# High Speed +/- 10V VDC Analog Input Module
Product Specifications and Installation Data

1   DESCRIPTION

The Horner APG High Speed +/-10V Analog Input Module provides eight single ended or four differential analog input channels, with 16-bits of resolution. The HE693ADC816 has 500VDC backplane isolation. This module converts the voltage input signals into digital values (-32,000 to +32,000), which are placed directly into the %AI table of the PLC CPU. Each of the eight channels has a programmable setpoint, the level of which is set in the PLC program via %AQ output registers. If the analog input value reaches or exceeds the setpoint, a corresponding digital input %I is energized.
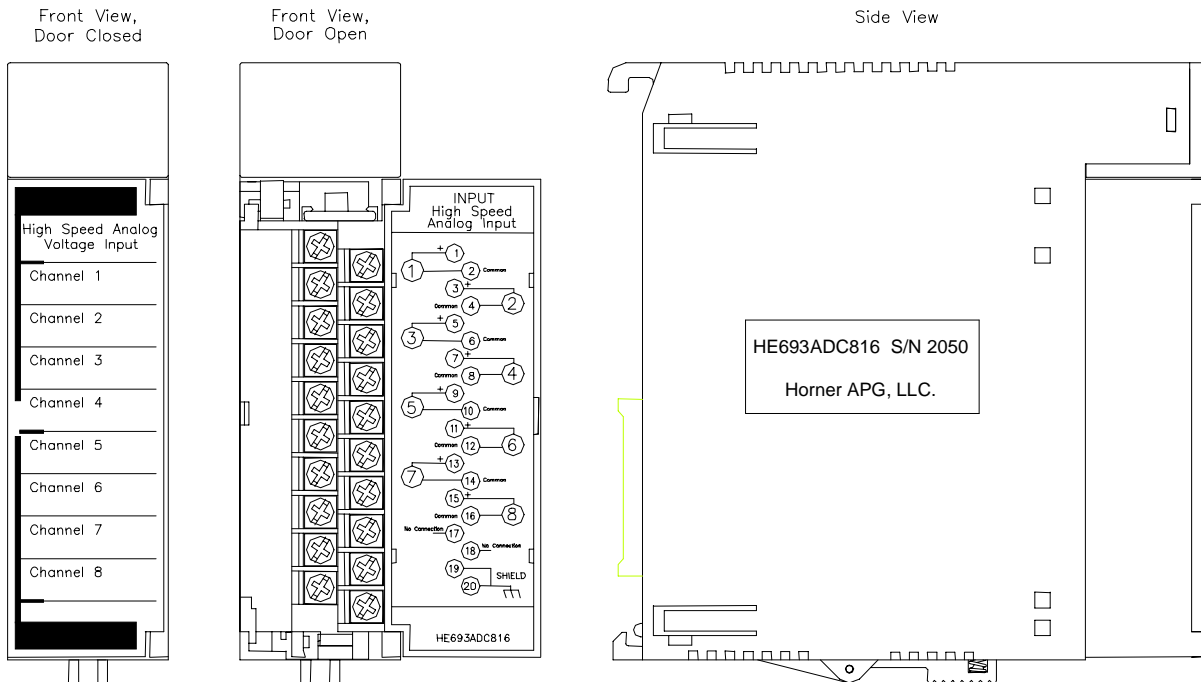
Figure 1 – HE693ADC816 Module

2   SPECIFICATIONS

<table>
<tr><th colspan="4">Table 1 – Module Specifications</th></tr>
<tr><th>Specification</th><th></th><th>Specification</th><th></th></tr>
<tr><td>Power Consumption, Typical</td><td>230mA @ 5VDC (440mA inrush)</td><td>Analog Filtering</td><td>1.6KHz low pass</td></tr>
<tr><td>Number of Channels</td><td>8 single ended
4 differential</td><td>Digital Filtering</td><td>1-128 samples/update</td></tr>
<tr><td>I/O Required</td><td>8 %AI, 8 %AQ, 16 %I</td><td>Maximum Error</td><td>.04% full scale</td></tr>
<tr><td>Input Range</td><td>+/- 10V</td><td>Maximum Input Voltage</td><td>75VDC</td></tr>
<tr><td>A/D Type, Resolution</td><td>Successive Approx. 16 bits</td><td>Backplane Isolation</td><td>500VDC</td></tr>
<tr><td>Useable Resolution</td><td>16 bits</td><td>Common Mode Rejection</td><td>>100dB</td></tr>
<tr><td>Sample Rate</td><td>3000 channels/S, No Filtering
*(See Installation Hints)</td><td>Operating Temperature</td><td>0 to 60● C</td></tr>
<tr><td>Input Impedance</td><td>1 Megohm</td><td>Relative Humidity</td><td>5% to 95%, non-condensing</td></tr>
</table>

