



Analog I/O Module
HE559MIX577
4 Input Channels
2 Output Channels
±5V / ±10V / 4-20mA / ±20mA
CsCAN

SmartStix

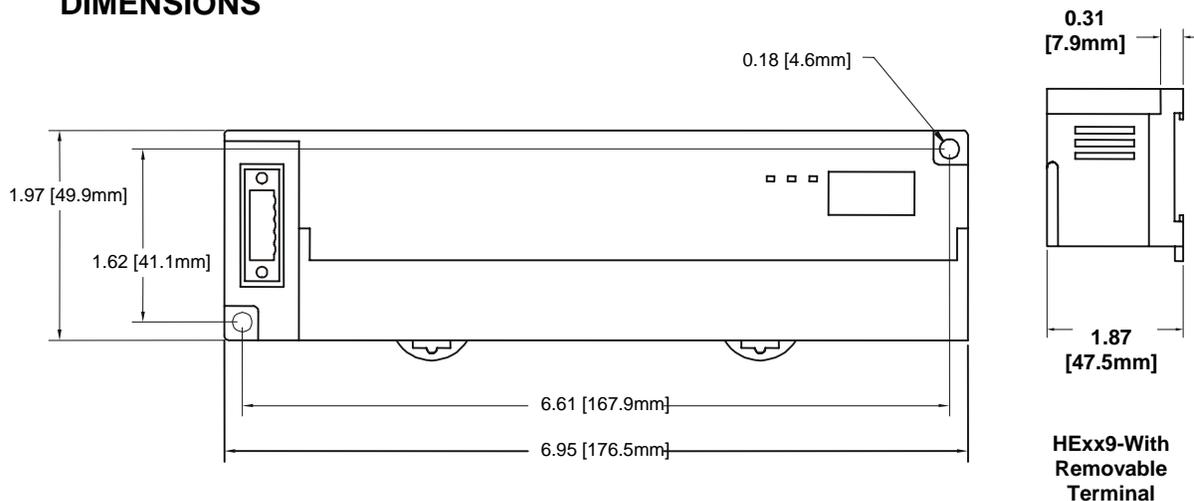
Refer to SmartStix Analog Programming Guide (MAN0703) at www.HornerOCS.com.

1 SPECIFICATIONS

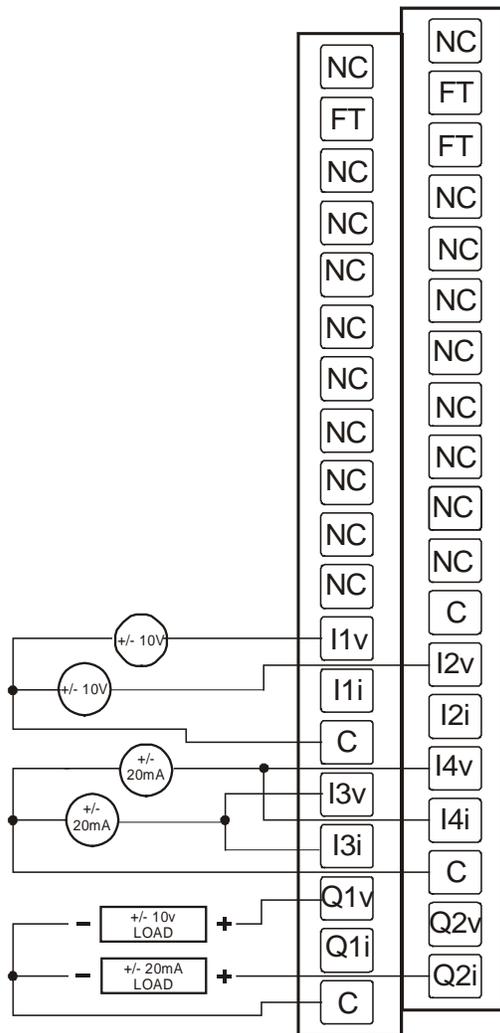
ANALOG IN			
Number of input points	4	Conversion Time	5mS for all Channels
Input Ranges	±5V, ±10V DC 4-20mA, ±20mA DC	Isolation	1000V DC IEC61010-1 300V RMS
Resolution	14 bits	Isolation Method	Magnetic
Accuracy, 25°C	0.3%	Maximum Continuous Overload	±10V: 150VAC ±20mA: ±30mA, Clamped at ±6V
Input Impedance	V: 1 Megohm mA: 150 Ohms	Programmable Filter Time Constants	0.01 to 1.28 Seconds
Register Value for Nominal Full Scale	32000	Filter Modes	Running Average or Adaptive
ANALOG OUT			
Number of output points	2	Isolation	1000V DC IEC61010-1 300V RMS
Input Ranges	±5, ±10V DC 4-20mA, ±20mA DC	Isolation Method	Magnetic
Resolution	14 bits	Output Clamp	±12V, 600Wpk
Accuracy, 25°C	0.3%	Register Value for Nominal Full Scale	32000
Load Resistance	V: 600 Min mA: 500 Max		
GENERAL			
Required Power (Steady State)	3.6W (150ma @ 24VDC)	Operating Temperature	0° to 55° C
Required Power (Inrush)	8A @ 24VDC for 1ms	Operating and Storage Humidity	5 to 95% Non-condensing
		Altitude for use	Up to 2,000m
Storage Temperature	-25° to 70° C	Pollution degree	2 or lower
Atmosphere	Free from corrosive gases and excessive dust	Cooling method	Self-cooling
		Weight	8.40 oz. (238 g)

