# T1H-EBC(100) ANALOG MODULE ADDRESSING - H2/4-ERM(100)

APPENDIX
# E

## In This Appendix...

# T1H-EBC(100) Analog Module Addressing - H2/4-ERM(100)

When using an H2-ERM(100) or H4-ERM(100) to T1H-EBC(100) configuration, the analog module data in the EBC base is mapped to V-memory or Discrete I/O.

The ERM Workbench software will tell you what the mapping is for each I/O module in the T1H-EBC(100) base. Once you have configured the ERM using ERM Workbench you will get a screen similar to the following:
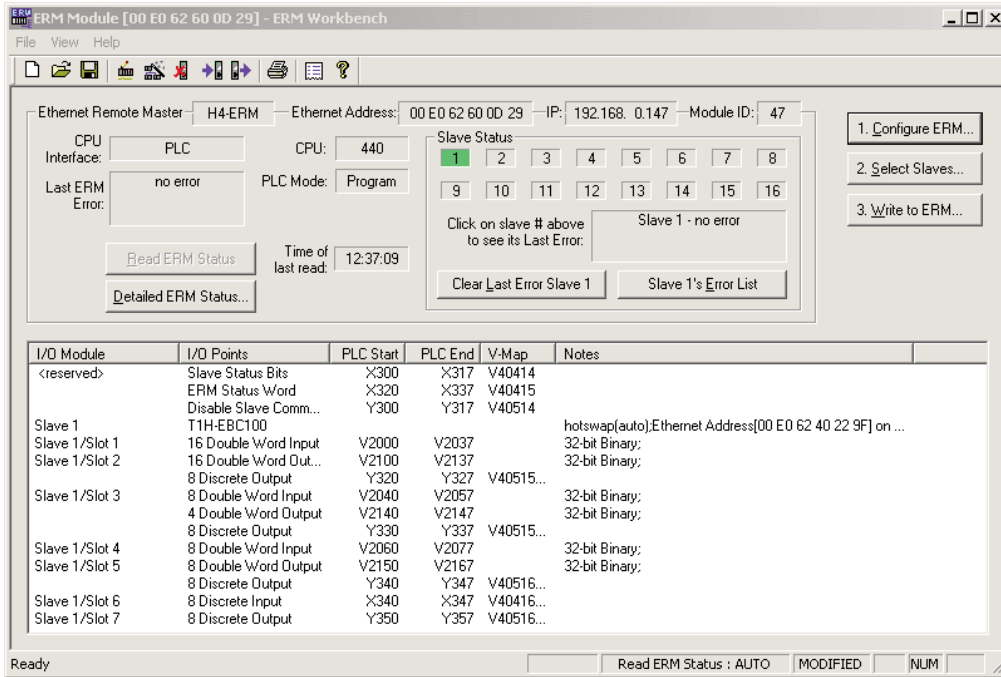


For the example above, the I/O configuration for Slave 1 is:

  Slot 1 = T1F-14THM
  Slot 2 = T1F-16DA-2
  Slot 3 = T1F-8AD2DA-2
  Slot 4 = T1F-08AD-2
  Slot 5 = T1F-08DA-2
  Slot 6 = T1K-08NA-1
  Slot 7 = T1K-08TR

Use the addresses shown in the ERM Workbench along with the following table to access the analog I/O with your ERM master.

| T1H-EBC(100) Analog Module Addressing - H2/4-ERM(100) | | | |
|---|---|---|---|
| **Part Number** | **Channel Data** | **Module Configuration Data** | **Diagnostics Data** |
| T1F-08AD-1 | Input Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>V+6 = Ch4<br>V+10 = Ch5<br>V+12 = Ch6<br>V+14 = Ch7<br>V+16 = Ch8 | No Software Configuration<br><br>Input Range Depends on Input Signal:<br>-20 to 20mA = -8192 to 8191<br>0 to 20mA = 0 to 8191<br>4 to 20mA = 1638 to 8191 | No Built-In Broken Transmitter Detection<br>Monitor for counts less than 1638 when using 4 to 20mA |
| T1F-08AD-2 | Input Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>V+6 = Ch4<br>V+10 = Ch5<br>V+12 = Ch6<br>V+14 = Ch7<br>V+16 = Ch8 | No Software Configuration<br><br>Input Range Depends on Input Signal:<br>0 to 5V = 0 to 4095<br>0 to 10V = 0 to 8191<br>+/-5V = -4095 to 4095<br>+/-10V = -8192 to 8191 | No Broken Transmitter Detection<br>(N/A for Voltage) |
| T1F-16AD-1 | Input Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>...<br>V+34 = Ch15<br>V+36 = Ch16 | No Software Configuration<br><br>Input Range Depends on Input Signal:<br>-20 to 20mA = -8192 to 8191<br>0 to 20mA = 0 to 8191<br>4 to 20mA = 1638 to 8191 | No Built-In Broken Transmitter Detection<br>Monitor for counts less than 1638 when using 4 to 20mA |
| T1F-16AD-2 | Input Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>...<br>V+34 = Ch15<br>V+36 = Ch16 | No Software Configuration<br><br>Input Range Depends on Input Signal:<br>0 to 5V = 0 to 4095<br>0 to 10V = 0 to 8191<br>+/-5V = -4095 to 4095<br>+/-10V = -8192 to 8191 | No Broken Transmitter Detection<br>(N/A for Voltage) |
| T1F-14THM | