests. (31,X,3,WORD)

Sequence Start Delay

Identifies the start delay time in minutes or seconds for each stage (31,X,34,LO BYTE)

Sequence Stop Delay

Identifies the stop delay time in minutes or seconds for each stage (31,X,34,HI BYTE)

Stage n Delay Start/Stop Timer

(31,X,5.10,HI BYTE)

Stage n Hysteresis

Hysteresis is always applied in going false. (31,X,21..27,WORD)

Stage n Min Off Flag

Indicates stage is in minimum Off time. (31,X,5.12,HI Bit 0..5)

Stage n Min Off Time

Identifies the minimum off-time in minutes or seconds. for each stage (31,X,28..33,LO BYTE)

Stage n Min On Time

Identifies the minimum on-time in minutes or seconds. for each stage (31,X,28..33,HI BYTE)

Stage n Min On Time

Identifies the minimum on-time in minutes or seconds. for each stage (31,X,28..33,HI BYTE)

Stage n Min On/Off Timer

Used to time mininimum On and Off for each stage. (31,X,5.10,LO BYTE)

Stage n Min On Flag

Indicates stage is in minimum On time. (31,X,5.12,LO Bit0..5)

Stage n Setpoint

Determines whether Output n Request Status is set. The Stage Setpoint is in the same units as the Sequence Value. If Compare sense is high then the stage Request Status is set when the Sequence Value in greater than the Stage Setpoint. If Compare sense is low then the stage Request Status is set when the Sequence Value in less than or equal to than the Stage Setpoint. (31,X,16..21,WORD)

Timer Units

Indicates units of all timers. 0 = Sec, 1 = minutes (31,X,14,LO BIT 4)

Units

Used to identify the Units of the Sequence Input and Setpoints. (31,X,15 LO Byte)

Sequence Properties

The Sequence Object allows staging of binary outputs based on an analog value.

The SEQUENCE object defines the present values and setup parameters used by the control block.

SEQUENCE (i,j)
Object Number   = 31
Data Type   = Word
Index   = As allocated
Attribute   = 0..47
DYNAMIC Attributes   = 14 (0..13) (FW740A..)
STATIC Attributes   = 34 (14..47) (FW740A..)

Sequence Firmware Revision

ASIC/2-7540 FW754a Ver 1.4m Release 2006-04-07
ASIC/2-8540 FW854a Ver 1.4m Release 2006-04-07
Fixes SEQ Interlock to clear Can Be On Flags so it restarts at the beginning.

ASIC/2-7540 FW754a Ver 1.3h Release 2006-02-17 PN70025-04
o   As in FW740E.

ASIC/2-7040 FW740A Rev 1.3 Released (16 June 1994)
        Fix Minutes Sequence Bug.
        Earlier versions did not stage properly when using minutes.

ASIC/2-7040 FW740A Rev 1.1, Released (27 May 94)
        Add Reset Handle

ASIC/2-7040 FW740A Rev 1.0 Released(31 March 1994)
        New Object

Sequence DYNAMIC Properties

Attr-0   Present Value
    Attr-0 LO Byte Output n On Status
        LO Bit 0 - **Output 1 On**
        LO Bit 1 - **Output 2 On**
        LO Bit 2 - **Output 3 On**
        LO Bit 3 - **Output 4 On**
        LO Bit 4 - **Output 5 On**
        LO Bit 5 - **Output 6 On**
        LO Bit 6 - Spare
        LO Bit 7 - Spare

    Attr-0 HI Byte Output n Request Status
        HI Bit 0 - **Output 1 Request**
        HI Bit 1 - **Output 2 Request**
        HI Bit 2 - **Output 3 Request**
        HI Bit 3 - **Output 4 Request**
        HI Bit 4 - **Output 5 Request**
        HI Bit 5 - **Output 6 Request**
        HI Bit 6 - Spare
        HI Bit 7 - Spare

Attr-1   Previous Value
        Rotates each second from Present Value

Attr-2   Delayed Status

        Attr-2 LO Byte Delayed Stop n Status
- LO Bit 0 - **Delayed Stop 1 Status**
- LO Bit 1 - **Delayed Stop 2 Status**
- LO Bit 2 - **Delayed Stop 3 Status**
- LO Bit 3 - **Delayed Stop 4 Status**
- LO Bit 4 - **Delayed Stop 5 Status**
- LO Bit 5 - **Delayed Stop 6 Status**
- LO Bit 6 - Spare
- LO Bit 7 - Spare

        Attr-2 HI Byte Delayed Start n Status
- HI Bit 0 - **Delayed Start 1 Status**
- HI Bit 1 - **Delayed Start 2 Status**
- HI Bit 2 - **Delayed Start 3 Status**
- HI Bit 3 - **Delayed Start 4 Status**
- HI Bit 4 - **Delayed Start 5 Status**
- HI Bit 5 - **Delayed Start 6 Status**
- HI Bit 6 - Spare
- HI Bit 7 - Spare

Attr-3   **Sequence Input Value**

Attr-4   Action - None Defined

Attr-5   Stage 1
LO Byte - **Stage 1 Min On/Off Timer**
HI Byte - **Stage 1 Delay Start/Stop Timer**

Attr-6   Stage 2
LO Byte - **Stage 2 Min On/Off Timer**
HI Byte - **Stage 2 Delay Start/Stop Timer**

Attr-7   Stage 3
LO Byte - **Stage 3 Min On/Off Timer**
HI Byte - **Stage 3 Delay Start/Stop Timer**

Attr-8   Stage 4
LO Byte - **Stage 4 Min On/Off Timer**
HI Byte - **Stage 4 Delay Start/Stop Timer**

Attr-9   Stage 5
LO Byte - **Stage 5 Min On/Off Timer**
HI Byte - **Stage 5 Delay Start/Stop Timer**

Attr-10   Stage 6
LO Byte - **Stage 6 Min On/Off Timer**
HI Byte - **Stage 6 Delay Start/Stop Timer**

Attr-11   LO Byte Output n Can Be On Status
- Attr-11 LO Bit 0 - **Output 1 Can Be On**
- Attr-11 LO Bit 1 - **Output 2 Can Be On**
- Attr-11 LO Bit 2 - **Output 3 Can Be On**
- Attr-11 LO Bit 3 - **Output 4 Can Be On**
- Attr-11 LO Bit 4 - **Output 5 Can Be On**
- Attr-11 LO Bit 5 - **Output 6 Can Be On**
- Attr-11 LO Bit 6 - **Lockout Status**
  - 0 = OK, 1 = Locked
- LO Bit 7 - Spare

Attr-11 HI Byte -**Minute Timer**
Used to count seconds to one minute when Timer Units is minutes.

Attr-12 Minimum On/Off Flags

    Attr-12 LO BYTE

        LO Bit 0 - **Stage 1 Minimum On Flag**

        LO Bit 1 - **Stage 2 Minimum On Flag**

        LO Bit 2 - **Stage 3 Minimum On Flag**

        LO Bit 3 - **Stage 4 Minimum On Flag**

        LO Bit 4 - **Stage 5 Minimum On Flag**

        LO Bit 5 - **Stage 6 Minimum On Flag**

        LO Bit 6 - Spare

        LO Bit 7 - Spare

    Attr-12 HI BYTE

        HI Bit 0 - **Stage 1 Minimum Off Flag**

        HI Bit 1 - **Stage 2 Minimum Off Flag**

        HI Bit 2 - **Stage 3 Minimum Off Flag**

        HI Bit 3 - **Stage 4 Minimum Off Flag**

        HI Bit 4 - **Stage 5 Minimum Off Flag**

        HI Bit 5 - **Stage 6 Minimum Off Flag**

        HI Bit 6 - Spare

        HI Bit 7 - Spare

Attr-13 **Reset Input Value**

Note: The Active Stage SP calculation is done with signed arithmetic. If the raw value of either the Setpoint or the Reset Input Value is greater than 16000, then the result of the addition is not allowed to go negative. If either is less than -16000, then the result is not allowed to go positive.

Sequence STATIC Properties

Attr-14 Setup

    Attr-14 LO Byte

        LO Bit 0 - **Index Enable**

            0 = No, Disabled; 1 = Yes, Enabled,

        LO Bit 1 - **Compare Sense**

            0 = Low , True if Sequence Input <= Setpoint

            1 = High, True if Sequence Input >= Setpoint

            SETSYS DT=13,Class 1, SubClass 14

        LO Bit 2 - **Cascade Enable**

        LO Bit 3 - **Interlock Enable**

        LO Bit 4 - **Timer Units**

            0 = Sec, 1 = minutes

            SETSYS DT=13,Class 4, SubClass 18

        LO Bit 5 - **Previous Stage On Enable**

            Used when Cascade Enable is true.

            0 - Next Stage On; 1 = Previous Stage Delayed Start

        LO Bit 6 - **Reset Enable**

        LO Bit 7 - Spare

    Attr-14 HI Byte Output Enables

        HI Bit 0 - **Output 1 Enable**

        HI Bit 1 - **Output 2 Enable**

        HI Bit 2 - **Output 3 Enable**

        HI Bit 3 - **Output 4 Enable**

        HI Bit 4 - **Output 5 Enable**

        HI Bit 5 - **Output 6 Enable**

        HI Bit 6 - Spare

        HI Bit 7 - Spare

Attr-15 LO Byte - Units

Stage Setpoints

Attr-16 **Stage 1 Setpoint**
Attr-17 **Stage 2 Setpoint**
Attr-18 **Stage 3 Setpoint**
Attr-19 **Stage 4 Setpoint**
Attr-20 **Stage 5 Setpoint**
Attr-21 **Stage 6 Setpoint**

Stage Hysteresis

Attr-22 **Stage 1 Hysteresis**
Attr-23 **Stage 2 Hysteresis**
Attr-24 **Stage 3 Hysteresis**
Attr-25 **Stage 4 Hysteresis**
Attr-26 **Stage 5 Hysteresis**
Attr-27 **Stage 6 Hysteresis**

Min On/Off Times

Stage Min On/Off Times
      LO Byte **Min Off Time**
      HI Byte **Min On Time**

Attr-28 Stage 1
      LO Byte - **Stage 1 Min Off Time**
      HI Byte - **Stage 1 Min On Time**
Attr-29 Stage 2
      LO Byte - **Stage 2 Min Off Time**
      HI Byte - **Stage 2 Min On Time**
Attr-30 Stage 3
      LO Byte - **Stage 3 Min Off Time**
      HI Byte - **Stage 3 Min On Time**
Attr-31 Stage 4
      LO Byte - **Stage 4 Min Off Time**
      HI Byte - **Stage 4 Min On Time**
Attr-32 Stage 5
      LO Byte - **Stage 5 Min Off Time**
      HI Byte - **Stage 5 Min On Time**
Attr-33 Stage 6
      LO Byte - **Stage 6 Min Off Time**
      HI Byte - **Stage 6 Min On Time**

Attr-34 - Delay Times
      LO Byte - **Sequence Start Delay**
      HI Byte - **Sequence Stop Delay**

Attr-35 - Spare
Attr-36 - Spare
Attr-37 - Spare
Attr-38 - Spare
Attr-39 - Spare

Attr-40 ,41 **Reset Input Handle** - New FW740A Rev 1.1
    The reset handle if enabled is used to modify the setpoints from Reset Input Value

Attr-42,43 **Sequence Input Handle**
    The Sequence Input is the sensed variable that is used to compare with the setpoints. for the input A to the Sequential operation or comparison.

Attr-44,45 **Cascade Handle**
    If enabled allows cascade of sequence blocks. Identifies that the next stage is still on or that the previous stage is not on.

Attr-46,47 **Interlock Handle**
    If enabled the Interlock Value returned by the Interlock Handle is examined. If the Interlock Value is true, then the stages sequence normally. If the interlock value is false all outputs are off immediately, and all minimum on timers are cleared.

Object 32 - Logic 2

Logic 2 Summary

Overview: The Logic 2 object performs a sequence of Boolean operations on its inputs to obtain its output. Object 32 - Logic 2 is identical in function to Object 20 - Logic. This is a new object in the ASIC/2 to accommodate large configurations that require more than 256 logic blocks. Object 32 is executed immediately following Object 20. Attr-3, Source of Selector Signal is not used by Object 32. Handle C must be used for Select Operations.

Handles: The three input handle, A, B, C may be any attribute of any index of any object in memory. The attributes may be masked so as to contain only a given bit. Attributes may also be converted to read in as 0000h or FFFFh depending on whether the attribute is zero or non-zero. The Input C Handle is used only by select logic blocks, and then only if the Selector Source has been chosen to be Input C Handle.

Outputs: The output may be analog or binary according to the operation performed. The output is a Binary Value, or a 2 byte Analog value depending on the Logic Class used.

Operations: Three classes of operations are available: Binary inputs to binary output: Analog inputs to binary output, Analog inputs to analog output:

> **Binary inputs to binary output:** The Boolean operators "and", "or", and "exclusive or" are available; any operand or the result may be inverted (the "not" operator). Optionally, the logic object may be configured to select one of the inputs, Select A or Select B depending on the logical state of the selector.

> **Analog inputs to binary output:** The comparison operators "greater than", "greater than or equal to", "equal to", "less than", "less than or equal to" may be applied to the 2 analog inputs; the output is Boolean (yes if statement is true, no if the statement is false).

> **Analog inputs to analog output:** The greater or the lesser of the 2 analog inputs may be chosen to be output. The inputs may be considered as either signed or unsigned values. Optionally, the logic object may be configured to select one of the inputs, Select A or Select B depending on the logical state of the selector.

> Please Refer to Object 20 for further description of the Logic Object.

> **Special Handle:** Any logic handle can be made Special which allow a constant value to be entered into the handle. (FW740E2.0, 840E2.0, 300B2.0, 754A)

Logic 2 Properties

The Object 32 - Logic 2 Object is identical in function to Object 20 - Logic. This is a object in the ASIC/2 accommodates large configurations that require more than 256 logic blocks. Object 32 is executed immediately following Object 20. Attr-3, Source of Selector Signal is not used by Object 32. Handle C must be used for Select Operations.

The LOGIC2object defines the present values and setup parameters used by the broadcast control block.

LOGIC2 (i,j)
Object Number   = 32
Data Type   = BYTE
Index   = As allocated
Attribute   = 0..17
DYNAMIC Attribute   = 2 (0..1)
STATIC Attribute   = 16 (2..17) (FW740A..)

Logic 2 Firmware Revision

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005
o   As in FW740E2.0.

ASIC/2-7040 FW740E Rev 1.9 Unreleased 11/17/2000
ASIC/2-8040 FW840E Rev 1.9 Unreleased 11/17/2000
o   Adds Special Handles generally to objects such as Logic
Note: Not implemented in FW300B.

ASIC/2-7040 FW740C Rev 2.4 Released 06/09/99 CHK 0x68E1
ASIC/2-8040 FW840C Rev 1.4 Released 06/09/99 CHK 69B7h
o   Fixes problem with Inverted Logic, for example Logic Type 192, 196, etc.

ASIC/2-7040 FW740C Rev 1.0 Released 01/29/97
        Restore Output Inverted Attr-2 LOBit6
        Always use Input C handle for Select.

ASIC/2-8040 FW840A Rev 1.0, March 1996
        Restore Output Inverted Attr-2 LOBit6
        Always use Input C handle for Select.

ASIC/2-7040 FW740A Rev 1.0 (31 March 1994)
        Add C Handle Attr-14..17 and Selector Source = 3
        Delete Output Inverted Attr-2 LOBit6

Logic 2 DYNAMIC Properties

Attr-0   **Analog Output - LO Byte**
    Binary Output
    Attr-0 bit 0 - **Binary Output Status**
            0 = OFF, 1 = ON
    bit 1..7 undefined

Attr-1 **Analog Output - HI Byte**
     Binary Output - Spare

Logic 2 STATIC Properties

Attr-2 Setup

Attr-2 LO-NBL (bits 0..3) **Type of Comparison**
(Depends on Class)
See Below

Attr-2 LO bits 4,5 - **Logic Class**
0 = (BI/BO) Binary Inputs, Binary Outputs
1 = (AI/BO) Analog Inputs, Binary Outputs
2 = (AI/AO) Analog Inputs, Analog Outputs

Attr-2 LO bits 6 - Output Inverted . FW840A
Spare - Not Used in FW740A..

Attr-2 LO bits 7 - **Index Enable**
0 = No, Disabled
1 = Yes, Enabled

Attr-3 Spare - Not Used in FW740A..
Source of Selector Signal is not used by Object 23. Handle C must be used for Select Operations.

Attr-4,5,6,7 **Input A Handle**
The Logic A is the sensed variable that is used for the input A to the logical operation or comparison.

Note: Handle Select is used to identify which data the handle should retrieve and is not the same as the logical Selector as discussed above.

Attr-8,9,10,11 **Input B Handle**
The Logic B is the sensed variable that is used for the input B to the logical operation or comparison.

Attr-12,13 **Hysteresis**
Hysteresis is always applied in Logic Class 1 (AI/BO) in going from true to false. It is in the same units as the Logic Value A and B. It is signed or unsigned depending on the Type of Comparison
Attr-12 Hysteresis- LO Byte
Attr-13 Hysteresis- HI Byte

Attr-14,15,16,17 **Input C Handle**
The Logic C is the sensed variable that is used for the select by Object 32. Also used in Triple Or and Triple And type Logic Operations.

Object 33 - Monitor

Monitor Summary

Overview: The Monitor object is used to facilitate the upload of information from the controller. The Monitor object has 32 words of dynamic data which are updated every second. The graphic user interface program can request all of this data in a single message.

Handles: The Monitor object has 32 full handles to identify the dynamic data to be returned.

Monitor Properties

The Object 33 - Monitor Object is used to identify dynamic data to facilitate upload to a graphic user interface.

The MONITOR object defines the present values and setup parameters used by the control block.

Object Name	MON, Monitor
Object Number	= 33
Data Type	= WORD
Index	= As allocated
Attribute	= 0..32
DYNAMIC Attributes	= 34 (0..33)
STATIC Attributes	= 66 (34..99) (FW740A, Rev 10..)

Monitor Firmware Revision

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005
o   As in FW740E.

ASIC/2-8040 FW840A Rev 1.0 (March 1996)
ASIC/2-7040 FW740A Rev 1.0 (31 March 1994)
        New Object

Monitor DYNAMIC Properties

Attr-0   **Monitor Value 1**
Attr-1   **Monitor Value 2**
Attr-2   **Monitor Value 3**
Attr-3   **Monitor Value 4**
Attr-4   **Monitor Value 5**
Attr-5   **Monitor Value 6**
Attr-6   **Monitor Value 7**
Attr-7   **Monitor Value 8**

Attr-8   **Monitor Value 9**
Attr-9   **Monitor Value 10**
Attr-10 **Monitor Value 11**
Attr-11 **Monitor Value 12**
Attr-12 **Monitor Value 13**
Attr-13 **Monitor Value 14**
Attr-14 **Monitor Value 15**
Attr-15 **Monitor Value 16**

Attr-16 **Monitor Value 17**
Attr-17 **Monitor Value 18**
Attr-18 **Monitor Value 19**
Attr-19 **Monitor Value 20**
Attr-20 **Monitor Value 21**
Attr-21 **Monitor Value 22**
Attr-22 **Monitor Value 23**
Attr-23 **Monitor Value 24**

Attr-24 **Monitor Value 25**
Attr-25 **Monitor Value 26**
Attr-26 **Monitor Value 27**
Attr-27 **Monitor Value 28**
Attr-28 **Monitor Value 29**
Attr-29 **Monitor Value 30**
Attr-30 **Monitor Value 31**
Attr-31 **Monitor Value 32**

Attr-32 Status

Attr-33 Spare

Monitor STATIC Properties

Attr-34 Setup

    LO Bit 0 **- Index Enable**

        If the index is not enabled then the Monitor Values will not be updated.

    LO Bit 1
    LO Bit 2
    LO Bit 3
    LO Bit 4
    LO Bit 5
    LO Bit 6
    LO Bit 7

    HI Byte **Active Count**

        Identifies the number of values to be monitored 0 or greater than 32 will monitor 32 points. Otherwise it will monitor the first N values where N is the Active Count.

If handle is null or defective then the Monitor Value data will be zero.

Attr-35 Spare

Attr-36,37	**Monitor Handle 1**
Attr-38,39	**Monitor Handle 2**
Attr-40,41	**Monitor Handle 3**
Attr-42,43	**Monitor Handle 4**
Attr-44,45	**Monitor Handle 5**
Attr-46,47	**Monitor Handle 6**
Attr-48,49	**Monitor Handle 7**
Attr-50,51	**Monitor Handle 8**
Attr-52,53	**Monitor Handle 9**
Attr-54,55	**Monitor Handle 10**
Attr-56,57	**Monitor Handle 11**
Attr-58,59	**Monitor Handle 12**
Attr-60,61	**Monitor Handle 13**
Attr-62,63	**Monitor Handle 14**
Attr-64,65	**Monitor Handle 15**
Attr-66,67	**Monitor Handle 16**
Attr-68,69	**Monitor Handle 17**
Attr-70,71	**Monitor Handle 18**
Attr-72,73	**Monitor Handle 19**
Attr-74,75	**Monitor Handle 20**
Attr-76,77	**Monitor Handle 21**
Attr-78,79	**Monitor Handle 22**
Attr-80,81	**Monitor Handle 23**
Attr-82,83	**Monitor Handle 24**
Attr-84,85	**Monitor Handle 25**
Attr-86,87	**Monitor Handle 26**
Attr-88,89	**Monitor Handle 27**
Attr-90,91	**Monitor Handle 28**
Attr-92,93	**Monitor Handle 29**
Attr-94,95	**Monitor Handle 30**
Attr-96,97	**Monitor Handle 31**
Attr-98,99	**Monitor Handle 32**

Object 34 - Dial Manager

Dial Manager Summary
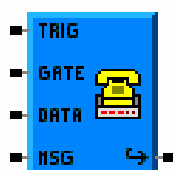
DIL-00
Logical

The Dial Manager object has the ability to initiate a telephone Dial-out request and send an ASCII message to a line printer or to a numeric pager.