3   CONFIGURATION

```
│RACK       │          │          │          │          │          │          │          │          │
1pcm       2hsc       3frgn      4oi        5apm       6iolink 7iop       8          9          10

>

        SERIES 90-30 MODULE IN RACK 0 SLOT 2
                        SOFTWARE  CONFIGURATION
  SLOT     Catalog #: FOREIGN                   FOREIGN MODULE
   2
  FRGN
           Module ID  :    3
           %I Ref Adr :   %I0001    Byte 1   : 00000001   Byte 9    : 00
           %I Size    :    16       Byte 2   : 00000100   Byte 10   : 00
           %Q Ref Adr :   %Q0001    Byte 3   : 00         Byte 11   : 00
           %Q Size    :    0        Byte 4   : 00         Byte 12   : 00
           %AI Ref Adr:   %AI0001   Byte 5   : 00         Byte 13   : 00
           %AI Size   :    8        Byte 6   : 00         Byte 14   : 00
           %AQ Ref Adr:   %AQ001    Byte 7   : 00         Byte 15   : 00
           %AQ Size   :    8        Byte 8   : 00         Byte 16   : 00
```

Figure 2 – Foreign Module Configuration

To reach this screen, select I/O Configuration (F1), cursor over to the slot containing the module and select Other (F8), and Foreign (F3).
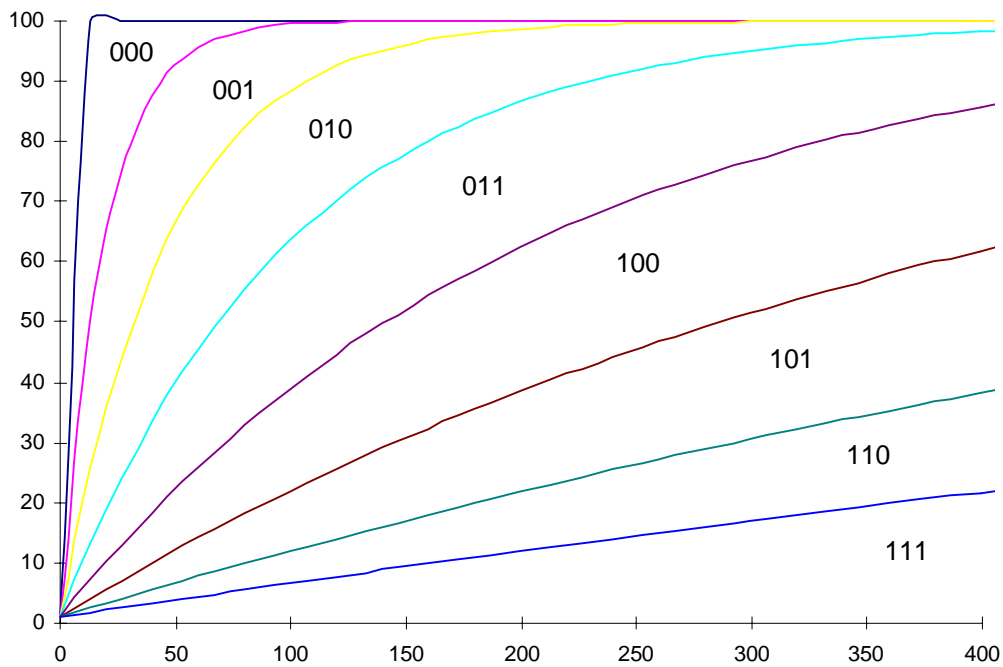
Figure 3 – Digital Filtering

The effect of digital filtering (set with Byte 2) on module response to a voltage change. *(% voltage change completed vs. time in milliseconds).*

Table 2 – I/O Description			
	Channel	**Setpoint Bit**	**Setpoint**
S I N G L E E N D E D	1	%I1	%AQ1
	2	%I2	%AQ2
	3	%I3	%AQ3
	4	%I4	%AQ4
	5	%I5	%AQ5
	6	%I6	%AQ6
	7	%I7	%AQ7
	8	%I8	%AQ8
D I F F E R E N T I A L	**Channel**	**Setpoint Bit**	**Setpoint**
	1/2	%I1	%AQ1
	3/4	%I3	%AQ3
	5/6	%I5	%AQ5
	7/8	%I7	%AQ7

Table 3 – Configuration Parameters					
%I Size	%AI Size	%AQ Size	Byte 1	Byte 2	Bytes 3-6
16	8	8	0001	0000 thru 0111 (see chart)	0=Single Ended 1=Differential

The nine necessary parameters are %I Size, %AI Size, %AQ Size, and Bytes 1 through 6.

Table 4 – Scaling	
Scaling	Smallest Step Change
Volts = %AI / 32,000 x 10	1 (dec) = 0.3125mV

The module converts each analog voltage into a decimal value between +/-32,000. Each bit is significant, therefore the smallest decimal step change is 1.