Vibration				
Occasional Vibration				
Frequency	Acceleration	Amplitude		Sweep Count
$10 \leq f < 57$ Hz	-	0.075 mm		10 times in each direction for X,Y,Z
$57 \leq f \leq 150$ Hz	$9.8 \text{ m/s}^2 \{1G\}$	-		
Continuous Vibration				
Frequency	Acceleration	Amplitude		Sweep Count
$10 \leq f < 57$ Hz	-	0.035 mm		10 times in each direction for X,Y,Z
$57 \leq f \leq 150$ Hz	$4.9 \text{ m/s}^2 \{0.5G\}$	-		
Shocks				
Maximum shock acceleration		$147 \text{ m/s}^2 \{15G\}$		
Duration Time		11 ms.		
Pulse Wave		Half sine wave pulse (3 times in each of X, Y, Z directions)		
Noise Immunity				
Square wave impulse noise		AC: $\pm 1,500\text{VDC}$ DC: $\pm 900\text{VDC}$		
Electrostatic Discharge		Voltage: 4kV (contact discharge)		
Radiated electromagnetic field		27 – 500MHz, 10V/m		
Fast Transient Burst Noise	Severity level	All power modules	Digital I/Os ($U_e \geq 24\text{V}$)	Digital I/Os ($U_e < 24 \text{ V}$) Analog I/Os Communication I/Os
	Voltage	2 kV	1 kV	0.25 kV

2 DIMENSIONS



3 WIRING



006MIX003-R1

MIX577		MIX577	
2	NC	1	NC
4	FT	3	FT
6	NC	5	FT
8	NC	7	NC
10	NC	9	NC
12	NC	11	NC
14	NC	13	NC
16	NC	15	NC
18	NC	17	NC
20	NC	19	NC
22	NC	21	NC
24	I1v	23	C
26	I1i	25	I2v
28	C	27	I2i
30	I3v	29	I4v
32	I3i	31	I4i
34	Q1v	33	C
36	Q1i	35	Q2v
38	C	37	Q2i

FT: Factory Test, Do Not Connect

C terminals are connected together internally but isolated from bus and power circuits.