The ASIC/2-7540, ASIC/2-7040 and ASIC/2-8040 controllers support dial-out on the system bus and are designed for single controller systems.

The SINC/3-3000 dials out on the Modem port and is designed for multiple controller systems.

Dial Manager Type: Three types are supported: 0, Logical uses the Trigger, Message, and Data Handles to determine when and what to send: 1, Notify examines the Notify Log to determine when New Events occur and which match its Dial Group and Priority to be sent. 2, Initialize Only just sends the initialization string to reset the modem.

> **Note:** In earlier firmware FW740C, 840C, Type 0 or 1 was Logical.

Dial Group Number: Any Dial Manager that is active will transmit its message in turn if it is a member of the same group, while the telephone connection is established. For Notify Dial Managers, the Dial Group must match the Notify Group.

Multiple Retries: The controller has the ability to dial a telephone number with multiple retries, **Dial Retries,** with a Retry Delay between each try. Should the Primary Number fail to connect, a Secondary Number can be tried.

Hang Up: Upon completion of the transmission the Dial Manager shall hang up and waits until there is a new active Dial Manager.

Trigger Handle: Logical type Dial Managers use the Trigger Handle that identifies the logical event in the controller that initiates Dial-out. When the Trigger handle goes true, the controller initiates dial-out.

Dial Event Label: Each Dial Manager instance has a 20 character text label that can be used to uniquely identify the event that initiates the dial-out.

Time Stamp: A time stamp records the last successful connection and the number of failed connections since the last success for the primary and secondary phone numbers.

Message Handle: Each Dial Manager has a specific Message Handle that identifies the message text to be sent after establishing connection. The message strings are typically kept in an instance of the Utility object which is not used for other data. For example it could be the controller description. Message strings must be terminated with the null character.

Call Back Number: The dial-out message includes a Call Back Number. The Dial Manager allows normal dial-in access to the controller. After an event notification, the user may dial into the controller.

Gate Handle: Each Dial Manager has a Gate Handle so that alternate managers can be used at different times for the same trigger event. If an event is active (the trigger handle is true) when the gate goes true, the manager will attempt to dial-out.

Data Handle: Each Dial Manager has a specific Data Handle that allows a dynamic value to be transmitted as part of the dial-out procedure. enabled The data is presented as an integer value. A **Value Data Type** allows scaling the data display.

Value Data Type: The Dial Manager Type 0, Logical uses the Value Data Type to format the data value being transmitted.

Dial Manager Operation

Dial Manager Type

Three types of dial managers are supported:

Dial Manager Type =0, Logical makes the decision to dial based on the Dial Trigger Handle value.

> **Note:** In earlier firmware FW740C, 840C, Type 0 or 1 was Logical.

Dial Manager Type=1, Notify makes the decision to dial based on the a new Notify Log item that matches its Dial Manager Group, and whose priority is greater or equal to the Dial Manager Priority. (FW740E, 840E, 300B)

Dial Manager Type = 2, Initialize Only makes the decision to initialize the modem based on the Dial Trigger Handle value. It does not dial or have any other action. (FW740E, 840E, 300B)

Decision to Dial

A Logical type Dial Manager has a specific **Trigger Handle** that identifies the logical event in the controller that initiates Dial-out. The Logical Dial Manager Type will initiate a dial-out whenever the Trigger Handle goes true.

A Notify type Dial Manager initiates a dial-out whenever there is a New Notify Event whose Notify Group matches its Dial Group and whose Notify Priority greater than or equal to Dial Priority. The Notify type Dial Manager does not use the Trigger Handle.

> Notify Group = Dial Group
> Notify Priority >= Dial Priority.

Each Dial Manager has a **Gate Handle** that can be used to enable or disable a dial manager, for example, alternate managers could be active on the weekends for the same trigger event. A dial out message is sent when the condition for dial out exists for logical or notify type dial manager and:

1) Gate Handle is not enabled.
2) Gate Handle is not enabled and there is a reset of power.
3) Gate Handle is enabled and true;
4) Gate Handle is enabled and goes true; or
5) Gate Handle is enabled and true on reset of power.

Establish Telephone Connection

Once the decision to dial-out has been made, the Active Dial Manager will control the process until its transaction and transactions by any other managers in its Dial Group have been completed.

First the controller will get the attention of the modem by sending "+++" and waiting for an "OK" response.

If **Initialize Enable** is "Yes", the Dial Manager will send to the modem command "AT" followed by the **Initialize String**, typically "Z", followed by <CR><LF> Carriage Return (0Ah), Line Feed (0Dh).

All normal Hayes compatible characters are permitted. The Dial Manager adds the "ATDT" at the beginning and "<CR><LF>" at the end to complete the dialing string.

The controller has the ability to dial a **Primary Phone Number** with multiple retries, **Dial Retries,** with a **Retry Delay** between each try.

Should the Primary Phone Number fail to connect after Dial Retries and if **Use 2nd Phone Enable** is "Yes", a **Secondary Phone Number** is tried. If the Secondary Number also fails, then a **Tried and Failed** fault is set.

If **Send To Both Enable** is Yes, then it will attempt to reach the Second Phone Number even if it is successful with the first.

A Time Stamp recording the last successful connection and the number of tries and the number of fails are kept for each phone number.

A **Message Format** is associated with each Phone Number. The Message Format 1 indicates Line Printer. The Message Format 2 indicates numeric pager.

Message Formatting

Once connection has been made, the Dial Manager will send a message, based on the selected **Message Format** and **Dial Manager Type**.

Each dial manager instance has a 20 character text **Dial Event Label** that can be used to uniquely identify the event that initiates the dial-out.

Each dial manager has a specific **Message Handle** that identifies the message text to be sent after establishing connection. The message strings are typically kept in the an instance of the Utility object. For example it could be the controller description. Message strings must be terminated with the null character, (00hex).

Dial Manager Type 0, Logical uses a specific **Data Handle** that points to a numerical value to be part of the Dial-out message. If enabled the data is presented as an integer value. The Value Data Type is used to format that data.

Dial Manager Type 1, Notify uses the data from the active Notify Log to generate the Dial-out message. If No Data Display is not set in the Notify Log, then the Present Value in the Notify Log is presented and formatted according to the Value Data Type from the Notify Log.

The dial-out message includes a **Call Back Number**. The controller can receive a call back, so that after the event notification the user can call in and communicate with the network.

Dial Manager Group

Each Dial Manager instance is assigned to a Dial Group Number. Any Dial Manager that is active and a member of the current Dial Group will transmit its message in turn while the telephone connection is established

Dial Manger Type 0, Logical, Dial Groups should only be used with Line Printer type messages. All members of the Dial Manger Type 0, Logical, Dial Group should have the same primary and secondary phone numbers and Call Back Number. Numeric Pager message format only sends the Call Back Number.

Dial Manager Type, 1, Notify, The Dial Group must match the Notify Group Number.

Dial Notify Authority

For Dial Manger Type 1, Notify , if each dial manager with the same Dial Group should have a different **Dial Notify Authorities** which are used to keep track that the messages have been sent.

Dial Notify Authority 1, DIL Attr-14 HI Bits67 for the 1st Phone number.
Dial Notify Authority 2, DIL Attr-14 HI Bits45 for the 2nd Phone number.

A total of 4 different Dial Notify Authorities 0,1,2,3 may be used .

Hang Up

When all active Dial Managers in the Dial Group have reported their events, the controller will hang up the modem and wait until there is a new active Dial Manager.

Do Not Dial

The ASIC/2 and SINC/3 has the ability to send dial messages without connecting. If Do Not Dial, Attr-14 LO Bit5 is yes, then the controller listens for a quiet line and then send

the Line Printer messages strings without bothering with the dial connection. The message is sent only once. (FW740E1.6, 840E 1.6, 300B 1.6)

This is useful in testing, or if an ASIC/2 or SINC/3 is connected directly to a printer or other terminal.

Call Back Number

The dial-out message includes a **Call Back Number** to identify the originator of the dial-out message. The Dial Manager allows normal dial-in access to the controller. After an event notification, the user may dial into the controller.

Modem Connection

ASIC/2- Null Modem Cable

The field modem that is originating dial-out messages is connected to the ASIC/2-7040 through a Null Modem Cable, DB-25 Male to DB-9 male, or DB-9 male to DB-9male.. Both the ASIC/2 and the modem are Data Communication Equipment (DCE). When two DCE devices are connected a null modem is required, so that the Transmit is connected to the Receive on both devices.

SINC/3 - Modem Cable

The field modem that is originating dial-out messages is connected to the SINC/3-3000 through a Standard Modem Cable, DB-25 Male to DB-9 Female, or DB-9 Male to DB-9 Female. The SINC/3 Modem Port is Data Terminal Equipment (DTE). The modem is Data Communication Equipment (DCE). When a DTE device is connected to a DCE device use a standard modem cable.

Modem Configuration

The following method may be used to program the BOCA 56k Internet/Fax/Modem: Please contact ASI Technical support for the correct configuration of your ASI TELMODEM.

Using a terminal program such as Windows HyperTerminal, connect the computer to the modem with a standard Modem Cable.

> Make sure that the terminal program is set to communicate at the same baud rate as the ASI Control system access device, typically 9600 baud.

AT&F - Restore Factory Settings. - Restores modem configuration to factory values.

AT&D0 - Ignore DTR -
> This ignores Data Terminal Ready which Detect which disables hardware handshaking.

AT&K0 - Flow Control Off.
> This disable software X-on X-off flow control. It allows the modem to pass back responses immediately.

ATQ0 -   Display Result Codes.
> Causes the modem to return result codes.

ATS0=1 - Auto Answer
> Answer on first ring if the modem is called.

ATS37=9 - Maximum Data Link Speed.
> Attempt to connect at 9600 baud..

AT&Y0 Use Profile 0
> Identifies that Stored Profile 0 (previously saved using &W0) is used on reset of modem by toggle of power or ATZ command. AT&Y1 identifies that Stored Profile 1 (previously saved using &W1) is used

ATE0 -   Echo Off
> Usually the modem echoes every character sent to it. However, this will interfere with passing a series of data from the controller.

> Note: At this stage, the modem will stop echoing commands and so the screen will not show what is being typed. However it will still be accepting commands. **Type with care!**

AT&W0 - Save Current Settings -
> Saves the current settings to non-volatile RAM as Stored Profile 0, or AT&W1 to save the current settings to non-volatile RAM as Stored Profile 1.

ATZ - Reset the modem and used Stored Profile 0 (ATZ0).

> Note: The Dial Manager can be programmed to initialize the modem. However, the setting ATE0 -   Echo Off MUST be programmed into the modem before an ASIC/2-7040 or SINC/3 can successfully initialize it.

Destination Modem Settings

The destination modem that is receiving dial-out messages from the ASIC/2-7040 or SINC/3 is typically connected to a serial printer or computer. A standard modem cable is used to connect the computer (DTE) to the modem (DCE). A Smart Printer Cable, connects the Modem serial connection to a parallel printer.

Typically the Destination Modem is programmed with the same values as the Dial-out Modem.

Normally result codes are displayed (ATQ0). This can cause messages such as "RING" and "CONNECT 9600" to be displayed on the line printer. You may wish to set ATQ1 which eliminates the modem result codes.

> ATQ1 -   Do not display Result Codes.
> ATQ1 causes the modem to eliminate result codes.

Dial Manager Configuration - Logical

Configuration of the Dial Type 1, Logical, dial manager requires identifying:

1) The trigger event and gate that initiates dial-out of a particular message.
2) The primary phone number to be dialed with the number of retries, secondary phone number and the primary and secondary message formats.
3) The message to be sent.
4) The dial group which the event is associated.
5) Call Back Number to identify where the dial message is coming from.

Trigger Event

The trigger event is identified by the Trigger Handle and the Gate Handle. The Index must be enabled. The Trigger Handle points to the event which goes true to initiate a dial-out attempt. The Gate Handle if enabled, will be examined to determine if the Dial-out manager should be active.

Numeric Pager Format - Logical

If the Message Format is Numeric Pager , it will just transmit Call Back Number, for the controller and then hang up. The user can then call into the controller and examine the Alarms.

o   Send "ATDT"+PHONE_STRING+"@"+<CALL_BACK> <CR><LF>

The "@" causes the modem to wait for 5 seconds of quiet before sending the rest of the message.

o   After sending the message it will hang up the modem.

Line Printer Format - Logical

The message to be sent is configurable. The Dial Manager sends the Dial Event Label string to identify the specific event that initiated the dial-out.

A typical Dial Manager event messages is as shown for Logical type Dial Manager.

MyDial Message   EVENT 02/23/96, 13:13:42
FROM FW740C Dial-out Test Program AT 866-2926
DATA VALUE IS 16706

--- For Each Dial Manager
[DIL_EventLabel] EVENT [DIL_PrimaryDateStamp], [DIL_PrimaryTimeStamp]
FROM [%DIL_MessageHandle] AT [DIL_CallBackNumber]
DATA VALUE IS [%DIL_DataHandle]

If Message Enable is "Yes", it sends the string identified by the Message Handle. [%DIL_MessageHandle] The Message Handle points at the first word in the message string, typically stored in the Utility Object. For example the Controller Description UTL-0, Attr- 9..25 can be used to identify the controller initiating the request. The message string must end with the numerical value 0.

Other indexes of the utility object could be configured to send a specific text message up to the length of an index of the utility object, Attr-6...21 Attr-22..37 characters. All message strings must be terminated with the value 0, Null.

CAUTION: Do not place message strings in utility indexes that are used for other parameters.

Data Value

If Data Handle Enable is yes, the value returned by the Data Handle is formated as defined by the Value Data Type from the Display Manager [DIL_ValueDataType]. The Value Data Type is used to format the numerical value.

Dial Group

Multiple messages can be sent with the same telephone connection by giving the different dial manager indexes the same Dial Group.

Note: Dial Groups should only be used with Line Printer type messages. All members of the Dial Group should have the same primary and secondary phone numbers.

Repeat

For a Logical Type Dial Manager, once a dial-out event has occurred, a **Repeat Timer** is started. The **Repeat Time** is in increments of 15 minutes. After the elapse of the designated number of 15 minute increments, if the event has not cleared, then the event notification is repeated. A Repeat Time of zero disables the repeat feature. This Repeat feature is available only for Logical type Dial Managers.

Dial Manager Configuration - Notify

Configuration of the Dial Type 1, Notify, dial manager requires identifying:

1) The Dial Group and Priority of Notify Event that initiates dial-out of a particular message. The Trigger Handle, and Data Handle are not used by Notify Type dial managers.

2) The primary phone number to be dialed with the number of retries, secondary phone number and the primary and secondary message formats.

3) Call Back Number to identify where the dial message is coming from.

Dial Group

If the Dial Type is Notify, when the controller detects a New Notify Event, the Dial Manager scans the Notify Log for new or unsent events.

A Notify type Dial Manager initiates a dial-out whenever there is a New Notify Event whose Notify Group matches its Dial Group and whose Notify Priority greater than or equal to Dial Priority. The Notify type Dial Manager does not use the Trigger Handle.

> Notify Group = Dial Group
> Notify Priority >= Dial Priority.

Dial Manager Type 1, Notify uses the data from the active Notify Log to generate the Dial-out message. If No Data Display is not set in the Notify Log, then the Present Value in the Notify Log is presented and formatted according to the Value Data Type from the Notify Log.

The Gate Handle if enabled, is examined to determine if the Dial-out manager should be active.

Numeric Pager Format - Notify

If the Message Format is Numeric Pager , it will just transmit Call Back Number and a six digit code for the Notify Group and Notify Event number and then hang up. The user can then call into the controller and examine the Alarms.

> Send "ATDT"+PHONE_STRING+"@"+<CALL_BACK> 0NN0MM<CR><LF>
>
> The "@" causes the modem to wait for 5 seconds of quiet before sending the rest of the message.
>
> After sending the message it will hang up the modem.

The three digit code, 0NN, for Notify Group 15 would be 015. The three digit code, 0MM, for Event 123 would be 123. Leading zeros are not suppressed. (FW300B1.6, 740E1.6, 840E1.6)

Line Printer Format - Notify

A typical Dial Manager event messages is as shown for Notify Dial Manager Type. The first two lines of the Notify type message is identical to the Logical Type.

My Dial Manager 3   EVENT 09/01/96 13:22:42
FROM FW740D Dial-out Test Program   AT 866-2926

NOTIFY 11 Test Notify Message DATE 09/01/1999
ACTIVE TIME 13:22:25 CONDITION HI Alarm Set
DATA VALUE IS 85.66

NOTIFY 14 Another Test Message DATE 09/01/1999
ACTIVE TIME 13:22:28 CONDITION LOLO Alarm Clear
DATA VALUE IS 70.22

Dial Manager Message

The Dial Manager sends the Dial Event Label string to identify the specific manager that initiated the dial-out.

If Message Enable is "Yes", then it will also send the string identified by the Message Handle. The Message Handle points at the first word in the message string, typically stored in the Utility Object. For example the Controller Description UTL-0, Attr- 9..25 can be used to identify the controller initiating the request. The message string must end with the numerical value 0.

Other indexes of the utility object could be configured to send a specific text message up to the length of an index of the utility object, Attr-5...38. 66 characters.

CAUTION: Do not place message strings in utility indexes that are used for other parameters.

All message strings must be terminated with the value 0, Null.

--- For Each Dial Manager
[DIL_EventLabel]   EVENT [DIL_PrimaryDateStamp] [DIL_PrimaryTimeStamp]<
FROM [%DIL_MessageHandle] AT [DIL_CallBackNumber]

Notify Message

If the Dial Type is Notify then the notify message is taken from the Notify Log. There will be a separate notify message generated for each changed notify event, for the group and priority.

--- For Each Active Notify Event in the Group
NOTIFY [NLG_NotifyEventNumber] [NLG_NotifyMessage] DATE [MMDDYY]
ACTIVE TIME [NLG_ActiveTime] CONDITION [NLG_Change Status]
DATA VALUE IS [NLG_Present Value]

--- For Each InActive Notify Event in the Group
NOTIFY [NLG_NotifyEventNumber] [NLG_NotifyMessage] DATE [MMDDYY]

INACTIVE TIME [NLG_InactiveTime] CONDITION [NLG_Change Status]
DATA VALUE IS [NLG_Present Value]

Value Data Type

The Data Value is displayed in the Notify type Dial Manager if the Do Not Display flag in the Notify Log is No. The Present Value from the Notify Log is formated as defined by the Value Data Type from the Notify Log [NLG_ValueDataType].

Class 42, Value Data Type
Used for display and keypad, and Dial Manager Display 0..31
Class 42, MS_NBL = 0 - Unsigned Numerical Display Value
Class 42, MS_NBL = 1 - Signed Numerical Display Value

BYTE	Display	
0	Unsigned Value*1.0	XXXXX
1	Unsigned Value*0.1.	XXXX.X
2	Unsigned Value *0.01	XXX.XX
3	Unsigned Value*0.001	XX.XXX
4	Unsigned Value*2	XXXXX
5	Unsigned Value*4	XXXXX
6	Unsigned Value*8	XXXXX
7	Unsigned Value/2	XXXX.X
8	Unsigned Value/4	XXX.XX
9	Unsigned Value/8	XX.XXX
10	Unsigned Percent, Value/2.55 , XXX.XX	
11	Unsigned Token Range, Value + 32000	XXXXX

Class 42, MS_NBL = 1 - Signed Numerical Display Value

BYTE	Display	
16	Signed Value*1.0	XXXXX
17	Signed Value*0.1.	XXXX.X
18	Signed Value *0.01	XXX.XX
19	Signed Value*0.001	XX.XXX
20	Signed Value*2	XXXXX
21	Signed Value*4	XXXXX
22	Signed Value*8	XXXXX
23	Signed Value/2	XXXX.X
24	Signed Value/4	XXX.XX
25	Signed Value/8	XXX.XX
26	Signed Percent, Value/2.55	XXX.XX

CONDITION

The condition displayed in the Dial Out message is based on the Notify Status and the Changed Status. If there are multiple changes in condition, then each is reported separately. Only the latest changes are reported . The changed value is reported as a string:

LOBits01 NLG_HILOAlarm	"HI Alarm Set"
	"HI Alarm Clear"
	"LO Alarm Set"
	"LO Alarm Clear"
LOBits23 NLG_HIHILOLOAlarm	"HIHI Alarm Set"
	"HIHI Alarm Clear"
	"LOLO Alarm Set"
	"LOLO Alarm Clear"
LOBits45 NLG_COVEvent	"COV LO Event"
	"COV HI Event"
LOBit6 NLG_COSEvent	"COS Event"
LOBit7 NLG_FaultAlarm	"Fault Alarm Set"
	"Fault Alarm Clear"

Dial Notify Authority

Each Dial Manager can be assigned two Dial Notify Authorities [0..3]
When the Dial Manager has successfully delivered the dial out message, it can mark the appropriate Dial Authority Status in the Notify Log instance that the Notice is complete. (FW740E1.6, 840E 1.6, 300B 1.6)

Dial Notify Authority 1, DIL Attr-14 HI Bits67 for the 1st Phone number.
Dial Notify Authority 2, DIL Attr-14 HI Bits45 for the 2nd Phone number.

