WESTLOCK
CONTROLS CORPORATION

Intellis 7704, 7744, 7745, 7775, 7779 with AS-interface MiniPAC Module EL-40217 OPERATING MANUAL

IOM: Tech-447		**Revision:**	
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Revision History

Revision
8 April, 2011 Initial release

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1. *Introduction*

1.1 Product Certification

7a44 bcde2HES 00 f . Network Valve Monitor
NI / I / 2 ABCD; S / II, III / 2 / FG / T4 Ta = 60°C; Type 4X
a = Series: 2, 3, 4, 5, 6, 7.
b = Enclosure: 04, 44, 45.
c = Shaft: S, N 0.
d = Beacon: BY, RG, AG, AB, AR, B1, B3, B5, B7, B9, FC.
e = Entry: None, 1A.
f = Solenoid: 0, D.

7a44 bcde2HES 00 f . Network Valve Monitor
NI / I / 2 ABCD / T4 Ta = 60°C; Type 4, 4X
a = Networks: 5, 6, 7*
b = Enclosure: 04, 44, 45.
c = Shaft: S, N 0.
d = Beacon: BY, RG, AG, AB, AR, B1, B3, B5, B7, B9, FC.
e = Entry: 1M, 1U.
f = Solenoid: 0, D.

* Note: may include optional accessory 77-ANT

7a79b c X8 XSOd01, 7a75b c X8 XSOd01. Network Valve Monitor
XP / I / 1 / CD T6 Ta = 60°C; NI / I / 2 / ABCD / T5 Ta = 60°C; DIP / II, III / 1 / EFG T6 Ta = 60°C; Type 4, 4X
a = Networks 2, 3, 4, 5, 6 or 7.
b = Shaft S or N.
c = Beacon BY, AG, AB,B1, B3, B5, B7 or B9.
d = Solenoid 21, 31, 41, 51, 61, 61, 22, 32, 42, 52, 62, 23, 33, 43, 53, 63, 34, 64, 25, 35, 45, 55, 65, 26, 36, 46, 56, 66, 27, 37, 47, 57, 67, 38 or 68.

1.2 Warnings

This symbol warns the user of possible danger. Failure to heed this warning may lead to personal injury or death and/or severe damage to equipment.

This symbol identifies information about operating the equipment in a particular manner that may damage it or result in a system failure. Failure to heed this warning can lead to total failure of the equipment or any other connected equipment.

This symbol draws attention to information that is essential for understanding the operation and/or features of the equipment.

1.3 Description

The AS-i Pneumatic Actuator Controller (APAC) EL-40217 module is a two input, two output network monitor with default slave profile S-7/A, (S-I/O code/ID code). Inputs 0 and 1 are internal Hall Effect sensors that are activated by the shaft trigger assembly magnets. Outputs are FET (field effect transistor) open drain active low with diode and short circuit protection.

The module consumes 44 mA of current with one input and one output active, driving a standard NI Falcon solenoid (20mA non-incendive solenoid coil). For current consumptions see Page 13. Minimum power supply input voltage is 19 VDC to assure proper communications.

1.4 Principles of Operation

Connection to the network is via the single unshielded two-wire cable that supplies power, nominal 30 VDC, and signal. The sensors and actuator are connected to the AS-i cable via the AS-i slave chip.

In the Extended Address Mode 62 slaves can be used on one network. The address range is still 1- 31 but each slave is assigned as an “A” slave or a “B” slave. The fourth output data bit of the slave is used to identify whether a slave is an “A” slave or a “B” slave. In each scan cycle, 3 output data bits plus one address selector bit (“A” slave or “B” slave indication) are transferred serially to each slave from the master and 4 input data bits are returned to master by each slave. In a full configuration with 62 slaves the scan cycle time is 10 ms. For a network with 31 slaves the scan cycle time is 5 ms. Scanning is deterministic. For data exchange to occur, each network monitor connected to the AS-i network must be programmed with an unique address, numbered between 1-31 “A” and 1-31 “B” for Extended Address Mode. This may be accomplished via a handheld programmer or directly through the master. The address, which can be changed at any time, is stored internally in an EEPROM.