5 CHANNEL MODE, PROGRAMMABLE FILTER, AND OUTPUT DEFAULT CONFIGURATION

The network supplies configuration information to the HE550MIX577 in the Consumed Directed Digital Data Words sent to the HE550MIX577. In the first word, the low 12 bits, 1 through 12, are channel mode bits. A low mode bit selects $\pm 10V$ and a high mode bit selects $\pm 20mA$. The next three bits, 13 through 15, are input digital filter time constant codes and the high bit, 16, is an adaptive filter enable bit. In the second word, the low 12 bits are channel scale bits. A low scale bit selects $\pm 10V$ or $\pm 20mA$ for the corresponding channel. A high scale bit selects $\pm 5V$ or $4-20mA$. The upper four bits are unused.

Bit	Channel
1	AI1
2	AI2
3	AI3
4	AI4
5	Not used
6	Not used
7	Not used
8	Not used
9	AQ1
10	AQ2
11	Not used
12	Not used

Each analog input on the HE550MIX577 has a single pole 345Hz (461 μ S) cutoff high frequency noise filter. In addition a second digital filter may be specified in the first configuration word with the following time constants.

Bit			Time Constant
15	14	13	
0	0	0	10 milliseconds (Nominal hardware scan rate)
0	0	1	15 milliseconds
0	1	0	35 milliseconds
0	1	1	75 milliseconds
1	0	0	155 milliseconds
1	0	1	315 milliseconds
1	1	0	635 milliseconds
1	1	1	1.275 seconds

This digital filter is useful for applications with significant amounts of random noise. The slower time constants, while yielding better noise suppression, take a longer time to settle after step changes and are also sensitive to impulse noise which is treated like Gaussian noise and averaged.

Bit 16 of the first configuration word may be set to specify an adaptive filter algorithm that:

1. Responds much more quickly to large step changes at slower time constants with full filtering of low level noise.
2. Suppresses impulse noise at the expense of slightly slower response at the shortest time constant settings. (Approximately 10 additional milliseconds)

Note that actual system response time is network dependent.

Bits 9 through 12 of the 5th configuration word control the behavior of the analog outputs when network communication is lost. The bit to channel correspondence is the same as for the mode and scale bits. If the corresponding bit is set, the outputs hold the last state. If the corresponding bit is cleared, the outputs are set to the respective value supplied to the HE550MIX577 in the second four words of the Consumed Directed Analog Data sent by the OCS. The other bits of the 5th configuration word are unused.

Refer to SmartStix Analog Programming Guide.

6 INPUT AND OUTPUT CONVERSION FACTORS

The following table describes how real-world values are scaled in the controller. For a given physical voltage or current, the register data value may be calculated by using the conversion factor from the table. The following formula is used: **Data = Voltage or Current / Conversion Factor**

Example: The user selects a voltage range of $\pm 10V$:

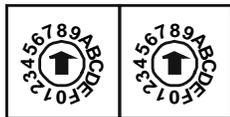
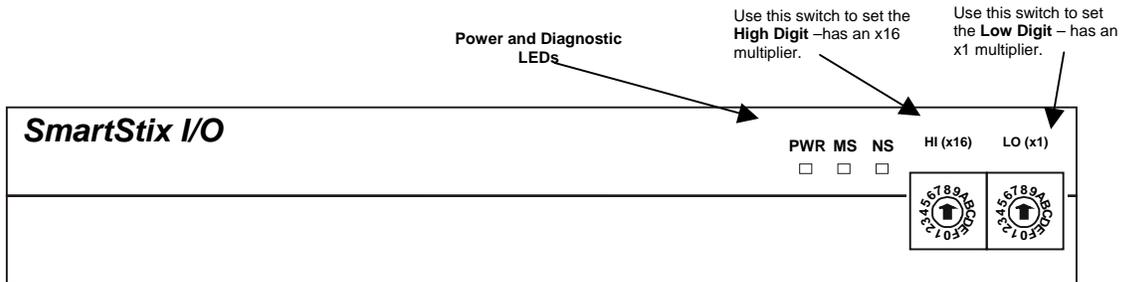
1. The physical voltage is 6 Volts.
2. Using the table, the conversion factor for the voltage range of $\pm 10V$ is .0003125.
3. To determine the data value, the formula is used: $\text{Data} = V / \text{Conversion Factor}$
 $19200 = 6 \text{ VDC} / 0.0003125$
4. For the 4 to 20mA range, the offset, 4mA, must first be subtracted from the physical output value before dividing by the scale factor to yield the register data value.

Conversion between Physical Values and Register Values			
Selected Range	Volts / mA	Register Data	Conversion Factor
$\pm 5.00 \text{ V}$	> +5.11	32767	0.00015625
	+5.00	32000	
	0.00	0	
	-5.00	-32000	
	< -5.11	-32768	
$\pm 10.00 \text{ V}$	> +10.23	32767	0.0003125
	+10.00	32000	
	0.00	0	
	-10.00	-32000	
	< -10.23	-32768	
4..20 mA	< +20.37	32767	0.0005
	+20.00	32000	
	+4.00	0	
	-12.00	-32000	
	> -12.38	-32768	
$\pm 20.00 \text{ mA}$	> +20.47	32767	0.0006250
	+20.00	32000	
	0	0	
	-20.00	-32000	
	< -20.47	-32768	

7 SETTING ID SWITCHES

CsCAN Network IDs are set using the hexadecimal number system from 01 to FD. The decimal equivalent is 1-253. Refer to following Conversion Table, which shows the decimal equivalent of hexadecimal numbers. Set a unique Network ID by inserting a small Phillips screwdriver into the two *identical* switches.

Note: The CsCAN Baud Rate for SmartStix I/O is fixed at 125KBaud



Close-up of Switches

Decimal (Dec) to Hexadecimal (Hex) Conversion																
Dec	Hex		Dec	Hex		Dec	Hex		Dec	Hex	Dec	Hex		Dec	Hex	
	HI	LO		HI	LO		HI	LO				HI	LO		HI	LO
			54	3	6	108	6	C	162	A	2	216	D	8		
1	0	1	55	3	7	109	6	D	163	A	3	217	D	9		
2	0	2	56	3	8	110	6	E	164	A	4	218	D	A		
3	0	3	57	3	9	111	6	F	165	A	5	219	D	B		
4	0	4	58	3	A	112	7	0	166	A	6	220	D	C		
5	0	5	59	3	B	113	7	1	167	A	7	221	D	D		
6	0	6	60	3	C	114	7	2	168	A	8	222	D	E		
7	0	7	61	3	D	115	7	3	169	A	9	223	D	F		
8	0	8	62	3	E	116	7	4	170	A	A	224	E	0		
9	0	9	63	3	F	117	7	5	171	A	B	225	E	1		
10	0	A	64	4	0	118	7	6	172	A	C	226	E	2		
11	0	B	65	4	1	119	7	7	173	A	D	227	E	3		
12	0	C	66	4	2	120	7	8	174	A	E	228	E	4		
13	0	D	67	4	3	121	7	9	175	A	F	229	E	5		
14	0	E	68	4	4	122	7	A	176	B	0	230	E	6		
15	0	F	69	4	5	123	7	B	177	B	1	231	E	7		
16	1	0	70	4	6	124	7	C	178	B	2	232	E	8		
17	1	1	71	4	7	125	7	D	179	B	3	233	E	9		
18	1	2	72	4	8	126	7	E	180	B	4	234	E	A		
19	1	3	73	4	9	127	7	F	181	B	5	235	E	B		
20	1	4	74	4	A	128	8	0	182	B	6	236	E	C		
21	1	5	75	4	B	129	8	1	183	B	7	237	E	D		
22	1	6	76	4	C	130	8	2	184	B	8	238	E	E		
23	1	7	77	4	D	131	8	3	185	B	9	239	E	F		
24	1	8	78	4	E	132	8	4	186	B	A	240	F	0		
25	1	9	79	4	F	133	8	5	187	B	B	241	F	1		
26	1	A	80	5	0	134	8	6	188	B	C	242	F	2		
27	1	B	81	5	1	135	8	7	189	B	D	243	F	3		
28	1	C	82	5	2	136	8	8	190	B	E	244	F	4		
29	1	D	83	5	3	137	8	9	191	B	F	245	F	5		
30	1	E	84	5	4	138	8	A	192	C	0	246	F	6		
31	1	F	85	5	5	139	8	B	193	C	1	247	F	7		
32	2	0	86	5	6	140	8	C	194	C	2	248	F	8		
33	2	1	87	5	7	141	8	D	195	C	3	249	F	9		
34	2	2	88	5	8	142	8	E	196	C	4	250	F	A		
35	2	3	89	5	9	143	8	F	197	C	5	251	F	B		
36	2	4	90	5	A	144	9	0	198	C	6	252	F	C		
37	2	5	91	5	B	145	9	1	199	C	7	253	F	D		
38	2	6	92	5	C	146	9	2	200	C	8					
39	2	7	93	5	D	147	9	3	201	C	9					
40	2	8	94	5	E	148	9	4	202	C	A					
41	2	9	95	5	F	149	9	5	203	C	B					
42	2	A	96	6	0	150	9	6	204	C	C					
43	2	B	97	6	1	151	9	7	205	C	D					
44	2	C	98	6	2	152	9	8	206	C	E					
45	2	D	99	6	3	153	9	9	207	C	F					
46	2	E	100	6	4	154	9	A	208	D	0					
47	2	F	101	6	5	155	9	B	209	D	1					
48	3	0	102	6	6	156	9	C	210	D	2					
49	3	1	103	6	7	157	9	D	211	D	3					
50	3	2	104	6	8	158	9	E	212	D	4					
51	3	3	105	6	9	159	9	F	213	D	5					
52	3	4	106	6	A	160	A	0	214	D	6					
53	3	5	107	6	B	161	A	1	215	D	7					