By adding Dial Notify Authority 2, both the primary and secondary phone numbers will respond to a new notify event.

Dial Manager Glossary

Dial Manager Parameters

Active Gate Value

The numerical value returned by the Gate Handle. DIL-i, Attr-5

Active Trigger Value

The numerical value returned by the Trigger Handle. DIL-i, Attr-0

Call Back Number

Call Back telephone Number 20 character string. DIL-i, Attr-67..76

Data Enable

Dial Data is reported if enabled. DIL-i, Attr-14 Bit 3

Data Handle

The full handle points to the Numerical Value that will be returned by Logical Type. Not used by Notify Type. DIL-i, Attr-25,26.

Dial Active

Dial has control of the dial-out process. DIL-i, Attr-2 Bit 0

Dial Event Label

20 character string. The identifier for this particular set of alarms. For example : "High Temp Event" DIL-i, Attr-57,66

Dial Group Number

 All Dial Managers that are Active and in event at the time a connection is made will send their message while the connection is made.DIL-i, Attr-15 HI Byte

Dial Manager Type

The Dial Manager Type will identify the way in which the Dial Manager will respond: 0) Logical, 1) Notify, 2) Initialize. DIL-i, Attr-16,LOBYTE

Dial Notify Authority

When the Dial Manager has successfully delivered the dial out message, it can mark the appropriate Dial Authority Status in the Notify Log instance that the Notice is complete. Dial Notify Authority 1, DIL Attr-14 HI Bits67 for the 1st Phone number. Dial Notify Authority 2, DIL Attr-14 HI Bits45 for the 2nd Phone number. (FW740E1.6, 840E1.6,300B1.6)

Dial Now

This Dial Manager has something to report now. DIL-i, Attr-2 Bit 5

Dial Retries

Number of retries before going to the next number. DIL-i, Attr-17 LO Byte

Dialing

Dial has something to report. This is a global flag true for all indexes. (rfDIALING) DIL-i, Attr-1Bit0

Do Not Dial

. If Do Not Dial, is yes, then the controller listens for a quiet line and then send the Line Printer messages strings without bothering with the dial connection. DIL-i, Attr-14 LO Bit5 (FW740E1.6, 840E1.6,300B1.6)

Gate Enable

If Dial Gate Enable is yes, then the Dial Gate Handle is examined. Otherwise it is always active. DIL-i, Attr-14 Bit 1

Gate Handle

A full handle that allows the manager to be enabled or disabled based on schedule, day of week, or other logic. For example, if disabled on Sunday, then any alarms would be held until Monday morning. DIL-i, Attr-19,20

Index Enable

If Index Enable is yes, then the Dial Manager is operational. DIL-i, Attr-14 Bit 0

Initialize Enable

If Initialize Enable is yes, then Initialize String is sent before dialing the number. DIL-i, Attr-14 Bit 4

Initialize String

If Initialize Enable is yes, then Modem is initialized using this 20 character string before dialing the number. 20 character string., typically "Q0E0". Manager adds "AT"DIL-i, Attr-27,36

Message Enable

If Dial Message Enable is yes, then the Dial Message Handle is examined for message string. Otherwise it ignored. DIL-i, Attr-14 Bit 2

Message Handle

The full handle that points to the Dial-out Message Text. Typically it is the description contained in UTL-0,Attr-9 , .Must point to a string when ends in a value 0, Null. DIL-i, Attr-20,21

Primary Fail

Total Number of Failed Attempts to contact Primary Phone Number DIL-i, Attr-7 LO Byte

Primary Fault

Dial has tried and failed to get a primary connection. DIL-i, Attr-2 HI bit 1

Primary Message Format

 Message format for Primary Phone Number. DIL-i, Attr-15, LOLSNBL 1) Line Printer, 2) Numeric Pager,

Primary Phone Number

Primary Phone Number- 20 character string. DIL-i, Attr-37..46

Primary Time Stamp

Primary Time Stamp MM/DD HH:MM RAM DIL-i, Attr-8,9

Primary Tries

Counter for number of attempts to reach the primary phone number.   DIL-i, Attr-5 LO Byte

Repeat Time

Indicates how often in increments of 15 minutes a dial out should be repeated. If the Repeat Time is zero,this feature is inactive. DIL-i, Attr-16 HI Byte

Repeat Timer

Once a dial-out event has occurred, a Repeat Timer is started and loaded with the Repeat Time, in increments of 15 minutes. If the event has not cleared after the elapse of the designated number of 15 minute increments, then the event notification is repeated. DIL-i, Attr-12 HI Byte

Retry Counter

If the Dial Manager tries and Fails to connect, the Retry counter is incremented. DIL-i, Attr-3 LO Byte

Retry Delay

Time in seconds to wait before re-dialing the number. DIL-i, Attr- 17, HI Byte

Retry Timer

If the Dial Manager tries and fails to connect, the Retry Timer is started. DIL-i, Attr-3 HI Byte

Secondary Fail

Total Number of Failed Attempts to contact Secondary Phone Number . DIL-i, Attr-7 HI Byte

Secondary Fault

Dial has tried and failed to get a secondary connection. DIL-i, Attr-2 HI Bit 2

Secondary Message Format

Message format for Secondary Phone Number DIL-i, Attr-15, LOMSNBL 1) Line Printer, 2) Numeric Pager,.

Secondary Number

Secondary Phone Number , 20 character string.DIL-i, Attr-47..56

Secondary Time Stamp

Secondary Time Stamp MM/DD HH:MM RAM DIL-i, Attr-10,11

Secondary Tries

Counter for number of attempts to reach the second phone number. DIL-i, Attr-5 HI Byte

Send to Both Enable

If set then messages will be sent to both the primary and secondary number. DIL-i, Attr-14 HI Bit0

Tried and Failed

Dial has tried and failed to get a connection. DIL-i, Attr-2 HI Bit 0

Trigger Handle

 The handle of the trigger object that controls this Dial Manager. More than one dial manager can point to the same trigger object. DIL-i, Attr-18,19

Value Data Type

Used to format Data Value in messages.

Dial Manager Properties

Dial Manager
Object Number   34
Data Type   Word
Index   0
Attribute   77(0.. 76)
DYNAMIC Attributes   14 (0.. 13)
STATIC Attributes   63(14.. 76)

Dial Manager Firmware Revisions

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005
o   As in FW740E.

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
o   Adds Dial Manager Disable SYS Attr-10, HIBit6 to System Object.
         These are now set when allocation is changed, so that
         when the allocation is changed it does not attempt to dial
         until the configuration has been restored.

ASIC/2-8040 FW840E Rev 2.0 Released 12/15/2000 CHK 0xF6C1
ASIC/2-7040 FW740E Rev 2.0 Released 12/15/2000 CHK 0x181F
SINC/3-3000 FW300B Rev 2.0 Released 12/15/2000 CHK 0xDDAD
o   Dial Manager upgraded to suppress Data Value
         if No Data Display flag is set in Notify Log
o   Dial Manager upgraded to support new Notify Alarm conditions
         COV Hi Event, COV Lo Event, COS Event, Fault Alarm Set, Fault Clear.

ASIC/2-7040 FW740E Rev 1.7 Released 09/27/2000 CHK 0xE62A
SINC/3-3000 FW300B Rev 1.8 Released 10/05/2000 CHK 0xCB3B
o   Improves Dial Manager for Notify messages to 2nd Phone number:
         1-Line Printer, 2-Line Printer
         1-Line Printer, 2-Numeric Pager
         1-Numeric Pager, 2-Numeric Pager

SINC/3-3000 FW300B Rev 1.7 Released 09/21/2000 CHK
o   Fixes Dialout to second phone number.
o   Pager does not dial out on Inactive.

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
SINC/3-3000 FW300B Rev 1.6 Released 08/22/2000 CHK 0x0FC0
o   Dial Manager Improves Numeric Pager Message for Notify
         Now sends Call Back Number, Notify Group, 0NN,
         and Notify Event Number, 0MM.
         All non-numeric characters are stripped.
         Pager Does not dial out on Inactive.
o   Dial Manager adds DIL Attr-14 HI Bits45 Dial Notify Authority 2
         0,1,2,3 for different managers in the same group so that
         Both the second phone number can be used with Notify.
o   Dial Manager adds Do Not Dial feature
         DIL Attr-14 LO Bit 5 Do Not Dial
o   Dial Manager now waits for quiet line.

ASIC/2-8040 FW840E Rev 1.5 Released 04/19/2000 CHK 0x14BF
ASIC/2-7040 FW740E Rev 1.5 Released 04/19/2000 CHK 0x15DB
SINC/3-3000 FW300B Rev 1.4 Released 04/26/2000 CHK 0x4F8F
o   34-Dial Manager now allows 64.
         Add 5 second delay after connect before message sent.
         Time Stamp should be reliable with Initialize

ASIC/2-8040 FW840E Rev 1.1 Preliminary 11/08/99 CHK 0x7166
ASIC/2-7040 FW740E Rev 1.0 Unreleased 10/26/99 CHK 0x74B4

SINC/3-3000 FW300B Rev 1.0 Released 10/06/1999 CHK 0x8FB7
o   Enhanced 34-Dial Manager implemented.
o   Add Attr-14 HI Bits67 **Dial Notify Authority**
o   Add Attr-18 LO Byte **Dial Priority**
o   Change Attr-16 LO BYTE   **Dial Manager Type** = 0, Logical Events
o   Add Attr-16 LO BYTE   **Dial Manager Type** = 1, Notify Events
o   Add Attr-16 LO BYTE **Dial Manager Type** =2, Initialize Only
o   Add Attr-18 HI Byte **Value Data Type**

ASIC/2-8040 FW840C Rev 1.0 Release 06/05/98 Chk 0D55h
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.
o   Adds all features of 740C 2.0 including Calendar & Special Days,
          Local Bus Polling, Broadcast and Dial Manager

ASIC/2-7040 FW740C Rev 1.3 Released 05/27/97
o   Modification of Dial Manager to prevent looping on failure

ASIC/2-7040 FW740D Rev 1.5 Preliminary 03/13/97
o   Add sanity test for system bus for dial-out.

ASIC/2-7040 FW740D Rev 1.4 Released 11/05/96
o   Increased max allowed of Dial managers to 32
o   Modified Dial manager Trigger Handle to allow object 1, System.

ASIC/2-7040 FW740D Rev 1.0 Released 29 Feb 1996
o   Initial Release of Dial out on System Bus Only

Dial Manager DYNAMIC Properties

Attr-0 **Active Trigger Value**

Displays current value retrieved from the Dial Trigger Handle, when the Dial Manager is
active and Dial Manage Type is Alarm.

Attr-1 **Active Dial Status 1**

;Flag bits for rDialFlags; These are global flags true for all indexes.
    LoBit0- Dialing (rfDIALING)
    LoBit1-   (rfDIAL_XMIT)
    LoBit2-   (rfDIAL_RESPONSE)
    LoBit3-   (rfDIAL_BUSY)
    LoBit4-   (rfDIAL_CONNECT)
    LoBit5-   (rfDIAL_NO_FLAG)
    LoBit6-   (rfDIAL_MSG_OK)
    LoBit7-   (rfANYBODY_ELSE)

;Flag bits for rDialFlags + 1;
    HiBit0-   (rfDIAL_INIT_TO)
    HiBit1-   (rfDIAL_INIT_ERR):
    HiBit2-   (rfDIAL_DIAL_TO)
    HiBit3-   (rfDIAL_DIAL_ERR)
    HiBit4-   (rfDIAL_MSG_TO)
    HiBit5-   (rfDIAL_MSG_ERR)
    HiBit6-   (rfDIAL_HANG_TO)
    HiBit7-   (rfDIAL_HANG_ERR)

Attr-2 **Active Dial Status 2**
    LoBit0- Dial Active
    LoBit1- Dial Originate
    LoBit2- Gate New
    LoBit3- Trigger Old
    LoBit4- Trigger New
    LoBit5- Dial Now
    LoBit6- Gate Old
    LoBit7-
    HiBit0- Tried and Failed (TRIED_FAILED)

HiBit1- Primary Fault (PRIMARY_FAIL)
HiBit2- Secondary Fault (SECONDARY_FAIL)
HiBit3- Retry Status (REALLY_DONE:)
HiBit4- Use 2nd Phone (SECOND_PHONE)
HiBit5- Retry Now (RETRYING)
HiBit6- Delay Now (DELAYING)
HiBit7-

Attr-3 Retry

LO Byte **Retry Counter**
HI Byte **Retry Timer**

Attr-4 **Dial Action** - None Defined

Attr-5 **Active Gate Value**

Attr-6 Dial Tries

LO Byte - **Primary Tries** - Primary Try Counter .

HI Byte - **Secondary Tries** -   Secondary Try Counter .

Attr-7 Dial Failures

LO Byte - **Primary Fail** - Total number of failures

HI Byte - **Secondary Fail** - Total number of failures.

Attr-8,9 **Primary Time Stamp**

Primary Time Stamp MM/DD HH:MM
Attr-8 LO Byte - Minute (0..59)
Attr-8 HI Byte - Hour (0..23)
Attr-9 LO Byte - Day (1..31)
Attr-9 HI Byte - Month (1..12)

Attr-10,11 **Secondary Time Stamp**

Secondary Time Stamp MM/DD HH:MM
Attr-10 LO Byte - Minute (0..59)
Attr-10 HI Byte - Hour (0..23)
Attr-11 LO Byte - Day (1..31)
Attr-11 HI Byte - Month (1..12)

Attr-12 Dial -

LO Byte **Dialing State**
0, ssNULL_STATE
1, ssSTART_STATE
2, ssESCAPE1_STATE?
3, ssESCAPE2_STATE
4, ssINITIAL_STATE
5, ssDIAL_
6, ssMESSAGE_STATE
7, ssPAGER_STATE
8, ssHANGUP_STATE
9, ssEND_STATE
10, ssINIT_RESPONSE
11, ssDIAL_RESPONSE
12, ssMESSAGE_RESPONSE
13, ssHANGUP_
14, ssCONNECT_STATE
15, ssCONNECT_RESPONSE

HI Byte **Repeat Timer**
In 15 minute increments

Attr-13 **Dial Test**

LO BYTE
LoBit0- (TEST_GATE)
LoBit1- (TEST_SOURCE)
LoBit2- (TEST_MSG)
LoBit3- (TEST_DATA)
LoBit4- (TEST_INIT)

Dial Manager STATIC Properties

Attr-14 Dial Setup 1

LO Bit 0 **Index Enable** (DIAL_MGR_EN)
LO Bit 1 **Gate Enable** (DIAL_GATE_EN)
LO Bit 2 **Message Enable** (DIAL_MSG_EN)
LO Bit 3 **Data Enable** (DIAL_DATA_EN)
LO Bit 4 **Initialize Enable** (DIAL_INIT_EN)
LO Bit 5 **Do Not Dial** (FW740E1.6, 840E 1.6, 300B 1.6)
LO Bit 6
LO Bit 7

HI Bit 0 **Send to Both Enable** - (DIAL_BOTH_EN)
 If set then messages will be sent to both the primary and secondary number.

HI Bit 1 - (DIAL_ACK_EN) <<-- Future.
HI Bit 2 - (DIAL_CLEAR_EN) <<-- Future
HI Bit 3 **Dial 2nd Enable** (DIAL_SECOND_EN)

HI Bits 4 5**Dial Notify Authority** 2 (FW740E1.6, 840E 1.6, 300B 1.6)
 0,1,2,3 for Different Managers in same Group
HI Bits67 **Dial Notify Authority** (FW300B,740E, 840E)
 0,1,2,3 for Different Managers in same Group

Attr-15 Dial Setup 2

LOLSNBL - **Primary Message Format**
 Message format for Primary Phone Number
   1) Line Printer
   2) Numeric Pager

LOMSNBL -**Secondary Message Format.**
 Message format for Secondary Phone Number
   1) Line Printer
   2) Numeric Pager

HI Byte - **Dial Group Number** -
 All Dial Managers that are Active and active at the time a connection is made will send their message while the connection is made.

Attr-16 Dial Setup 3

LO BYTE   **Dial Manager Type**
 0 = Logical -
 1 = Notify (New FW300B, 740E, 840E)
 2 = Initialize Only (New FW300B, 740E, 840E)

HI Byte **Repeat Time**
 In 15 minute increments

Attr-17 Dial Retries

LO Byte **Dial Retries**
 Number of retries before going to the next number. If next number is blank, then do not try.

HI Byte - **Retry Delay**
 Delay in seconds between retries.

Attr-18 LO Byte **Dial Manager Priority** (New FW300B, 740E, 840E)
HI Byte **Value Data Type** (New FW300B, 740E, 840E)
 For Dial Manager Type = Logical.
 Dial Manager Type = Notify uses Value Data Type from Notify Log.

Attr-19,20 **Gate Handle**

A full handle that allows the manager to be enabled or disabled based on schedule, day of week, or other logic. For example, if disabled on Sunday, then any alarms would be held until Monday morning.

Attr-21,22 **Trigger Handle:**

The handle of the controlling object for this Dial Manager. The Controlling object could be an Event Alarm, an Event Log, a Remote Point, etc. More than one dial manager could point to the same object.

Attr-23,24 **Message Handle**

The full handle that points to the start of Dial-out Message Text. Typically it is the description contained in UTL-0,Attr-9 . UTL-3 Attr-6..21, or UTL-3Attr22..37 may also be used if not used for other purposes. It must point to a string that ends with the value 0, Null.

Attr-25,26 **Data Handle**

The full handle that points to the Numerical Value that will be returned, when the Event is reported.

Attr-27,36 **Initialize String**

20 character string., typically "Q0E0". Manager adds "AT"

Attr-37,46 **Primary Number**

Primary Phone Number20 character string. 9,1-888-555-1212

Attr-47,56 **Secondary Number** :

Secondary Phone Number, 20 character string.

Attr-57,66 **Dial Event Label**

20 character string. The identifier for this particular Event. For example : Supervisor Notice

Attr-67,76 **Call Back Number**

Call Backup Phone Number : 20 character string.

Object 35 - Encode

Encode Summary
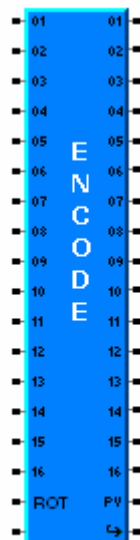
ENC-00
ENCODE

The Encode object has three different operations depending on the Encode Type. (FW754a2.3, 854a2.3)

Encode Type 0, FIFO, may be used as a First-In First-Out, FIFO, encoder, for example to provide the control of up to 16 stages of output based on up to 16 stages of stage requests where only a maximum number of outputs may be on at any one time. It may also be used to encode individual bits, for example the current status of the binary outputs into a single word of data.

Encode Type 1, Load Balance, may be used to even out the run times of multiple stages by keeping track of the ON times for each stage. Load Balance can accumulate run times up to 65535 in seconds, or in minutes. If any stage timer rolls over, then all timers are reset to zero.

Encode Type 2, Rotate, may be used to even out the run times of multiple stages by rotate the stages. The stages can be rotate with increasing number, or reversed, based on the value read by the Rotate Handle.

Only Encode Type 0, FIFO, is supported in earlier versions.

Note: To use these new features you must update the ASIC2.mdb, a2-ENC.pvs, a2-ENC.tcl, Encode.bmp, and Encode.sym files and FW754a2.3, FW854a2.3 or later.

Configuration

The Stage Enable causes the Stage Handle to be examined. If the stage handle is NONE 00-00-00-00, then it always returns zero and never sets the Stage request bit. If the value returned by the handle is non-zero then the **Stage Request** bit is set.

Upto 16 stages can be enabled.

For FIFO and Load Balance, Max Number represents the maximum number of stages that can be On at any one time. For Rotate, Max Number is the maximum number of Stages (bits) that will be shifted.

Operation - Type 0, FIFO

When each stage is requested, if the number **Stages Active** is less than the **Maximum Number,** then it comes on immediately.

If the number of **Stages Active** already on is greater or equal to the Maximum Number, when an additional stage is requested, then the **Stage Timer** starts counting in seconds.

When a stage goes off, its corresponding output goes off immediately. The stages with timers are examined and the stage with the largest value (waiting the longest) turns on and its timer set to zero. The Stage Timers for all pending requested outputs continue to count. This results in a first-in first-out, FIFO, operation once the Maximum Number is reached.