Note: To utilize the extended addressing mode an AS-i Specification rev.2.1 master must be used.

1.5 Special Features

To avoid build-up and discharge of static electricity in a hazardous area, only clean Westlock units with a static-free cloth dampened with water. Avoid the use of alcohol-based cleaners.

2. Order Guide

Ordering guides for all AS-i product series covered by this IOM are available through a local Westlock distributor, the current Westlock Controls catalog literature or the Westlock Controls website at www.westlockcontrols.com. Spare parts lists for refurbishments or repairs are also available for common AS-i models.

3. Definitions

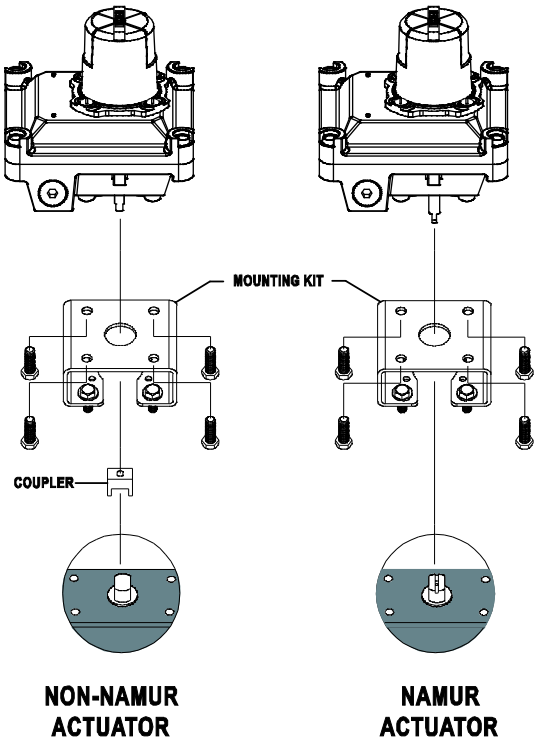
APAC –The AS-i Pneumatic Actuator Controller
EEPROM – Electrically Erasable Programmable Read-Only Memory

4. Installation

4.1 Mounting

Required Tools: Open-end wrenches or adjustable wrench to fit all sizes of hex head bolts in the mounting kit.

1. Obtain a mounting kit suited for the actuator/valve, commonly available through a local Westlock Controls distributor.
2. Attach the mounting bracket and coupler (if required) to the unit housing with the hardware provided.
3. Attach the unit and mounting system to the actuator.
4. Ensure proper axial alignment between unit shaft, coupler and actuator shaft. Failure to ensure alignment could result in long-term stress-related failure of unit shaft in high cycle or high torque applications.



4.2 Calibration

Note 1: Switch actuation can be confirmed using a 24VDC power supply or an ASi network applied to ASi + and ASi -. Use LED2 (IN0 CL) to show lower switch activation and LED3 (IN1 OL) to show upper switch activation.

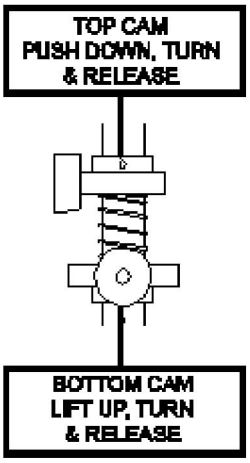
Note 2: Adjust cams by hand by pushing/pulling the cam against the shaft spring to disengage from the mating spline, rotating to adjust and re-engaging firmly onto spline.

Required Tools: Power source (see note 1); slotted screw drivers for cover screws (M4, #10 or 5/16 by model)

Switch Adjustment (two switches):

1. Remove unit cover as follows: loosen (but do not remove) captive screws, rotate cover slightly to grip corners, pull firmly.
   DO NOT PRY COVER WITH TOOLS.
2. With valve in the closed position, adjust bottom cam until bottom switch (#2) actuates.
3. Stroke valve to the open position, adjust top cam until top switch (#1) actuates.
4. Cycle actuator several times to confirm proper switch indication at each end of stoke. Finely adjust cams if necessary.