8 LEDS

SmartStix I/O Modules provide diagnostic and status LED indicators.

a. Diagnostic LED Indicators

Diagnostic LED	State	Meaning
MS (Module Status)	Solid Red	Initializing
	Blinking Red	I/O test failed, internal hardware fault
	Blinking Green	Module is in power-up state *
	Solid Green	Module is running normally
NS (Network Status)	Solid Red	Network Ack or Dup ID test failed **
	Blinking Red	Network ID test failed: ID not in the range of 1..253
	Blinking Green	Life Expectancy timeout, outputs are in default state ***
	Solid Green	Network is running normally

* If a blinking green Module Status persists for more than a few seconds the module has not received the expected configuration from the OCS. This may be due to no Network I/O configuration created in Cscape, not having downloaded the Network I/O configuration to the master OCS, an unpowered master OCS, or the wrong Network ID number set on the module's rotary switches.

** **Network Ack** means that no other node is active on the network. **Dup ID test failed** means that another node with the same ID switch setting is already on the network.

*** Life Expectancy timeout means that the module has not received a periodic message from the master OCS in the time specified in either the Life Expectancy directed data message or the Comm timeout of the Network I/O Configuration window in Cscape.

b. Status LED Indicators

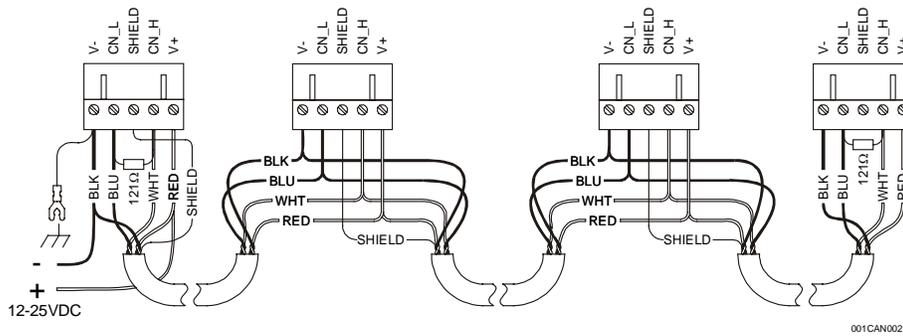
The Power Status LED illuminates Red when power is applied to the module. There are I/O Status LED indicators for each of the Digital I/O points, which illuminate Red when an I/O point is ON.