Operation - Type 1, Load Balance

The objective of Encode Type 1, Load Balance is to even out the run time on each output. There are Stage Timers associated with each stage which run when the stage is On. The Timer Units is either seconds or minutes.
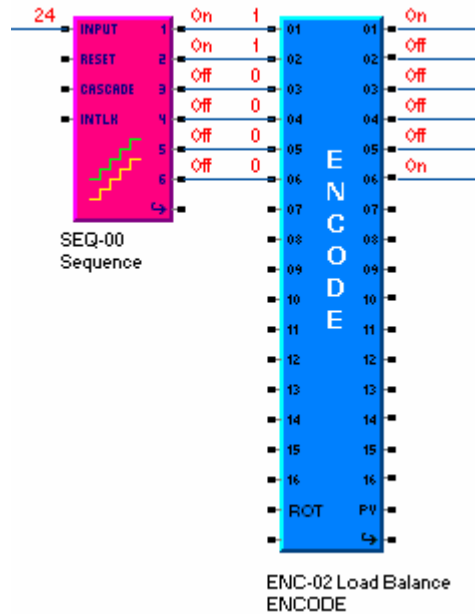
The value of each enabled Request Handle is examined, and the total Request Count is determined. The Request count is clamped at the Maximum Number. The number of stages actually on is given by the Stages Active.

If the Request Count is less than the Active Count, then first enabled output with the smallest time is turned ON. This is repeated once a second until the Stages Activeequals the Request Count.

The order in which the outputs are energized is determined only by the Stage Timer, smallest time On, longest time Off, thus achieving a balancing of the loads. The order in which outputs turn on may appear random.

If any stage timer rolls over past 65535, then all of the timers are reinitialized to zero. If Timer Units is minutes, then the Stage timers increment at the minute mark.

Operation - Type 2, Rotate

Encode Type 2, Rotate, may be used to even out the run times of multiple stages by rotate the stages. Only the Stages up to Max Number are used.
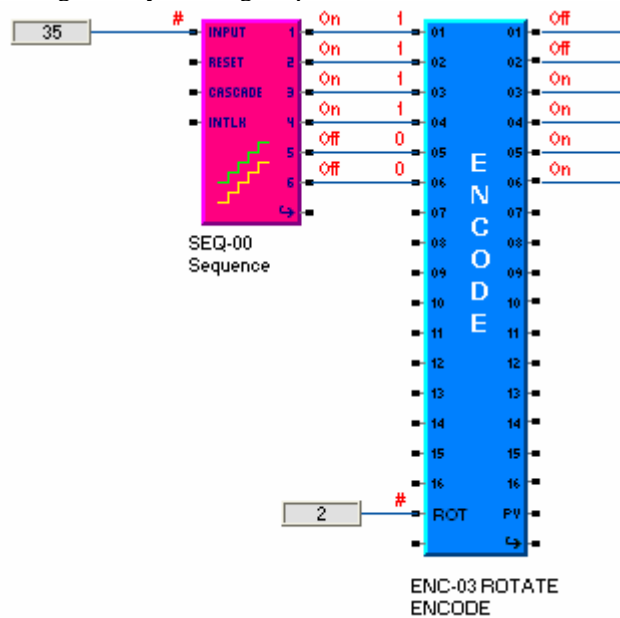
With Max Number 6 and a Rotate Handle value of 2,

            Stage 1 -> Output 3,

            Stage 2-> Output 4

            Stage 3-> Output 5

            Stage 4-> Output 6

            Stage 5-> Output 1

            Stage 6-> Output 2

If Rotate Reverse is Yes, then the outputs would rotate in the other direction.

Glossary

Encode Parameters

Encode Action

Encode Action 1 clears all Stage Timers. (35,x,4,WORDU) (FW7/854a2.3)

Encode Index Enable

Enables the instance for operation. (35, X, 26, Bit 0) ENC_IndexEnable

Encode Type

The Encode Type determines the operation of the Encode object.
0 = FIFO; 1 = Load Balance, 2 = Rotate (35, X, 26, HI BYTE) (FW7/854a2.3)
ENC_EncodeType

Max Number

The Maximum Number of stages that can be On at any one time. For Rotate, is the maximum number of Stages (bits) that will be shifted. (FW7/854a2.3)

 (35, X, 28, LOByte) ENC_MaxNumber

Request Count

For Encode Type 1, Load Balance the number of enabled requested stages are counted. (35, X, 6, WORDU) (FW7/854a2.3) ENC_RequestCount

Rotate Handle

For Encode Type 2, Rotate, the Rotate Handle gets the number of positions to shift the outputs. Positive shifts to increasing output number. Negative shifts to decreasing output number. If the Rotate Handle is Special, then the Rotate Constant shows the value.(35, X, 30-31 ,DBL_WORD) (FW7/854a2.3) ENC_RotateHandle, ENC_RotateHandleNamd, ENC_RotateConstant

Rotate Reverse

For Encode Type 2, Rotate, if Rotate Reverse is set . positive shifts to decreasing and negative shifts to decreasing output number. . (35, X, 26, LO Bit 1) (FW7/854a2.3) ENC_RotateReverse

Stage Enable

Stage Enable causes the Stage Handle to be examined . . If the value returned by the handle is non-zero then the **Stage Request** bit is set. (35, X, 27, Bit 0..15) ENC_Stage01Enable, .., ENC_Stage16Enable

Stage Handle

Points at the binary value to be used for each stage. If the value returned by the handle is non-zero then the **Stage Request** bit is set. 0 = Off, non-zero = On.

(35, X, 32, 4BYTES) ENC_Stage01Handle

…

(35, X, 62, 4BYTES) ENC_Stage16Handle

Stage n Handle

An binary value used to determine if stage n is requested to be on. (35, X, 32..63 ,DBL_WORD)

Stage Request Status

A word value which indicates the state of each of the 16 possible stage requests as bit values. (35,X,1,Bit 0 .. 15) ENC_Stage01Request .. ENC_Stage16Request

Stage Status

 If stage enabled, depending on the order in which request are made up to some maximum number of stages, may be ON. Stages are turned on in the order they are received and turn off immediately when the Stage request goes off, (35,X,0,Bit 0..15) ENC_Stage01Status, …, ENC_Stage16Status

Stage Timer

If stage enabled, a timer is started when the stage request goes true, and the number of stages requested is greater than the maximum number of stages allowed.
(35,X, 10..25, WORD) ENC_Stage01WaitTimer, …, ENC_Stage16WaitTimer

Stages Active

When each stage is requested, if the number Stages Active is less than the Maximum Number, then it comes on immediately. (35, X, 3, Bit 0..15) ENC_StagesActive

Timer Units

For Encode Type 1, Load Balance, the Stage Timers count once a second unless Timer Units is minute. Then they count if they are on at the minute mark.
0=sec, 1=min (35, X, 26, LO Bit 2) (FW7/854a2.3) ENC_TimerUnits

Wait Status

If a stage is requested and waiting to start the Wait Status bit is set. (35, X, 2, Bit 0..15) ENC_WaitStatus

Encode Properties

The ENCODE Object allows staging of binary outputs based on an analog value. The ENCODE object defines the present values and setup parameters used by the control block.

ENCODE (i,j)

Object Number	= 36
Data Type	= Word
Index	= As allocated
Attribute	= 0..63
DYNAMIC Attributes	= 26 (0..25 (FW740C..)
STATIC Attributes	= 38 (26..63) (FW740C..)

Encode Firmware Revision

ASIC/2-7540 FW854A Rev 2.3 2008-01 29
ASIC/2-7540 FW754A Rev 2.3 2008-01 29
o   Adds Encode Type: 0, FIFO; 1, Load Balance; 2, Rotate
o   Add Rotate Handle, Rotate Reverse
o   Timer Units, Request Count

ASIC/2-7540 FW754A Rev 1.0 2005-08-10
o   As in FW740E.

ASIC/2-7040 FW740C Rev 1.0 Released 1997-01-29
o   New object 35, Encode/FIFO (First In First Out)

Encode DYNAMIC Properties

Attr-0   Present Value Stage Status
    Attr-0 LO Byte Stage n On Status
        LO Bit 0 - **Stage 1 On**
        LO Bit 1 - **Stage 2 On**
        LO Bit 2 - **Stage 3 On**
        LO Bit 3 - **Stage 4 On**
        LO Bit 4 - **Stage 5 On**
        LO Bit 5 - **Stage 6 On**
        LO Bit 6 - **Stage 7 On**
        LO Bit 7 - **Stage 8 On**

    Attr-0 HI Byte Stage n On Status
        HI Bit 0 - **Stage 9 On**
        HI Bit 1 - **Stage 10   On**
        HI Bit 2 - **Stage 11 On**
        HI Bit 3 - **Stage 12 On**
        HI Bit 4 - **Stage 13 On**
        HI Bit 5 - **Stage 14 On**
        HI Bit 6 - **Stage 15 On**
        HI Bit 7 - **Stage 16 On**

Attr-1 Stage Request Status

 LO Byte -
        LO Bit 0 - **Stage 1 Request**
        LO Bit 1 - **Stage 2 Request**
        LO Bit 2 - **Stage 3 Request**
        LO Bit 3 - **Stage 4 Request**
        LO Bit 4 - **Stage 5 Request**
        LO Bit 5 - **Stage 6 Request**
        LO Bit 6 - **Stage 7 Request**
        LO Bit 7 - **Stage 8 Request**

Attr-1 HI Byte

      HI Bit 0 - **Stage 9 Request**
      HI Bit 1 - **Stage 10 Request**
      HI Bit 2 - **Stage 11 Request**
      HI Bit 3 - **Stage 12 Request**
      HI Bit 4 - **Stage 13 Request**
      HI Bit 5 - **Stage 14 Request**
      HI Bit 6 - **Stage 15 Request**
      HI Bit 7 - **Stage 16 Request**

Attr-2   Wait Status

      LO Bit 0 - **Wait 1 Status**
      LO Bit 1 - **Wait 2 Status**
      LO Bit 2 - **Wait 3 Status**
      LO Bit 3 - **Wait 4 Status**
      LO Bit 4 - **Wait 5 Status**
      LO Bit 5 - **Wait 6 Status**
      LO Bit 6 - **Wait 7 Status**
      LO Bit 7 - **Wait 8 Status**

      HI Bit 0 - **Wait 9 Status**
      HI Bit 1 - **Wait 10 Status**
      HI Bit 2 - **Wait 11 Status**
      HI Bit 3 - **Wait 12 Status**
      HI Bit 4 - **Wait 13 Status**
      HI Bit 5 - **Wait 14 Status**
      HI Bit 6 - **Wait 15 Status**
      HI Bit 7 - **Wait 16 Status**

Attr-3   **Stages Active** - The number of bits that are set.

Attr-4   **Encode Action** (FW7/854a2.3)
      0, No Operation
      1, Clear all Stage Timers

Attr-5 Encode Flags
      LoBit 0 – Index Enabled

Attr-6   **Request Count** (FW7/854a2.3)
Attr-7   Spare
Attr-8   Spare
Attr-9   Spare

Stage Timers

Start when request is made. Counts up 0 ..65535 seconds. For Encode Type 0, FIFO, Cleared when output actually comes on or when request is withdrawn.

Attr-10 **Stage 1 Timer**
Attr-11 **Stage 2 Timer**
Attr-12 **Stage 3 Timer**
Attr-13 **Stage 4 Timer**
Attr-14 **Stage 5 Timer**
Attr-15 **Stage 6 Timer**
Attr-16 **Stage 7 Timer**
Attr-17 **Stage 8 Timer**
Attr-18 **Stage 9 Timer**
Attr-19 **Stage 10 Timer**
Attr-20 **Stage 11 Timer**
Attr-21 **Stage 12 Timer**
Attr-22 **Stage 13 Timer**
Attr-23 **Stage 14 Timer**
Attr-24 **Stage 15 Timer**
Attr-25 **Stage 16 Timer**

Encode STATIC Properties

Attr-26 Setup

    Attr-26 LO Byte

        LO Bit 0 - **Index Enable**

            0 = No, Disabled; 1 = Yes, Enabled,

        LO Bit 1 – **Rotate Reverse** (FW7/854a2.3)

        LO Bit 2 – **Timer Units** 0=sec, 1=min (FW7/854a2.3)

        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-26 HI Byte **Encode Type** (FW7/854a2.3)

        0 = FIFO; 1 = Load Balance, 2 = Rotate

Attr-27 LO Byte Stage Enables

        LO Bit 0 - **Stage 1 Enable**

        LO Bit 1 - **Stage 2 Enable**

        LO Bit 2 - **Stage 3 Enable**

        LO Bit 3 - **Stage 4 Enable**

        LO Bit 4 - **Stage 5 Enable**

        LO Bit 5 - **Stage 6 Enable**

        LO Bit 6 - **Stage 7 Enable**

        LO Bit 7 - **Stage 8 Enable**

 Attr-27 HI Byte Stage Enables

        HI Bit 0 - **Stage 9 Enable**

        HI Bit 1 - **Stage 10 Enable**

        HI Bit 2 - **Stage 11 Enable**

        HI Bit 3 - **Stage 12 Enable**

        HI Bit 4 - **Stage 13 Enable**

        HI Bit 5 - **Stage 14 Enable**

        HI Bit 6 - **Stage 15 Enable**

        HI Bit 7 - **Stage 16 Enable**

Attr-28 LO Byte - **Max Number**

Attr-28 HI Byte - Spare

Attr-29 - Spare

Attr-30,31 **Rotate Handle** (FW7/854a2.3)

Stage Handles

The stage handle if enabled is used to identify when a stage is requested. If handle is set for object 0 (Invalid) then it returns zero.

Attr-32,33 **Stage 1 Handle**

Attr-34,35 **Stage 2 Handle**

Attr-36,37 **Stage 3 Handle**

Attr-38,39 **Stage 4 Handle**

Attr-40,41 **Stage 5 Handle**

Attr-42,43 **Stage 6 Handle**

Attr-44,45 **Stage 7 Handle**

Attr-46,47 **Stage 8 Handle**

Attr-48,49 **Stage 9 Handle**

Attr-50,51 **Stage 10 Handle**

Attr-52,53 **Stage 11 Handle**

Attr-54,55 **Stage 12 Handle**

Attr-56,57 **Stage 13 Handle**

Attr-58,59 **Stage 14 Handle**

Attr-60,61 **Stage 15 Handle**

Attr-62,63 **Stage 16 Handle**

Object 36 - Calendar

Calendar Summary

CDR-00
CALENDAR

The Calendar object works with clock to establish special days and Holidays in the controller.

An Active Special Day has been added to the Clock object to indicate the status of the special days. An existing flag indicates if it is a holiday. Active Special Day has been added to the Time, MT=0x38, and TimeDate, MT=0x3F, messages to indicate the current special day status.

Seven Special Day On and Off times have been added to the Schedule object, to be used if the indicated special day is active.

Periodically all instances of the calendar are examined by clock. If all of its conditions have been satisfied, then the instance is active, and the present value has the appropriate special day flag set. The holiday flag could be set also. The existing holiday schedule can also be used. A zero day, month, or year indicates any, " *".

If more than one are active, then the first one wins. There can be only one special day type active, and one holiday active.

Calendar Summary								
Instance Name	Enabled	Start Date	End Date	Frequen...	Range	Day Type	Holiday	Active?
New Years	Yes	01/01/****	**/**/****	Any	Any	None	Yes	No
President's	Yes	02/**/****	**/**/****	3rd	Mon	Sp-1	No	No
Memorial	Yes	05/**/****	**/**/****	Last	Mon	Sp-1	No	No
Back to School	Yes	08/01/2003	09/24/2003	Any	Any	Sp-2	No	No

Calendar Operation

A new calendar object is required to support the special days.

Periodically all instances of the calendar are examined by clock. If all of its conditions have been satisfied, then the instance is active, and the present value has the appropriate special day flag set. The holiday flag could be set also. The existing holiday schedule can also be used.

If more than one are active, then the first one wins. There can be only one special day type active, and one holiday active.

The conditions are between

1) **Start Date** and **End Date**, inclusive.
2) The proper **Frequency of Days**: any, the first,..., the last,
3) The matching **Range of Days** any, Mon,..., Sun, Hol, Mon-Fri, MWF, TuTh, Sat, Sun

Calendar Parameters

Start Date and End Date

Dates are specified MM/DD/YYYY, if any field is zero (*) it is a wild card and means ANY.(don't care)

A) Today must be >= Start Date and <= End Date to be in the Valid Range.
    Start and End dates are inclusive.
B) If No End Date, then it will be true forever after Start Date.
C) If No Start Date, then it will be true until End Date.
D) The first index evaluated wins.
E) Wild cards must be to the right 12/25/****, 12/**/****, **/**/****
F) Today must in a Valid Range before the Frequency and Range of Days is considered.
G) If year is **** then if Start Date > End Date then Valid period is over end of year.

01/**/**** means any January of any year.

If the End Date is 00/00/0000 it means from the Start Date onward. It is necessary to specify End Date.

If the year is 0000 and the start date is later than the end date it means across the year boundary.   12/27/**** to 01/02/****.

Frequency of Days

Last, Mon is Last Monday in May
        1 = 1st is day of week and 1..7
        2 = 2nd is day of week and 8..14

3 = 3rd is day of week and 15..23
                4 = 4th is day of week and 24..30
                5 = Last is day of week and
                        25..31 for months with 31 days
                        24..30 for months with 30 days
                        23..29 for months with 29 days
                        22..28 for months with 28 days
ASI Expert Class 53 = Frequency of Days
Value   0 = "Any" = "Any Day   "
         1 = "1st" = "First   "
         2 = "2nd" = "Second "
         3 = "3rd" = "Third"
         4 = "4th" = "Fourth "
         5 = "L" = "Last   "
         Else "N/A" = "N/A   "

Range of Days

ASI Expert Class 54 = Range of Days
Value   0 = "Any" = "Any Day   "
         1 = "MON" = "Monday   "
         2 = "TUE" = "Tuesday "
         3 = "WED" = "Wednesday"
         4 = "THU" = "Thursday "
         5 = "FRI" = "Friday   "
         6 = "SAT" = "Saturday "
         7 = "SUN" = "Sunday   "
         8 = "HOL" = Holiday
         9 = "Every" = "Everyday"
         10 = "M-F" = "Mon-Fri"
         11 = "S-S" = "Sat Sun",
         12 = "MWF" = MonWedFri"
         13 = "T T" = "Tue Thu"
         Else "N/A" = "N/A   "

Special Day Type

The Special Day Type identifies type special day for the particular calendar event:
0=Normal, 1=Special 1, 2=Special 2, ..., 7=Special 7. Normal is used to identify a
calendar event which is only a normal holiday.

ASI Expert Class 55 = Special Day Type
Value   0 = "Norm" = "Normal   "
         1 = "Sp-1" = "Special 1"
         2 = "Sp-2" = "Special 2"
         3 = "Sp-3" = "Special 3"
         ...
         7 = "Sp-7" = "Special 7"
         Else "N/A" = "N/A   "

Calendar Properties

The Calendar Object allows defining special days and holidays by specifying a start and end date, a frequency and a range of days. The Calendar object defines the present values and setup parameters used by the control block.

```
Calendar()
Object Number        = 36
Data Type            = Word
Index                = As allocated
Attribute            = 0..18
DYNAMIC Attributes   = 5 (0..4 (FW740C..)
STATIC Attributes    = 14  (5..18) (FW740C..)
```

Calendar Firmware Revision

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005
o   As in FW740E.

ASIC/2-7040 FW740C Rev 2.0 Released 1998-06-05
ASIC/2-8040 FW840C Rev 1.0 Release 1998-06-05
o   Calendar Range of Days has been fixed. Every is the Same as Any.

ASIC/2-7040 FW740C Rev 1.9 Released 1998-04-15

o   Update Calendar so that it will work correctly using wild cards for month and year

Rules
   A) Today must be >= Start Date and <= End Date to be in the Valid Range.
       Start and End dates are inclusive.
   B) If No End Date, then it will be true forever after Start Date.
   C) If No Start Date, then it will be true until End Date.
   D) The first index evaluated wins.
   E) Wild cards must be to the right 12/25/****, 12/**/****, **/**/****
   F) Today must in a Valid Range before the Frequency and
       Range of Days is considered.
   G) If year is **** then if Start Date > End Date then Valid period is over
       end of year.

ASIC/2-7040 FW740C Rev 1.2 Release 1997-05-07
o   Attr-7, Start Year now full word. 1997…2025…
           Attr-8, End Year now full word. 1997…2025…
           Fixes problem with Calendar events that span year.

ASIC/2-7040 FW740C Rev 1.0 Released 1997-01-29
o   New object 36, Calendar

Calendar DYNAMIC Properties

Attr-0 Present Value
          LOLSNBL - **Active Special Day** (0..7)
                    set when all conditions are met.
          LObit 4 Spare
          LObit 5 **Holiday**
          Lobit6 Spare
          Lobit7 Spare

Attr-1 Spare
Attr-2 Calendar Status
          LO Bit 0 **Calendar Active**
          LO Bit 1 **Calendar Override**
Attr-3 Spare
Attr-4 **Calendar Action**
          1 - Set Active Special Day = 1
          2 - Set Active Special Day = 2
          3 - Set Active Special Day = 3

4 - Set Active Special Day = 4
5 - Set Active Special Day = 5
6 - Set Active Special Day = 6
7 - Set Active Special Day = 7
8 - Set Holiday
9 - Clear Special Day and Holiday, Attr-0
10 - Clear Dynamic Override
11 - Set Override Enable
12 - Clear Override Enable

Calendar STATIC Properties

Attr-5 Enables
        Lobit0 = **Calendar Index Enable** Yes, No
        Lobit1 = **Calendar Holiday Enable** Yes, No
        Lobit2 = **Calendar Override Enable**, Yes, No
        Lobit3 = Spare
        LOMSNBL = **Special Day Type**
                0=Normal, 1=Special 1, 2=Special 2, ..., 7=Special 7
        HI Byte = Spare

Attr-6   Start Date
      LO Byte = **Start Day**, DD
      HI Byte = **Start Month**, MM

Attr-7 **Start Year** - YYYY, 1997 ..2055

Attr-8 End Date
      LO Byte = **End Day**, DD
      HI Byte = **End Month**, MM

Attr-9 **End Year** - YYYY, 1997 ..2055

Attr-10 Frequency & Range
        LO Byte = **Frequency of Days**
                0=Any, 1=First, 2=Second, 3=Third, 4=Fourth, 5=Last
        HI Byte = **Range of Days**
                0=Any, 1=Mon, 2=Tue, 3=Wed,
                4=Thur, 5=Fri, 6=Sat, 7=Sun,
                8=Hol, 9=Every, 10=Mon-Fri, 11=Sat-Sun,
                12=MWF, 13=TuTh

Attr-11...18 **Calendar Name** 16 characters

Other Object Operation

Clock Operation

Special Days: With FW740C flags for three special days have been added to the clock object. Only one of these flags can be set. If Special Day Calendar is enabled then the clock will examine all indices of object 36, Calendar, to see if any special days or holidays is active. If any of these three days is enabled, and active in the calendar, then the special day is set in the clock.