5. Skip to Field Wiring section or replace unit cover, applying approximately 20 in-lbs of torque to cover screws.



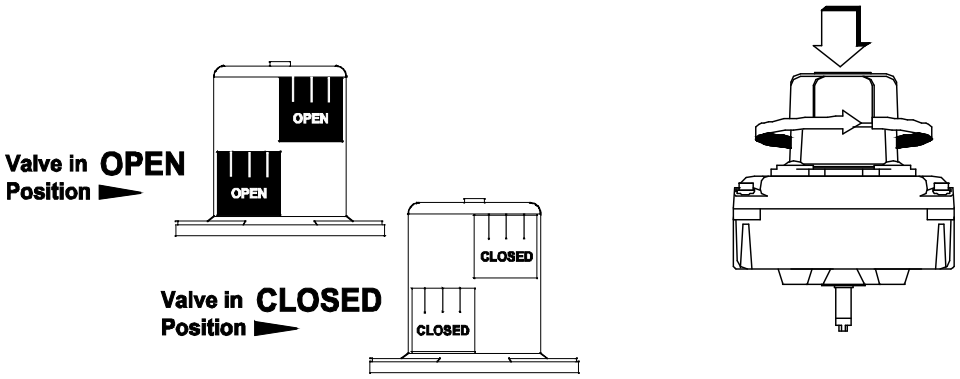
INTENAL HALL SENSOR

Beacon Adjustment:

Note: Skip this step if cover is flat or Beacon already displays the correct valve status.

Required Tools: slotted screw driver for #12 screws.

1. For two-way OPEN/CLOSED: remove, rotate and re-fasten outer beacon to synchronize displayed position with valve position.
2. For three-way flow paths: remove, rotate and re-fasten outer beacon and/or inner beacon coupler to synchronize displayed flow path with valve/actuator flow path.



4.3 Operating Instructions for Falcon Solenoid

General Description

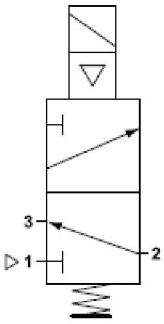
The Flacon Solenoid valve incorporates elastomer static seals through which a shaped spool moves and are manufactured for 3 or 4 way operation. 3 way is normally used for pilot control of the other relay valves or for the operation

of single acting cylinders. 4 way is normally used to control the action of double acting cylinders.

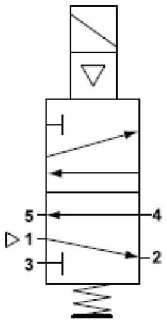
The seal spacer assembly forms individual annular chambers opposite each valve port and the grooved spool either closes or allows flow between adjacent chambers, hence the position of the spool determines which ports are open or closed.

The spool is moved by way of a manually or mechanically operated mechanism normally against a return spring. Operation may be by application or removal of a pilot air supply acting as a pilot piston. This form of control is utilized for electrical actuation where integral solenoid valves control the pilot air supply.

Description of Operation



3 Way Spring Return Valve
Solenoid De-energized - air flows from Outlet Port 2 to Echaust Port 3.
Solenoid Energized - air flows from Inlet Port 1 to Outlet Port 2

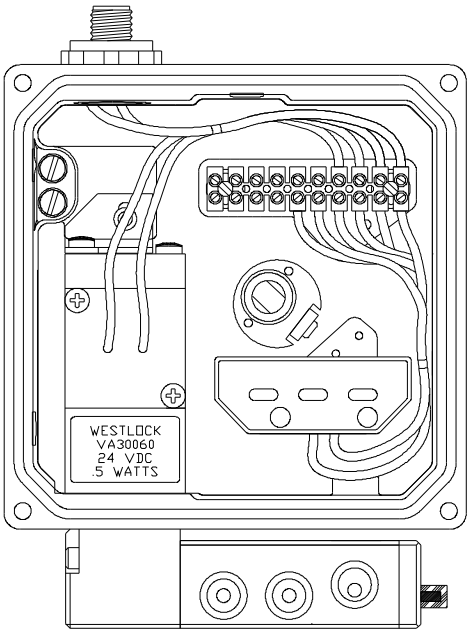


4 Way Spring Return Valve
Solenoid De-energized - air flows from Inlet Port 1 to Outlet Port 2 and exhausts from Port 4 to Port 5.
Solenoid Energized - air flows from Inlet Port 1 to Outlet Port 4 and exhausts from Port 2 to Port 3.

5. Field Wiring

See the warnings section of this document for important warnings pertaining to the wiring of AS-i units. Remove and replace cover before and after wiring, per instructions given in the Switch Adjustment section above. Required Tools: slotted screw drivers for terminal strip screws (#2), cover screws (M4, #10 or 5/16 by model), and grounding screw (#8 or M4 by model); wire strippers as required for field wires.

1. Wire the AS-i Module strictly according to the wiring diagram on the inside of the enclosure cover.
2. Confirm that the ground wire is secure under the green grounding screw in the enclosure.
3. Seal all unused conduit entries as required with suitably certified plugs having an ingress protection rating of IP67 or better.
4. Ensure that only suitably certified cable glands are used, having an ingress protection rating of IP67 or better.
5. Ensure that the temperature rating of all field wiring meets the service temperature range of the application.



6. *Maintenance and Repair*

Maintenance or repair of Westlock equipment must only be done by Westlock Controls or by qualified personnel that are knowledgeable about the installation of electromechanical equipment in hazardous areas. All parts needed for repairs or maintenance must be purchased through a Westlock Controls authorized distributor to maintain warrantee and to ensure the safety and compliance of the equipment.

No routine maintenance of Westlock AS-i units is recommended when units are installed in environments for which they are designed. Severe environments may warrant regular replacement of field units every two to five years for maximum performance and safety.

Troubleshooting

Problem: *No Power*

- Check that power supply to the loop is functioning correctly and adequate to power all devices on the loop;
- Check that power wiring is in the correct location (device is polarity sensitive);
- Check that power being supplied to unit is within the rated specifications;
- Check wiring integrity immediately at the connection to the control device;
- Check field wiring coming into the AS-i terminal strip for proper connection and good wire preparation practices (approximately ¼" of insulation removed and all strands intact);
- Check that field wiring is no larger than 12AWG for proper fit in terminal strip and compliance with terminal strip rating.

Problem: *Device does not appear on network*

- Check address and make sure another unit is not using the same address.

Problem: *Beacon does not display the correct flow path*

- Reset Beacon per the Beacon Adjustment section under Calibration.

Problem: *Unit appears to be binding during valve stroke or unit shaft has broken*