4　　WIRING / INSTALLATION

Table 5 – Input Description			
Single Ended		Differential	
Reference	Description	Reference	Description
%AI1	Input Value of Channel 1	%AI1	Difference Between Channel 1 and 2
%AI2	Input Value of Channel 2	%AI2	Difference Between Channel 1 and 2
%AI3	Input Value of Channel 3	%AI3	Difference Between Channel 3 and 4
%AI4	Input Value of Channel 4	%AI4	Difference Between Channel 3 and 4
%AI5	Input Value of Channel 5	%AI5	Difference Between Channel 5 and 6
%AI6	Input Value of Channel 6	%AI6	Difference Between Channel 5 and 6
%AI7	Input Value of Channel 7	%AI7	Difference Between Channel 7 and 8
%AI8	Input Value of Channel 8	%AI8	Difference Between Channel 7 and 8

When configured as a single ended input, each channel reports the analog value in the appropriate %AI register. When configured as a differential input, the odd numbered %AIs report the difference between the two channels and the even numbered %AIs report the average between the two channels.
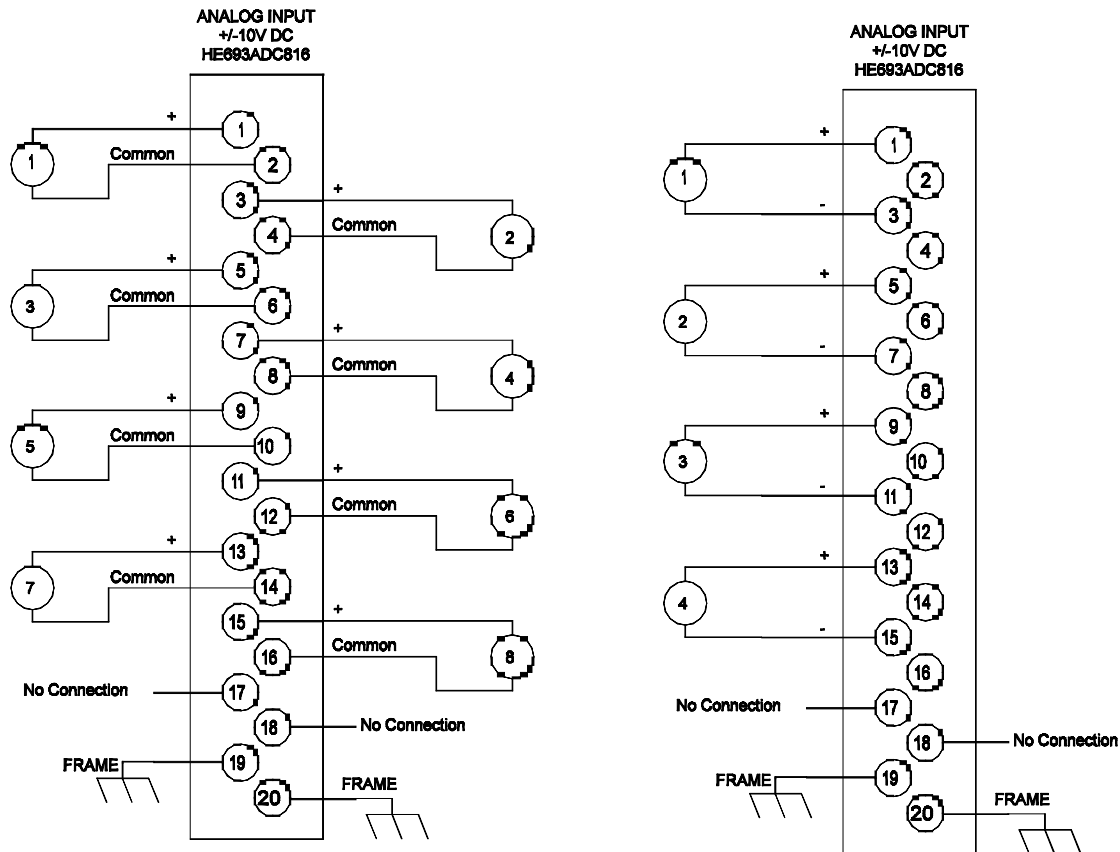
4.1   Installation Hints

The following installation hints need to be followed.

a. Wiring needs to be routed in its own conduit.

b. Shielded, twisted pair extension wiring offers best noise immunity.

c. If shielded wiring is used, a good earth ground connection is critical. If shields are connected at the module end, terminals 19 and 20 should be used as the shield ground point.

d. 3000 channels/S is achieved if there are 2 or more modules present in the rack. With the HE693ADC816 in the rack alone or using the DO/IO command, the Sample Rate is 2700 channels/S.