If Special Day Calendar is not enabled in the clock object, the special day flags may be set with communication using a MT=3Fh message.

Protocol Changes

MT=0x38, Synchronize Clock

Message body:
        M1 = Day of Week
                LSNBL = Day, 01...07 where 1 = Monday
                bits4,5,6 - Special Day Status (0..7)
                bit 7 = Holiday
        Response: ACK

MT=0x3F, M1 = 01 Set Real Time Clock

Message body:
        M9 = Day of Week
                LSNBL = Day, 01...07 where 1 = Monday
                bits4,5,6 - Special Day Status (0..7)
                bit 7 = Holiday
        Response: ACK

Schedule Operation

Special Days: With FW740C seven special days and a 16 character description have been added to schedule. Enable Flags have been added for these special days.

If any of these Special 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.

Zero Time: In earlier versions a time value of 0 was considered to be disabled. With FW740C an index enable, Attr-14 LObit 0, is added. A time value of 0 of On or Off represents midnight at the beginning of the day. If something starts at midnight and runs until 5 AM the On time would be 00:00 and the Off time would be 05:00.

Optimum Start Operation

Optimum Start is enhanced to look for Special Day and Holiday flags in the clock to determine the Optimum Start period.

Object 37 - Notify

Introduction - Notify

NOT-00
Point
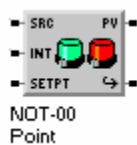
The 37-Notify object is used for event and alarm notification within a controller and between controllers on an ASI Network. An Event is a detectable occurrence which can be identified and reported. An alarm is a type of event which reports an abnormal condition.

The 37-Notify object has the following functions:

1)   To generate notify events updating alarm status, present value, and time stamps.

2)   To interlock notify events based on delayed start and stop timers, interlocks, etc.

3)   To post the notify events to a Notify Log on a controller at a Notify Destination, which can be itself.

The 38-Notify Log object has the following functions:

1)   To log the latest notify events from all controllers on the ASI network including itself.

2)   To be the source for the Dial-manager which will annunciate the Notify Events posted to the Notify Log.

The notify type identifies how the notify event is to be processed. The notify object has the following notify types:

1)   Point (Existing 300B/740E/840E)

2)   Deviation (New 300B2.0/740E2.0/840E2.0)

3)   Change of State (New 300B2.0/740E2.0/840E2.0)

4)   Object Alarms (New 300B2.0/740E2.0/840E2.0)
     Input , PID, or Poll List

Generating Events

If the **Notify Type** is Point, the **Source Handle** is used to get the current value of the variable to be used to generate the notify event when the present value is compared with the Alarm Setpoints.

If the **Notify Type** is Deviation, the **Source Handle** is used to get the current value of the variable to be used to generate the notify event when the present value is compared with the Active Setpoint value provided by the Setpoint Handle.

If the **Notify Type** is Point or Deviation and **Change of Value Enable** is Set, COV, the **Source Handle** is used to get the current value of the variable to be used to generate the COV HI or LO event when the present value changes by the COV Threshold.

If the **Notify Type** is Change of State, COS, the **Source Handle** is used to get the current value of the variable to be used to generate the COS event when the present value changes.

If the **Notify Type** is Object, the **Source Handle** is used to identify the object and instance that has the data for present value and notify alarms. Object Notify Types will be generated for Input, PID, Poll List, .

Notify Status shows HI, LO, HIHI, LOLO, COS, COV HI, COV LO or Fault Events.

Interlocking Events

The Notify Events can be locked out based on Delayed Start or Stop, or the condition of an interlock handle.

Posting Events

The **Notify Event Number** and **Notify Group**, and **Notify Message** identify which event is being reported. The **Notify Priority** indicates how serious the event is. The Dial Manager can be set up to report events which have a certain priority number.

On any change of Notify Status, the updated Notify Status, Changed Status, Time Stamps, Notify Name, Notify Group, Priority, and Event Number will be posted to the Notify Log indicated by the **Notify Destination**. The Notify Destination may be itself, an individual controller, or a Global Address (5A70h). If **Post Self Enable** is yes, then it will always post to itself, as well as the notify destination.

The controller with the Notify Event will transmit the Notify Log entry using a MT=92 message to the Notify Log object. The Notify Log will post the data to the next available entry in the Notify Log. The current **Notify Log Pointer**, is kept in the System Object.(SYS-0 Attr-2 LO Byte), The Notify Log is as allocated and can have up to 255 instances.

Dial-out Notification

A **New Notify Event** , SYS-0 Attr-3 LoBit2, will be set indicating that a new entry has been received.

On New Notify Event, the enhanced Dial Manager object will examine the Notify Log for any un-transmitted items which need to be sent. Each Dial Manager will be assigned a Dial Manager Group and **Dial Authority** and **Dial Authority 2**. The dial manager will be responsible for sending any notification for its group, that equals or exceeds the dial priority. Up to 4 different Dial Managers with different dial authorities can be identified for a group.

Each Dial Manager will mark the Notify Log when it has succeeded in completing its notification. The dial managers may be interlocked against schedules, so that different Dial Managers can be assigned to a group at different times.

Notify Repeat Feature

Notifications that are still active after a **Repeat Time** are sent again. If Repeat Enable is yes, then a **Repeat Timer** in 15 minute increments is loaded whenever there is a change in the notification event. When the Repeat Timer is satisfied, then the last notification is re-sent. (FW7/840E2.1)

Notify Retry Feature

To assure that notifications sent from one controller to another are received and acknowledged, if the Notify Destination address is a specific controller, then notify expects an acknowledge message in response. If it does not get it tries three times, and retries until the **Retry Count** reaches 9 times. (FW7/840E1.6)

Point

Device Address: 32103 **Firmware:** 740e v2.0 Wed 1/03/01 16:46:11
Description: RPU-51B

[Send]

Point | Post

Enable Index: ☑ Yes	**Notify Type:** POINT
Notify Event Number: 4	**Notify Group:** 4

Active Time: 13:20:5:
Inactive Time: 8:33:34

Notify Message: NOT-04 PT-COV **Active Date:** 01/03/2001
Instance Name: NOT-04 PT-COV **Present Value:** 16097
Previous Value: 16097

Source Handle: INP-04-00-WD_VAL **Source Handle Name:** OAHU 51-2

Enable HIHI Alarm: ☑ Yes **HIHI Alarm Setpoint:** 350 **Notify Status Hex:** 305h
Enable HI Alarm: ☑ Yes **HI Alarm Setpoint:** 300 **Changed Status Hex:** 10h
Enable LO Alarm: ☑ Yes **LO Alarm Setpoint:** 200 **High Low Alarm:** HI Alarm
Enable LOLO Alarm: ☑ Yes **LOLO Alarm Setpoint:** 150 **HIHILOLO Alarm:** HI Alarm
Alarm Hysteresis: 0

Enable COV Event: ☑ Yes **COV Threshold:** 20 **COV Event:** OK
Enable Interlock Handle: ☐ No **Delay Start Enable:** ☐ No **Delay Stop Enable:** ☐ No

PostSelfEnable: ☑ Yes **Notify Destination:** 32100 **Notify Priority:** 83
No Data Value Enable: ☐ No **No Data Display:** No
Value Type Display: Unsigned Numerical **Value Data Type:** Unsigned Value*0.1

ASIC/2-7040 Configuration View (ASI Controls, 1998) ●●

If the **Notify Type** is Point, the **Source Handle** is used to get the **Present Value** of the variable to be used to generate the notify event.

The Present Value is compared with the Alarm Setpoints. If the setpoints are not enabled, then the comparison is ignored.

If any of the Alarms are enabled, and **Enable Index** is Yes, then the **Event Enabled** is set to yes. If any of the Alarm Statuses are active then **Event Active** is Yes. Any change in the Alarm Statuses is a new notify event. **Changed Status** identifies which conditions have changed since the last notification. For example, both LO and LOLO Alarm may have cleared by the time the delay stop timer has cleared.

If not already in LO Alarm and if the Present value is less than the **LO Alarm Setpoint**, the Delay 1 Timer is started with the **Delay Start Time**. If the condition persists when the Delay 1 Timer is satisfied, then the LO Alarm Status is set. If the condition is removed before the Delay 1 Timer is satisfied, then the LO Alarm Status is not set, and the Delay 1 Timer is cleared.

If the LO Alarm Status is Yes, and if the Present value is greater than the LO Alarm Setpoint plus the **Alarm Hysteresis** , the **Delay 1 Timer** is started with the **Delay Stop Time**. If the condition persists when the Delay 1 Timer is satisfied, then the LO Alarm Status is cleared. If the condition returns before the Delay 1 Timer is satisfied, then the LO Alarm Status is not cleared, and the Delay 1 Timer is cleared.

The LO LO Alarm behaves similarly except that it uses the **LOLO Alarm Setpoint**, and the **Delay 2 Timer**

The HI Alarm behaves similarly except that it uses the **HI Alarm Setpoint**, and the **Delay 3 Timer**

The HI HI Alarm behaves similarly except that it uses the **HIHI Alarm Setpoint**, and the **Delay 4 Timer**

Present Value

The **Value Data Type** is passed to the Notify Log and is used to identify the final units for display of the Present Value in the Dial Manager Notify Message.

Change of Value

Change of Value is a feature of the Point and Deviation Notify Type. New 300B2.0/740E2.0/840E2.0

If **Enable COV Event** is yes, then the **Present Value** is compared with the **Previous Value.**

If the Present Value is greater than the Previous Value plus the **COV Threshold,** then the **COV HI Event** is set, and the Present Value is copied to the Previous Value.

If the Present Value is less than the Previous Value minus the **COV Threshold,** then the **COV LO Event** is set, and the Present Value is copied to the Previous Value.

Deviation

If the Notify Type is Deviation, the Source Handle is used to get the Present Value of the variable to be used to generate the notify event. (New 300B2.0/740E2.0/840E2.0)

The Present Value is compared with **Setpoint Value** that is provided by the Setpoint Handle plus or minus the appropriate Alarm Setpoint. If the setpoints are not enabled, then the comparison is ignored.

Enable LOLO Alarm	Setpoint Value - LOLO Alarm Setpoint
Enable LO Alarm	Setpoint Value - LO Alarm Setpoint
Enable HI Alarm	Setpoint Value + HI Alarm Setpoint
Enable HIHI Alarm	Setpoint Value + HIHI Alarm Setpoint
	Alarm Hysteresis
LO Alarm Status	Delay 1 Timer
LO LO Alarm Status	Delay 2 Timer

| HI Alarm Status | Delay 3 Timer |
| HIHI Alarm Status | Delay 4 Timer |

If **Enable COV Event** is yes, then the **Present Value** is compared with the **Previous Value.**

If the Present Value is greater than the Previous Value plus the **COV Threshold,** then the **COV HI Event** is set, and the Present Value is copied to the Previous Value.

If the Present Value is less than the Previous Value minus the **COV Threshold,** then the **COV LO Event** is set, and the Present Value is copied to the Previous Value.

The deviation alarms are otherwise determined in the same way that the Point alarms are determined.

Change of State

Change of State	Post

Enable Index:	☑ Yes		Notify Type:	COS	
Notify Event Number:	6		Notify Group:	6		Active Time:	8:33:36
					Inactive Time:	8:33:34
Notify Message:	NOT-06 COS			Active Date:	01/03/2001
Instance Name:	NOT-06 COS			Present Value:	5
				Previous Value:	5
Source Handle:	UTL-01-06-WD_VAL		Source Handle Name:	UTL-01
			Notify Status Hex:	300h
Enable COS Normal:	☑ Yes	COS Normal State:	1	Change Of State Event:	No

Enable Interlock Handle:	☐ No	Delay Start Enable:	☐ No	Delay Stop Enable:	☐ No
PostSelfEnable:	☑ Yes	Notify Destination:	32166	Notify Priority:	83
No Data Value Enable:	☐ No			No Data Display:	No
Value Type Display:	Unsigned Numerical		Value Data Type:	Unsigned Value*0.1

ASIC/2-7040 Configuration View (ASI Controls, 1998) ●●

If the **Notify Type** is **Change of State**, the **Source Handle** is used to get the **Present Value** of the variable to be used to generate the notify event. (New 300B2.0/740E2.0/840E2.0

If **Enable COS Normal** is yes, then the **COS Normal State** , Attr-37 is used to identify the return to normal condition.

COS Normal State (signed) .Used to identify when the state has returned to the inactive condition when Enable COS Normal is yes. Both the current active alarm time and inactive alarm time are updated on return to normal. Attr-37 (New 300B2.0/740E2.0/840E2.0)

The **Present Value** is compared with the **Previous Value.** If the Present Value is different from the Previous Value**,** then the **COS Event** is set, and the Present Value is copied to the Previous Value.

This is always immediate with out delay. The COS Event will persist only long enough to be posted to the event log.

Object Notify

The Object Alarms will get their alarm status information from the object which is pointed to by the Source handle. Input, PID, and POLL List are defined. If the source handle points at any other object, then the Notify Type Object is inactive. (New 300B2.0/740E2.0/840E2.0)

```
Object | Post |

Enable Index: ☑ Yes              Notify Type: OBJECT
Notify Event Number: 7           Notify Group: 0              Active Time: 8:33:37
                                                           Inactive Time: 8:33:34
Notify Message: NOT-07 Input                  Active Date: 01/03/2001
Instance Name: NOT-07 Input                  Present Value: 16097
Source Handle: INP-04-00-WD_VAL    5          Previous Value: 0
Source Handle Name: OAHU 51-2                Notify Status Hex: 301h
Enable HIHI Alarm: ☑ Yes                    Changed Status Hex: 1h
Enable HI Alarm: ☑ Yes
Enable LO Alarm: ☑ Yes                        High Low Alarm: HI Alarm
Enable LOLO Alarm: ☑ Yes                      HIHILOLO Alarm: OK
Enable Fault Alarm: ☑ Yes      Fault Alarm: OK
Notify INP gets its alarms from the Input Object.

Enable Interlock Handle: ☐ No   Delay Start Enable: ☐ No    Delay Stop Enable: ☐ No
PostSelfEnable: ☑ Yes           Notify Destination: 0        Notify Priority: 0
No Data Value Enable: ☐ No                                  No Data Display: No
Value Type Display: Unsigned Numerical      Value Data Type: Unsigned Value*0.001

ASIC/2-7040 Configuration View (ASI Controls, 1998)            ●●
```

Source Handle = Input

If the Notify Type is Object, and the Source Handle points to the Input object, then the Source Handle is used to indicate which instance of the input object is used to obtain the alarm information. All further information is obtained from the Input object.

INP_PresentValue	NOT_PresentValue
INP_FaultStatus	NOT_FaultAlarm
INP_LowAlarmStatus	NOT_LowAlarm
INP_HighAlarmStatus	NOT_HighAlarm
INP_LowLimitFault	NOT_LOLOAlarm
INP_HighLimitFault	NOT_HIHIAlarm

Source Handle = PID

If the Notify Type is Object, and the Source Handle points to the PID object, then the **Source Handle** is used to indicate which instance of the PID object is used to obtain the alarm information. All further information is obtained from the PID object.

PID_LowControlAlarm	NOT_LowAlarm
PID_HighControlAlarm	NOT_HighAlarm
PID_VerifyAlarm	NOT_FaultAlarm
PID_DriveAlarm	NOT_FaultAlarm
PID_ControlSP	NOT_SetpointValue
PID_ControlInput	NOT_PresentValue

Source Handle = Poll List

If the Notify Type is Object, and the Source Handle points to the Poll List object, then the **Source Handle** is used to indicate which instance of the Poll List object is used to obtain the alarm information. All further information is obtained from the Poll List object.

POL_Alarm1Low	NOT_LowAlarm
POL_Alarm1High	NOT_HighAlarm
POL_CommError	NOT_FaultAlarm
POL_DataByte1	NOT_PresentValue

Only those alarms that are enabled will be reported. Attr-35 LO bit0 Enable HI Alarm, LO bit1 Enable LO Alarm, LO bit7 Enable Fault Alarm.

Interlocks

Interlock Handle

The Notify Events can be conditioned base on the condition of an **Interlock Handle** which returns an **Interlock Value**. For example, notify events associated with an AHU can be locked out when the fan is off and for a Delayed Start period after the fan starts using the Interlock Handle

If the **Enable Index** is yes and **Enable Interlock** is yes, then the **Interlock Value** returned by the **Interlock Handle** is examined. If it is zero, then **Event Enabled** is set to no, and no events are calculated or reported, and **Lockout Status** is set to yes. If it is non-zero then **Event Enabled** is set to yes, and normal event processing is done, and **Lockout Status** is set to no.

Delayed Start/Stop

If Delayed Start or Stop Enable are yes, then timers are used for the LO LOLO, HI, and HIHI Alarms. Delayed start timers are reloaded as needed when the Interlock Value goes true.

Posting Events

Enable Index: ☑ Yes	Notify Type: DEV	Notify Priority: 83
Notify Event Number: 5	Notify Group: 5	Active Time: 13:20:53
Notify Message: NOT-05 DEV		Inactive Time: 8:33:34
Instance Name: NOT-05 DEV		Active Date: 01/03/2001
PostSelfEnable: ☑ Yes	Notify Destination: 32103	Active Date YYYY: 2001
	7D67h	Action: 0
Event Enabled: Yes		
New Event: No		
DO Notify: No		
Posting Complete: No		
Notify Status Hex: 4305h	Present Value: 16097	NOT_ACK: No
Changed Status Hex: 10h	Previous Value: 16097	Notify DELAY: No
		Notify RETRY: No
		Retry_Count: 0
Event Active: Yes		Retry_Timer: 0
Event Acknowledged: No		

ASIC/2-7040 Configuration View (ASI Controls, 1998)

When any of the notify conditions are set then the **Event Active** is set to yes. At the point when an alarm or event becomes active or changes its active condition, the **Active Date and Time** is recorded in the Notify object.

When all of the notify conditions are cleared then the Event Active is set to no. When the Notify condition becomes Inactive indicating there are no events, then the **Inactive Time** and Date are recorded in the Notify object.

At reset of power, if notify conditions are active, then the present time and date is written to the Active Date, and Active Time. At reset of power, if no notify conditions are active, then the present time and date is written to the Active Date, and Inactive Time.

The **Notify Event Number** and **Notify Group**, and **Notify Message** identify which event is being reported. The Notify Event Number identifies a particular event 0..255 and is not related to index number. **Notify Groups** is used by the Dial Manager to determine who gets which notifications and can be related to a specific process, or an area of responsibility The Notify Message is a 20 character string.

The **Notify Priority** indicates how serious the event is. The Dial Manager reports events where the Notify Priority >= Dial Manger Priority.

Notify Destination

On any change of Notify Status, the updated Notify Status, Changed Status, Time Stamps, Notify Name, Notify Group, Priority, and Event Number are posted to the Notify Log indicated by the **Notify Destination**. The Notify Destination identifies where the notification is to be sent and may be itself, an individual controller, or a Global Address (5A70h). A special global Notify Destination 23264 (0x5AE0) is used to forward notify messages to the ASI EtherLink.

Notify messages sent to Global or Group addresses are sent only three times.

If **Post Self Enable** is yes, then it will always post to itself, as well as the Notify Destination. (FW740E1.9,840E1.9,300B1.9)

Retries

With FW740E 1.6 and 840E 1.6 the ASIC/2 controller which is sending a notification to a specific Destination Address will expect an acknowledgement message and retry up to 9 times if it does not get one. This is not implemented in the SINC/3. Global notifies will be sent just three times.

> Caution: If there are multiple notifies, and if the destination controller is off-line, this will generate multiple notify messages.

Notify messages sent to a specific Device Address try to get a message acknowledgement until the **Retry Count** reaches 9**. Notify Acknowledge** shows that the message has been acknowledged. **Notify Retry** indicates that it is in retry. **Notify Delay** indicates that the Notify Retry Timer is running and waiting.

Changed Status

The **Changed Status** is used to identify the specific condition or conditions that have changed.

The controller with the Notify Event will post the message at its next token-hold time, or if in non-token mode, at the next gap in communications.

The Post Status Flags are used to keep track of whether the event has been properly posted. A **New Event** flag in the System object is set indicating that a new entry has been received. A **Posting Complete** flag is set and **New Event** is cleared when the posting has been complete.