9 NETWORK CABLE

For detailed wiring information, refer to the applicable hardware manual listed in this datasheet under **Installation/Safety**. A handy checklist is provided that covers panel box layout requirements and minimum clearances.

	Pin	Description
⊗	RED	1 V+
⊗	WHT	2 CAN_H
⊗	SHD	3 Shield
⊗	BLU	4 CAN_L
⊗	BLK	5 V-

Recommended Cable	
Thick: (Max Distance = 500m)	Belden 3082A
Thin: (Max Distance = 100m)	Belden 3084A



CAN Wiring

Note: 12 - 24VDC must be supplied to the network.

10 INSTALLATION / SAFETY

When found on the product, the following symbols specify:



Warning: Consult user documentation.



Warning: Electrical Shock Hazard.

WARNING: To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.

WARNING: To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.

WARNING: Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.

WARNING: In the event of repeated failure, do not replace the fuse again as a repeated failure indicates a defective condition that will not clear by replacing the fuse.

WARNING: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

For detailed installation and a handy checklist that covers panel box layout requirements and minimum clearances, refer to the hardware manual of the controller you are using. (See the **Additional References** section in this document.)

- All applicable codes and standards need to be followed in the installation of this product.
- For I/O wiring (discrete), use the following wire type or equivalent: Belden 8441 or equivalent.

Adhere to the following safety precautions whenever any type of connection is made to the module.

- Connect the green safety (earth) ground first before making any other connections.
- When connecting to electric circuits or pulse-initiating equipment, open their related breakers. Do not make connections to live power lines.
- Make connections to the module first; then connect to the circuit to be monitored.
- Route power wires in a safe manner in accordance with good practice and local codes.
- Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
- Ensure hands, shoes, and floor are dry before making any connection to a power line.
- Make sure the unit is turned OFF before making connection to terminals. Make sure all circuits are de-energized before making connections.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.

11 ADDITIONAL REFERENCES

The following table indicates the hardware manual numbers for the controller you are using. Hardware manuals contain detailed installation, configuration and other pertinent information. See the **Technical Support** section in this document for the web site address to download references and obtain revised editions.

Additional References	
Controller	Manual Number
QX Series Hardware e.g. HEQX451, HEQX551, HEQX651	MAN0798
NX Series Hardware e.g. HENX220, HENX221, HENX250, HENX251	MAN0781
Operator Control Station Hardware (OCS, OCX) e.g., OCS1XX / 2XX; Graphic QCS250	MAN0227
Remote Control Station Hardware RCS (except RCS116), RCX (e.g., RCS210, RCS250)	
Color Touch QX Hardware e.g., OCS300, OCS 301, OCS 350, OCS 351 e.g., OCS 451, OCS 551, OCS 651	MAN0465
LX Series Hardware e.g., LX-280 / LX-300; RCS116	MAN0755
MiniQX / MiniRCS / MiniOCX / MiniRCX Hardware e.g., HE500QXxxx	MAN0305
Other Useful References	
CAN Networks	MAN0799
Cscape Programming and Reference	MAN0313
DeviceNet™ Implementation	SUP0326
Wiring Accessories and Spare Parts Manual	MAN0347

12 TECHNICAL SUPPORT

For assistance and manual updates, contact Technical Support at the following locations:

North America:

(317) 916-4274

www.heapg.com

email: techspt@heapg.com

Europe:

(+) 353-21-4321-266

www.horner-apg.com

email: techsupport@hornerirl.ie