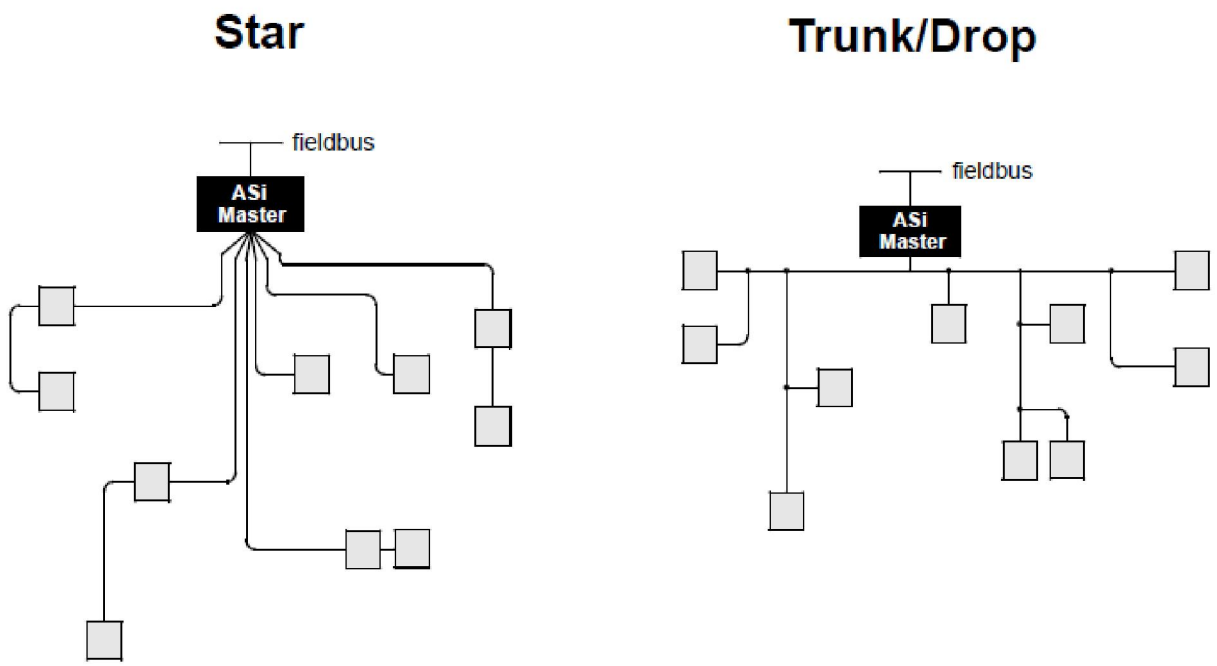
- Carefully measure and adjust axial alignment of unit shaft, coupler and actuator shaft to eliminate lifting or twisting of the coupler during travel.

Problem: *Unit has signs of moisture ingress*

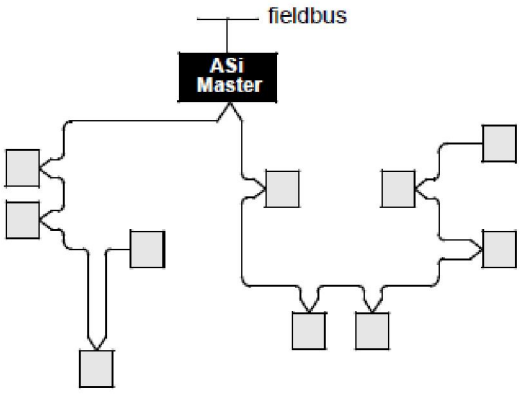
- Check torque on cover screws
- Check gaskets and sealing surfaces for debris and clean if necessary
- Check that conduit connections are properly sealed, including gland fittings and quick-disconnect receptacles
- Check that conduit pipes are properly pitched to direct condensing moisture away from units
- Check that all unused conduit entries are properly sealed with suitably certified plugs having an ingress protection rating of IP67 or better.