Notify Log

The controller with the Notify Event will transmit the Notify Log entry using a MT=92 message to the Notify Log object. The Notify Log will post the data to the next available entry in the Notify Log. The Notify Log is as allocated and can have up to 255 instances.

The following data is transmitted from the Notify object to the Notify Log:

Notify Dynamic Data	Notify Log
Attr-0..8	Attr-0..8
NOT_EventActive	NLG_EventActive
NOT_EventEnabled	NLG_EventEnabled
NOT_EventAckd	NLG_EventAckd
NOT_EventAckRequired	NLG_EventAckRequired
NOT_LockoutStatus	NLG_LockoutStatus
NOT_HILOAlarm	NLG_HILOAlarm
NOT_HIHILOLOAlarm	NLG_HIHILOLOAlarm
NOT_COVEvent	NLG_COVEvent
NOT_COSEvent	NLG_COSEvent
NOT_FaultAlarm	NLG_FaultAlarm

NOT_ActiveDateMMDDYY	NLG_ActiveDateMMDDYY
NOT_ActiveTimeHH:MM:SS	NLG_ActiveTime
NOT_InactiveTimeHH:MM:SS	NLG_InactiveTime
NOT_Present Value	NLG_Present Value
Notify Static Data	**Notify Log**
Attr-20..33	**Attr-9..22**
NOT_NotifyGroup	NLG_NotifyGroup
NOT_NotifyEventNumber	NLG_NotifyEventNumber
NOT_NotifyPriority	NLG_NotifyPriority
NOT_ValueDataType	NLG_ValueDataType
NOT_NotifyMessage	NLG_NotifyMessage
NOT_SourceHandle	NLG_SourceHandle
	Attr23-
SRC ADDR	NLG_NotifySourceAddr

Notify Actions

There are several actions defined for the Notify Object:

0 - No-operation
1 - Notify Now
2- Acknowledge this event.
3- Acknowledge all events this controller
4- Refresh all events now.

Notify Retry Feature

With FW7/840E1.6 a notify retry feature has been added to assure that notifications sent from one controller to another are received and acknowledged. If the Notify Destination address is a specific controller, then notify expects an acknowledge message in response. If it does not get it tries three times, and retries until the **Retry Count** reaches 9 times. **Notify Retry**, **Notify Acknowledge** and **Notify Delay** flags are used to keep track of the process. Notifies to group or global messages are only sent three times.

Note: If a Notify Destination controller is off line, this will generate a lot of messages on the system bus.

Notify Repeat Feature

With FW7/840E2.1 a notify repeat feature has been added so that notifications that are still active after a **Repeat Time** are sent again. If Repeat Enable is yes, then a **Repeat Timer** in 15 minute increments is loaded whenever there is a change in the notification event. When the Repeat Timer is satisfied, then the last notification is re-sent.

Notify Glossary

Active Time

Time Stamp for last active event. Attr-4,5 hh:mm:ss

Alarm Hysteresis

Used to determine the return to normal condition for alarms. Attr-44.

Change of Value Enable

In Point or Deviation Notify Type allows generate the COV HI or LO events when the present value changes by the COV Threshold.

Changed Status

identifies which conditions have changed since the last notification. Attr-1.

COS Normal State

.Used to identify when the state has returned to the inactive condition when Enable COS Normal is yes. Both the current active alarm time and inactive alarm time are updated on return to normal. Attr-37 (New 300B2.0/740E2.0/840E2.0) (signed)

COV Threshold

Identifies the change required to trigger a COV event. Attr-45.

Date Stamp

Shows date for latest Active or Inactive Event. MM/DD/YYYY, Attr-2,3

Delay 1,2,3,4 Timer

Used to delay start or stop of LO Alarm, LOLO Alarm, HI Alarm, and HIHI Alarm respectively.. Attr-13,14,18,19

Delay Start/Stop Time

Iif the Present value is less than the Low Alarm Setpoint, the Delay 1 Timer is started with the Delay Start Time. If the LO Alarm Status is Yes, and if the Present value is greater than the LO Alarm Setpoint plus the Alarm Hysteresis , the Delay 1 Timer is started with the Delay Stop Time. Attr-46,47

Delay Units

Identifies units for Delay Timers. 1= min, 0 = sec Attr-35 Hibit3.

Delayed Start/Stop Enable

Used to delay the reporting or clearing of events. If yes then delayed Start/Stop timers are used for LO, LOLO, HI, and HIHI Alarms. Attr-35 HiBit4,5

Enable COS Normal

If yes, then the COS Normal State , Attr-37 is used to identify the return to normal condition. Attr-35 LO bit6

Enable Index

Enables the instance of the Notify object. Attr-35, Hibit0

Enable Interlock

If enabled, then the Interlock Value returned by the Interlock Handle is examined. Attr-35 HIBit1

Event Active

 Indicates if any of the Alarm Statuses are active. Any change in the Alarm Statuses is a new notify event.

Event Enabled

Indicates that the Notify Event is enabled and not locked out.

Hi Alarm Setpoint

 For Notify Type Point , used to determine Hi Alarm Status. For Notify Type Deviation, subtracted from the Active Setpoint to determine Hi Alarm Status. Attr-41.

Hi Hi Alarm Setpoint

For Notify Type Point , used to determine Hi Hi Alarm Status. For Notify Type Deviation, subtracted from the Active Setpoint to determine Hi Hi Alarm Status. Attr-43.

Inactive Time

Time Stamp when event goes inactive. Attr-6,7 hh:mm:ss

Interlock Handle

Used to get the Interlock Value to lockout Notify Events. Attr-48,49

Interlock Value

Value returned by Interlock Handle. Attr-10.

Lockout Status

Indicates that a notify event is locked out by the Interlock.

Low Alarm Setpoint

For Notify Type Point , used to determine Low Alarm Status. For Notify Type Deviation, subtracted from the Active Setpoint to determine Low Alarm Status. Attr-40.

Low Low Alarm Setpoint

For Notify Type Point , used to determine LoLo Alarm Status. For Notify Type Deviation, subtracted from the Active Setpoint to determine LoLo Alarm Status. Attr-42.

No Data Display

: Suppresses the display of the data value in notification dial-outs. Set in the Notify Log when No Data Value Enable is yes. Atttr-0 HI bit 6   (740E2.0, 840E2.0,300B2.0)

No Data Value Enable

Suppresses the display of the data value in notification dial-outs. If enabled then No Data is set in the Notify Log. Attr-35 HIBit7 (740E2.0, 840E2.0,300B2.0)

Notify Action

Command for notify object. Reset to zero after executed: 0- No-operation, 1 - Notify Now, 2- Acknowledge this event, 3- Acknowledge all events this controller, 4- Refresh all events now. (Attr-12)

Notify Destination

Used to identify where the notification is to be sent. The Notify Destination may be itself, an individual controller, or a Global Address (5A70h).

Notify Event Number

Identifies a particular event 0..255 and is not related to index number. Attr-20, LO Byte.

Notify Group

Used by the Dial Manager to determine who gets which notifications. Can be related to a specific process, or an area of responsibility. Attr-20, HI Byte.

Notify Message

A 20 character text description of Notify Event. Attr-22..31

Notify Priority

indicates how serious the event is. The higher the priority the more serious the event. The Dial Manager reports events where the Notify Priority >= Dial Manger Priority. Attr-21, HI Byte.

Notify Status

shows HI, LO, HIHI, COS, COV HI, COV LO or Fault Events. Attr-0.

Notify Type

Identifies how the notify event is to be processed;
0 = Point (Existing 300B/740E/840E), 1 = Deviation (New 300B2.0/740E2.0/840E2.0), 2 = Change of State (New 300B2.0/740E2.0/840E2.0), 3= Object Alarms [INP, PID, POL] (New 300B2.0/740E2.0/840E2.0)

Post Self Enable

If set then notify will post to its own log in addition to sending notify message to Destination Address. (740E2.0, 840E2.0,300B2.0) Attr-35 HIBit6

Present Value

 returned by the Source handle and used to generate the notify event Attr-8.

Previous Value

Used by COV and COS event to determine when the value has changed. Attr-9

Retry Count

Attr-17 HIMSNBL (740E1.6, 840E1.6)

Retry Timer

Indicates that it is waiting to retry the notify message. Attr-17 HILSNBL(740E1.6, 840E1.6)

Notify Retry

Indicates that a notify message to a specific controller did not receive a response and is responding. Attr-17 LoBit1 (740E1.6, 840E1.6)

Notify Acknowledge

Indicates that a notify message to a specific controller has received a response. Attr-17 LoBit0 (740E1.6, 840E1.6)

Notify Delay

Attr-17 LoBit2 (740E1.6, 840E1.6)

Repeat Enable

Enables Repeat feature for notification. Attr-35 LO Bit5 (FW7/840E2.1)

Repeat Time

How long to wait before repeating notification. In 15 minute increments. Attr-38 HI BYTE (FW7/840E2.1)

Repeat Timer

If Event Active when timer satisfied, then repeats the notification. In 15 minute increments. Attr-15 HI BYTE (FW7/840E2.1)

Setpoint Handle

Used to get the Setpoint Value for the Notify Type, Deviation. Attr-50,51

Setpoint Value

Value returned by Setpoint Handle. Attri-11

Source Handle

Used to get the current value of the variable to be used to generate the notify event

Value Data Type

 Uses to format display Unsigned Numerical, Data Class 42.Attr-21 LOLSNBL

Value Type Display

 Uses to format display Unsigned Value*0.01, etc. to properly display scaling of the value. Data Class 41 Attr-21 LOMSNBL

Notify Properties

The Notify object defines the present values and setup parameters used by the controller to enable the different control blocks for FW740E and FW300B..

Notify

Object Number	= 37
Data Type	= Word
Index	= As allocated
Attributes	= 0..51
DYNAMIC Attributes	= 20 (0..19)
STATIC Attributes	= 32 (20.51)

Notify Firmware Revision

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005
o   As in FW740E.

SINC/3-3000 FW300B Rev 2.8g Released 12/24/2002 CHK 0xADC2
o   Increases Maximum Notify to 192 Instances
o   Fixed Ethernet Notify messages without rempote points
            or direct communication.

SINC/3-3000 FW300B Rev 2.2e 08/21/2001 CHK 0xDE50
o   Fixes Notify Log roll-over problem when self posting.
            Index 0 was posted twice.

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

o   Limits Notify Log to 128 indexes. Notify Log beyond 128 did not work.
o   Adds Notify Disable/Dial Manager Disable to System Object
            SYS Action 11 sets Notify Disable/Dial Manager Disable
            SYS Action 12 Clear clears Notify Disable/DialManager Disable
o   Adds Repeat to Notify so that Events are repeated if still active.
                    Notify Repeat Enable, Attr-35 LOBit5,
                    Repeat Time Attr-38 HI BYTE, (15 minute increments)
                    Repeat Timer Attr-15 HI BYTE (15 minute increments)
o   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.

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
o   Adds Repeat to Notify so that Events are repeated if still active.
            Notify Repeat Enable, Attr-35 LOBit5,
            Repeat Time Attr-38 HI BYTE, (15 minute increments)
            Repeat Timer Attr-15 HI BYTE (15 minute increments)
o   Adds Notify Disable SYS Attr-10, HIBit5
            to System Object. These are now set when allocation is changed, so that
            when the allocation is change, Notifies are not sent
            until the configuration has been restored.

ASIC/2-8040 FW840E Rev 2.0 Released 12/15/2000 CHK 0xF6C1
ASIC/2-7040 FW740E Rev 2.0 Released 12/15/2000 CHK 0x181F
 SINC/3-3000 FW300B Rev 2.0 Released 12/15/2000 CHK 0xDDAD
o   New Notify Types: 0-Point, 1-Deviation, 2-Change of State, 3-Object
            Object - Input, Object - PID, Object - Poll
o   Notify No Data Value Enable to set No Data Display in Notify messages.

SINC/3-3000 FW300B Rev 1.9 Released 10/30/2000 CHK
ASIC/2-7040 FW740E Rev 1.9 Unreleased 11/17/2000
ASIC/2-8040 FW840E Rev 1.9 Unreleased 11/17/2000
o   Adds Notify option for Enable Post Self NOT Attr-35 Hibit6
            Will post to its own notify log even if posted elsewhere.

SINC/3-3000 FW300B Rev 1.9 Released 10/30/2000 CHK
o   Adds Special Notify Global 0x5AE0 which is passed out modem port.
           For use with ASI EtherLink. 0x5AE0
o   Non-token Notifies on System bus now work.
o   Improved broadcast of Notify messages.

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
o   Notify to Device Address will retry up to 9x until acknowledged.
           NOT Attr-17 LOBit0 Notify Acknowledge
           NOT Attr-17 LOBit1 Notify Retry
           NOT Attr-17 LOBit2 Notify Delay
           NOT Attr-17 HILSNBL Notify Retry Timer
           NOT Attr-17 HIMSNBL Notify Retry Count

SINC/3-3000 FW300B Rev 1.7 Released 09/21/2000 CHK 0xCE1D
o   Notify Date stamp updated when event goes Inactive.

SINC/3-3000 FW300B Rev 1.5 Released 07/14/2000 CHK
o   Fixes problem with missing Notify messages on System Bus
           when communicating with the SINC/3 on Direct or Modem RS-232 Port

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
SINC/3-3000 FW300B Rev 1.1 Released 12/06/1999 CHK 0x33BB
o   Properly rolls Notify Log index at end of log.
o   Global 92h messages now filtered by checksum to eliminate duplicates
o   Token passing much improved and 90h and 92h reception improved

ASIC/2-7040 FW740E Rev 1.1 Preliminary 11/08/99 CHK 0x74B4
ASIC/2-8040 FW840E Rev 1.1 Preliminary 11/08/99 CHK 0x7166
o   Fixes problem with self notify.
           38-Notify Log did not clear Notify Authority on new item.

ASIC/2-7040 FW740E Rev 1.0 Unreleased 10/26/99 CHK 0x74B4
 SINC/3-3000 FW300B Rev 1.0 Released 10/06/1999 CHK
o   37-Notify and 38-Notify Log are now working.

Notify DYNAMIC Properties

Attr-0 LO Byte **Notify Status**
     LO bit0 **HI Alarm**
     LO bit1 **LO Alarm**
     LO bit2 **HI HI Alarm**
     LO bit3 **LO LO Alarm**
     LO bit4 **COV HI Event**
     LO bit5 **COV LO Event**
     LO bit6 **COS Event**
     LO bit7 **Fault Alarm**

Attr-0 HI Byte **- Notify State**
     HI bit 0 - **Event Active**
          - when any of the enabled event conditions are true.
     HI bit 1 - **Event Enabled**
          - Event is Enabled and interlock is true, else cleared
     HI bit 2 - **Event Acknowledge** (future)
     1 = Acknowledged, 0 = not acknowledged
     HI bit 3 - **Acknowledgement Required** (future)
          event stays active even if condition clears.
          1 = Acknowledged, 0 = not acknowledged
     HI bit 4 - Spare
     HI bit 5 - Spare
     HI bit 6 - **No Data Display** (740E2.0,300B2.0)
     HI bit 7 - **Lockout Status** - 1 = locked out by Interlock Handle.

Attr-1 LO Byte **Changed Status**
    LO bit0 **HI Alarm Changed**
    LO bit1 **LO Alarm Changed**
    LO bit2 **HI HI Alarm Changed**
    LO bit3 **LO LO Alarm Changed**
    LO bit4 **COV HI Event Changed**
    LO bit5 **COV LO Event Changed**
    LO bit6 **COS Event Changed**
    LO bit7 **Fault Alarm Changed**

Attr-2 **Date Stamp**
    For latest Active or Inactive Event
        DT=11,Class=6 = MM/DD/YYYY   Calendar Object
    LO Byte = Change Day, DD
    HI Byte = Change Month, MM

Attr-3 **Date Stamp Year** - YYYY, 1997 ..2055

Attr-4 **Active Time**
    DT=10,Class=13 = hh:mm:ss - 3 Byte Time Stamp
        NOTIFY   Attr-4 LO Byte - Seconds, Attr-4 HI Byte - Minutes
                        Attr-5 LO Byte - Hours
    LO BYTE - **Active Time**- Second (0..59)
    HI BYTE - **Active Time**- Minute (0..59)

Attr-5 LO BYTE - **Active Time** - Hour (0..24)
    HI BYTE - Spare

Attr-6 **Inactive Time**
    DT=10,Class=13 = hh:mm:ss - 3 Byte Time Stamp
        NOTIFY,   Attr-6 LO Byte - Seconds, Attr-6 HI Byte - Minutes
                        Attr-7 LO Byte - Hours
    LO BYTE - **Inactive Time**- Second (0..59)
    HI BYTE - **Inactive Time**- Minute (0..59)

Attr-7 LO BYTE - **Inactive Time**- Hour (0..24)
    HI BYTE - Spare

Attr-8 **Present Value**

Attr-9 **Previous Value**

Attr-10 **Interlock Value**

Attr-11 **Setpoint Value**

Attr-12 **Action**
    0- No-operation
    1 - Notify Now
    2- Acknowledge this event.
    3- Acknowledge all events this controller
    4- Refresh all events now.

Attr-13 **Delay 1 Timer -** Start/Stop Timer for LO Alarms

Attr-14 **Delay 2 Timer -** Start/Stop Timer for LOLO Alarms

Attr-15 LO BYTE - Spare

Attr-15 HI BYTE **Repeat Timer** - in 15 minute increments (7/840E2.1,300b2.1)
    If Event Active when timer satisfied, then repeats the notification.

Attr-16 LO BYTE Status Flags
    Lobit0 **Timing LO Alarm**
    Lobit1 **Timing LO LO Alarm**
    Lobit2 **Timing HI Alarm**
    Lobit3 **Timing HI HI Alarm**
    Lobit4
    Lobit5
    Lobit6
    Lobit7 **Do Notify**

Attr 16 Hi Byte - **Retry Timer** (FW7/840E1.6)

Attr-17 Notify Retries (740E1.6, 840E1.6)
   Lobit0 - **Notify Acknowledged**
   Lobit1 - **Notify Retry**
   Lobit2 - **Notify Delay**
   Lobit3 -
   LOMSNBL -
   HILSNBL **Retry Timer**
   HIMSNBL **Retry Count**

Attr-18 **Delay 3 Timer -** Start/Stop Timer HI Alarms

Attr-19 **Delay 4 Timer -** Start/Stop Timer for HIHI Alarms

Notify STATIC Properties

Notify Event Setup

Attr-20 LO Byte **Notify Event Number** - The event number designation

Attr-20 HI Byte **Notify Group** - The group number for dial-out notification.

Attr-21 LOLSNBL **Value Data Type**
   Uses to format display Unsigned Numerical, Data Class 42.

Attr-21 LOMSNBL **Value Type Display**,
   Uses to format display Unsigned Value*0.001, etc.

Attr-21 HI Byte **Notify Priority** - Priority of Notify Event
   Part of decision about dialing out.

Attr-22..31 **Notify Message** - 20 character description of Notify Event

Attr-32,33 **Source Handle**
   For Notify Type Point it returns the value to be used to determine notify event
   conditions.
   For Other types identifies the Index of the object to be used. The notify event
   conditions are updated based on the status of the Alarm in the object instance.

Attr-34 **Notify Destination** - Address of controller to receive Notification
   May be global (5A70h)

Attr-35 Notify Setup 1 - Notify Event Processing
   LO bit0 **Enable HI Alarm**
   LO bit1 **Enable LO Alarm**
   LO bit2 **Enable HI HI Alarm**
   LO bit3 **Enable LO LO Alarm**
   LO bit4 **Enable COV Normal** - (New 300B2.0/740E2.0/840E2.0)
      used for Change of Value events
   LO bit5 **Enable Repeat** (FW7/840E2.1,300B2.1)
   LO bit6 **Enable COS Normal** (New 300B2.0/740E2.0/840E2.0)
      used for change of state values, notifies on any change of value.
   LO bit7 **Enable Fault Alarm**- - (New 300B2.0/740E2.0/840E2.0)

Attr-35 HI Byte Notify Enables
   HIBit0 **Enable Index** - Must be set for the index to process.
   HIBit1 **Enable Interlock** - makes interlock active
      If active then it must be true to make the Notify Event enabled
   HIBit2 **Spare**
   Hibit3 **Delay Unit**s
      1= min, 0 = sec
   HiBit4 **Delay Start Enable**
   HiBit5 **Delay Stop Enable**
   HIBit6 **Post Self Enable** (740E2.0, 840E2.0,300B2.0)
   HIBit7 **No Data Value Enable** (740E2.0, 840E2.0,300B2.0)

Attr-36 LO Byte **Notify Type**
    0 - Point ,
    1 - Deviation (740E2.0, 840E2.0,300B2.0)
    3 - Change of State (740E2.0, 840E2.0,300B2.0)
    2 - Object - (740E2.0, 840E2.0,300B2.0)
    4- Spare

Attr-36 HI BYTE Spare

Attr-37 **COS Normal State** signed (740E2.0, 840E2.0,300B2.0)

Attr-38 LO BYTE - Spare
    HI BYTE **Repeat Time** (FW7/840E2.1,300B2.1) in 15 minute increments.

Attr-39 Spare

Setpoints

Attr-40 **Lo Alarm Setpoint** (signed)

Attr-41 **Hi Alarm Setpoint** (signed)

Attr-42 **Lo Lo Alarm Setpoint** (signed)

Attr-43 **Hi Hi Alarm Setpoint** (signed)

Attr-44 **Alarm Hysteresis** (unsigned)
     Used by LO, LOLO, HI, HIHI Events to determine when the alarm is cleared

Attr-45 **COV Threshold** (unsigned)
    Used by COV Events to determine when the Present value has changed from the previous value sufficiently to trigger a new COV event.

Attr-46 **Delay Start Time**
    If Enabled starts timer when Event conditions have been reached but delays notification.

Attr-47 **Delay Stop Time**
    If Enabled starts timer when Event conditions have cleared but delays notification.

Attr-48,49 **Interlock Handle**
    If Enabled, returns the value to be used to determine if the event is locked out.
    The Notify Event will continue to be processed, but the notification will not be sent.

Attr-50,51 **Setpoint Handle**
    If enabled, identifies the value to be used for deviation type of event. The HI and LO Setpoints the become offset from the value returned by the Setpoint Handle.

Object 38 - Notify Log

Introduction - Notify Log

The 38-Notify Log object has the following functions:

1) To log the latest notify events from all controllers on the ASI network including itself.

2) To be the source of information for the Dial-manager which will annunciate the Notify Events posted to the Notify Log.

The 34-Dial Manager object has the following functions:

1) On any new Notify Log posting, scan the Notify Log for items that match its Notify Group, and which have not been completed.

#	Grp	Message	Status	Cha...	Active	Inactive	Src	HILOAlarm	HIHILOLO	Value
1	2	Seconds Alarm	305h	4h	16:05:49	16:05:24	32100	HI Alarm	HI Alarm	49
2	2	Alarm 2 HI	200h	2h	16:03:00	16:03:29	32100	OK	OK	29
1	2	Seconds Alarm	301h	1h	16:03:37	16:03:24	32100	HI Alarm	OK	37
1	2	Seconds Alarm	305h	4h	16:03:49	16:03:24	32100	HI Alarm	HI Alarm	49
1	2	Seconds Alarm	30Ah	Fh	16:04:00	16:03:24	32100	LO Alarm	LO Alarm	0
2	2	Alarm 2 HI	302h	2h	16:04:00	16:03:29	32100	LO Alarm	OK	0
1	2	Seconds Alarm	302h	8h	16:04:12	16:03:24	32100	LO Alarm	OK	12
1	2	Seconds Alarm	200h	2h	16:04:12	16:04:24	32100	OK	OK	24
2	2	Alarm 2 HI	200h	2h	16:04:00	16:04:29	32100	OK	OK	29
1	2	Seconds Alarm	301h	1h	16:04:37	16:04:24	32100	HI Alarm	OK	37
1	2	Seconds Alarm	305h	4h	16:04:49	16:04:24	32100	HI Alarm	HI Alarm	49
1	2	Seconds Alarm	30Ah	Fh	16:05:00	16:04:24	32100	LO Alarm	LO Alarm	0
2	2	Alarm 2 HI	302h	2h	16:05:00	16:04:29	32100	LO Alarm	OK	0
1	2	Seconds Alarm	302h	8h	16:05:12	16:04:24	32100	LO Alarm	OK	12
1	2	Seconds Alarm	200h	2h	16:05:12	16:05:24	32100	OK	OK	24
2	2	Alarm 2 HI	200h	2h	16:05:00	16:05:29	32100	OK	OK	29

SINC/3-3000 Configuration View (ASI Controls, 1998)

Posting Events

The **Notify Event Number** and **Notify Group**, and **Notify Message** identify which event is being reported. The **Notify Priority** indicates how serious the event is. The Dial Manager can be set up to report events which have a certain priority number.

On any change of Notify Status, the updated Notify Status, Changed Status, Time Stamps, Notify Name, Notify Group, Priority, and Event Number will be posted to the Notify Log indicated by the **Notify Destination**. The Notify Destination may be itself, an individual controller, or a Global Address (5A70h).

Note: The Notify may post to its own Notify Log.

The controller with the Notify Event will transmit the Notify Log entry using a MT=92 message to the Notify Log object. The Notify Log will post the data to the next available entry in the Notify Log. The Notify Log is as allocated and can have up to 255 instances.

The following data is transmitted from the Notify object to the Notify Log:

Notify Dynamic Data	Notify Log
Attr-0..8	**Attr-0..8**
NOT_EventActive	NLG_EventActive
NOT_EventEnabled	NLG_EventEnabled
NOT_EventAckd	NLG_EventAckd
NOT_EventAckRequired	NLG_EventAckRequired
NOT_LockoutStatus	NLG_LockoutStatus
NOT_HILOAlarm	NLG_HILOAlarm
NOT_HIHILOLOAlarm	NLG_HIHILOLOAlarm
NOT_COVEvent	NLG_COVEvent
NOT_COSEvent	NLG_COSEvent
NOT_FaultAlarm	NLG_FaultAlarm
NOT_ActiveDateMMDDYY	NLG_ActiveDateMMDDYY
NOT_ActiveTimeHH:MM:SS	NLG_ActiveTime
NOT_InactiveTimeHH:MM:SS	NLG_InactiveTime
NOT_Present Value	NLG_Present Value

Notify Static Data	Notify Log
Attr-20..33	**Attr-9..22**
NOT_NotifyGroup	NLG_NotifyGroup
NOT_NotifyEventNumber	NLG_NotifyEventNumber
NOT_NotifyPriority	NLG_NotifyPriority
NOT_ValueDataType	NLG_ValueDataType
NOT_NotifyMessage	NLG_NotifyMessage
NOT_SourceHandle	NLG_SourceHandle
	Attr23-
SRC ADDR	NLG_NotifySourceAddr

When the Notify Log receives a posting it captures the source address of the sending controller even if the destination address was global. Thus it knows the origin of the notify event.

System Object

The System object needs to be enhanced to identify that there has been a New Event, and to keep track of the Notify Log Pointer.

The controller with the Notify Event will transmit the Notify Log entry using a MT=92 message to the Notify Log object. The Notify Log will post the data to the next available entry in the Notify Log.

SYS-0 Attr-2 LO Byte **Notify Log Pointer**
>   The current instance of the Notify Log used. The Notify Log is as allocated and can have up to 255 instances. When the last allocated instance is used, then it starts back at the top, instance 0.

SYS-0 Attr-3 Lo Bit2 **New Notify Event**
This flag is set indicating that a new entry has been received. It is cleared when all Notify Log instance have been processed. **Notify Log Pointer**

Dial-out Notification

Dial Manager is enhanced so that a single instance will address a group of alarms or notify instances. If Dial Manager Type is Notify then it scans the Notify Log for any new items that match the Dial Manager Group, and have a Notify Prioiry >= Dial Priority. The dial managers may be interlocked against schedules, so that different Dial Managers can be assigned to a group at different times.

Dial Setup
DIL Attr-14 HI Bits67 **Dial Notify Authority 1** (New FW740E, 840E, 300B)
DIL Attr-14 HI Bits45 **Dial Notify Authority 2** (New FW740E, 840E, 300B.)

DILAttr-15 HI Byte - **Dial Group Number** -
>   All Dial Managers that are Active and active at the time a connection
>   is made will send their message while the connection is made.

(new)   For Notify Events all active notify events will be reported
>   which match dial group.

DIL Attr-16 LO BYTE   **Dial Manager Type**
>   0 = Logical - Only One Supported

(new)   1 = Notify Events
>   2 = Initialize

DIL Attr-18 LO Byte **Dial Priority** (FW300B..,) !
Used to Send Notify Log Messages when
>   **Notify Priority** >= **Dial Priority**.

Each Dial Manager is assigned a Dial Authority. Up to 4 different Dial Managers with different dial authorities can be identified for a group. The Notify Log maintains **Dial Authority Status** flags that indicate the progress of the notification. Each Dial Manager will mark the Notify Log when it has succeeded in completing its notification.

Up to 4 dial managers may be assigned for any group of messages.
NLG Attr-25 LOLSNBL - **Dial Authority 0 Status**
>   LOBit 0 Auth-0 Notice Requested
>   LOBit 1 Auth-0 Notice Complete
>   LOBit 2 Auth-0 Spare
>   LOBit 3 Auth-0 Spare

LOMSNBL **- Dial Authority 1 Status**
HILSNBL - **Dial Authority 2 Status**
HIMSNBL - **Dial Authority 3 Status**

Notify Log Properties

The Notify Log object defines the present values used by the controller to post notify events for FW754A, 740E and 300B..

Notify

Object Number	= 38
Data Type	= Word
Index	= As allocated
Attributes	= 0..51
DYNAMIC Attributes	= 26 (0..25)
STATIC Attributes	= 0 ( )

Notify Firmware Revision

ASIC/2-7540 FW754a Ver 2.2q Release 2007-06-08 PN70025-07 ECO-408
ASIC/2-8540 FW854a Ver 2.2q Release 2007-06-08 PN70027-05 ECO-409
o   Fixes problem with Notify Log. Self Posts would overwrite System Bus posts.

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
o   Fixes Notify Log rollover problem that self posted twice to instance 0.

ASIC/2-7540 FW754A Rev 1.0 Forthcoming 2005
o   As in FW740E.

SINC/3-3000 FW300B Rev 2.8g Released 12/24/2002 CHK 0xADC2
o   Increases Maximum Notify to 192 Instances
o   Fixed Ethernet Notify messages without rempote points
          or direct communication.

SINC/3-3000 FW300B Rev 2.2e 08/21/2001 CHK 0xDE50
o   Fixes Notify Log roll-over problem when self posting.
          Index 0 was posted twice.

SINC/3-3000 FW300B Rev 2.1 06/18/2001 CHK 0xD16A ----- ASI PN 70015-01
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
o   Adds Repeat to Notify so that Events are repeated if still active.
          Notify Repeat Enable, Attr-35 LOBit5,
o   Adds Notify Disable SYS Attr-10, HIBit5

ASIC/2-8040 FW840E Rev 2.0 Released 12/15/2000 CHK 0xF6C1
ASIC/2-7040 FW740E Rev 2.0 Released 12/15/2000 CHK 0x181F
SINC/3-3000 FW300B Rev 2.0 Released 12/15/2000 CHK 0xDDAD
o   New Notify Types: 0-Point, 1-Deviation, 2-Change of State, 3-Object
          Object - Input, Object - PID, Object - Poll
o   No Data Value Enable to set No Data Display in Notify messages.

ASIC/2-7040 FW740E Rev 1.1 Preliminary 11/08/99 CHK 0x74B4
ASIC/2-8040 FW840E Rev 1.1 Preliminary 11/08/99 CHK 0x7166
o   Fixes problem with self notify.
          38-Notify Log did not clear Notify Authority on new item.

ASIC/2-7040 FW740E Rev 1.0 Unreleased 10/26/99 CHK 0x74B4
SINC/3-3000 FW300B Rev 1.0 Released 10/06/1999 CHK
o   37-Notify and 38-Notify Log are now working.

Notify Log DYNAMIC Properties

Posted from Dynamic RAM of source Notify Event

Attr-0 LO Byte **Notify Status**
    LO bit0 **HI Alarm**
    LO bit1 **LO Alarm**
    LO bit2 **HI HI Alarm**
    LO bit3 **LO LO Alarm**
    LO bit4 **COV HI Event**
    LO bit5 **COV LO Event**
    LO bit6 **COS Event**
    LO bit7 **Fault Alarm**

Attr-0 HI Byte **- Notify State**
    HI bit 0 - **Event Active**
       - when any of the enabled event conditions are true.
    HI bit 1 - **Event Enabled**
       - Event is Enabled and interlock is true, else cleared
    HI bit 2 - **Event Acknowledge** (future)
    1 = Acknowledged, 0 = not acknowledged
    HI bit 3 - **Acknowledgement Required** (future)
       event stays active even if condition clears.
       1 = Acknowledged, 0 = not acknowledged
    HI bit 4 - Spare
    HI bit 5 - Spare
    HI bit 6 - **No Data Display** (740E2.0,840E2.0,300B2.0)
       If No, then report the Present Value in Dialout
       If Yes, do not report the present value.
    HI bit 7 - **Lockout Status** - 1 = locked out by Interlock Handle.

Attr-1LO Byte **Changed Status**
    LO bit0 **HI Alarm Changed**
    LO bit1 **LO Alarm Changed**
    LO bit2 **HI HI Alarm Changed**
    LO bit3 **LO LO Alarm Changed**
    LO bit4 **COV HI Event Changed**
    LO bit5 **COV LO Event Changed**
    LO bit6 **COS Event Changed**
    LO bit7 **Fault Alarm Changed**

Attr-2 **Notify Active Date**
    DT=11,Class=6 = MM/DD/YYYY   Calendar Object
    LO Byte = Change Day, DD
    HI Byte = Change Month, MM

Attr-3 **Notify Active Year** - YYYY, 1997 ..2055

Attr-4 **Notify Active Time**
    DT=10,Class=13 = hh:mm:ss - 3 Byte Time Stamp
       CLOCK,   Attr-1 LO Byte - Seconds, Attr-1 HI Byte - Minutes
                   Attr-2 LO Byte - Hours
    LO BYTE - **Notify Active** - Second (0..59)
    HI BYTE - **Notify Active** - Minute (0..59)

Attr-5 LO BYTE - **Notify Active** - Hour (0..24)
    HI BYTE - Spare

Attr-6 **Notify Inactive Time**
    DT=10,Class=13 = hh:mm:ss - 3 Byte Time Stamp
       CLOCK,   Attr-1 LO Byte - Seconds, Attr-1 HI Byte - Minutes
                   Attr-2 LO Byte - Hours
    LO BYTE - **Notify Inactive Time**- Second (0..59)
    HI BYTE - **Notify Inactive Time**- Minute (0..59)

Attr-7 LO BYTE - **Notify Inactive Time**- Hour (0..24)
    HI BYTE - Spare

Attr-8 **Present Value**

Posted from Static EEPROM of source Notify Event Attr-20..

Attr-9 LO Byte **Notify Event Number** - The event number designation.

Attr-9 HI Byte **Notify Group** - The group number for dial-out notification. Dial Manager
Group must match Notify Group.

Attr-10 LOLSNBL **Value Data Type**
Uses to format display Unsigned Numerical, Data Class 42.

Attr-10 LOMSNBL **Value Type Display**,
Uses to format display Unsigned Value*0.001, etc.

Attr-10 HI Byte **Notify Priority** - Priority of Notify Event
Part of decision about dialing out.

Attr-11..20 **Notify Message** - 20 character description of Notify Event

Attr-21,22 **Source** Handle
It returns the value to be used to determine notify event conditions.
Together with the Source Address it uniquely identifies the origin of the event.

Attr-23 **Notify Source Address** -
Actual device address of controller sending notification. Captured from the Source
Address of incoming message when posted.

Attr-24 **Notify Log Action -**
0- No Operation
1- Acknowledge this Notify Log index
2 - Acknowledge all Notify Log indexes
3 - Clear this Notify Log entry
4- Clear all Notify Log entries.

Attr-25 **Dial Authority Status**
Scrach pad for up to 4 dial managers to indicate they have completed the transation.
LOLSNBL - **Dial Authority 0 Status**
LOBit 0 **Auth-0 Notice Requested**
LOBit 1 **Auth-0 Notice Complete**
LOBit 2 Auth-0 Spare
LOBit 3 Auth-0 Spare

LOMSNBL - **Dial Authority 1 Status**
HILSNBL - **Dial Authority 2 Status**
HIMSNBL - **Dial Authority 3 Status**

Object 39 – Modbus Master

Modbus Summary
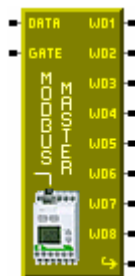
Overview: The ASIC/2-7540 and ASIC/2-8540 controller can serve as a Modbus RTU master device on the local bus. The modbus object is used to read and write registers in a Modbus slave device on the local bus of the ASIC/2 controller. A **Modbus Enable** in the system object allows the Modbus object to use the local bus. ASI Polling and Broadcast is not available if Modbus is used. Local Bus Baud Rate, Modbus Parity Enable, Even Parity and 2 Stop-bits parameters allow defining the communications format.

Each index of the Modbus object issues a single Modbus request message on a round-robin basis. The controller generates the modbus request message to the **Slave Address** with the CRC-16 checksum on the local bus. .

The controller listens for and valididates the Modbus response message. The controller waits 200 ms time out for a response. If it fails to get a response it will try on the next polling round.

Modbus Read: For read messages the controller requests up to eight words of data starting at a Modbus **Start Address**.. The returned data words are placed in the instance **Data Words** with the first returned word in Attr-0, Modbus Data 1, in LO Byte, Hi Byte.

Four Modbus Read functions are supported:

> Function 01 - Read Coil Status, 0xxxx
> Function 02 - Read Input Status, 1xxxx
> Function 03 - Read Holding Registers, 4xxxx
> Function 04 - Read Input Registers, 3xxxx

Modbus Write: For write messages the controller sends one or more data words and waits for the acknowledge response.   If the Modbus function is write, then the **Modbus Data Handle** returns a pointer to the first data value to be sent to the modbus device. If multiple words are to be sent they must be in adjacent attributes of the same object instance. Up to 8 word values can be written to the modbus device with Write Multiple Modbus Functions.

Four Modbus Write functions are supported:

> Function 05 - Write Single Coil, 0xxxx
> Function 06 - Write Single Register, 4xxxx
> Function 15 - Write Multiple Coil, 0xxxx
> Function 16 - Write Multiple Registers, 4xxxx

Transmit Timer: The Modus Master starts with instance 0 through the last instance. Each instance is examined in turn to see if it is enabled and if it is time to send a request. At the completion of a successful message, the **Transmit Timer** is re loaded with the **Transmit Interval**, and it will not send the message again until it times out.

> Note: You may need to optimize communications. If you have too many Modbus instances enabled, and you set the Transmitt Interval too small, it may start to interfere with system bus communications. Typically it will transmit several Modbus Messages per second. Adjust the Transmit Intervals so that it is not polling continuously.

Gate Handle: If the Gate Handle is enabled, it is used to make the instance active when the value returned by the handle is non-zero. When the Gate goes false, Gate Status = No, then the messges and the Transmit Timer stop (FW7/854a15). When the gate goes true, the messages start immediately and the Transmit Timer is reloaded. For Modbus read messages, it polls on the next round-robin turn and periodically for data when true. For Modbus write messages, it writes on the next round-robin turn and periodically when true.

> Note: All numbers are entered in Decimal.
>
> Note: Some Modbus devices are zero-base, and some are one-base: In zero-based devices a Register Address 0 returns register x0000; but in one-based devices a starting address 0 returns register x0001. All of our examples assume a zero-based Modbus RTU slave device.

Modbus Communication

The ASI Modbus Object has exclusive use of the Local Bus. The Local Bus parameters are configured in the System Object. If Modbus Enable is Yes, then Polling, Broadcast, and other Local Bus functions are disabled. You may not do both ASIC/1 polling and Modbus on the same local bus.

Modbus Enable:	☑ Yes
Modbus Parity Enable:	☑ Yes
Modbus Even Parity:	☐ No
Modbus 2 Stop Bits:	☐ No

Each Modbus Device has a specific Baud Rate, Parity, and Stop Bits.

Baud Rates are typically 9,600 and 19200 baud.

If Modbus Parity Enable is "No" then Parity is None, and set Modbus 2 Stop Bits to Yes.

If Modbus Parity Enable is "Yes" then Parity is Odd , unless Modbus Even Parity is Yes.

Make sure the local bus setup matches the Modbus device. All Modbus devices on the local bus must have the same communication setup.

Modbus Read Operation

Four Modbus Read functions are supported:

        Function 01 - Read Coil Status, 0xxxx

        Function 02 - Read Input Status, 1xxxx

        Function 03 - Read Holding Registers, 4xxxx

        Function 04 - Read Input Registers, 3xxxx

The Modbus polling starts with instance 0 through the last instance. Each instance is examined in turn to see if it is enabled, if the gate is active, and if it is time to send a request. If the Gate Handle is enabled, it is used to make the instance active when the value returned by the handle is non-zero. If the gate is not enabled, it is always active.

When it is time to read the data the Modbus device, the controller generates the Modbus request message with the CRC-16 checksum on the local bus at the current baud rate. .

Each Modbus Function returns response bytes based on the Number of Coils, Inputs, or Registers requested.

The returned data words are placed in the instance **Data Words** with the first returned word in Attr-0, Modbus Data 1, in LO Byte, Hi Byte.

Modbus typically returns data in Hi Byte, Low Byte (Big-Endian) order. If Modbys Byte Swap is Yes, then it assumes Modbus device receives and returns Lo and Hi Byte (Little-Endian) for word Read Input (04), Read Register (03) functions.

 32-bit floating values are returned using two registers and can be converted to integer values using the Function Object.

At the completion of a successful message, the **Transmit Timer** in seconds is re loaded with the **Transmit Interval**, and it will not send the message again until it times out. If the **Transmit Interval** is 0 it is polled every round.

If the Modbus slave does not respond after 200 ms, or if the response is not valid because of unexpected bytes or bad CRC-16, the Transmit Timer remains zero, and it is polled again on the next round. If the device responss the **On-Line Status** flag is set..

If the modbus message is not correctly configured the **Invalid Message** flag is set to alert the user of a problem.

Function 1 – Read Coil Status, 0xxxx

Modbus Function 01 Reads the status of coil registers and sets the data elements starting at a coil Start Address for the requested Number of Coils. . Start Address 0 corresponds to Modbus register 00000 or 00001 depending on whether the device is one- or zero-based.