7. Appendix

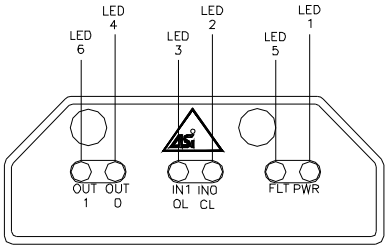
7.1 CONNECTION OPTION

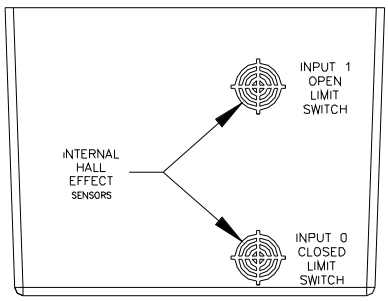


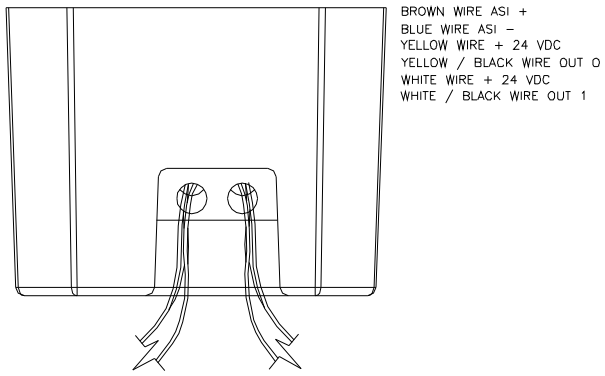
Zero Drop/Daisy Chain



7.2 ASi MINIPAC EL-40217 LAYOUT

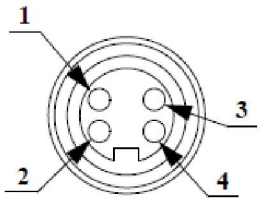




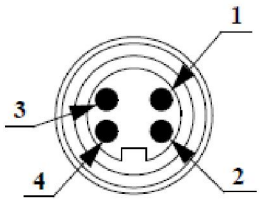


7.3 CONNECTOR OPTIONS

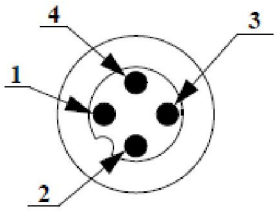
Pin 1/ ASI+/Brown
Pin 2/ NC
Pin 3/ ASI-/Blue
Pin 4/ NC



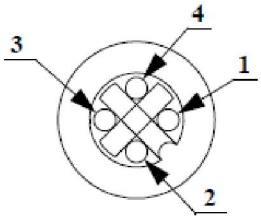
4-PIN
"MINI" CONNECTOR
FEMALE



4-PIN
"MINI" MALE
FIELD WIREABLE



4-PIN
M12 MALE
"MICRO" CONNECTOR



4-PIN
M12 FEMALE
"MICRO" CONNECTOR

7.4 L.E.D. STATUS INDICATORS

The LED's provide information concerning the status of inputs, outputs, the module and/or the network. The LED's provide visual indication of whether any inputs or outputs are active and whether the module or network is in a fault condition. The I/O Status LED's are intended to indicate the state of the inputs and outputs.

Module P/N	LED	State	Indicates
EL-40217	Power LED 1	Off	There is no power applied to device.
		Green	Device is operating in a normal condition.
	Fault LED 5	Red	No data exchange fault indication - possible causes are Master is Stop mode, slave has zero address, slave has an address not in LPS, slave has an incorrect IO/ID-configuration or the slave has detected an internal hardware fault
		Blinking Red	Periphery Fault Indication
	Close L.S. IN0 LED 2	Yellow	Input 0, Bottom L.S. Closed: Valve is in the closed position.
	Open L.S. IN1 LED 3	Yellow	Input 1, Top L.S. Closed: Valve is in the open position.
	Output OUT0 LED 4	Yellow	Output 0, "A" Solenoid is energized.
	Output OUT1 LED 5	Yellow	Output 1, "B" Solenoid is energized.

7.5 SPECIFICATION OVERVIEW

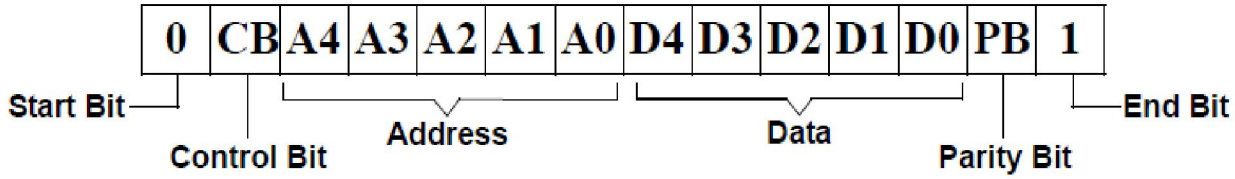
Slave Profile	Spec. 2.1 S-7/A (S-I/O code/ID code)
Medium	Unshielded 2-wire cable for data and power (30VDC/typically up to 8A for connected devices
Length of Bus Cable	100m for single cable; extendable up to 300m using repeaters
Number of Slaves	31 max (in standard address mode), 62 max (in extended address mode)
I/O Count	In standard address mode up tp 2 Inputs and 2 Outputs per slave (max 124 in + 240 out = max 248 I/O)
Addresses	Each slave has a defined address. Address is set by the master or by hand-held programmer. Address range is 1 – 31 "A" slave or "B" slave selected in extended address mode (0 = slave unused)
Bit-Rate	4 bits (net) per slave and message
Cycle Time with 31/62 Slaves	5mS/10mS @ 167 kbd
Encoding Method	Manchester Encoding
Process Data in the Master	Cyclic polling of all participants
Master Services	Initialization of the network, identification of participants and acyclic setting of parameter values to the slaves