Multiple coils may be read with a single message as specified by the Number of Coils.

The response message returns a number of bytes each returning upto 8 status bits. The status of the first 16 coils is saved in Data Word 1 with first coil in the least significant bit. The status of the up to 128 coils is stored in the 8 Data Words. Up to 8 data words can be requested, 8x16 = 128 coils in a single request.

Example: Request 64 bit values starting at 20, Coil 20

Request

Slave Address	Function Code	Start Addr HI	Start Addr LO	Number HI	Number LO	CRC16 LO	CRC16 HI
2	1	0	64	0	64	CHK-LO	CHK-HI

Returns Status of Coils 0..63 in 64 bits which requires 4 data bytes (1 + (n-1)/8)

The coil status is packed one coil per bit where the lease significant bit of the first data byte returns the coil addressed in the query. If the returned coil quanity is not a multiple of eight, the remaining bits in the final data byte are padded with zeros toward the high order end of the byte.

Response

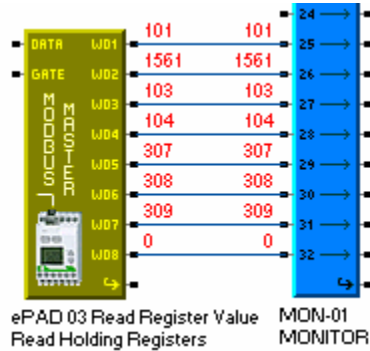| Slave Address	Function Code	Byte Count	Data 1 LO	Data 1 HI	Data 2 LOi	…	Data 3 HI	Data 4 Hi	CRC16 LO	CRC16 HI
2	1	8	C07..00	C15..08	C23..16	…	C55..48	C63..56	CHK-LO	CHK-HI

The modbus response is received by the controller on the local bus and the data is placed in the Data Words in Lobyte Hibyte order.

.

Function 2 – Read Input Status, 1xxxx

Modbus Function Code 02 Reads the binary status of input registers and sets the array elements starting at a particular Input address. up to the Number of Inputs requested. Input Status 0 corresponds to Modbus register 10000 or 10001, depending whether the device is "zero-based". .

Request 2 bit values starting at Input Status 10003

	Slave Address	Function Code	Start Addr HI	Start Addr LO	Number HI	Number LO	CRC16 LO	CRC16 HI
Request	1	2	0	2	0	2	CHK-LO	CHK-HI

Returns Status of Inputs 10002..10004

	Slave Address	Function Code	Byte Count	Data 1 LO	CRC16 LO	CRC16 HI
Response	2	2	1	I04..03	CHK-LO	CHK-HI

The modbus response is received by the controller on the local bus and the data is placed in the Data Words in Lobyte Hi Byte order.

Each Data word returns 16 bits of information.. Up to 8 data words can be requested, 8x16 = 128 input status values in a single request.

Function 3 – Read Holding Registers, 4xxxx

Function 03 requests up to 8 Holding Register Values from a Modbus device at a particulare Slave Address, starting at a particular register Start Address. Register Address 0 corresponds to Holding Registers 40001.

The modbus response is received by the controller on the local bus and the data is placed in the Data Words. Up to 8 data words may be requested. These data values can be read by other objects in the controller, for instance the monitor instance

ePAD 03 Read Register Value
Read Holding Registers
MON-01 MONITOR

Slave Address	Function Code	Addr HI	Addr LO	Number HI	Number LO	CRC16 LO	CRC16 HI
2	3	0	08	0	8	CHK-LO	CHK-HI

Response	Slave Address	Function Code	Byte Count	Data 1 Hi	Data 1 Lo	Data 2 Hi	Data 2 Lo	…	Data 8 Hi	Data 8 Lo	CRC16 LO	CRC16 HI
	2	3	16	6	25	6	25	…	0	0	CHK-LO	CHK-HI
				1561		1561		…	0			
				Data Word 1		Data Word 2			Data Word 8			

Function 4 – Read Input Registers, 3xxxx

Function 04 requests Input Registers Values from a Modbus device at a particulare Slave Address, starting at a particular Input Start Address. Input Address 0 corresponds to Input Register 30000. The modbus response is received by the controller on the local bus and the data is placed in the Data Words. Up to 8 data words may be requested.

T6900 04 Input Value
Read Input Registers

CAL-00
Calculated Point
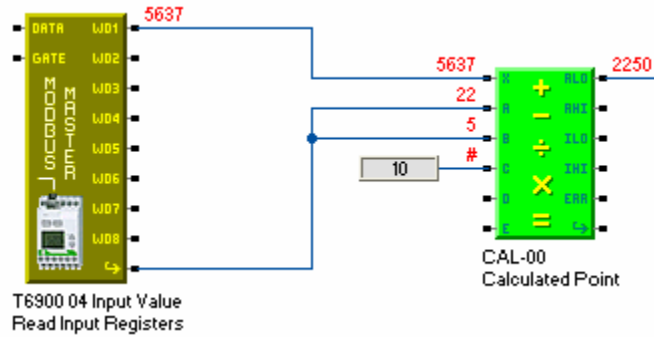
ModBus Master

Instance Name:	T6900 04 Input Value
Index Enable:	☑ Yes
Modbus Function:	4 Read Input Registers
Slave Address:	1
Start Address:	0
Number of Inputs:	1

Data1:	5637
Data2:	0
Data3:	0
Data4:	0
Data5:	0
Data6:	0
Data7:	0
Data8:	0

Gate Enable:	☐ No
Gate Handle:	NONE 00-00-00-00
Gate Handle Name:	NONE
Gate Constant:	0
Transmit Interval (s):	2
Transmitt Timer:	1

Index Enable Status:	Yes
Gate Status:	No
Invalid Msg:	No
On-Line Status:	Yes

ASIC/2-7540 Configuration -- Copyright © ASI Controls, 1997-2006

.

Request	Slave Address	Function Code	Addr HI	Addr LO	Number HI	Number LO	CRC16 LO	CRC16 HI
	1	4	0	1	0	1	CHK-LO	CHK-HI

Returns Inputs Value of 30008

Response	Slave Address	Function Code	Byte Count	Data 1 Hi	Data 1 Lo	CRC16 LO	CRC16 HI
	1	4	2	0	10	CHK-LO	CHK-HI

Modbus Write Operation

Four Modbus Write functions are supported:

Function 05 - Write Single Coil, 0xxxx
Function 06 - Write Single Register, 4xxxx
Function 15 - Write Coil Multiple, 0xxxx
Function 16 - Write Register Multiple, 4xxxx

The Modbus polling starts with instance 0 through the last instance. Each instance is examined in turn to see if it is enabled, if the gate is active, and if it is time to send a request. If the Gate Handle is enabled, it is used to make the instance active when the value returned by the handle is non-zero. If the gate is not enabled, it is always active.

When it is time to write the data to the Modbus device, the controller updates the value of Modbus Data 1 using the Data Handle and generates the Modbus request message with the CRC-16 checksum on the local bus at the current baud rate, parity and stopbits.

Modbus typically writes data in Hi Byte, Low Byte (Big-Endian) order. If **Modbys Byte Swap** is Yes, then it assumes Modbus device writes data in Lo and Hi Byte (Little-Endian) order for Write Register (06,16) functions.

When the Transmit Timer is satisfied, and the Gate Handle if enabled is true, an index of the Modbus object issues a write request for up to 8 words of data on a round-robin basis. The Modbus write messages use the data retrieved by the controller starting with the object instance and attribute identified by the Modbus Data Handle. For Multiple writes the data to be written must be in adjacent attributes of the same object instance.

The controller listens for and valididates the Modbus write acknowledge response message. If successful it restarts its Transmit Timer and not write again until its timer has expired.

The Gate Handle can be used to allow the write to become Active or Inactive.

Note: For a register entry to be both Read and Write, two separate entries must be created. Logic must be used to make the gate active when the Read Value does not equal the write value.

If the Modbus slave does not respond after 200 ms, or if the response is not valid because of unexpected bytes or bad CRC-16, the Transmit Timer remains zero, and tries again on the next round. . If the device responds the **On-Line Status** flag is set..
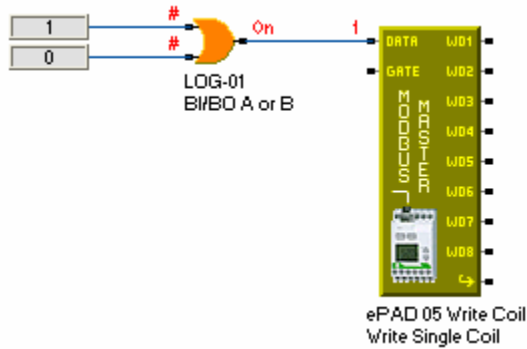
If the modbus message is not correctly configured the **Invalid Message** flag is set to alert the user of a problem.

Function 05 - Write Single Coil, 0xxxx

Modbus Function 05, Write Single Coil, 0xxxx, writes the binary value to a single coil register. .

The Modbus Data Handle loads Modbus Data 1 which is used for this function. The Gate Handle may be used to turn on and off the Modbus Coil Write message under sequence control.

If the value returned by the Data Handle is non-zero, then it sends a value value of 65280 = 255*256= ON. If the value returned by the Data Handle is zero, then it sends a value 0, OFF.

ePAD 05 Write Coil
Write Single Coil

Request Coil 20 ON

Request	Slave Address	Function Code	Addr HI	Addr LO	Data 1 HI	Data 1 LO	CRC16 LO	CRC16 HI
	2	5	0	20	255	0	CHK-LO	CHK-HI

Response	Slave Address	Function Code	Addr HI	Addr LO	Number HI	Number LO	CRC16 LO	CRC16 HI
	2	5	0	20	255	0	CHK-LO	CHK-HI

Function 06 - Write Single Register, 4xxxx

Function 06, Write Single Register, writes a single word value to a Holding Register in a Modbus device at a particular Slave Address. The Modbus Data Handle loads Modbus Data 1 which is used for this function.

The data value is posted from the response message.

Preset Register 40004 to value 307

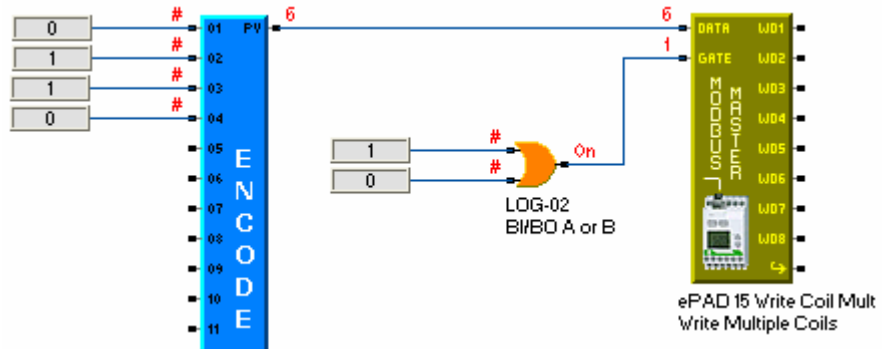| Request	Slave Address	Function Code	Reg Addr HI	Reg Addr LO	Data 1 HI	Data 1 LO	CRC16 LO	CRC16 HI
	2	6	0	4	1	51	CHK-LO	CHK-HI

AcknowledgePreset Register 40004 to value 307

Response	Slave Address	Function Code	Addr HI	Addr LO	Number HI	Number LO	CRC16 LO	CRC16 HI
	2	6	0	4	1	51	CHK-LO	CHK-HI

The data value is posted from the response message.

Function 15 - Write Multiple Coils, 0xxxx

Multiple coils are written by specifying the starting coil, the number of coils, and the word that specifies the bit-wise status of each output. Use the Encode object to pack the desired output state in to Modbus Data 1 for up to 16 coils. For more than 16 coils use the Monitor object to assemble the data to be sent.

Request	Slave Address	Function Code	Coil Addr HI	Coil Addr LO	Number HI	Number LO	Byte Count	DataLOi	Data HI	Data	CRC16 LO	CRC16 HI
	2	15	0	0	0	64	8	C07..00	C15.08	…	CHK-LO	CHK-HI

Response	Slave Address	Function Code	Addr HI	Addr LO	Number HI	Number LO	CRC16 LO	CRC16 HI
	2	15	0	0	0	64	CHK-LO	CHK-HI

Function 16 - Write Multiple Registers, 4xxxx

Multiple Registers are written by specifying the register Starting Address, the Number of Registers, and the data words to be written. The Data Handle points to the first data value. Subsequent data word values must be adjacent attributes of the same object instance. For example the Data Handle can point to an attribute of the Monitor Object which can be loaded from anywhere in the controller.

The Gate Handle can point to a Logic object that is used to enable the Register Write.

ePAD 16 Write
Write Multiple Registers

Modbus Glossary

Modbus Parameters

Coil Address

The starting Modbus Coil Address, for coil read and write messages. . (39,X,18,WORD)

Data Handle

Used by Modbus write messages and points to the Data 1 value to be written. May be a Special handle Not used by Modbus Read messages. (39,X,20,2 WORDS)

Gate Active

If the Gate Handle is enabled, it is used to make the instance active when the value returned by the handle is non-zero. If the gate is not enabled, it is always active.

Gate Enable

Enables the Gate Handle.

Gate Handle

Points to the parameter from which the value for the gate is to be obtained. For Modbus writes the next time it gets a round robin turn after going true. For reads it acts as a gate and polls while true. User-configurable. (39,X,24,2 WORDS)

Gate Status

Indicates that the gate is not enabled, or enabled and true. (39,x,9,LoBit1)

Instance Active

If the Modbus slave fails to respond properly to a request message, the Device Off-line flag is set. The Device Off-line flag is cleared on receipt of a valid message. (39,X,9,LO bit 1)

Invalid Message

Indicates that the modbus message is not valid. (39,x,9,LoBit4)

Modbus Action

No Modbus Actions have been defined.

Modbus Byte Swap

Modbus typically returns data in Hi Byte, Low Byte (Big-Endian) order If Modbys Byte Swap is Yes, then it assumes Modbus device receives and returns Lo and Hi Byte (Little-Endian) for word Read Input (04), Read Register (03) and Write Register (06,16) functions. (39,.x,15,LoBit2)

Modbus Data

The Modbus Object has 8 data words, Modbus Data 1, …, Modbus Data 8, for storing responses to Modbus read messages. Modbus Data 1 is also used by Modbus write messages to store the value retrieved by the Data Handle.

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)

Modbus Function

The modbus command, read or write to be used: 01 - Read Coil Status, 0xxxx; 02 - Read Input Status, 1xxxx; 03 - Read Holding Registers, 4xxxx; 04 - Read Input Registers, 3xxxx; 05 - Write Single Coil, 0xxxx; 06 - Write Single Register, 4xxxx; 15 - Write Multiple Coil, 0xxxx; and 16 – Write Multiple Registers, 4xxxx (39,X,17, HI BYTE)

Modbus Index Enable

Enables the index for operation. "Yes", "No"; user-configurable. (39,X,14,LO BIT 0).

Modbus Index Status

Indicates if the index has been enabled for operation. "Enabled", "Disabled"; not user-changeable. (39,X,9,LO BIT 0)

Modbus Responded

Indicates that the modbus device responded to the message. (39,x,9,LoBit3)

Modbus Transmit

Indicates that the modbus device has sent the message. (39,x,9,LoBit2)

Number of Coils

The number of coils status requested or override written for Modbud Functions 1or 15. . (39,X,19,WORD)

Number of Inputs

The number inputs status or input registers requested for Modbud Functions 2, or 4. (39,X,19,WORD)

Number of Registers

The number of registers requested or override written for Modbud Functions 3or 16. (39,X,19,WORD)

On-Line Status

Indicates that the device is communicating. (39,x,9,LoBit5)

Register Address

The starting Register for write Single Register messages. Some Modbus devices are zero-base, and some are one-base: In zero-based devices a Register Address 0 returns register x0000; but in one-based devices a starting address 0 returns register x00001. (39,X,18,WORD)

Slave Address

Represents Modbus RTU Slave device address   1..254 (39,X,17, LO BYTE)

Start Address

The starting register address for Input Status or Input Register Read messages; or the starting Holding Register address for register read or write messages. Some Modbus devices are zero-base, and some are one-base: In zero-based devices a Register Address 0 returns register x0000; but in one-based devices a starting address 0 returns register x00001. (39,X,18,WORD)

Transmit Interval

This is the time interval between successive polling message for this index in seconds . At the completion of a successful message, the **Transmit Timer** is re loaded with the **Modbus Interval**, and it will not send the message again until it times out. If the Modbus Interval is 0 it is polled every round.   (39,X,16,LO BYTE)

Transmit Timer

At the completion of a successful message, the **Transmit Timer**is re loaded with the **Transmit Interval**, and it will not send the message again until it times out. If the Modbus Interval is 0 it is polled every round. During each polling round the number is decremented until the Transmit Timer reaches zero, then the index polls again. (39,X,10,WORD)

Modbus Properties

The Modbus Object has Data Type WORD; allows Modbus RTU Master communication with an Modbus Slave device on the local bus.

Object Name	MODBUS
Object Number	39
Data Type	WORD
Index	0..n as allocated
Attributes	24 (0..213)
DYNAMIC Attributes	15 (0..14)
STATIC Attributes	10 (15..24) FW754A1.4, 854a1.4.

Modbus Firmware Revision

ASIC/2-7540 FW754a Ver 1.5m Release 2006-05-02
ASIC/2-8540 FW854a Ver 1.5m Release 2006-05-02
o   Improves Ethernet ARP, Address Resolution Protocol
o   Blocks pass thru of Group or Global if Modbus Master is used.
o   Improves operation of Modbus Master gate so message sent
           when timer goes true.

ASIC/2-7540 FW754A Rev 1.4 2006-04-07
ASIC/2-8540 FW854A Rev 1.4 2006-04-07
o   Adds new Object 39-Modbus Master for polling devices on Local Buso

Modbus DYNAMIC Properties

Attr-0 **Modbus Data 1**
Attr-1 **Modbus Data 2**
Attr-2 **Modbus Data 3**
Attr-3 **Modbus Data 4**
Attr-4 **Modbus Data 5**
Attr-5 **Modbus Data 6**
Attr-6 **Modbus Data 7**
Attr-7 **Modbus Data 8**

Attr-8 **Modbus Action**

Attr-9 Modbus Status
          LO bit 0 – **Modbus Index Status**
                    1 = Yes; 0 = No
          LO bit 1 – **Modbus Gate Status**
                    1 = Yes; 0 = No
          LO bit 2 – **Modbus Transmit**
                    1 = Yes; 0 = No
          LO bit 3 - **Modbus Responded**
                    1 = Yes; 0 = No
          LO bit 4 – **Invalid Message**
                    1 = Yes; 0 = No
          LO bit 5 – **On Line Status**
                    1 = Yes; 0 = No
          LO bit 6 -
          LO bit 7 -
HI BYTE

Attr-10 – **Transmit Timer** -
          Reset Transmit Interval at end of each successful message. Counts to zero.

Attr- 11 – **Spare**
Attr-12 **- Spare**
Attr-13 **- Spare**
Attr-14 **- Spare**

Modbus STATIC Properties

Attr- 15 Modbus Setup

    LO Bit 0 - **Modbus Index Enable**

    LO Bit 1 - **Gate Enable**

    LO Bit 2 – **Modbus Byte Swap** (754a14)

    LO Bit 3 -

    …. -

    HI Bit 0 -

    …

    HI Bit 7 -

Attr-16

    LO Byte   **Transmit Interval** seconds

    HI Byte   spare

Attr-17 LO Byte **Modbus Slave Address**

        Modbus RTU Slave device address 1..254

    HI Byte **Modbus Function** - Byte

    Function 01 - Read Coil Status, 0xxxx

        Reads the boolean status of coils and sets the array elements in the destination to TRUE or FALSE.

    Function 02 - Read Input Status, 1xxxx

        Reads the boolean status of inputs and sets the array elements in the destination to TRUE or FALSE.

    Function 03 - Read Holding Registers, 4xxxx

        Read the holding registers in a slave and put the data into an array.

    Function 04 - Read Input Registers, 3xxxx

        Read the input registers in a slave and put the data into an array

    Function 05 - Write Single Coil, 0xxxx

        turn on or off a single coil on the slave device.

    Function 06 - Write Single Register, 4xxxx

        sets a value in one holding register in the slave device.

    Function 15 - Write Multiple Coil, 0xxxx

        turn on or off a multiple coils on the slave device.

    Function 16 - Write Multiple Register, 4xxxx

        sets values in holding registers in the slave device.

Attr-18 **Start Address, Coil Address, Register Address**– Word

The starting Modbus Coil Address, for coil read and write messages. Starting Register Address. Some Modbus devices are zero-base, and some are one-base: In zero-based devices a Register Address 0 returns register x0000; but in one-based devices a starting address 0 returns register x0001. All of our examples l assume zero-based Modbus RTU slave device.

Attr-19 **Number of Registers, Number of Coils, Number of Inputs** - Word

The number of registers, inputs, coils status, input status to return or write.

Attr-20,21 **Data Handle** -

Used by Modbus Write messages and points to the Data 1 value to be written. Not used by Modbus Read messages.

Attr-20, LO - Data Object

Attr-20, HI - Data Index

Attr-21, LO - Data Attribute

Attr-21, HI - Data Select

Attr-22,23 **Gate Handle** - 2-Word

Sets active flag. If enabled and goes true.