7.6 AS-i MODULE EL-40217 CURRENT CONSUMPTION

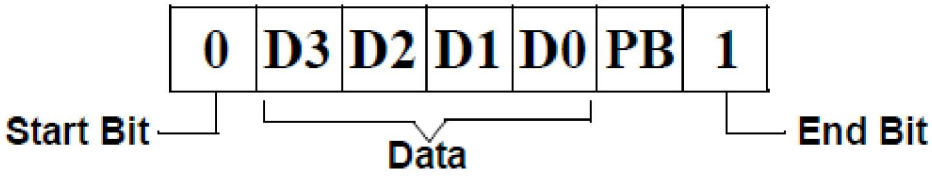
INPUT ACTIVE	OUTPUT ACTIVE	CURRENT DRAW[1]
0	0	11 mA
1	0	19 mA
1	1	44 mA
2	2	74 mA
1	1	54 mA(XP)
2	2	92 mA(XP)
[1]All current values acquired using a non-incendive solenoid except where noted by an XP (explosion proof solenoid)		

7.7 AS-i MESSAGE FRAMING

The AS-i master message frame is always 14 bits in length, including 10 user bits.



The master cyclically queries (Polling) each slave in sequence, each slave being identified by its own unique address.
The AS-i slave response if always 7 bits in length, including 4 user bits for input status.



There are 4 bits of input data and 4 bits of output data in standard address mode or 3 bits of output data in extended address mode of output data produced and consumed by the slave. Slave input and output data are mapped to the master as follows.

Bit 0 (1=Active)	Output #1	Input #1
Bit 1 (1=Active)	Output #2	Input #2
Bit 2 (1=Active)	Output #3	Input #3
Bit 3 (1=Active)	Output #4 or "A" slave "B" slave select bit in extended address mode	Input #4

7.8 AS-i MASTER OUTPUT BIT MAP

There are 4 bits of input data and 4 bits of output data produced and consumed by the slave. Slave input and output data are mapped to the master as follows.

AS-i Master Output Bit-Map

Byte	Bits 7,6,5,4	Bits 3,2,1,0
0	Slave 1 or 1A	Flags
1	Slave 3 or 3A	Slave 2 or 2A
2	Slave 5 or 5A	Slave 4 or 4A
3	Slave 7 or 7A	Slave 6 or 6A
4	Slave 9 or 9A	Slave 8 or 8A
5	Slave 11 or 11A	Slave 10 or 10A
6	Slave 13 or 13A	Slave 12 or 11A
7	Slave 15 or 15A	Slave 14 or 14A
8	Slave 17 or 17A	Slave 16 or 16A
9	Slave 19 or 19A	Slave 18 or 18A
10	Slave 21 or 21A	Slave 20 or 20A
11	Slave 23 or 23A	Slave 22 or 22A
12	Slave 25 or 25A	Slave 24 or 24A
13	Slave 27 or 27A	Slave 26 or 26A
14	Slave 29 or 29A	Slave 28 or 28A
15	Slave 31 or 31A	Slave 30 or 30A

Byte	Bits 7,6,5,4	Bits 3,2,1,0
16	Slave 1B	Flags
17	Slave 3B	Slave 2B
18	Slave 5B	Slave 4B
19	Slave 7B	Slave 6B
20	Slave 9B	Slave 8B
21	Slave 11B	Slave 10B
22	Slave 13B	Slave 12B
23	Slave 15B	Slave 14B
24	Slave 17B	Slave 16B
25	Slave 19B	Slave 18B
26	Slave 21B	Slave 20B
27	Slave 23B	Slave 22B
28	Slave 25B	Slave 24B
29	Slave 27B	Slave 26B
30	Slave 29B	Slave 28B
31	Slave 31B	Slave 30B

Flags

Bit 3	Protected Mode
Bit 2	Configuration Mode
Bit 1	Auto-Address Enable
Bit 0	Off-Line

7.9 AS- i MASTER INOUT BIT MAP

AS-i Master Input Bit-Map

Byte	Bits 7,6,5,4	Bits 3,2,1,0
0	Slave 1 or 1A	Flags
1	Slave 3 or 3A	Slave 2 or 2A
2	Slave 5 or 5A	Slave 4 or 4A
3	Slave 7 or 7A	Slave 6 or 6A
4	Slave 9 or 9A	Slave 8 or 8A
5	Slave 11 or 11A	Slave 10 or 10A
6	Slave 13 or 13A	Slave 12 or 11A
7	Slave 15 or 15A	Slave 14 or 14A
8	Slave 17 or 17A	Slave 16 or 16A
9	Slave 19 or 19A	Slave 18 or 18A
10	Slave 21 or 21A	Slave 20 or 20A
11	Slave 23 or 23A	Slave 22 or 22A
12	Slave 25 or 25A	Slave 24 or 24A
13	Slave 27 or 27A	Slave 26 or 26A
14	Slave 29 or 29A	Slave 28 or 28A
15	Slave 31 or 31A	Slave 30 or 30A

Byte	Bits 7,6,5,4	Bits 3,2,1,0
16	Slave 1B	Flags
17	Slave 3B	Slave 2B
18	Slave 5B	Slave 4B
19	Slave 7B	Slave 6B
20	Slave 9B	Slave 8B
21	Slave 11B	Slave 10B
22	Slave 13B	Slave 12B
23	Slave 15B	Slave 14B
24	Slave 17B	Slave 16B
25	Slave 19B	Slave 18B
26	Slave 21B	Slave 20B
27	Slave 23B	Slave 22B
28	Slave 25B	Slave 24B
29	Slave 27B	Slave 26B
30	Slave 29B	Slave 28B
31	Slave 31B	Slave 30B

Flags

Bit 3	Configuration Mode on Gateway Active
Bit 2	Normal Operation Active
Bit 1	"APF" AS-i Power failure
Bit 0	Configuration OK

I/O	TYPE	MODULE REFERENCE	BITMAP OF DATA
Input 0	Active High/Low[1]	Closed, Bottom Limit Switch	Byte0, Bit 0
Input 1	Active High/Low[1]	Open, Upper Limit Switch	Byte 0, Bit 1
Output 0	Active Low[2]	OUT_0 to Solenoid A	Byte 0, Bit 0
Output 1	Active Low[2]	OUT_1 to Solenoid B	Byte 0, Bit 0

[1] Active High indicates that pulling the input pin up to V+ activates the input. Active Low indicates that pulling the input pin down to ground activates the input.
[2] Active Low indicates that the output is an open collector type circuit.

7.10 WATCHDOG TIMER

The AS-i processor has an embedded watchdog timer that is enabled in the EL-40217 Module. The watchdog timer will be activated for any slave address after the reception of a Write_Parameter Request. It will be de-activated by any circuit reset and after the reception of a Delete_Address Request. When activated, the watchdog timer will be reset by every Write_Parameter and Data_Exchange Request received by the slave. If no such request is received by the slave withing 40 ms, a hardware reset will be performed by the slave and Outputs will be switched inactive, de-energizing any attached solenoids.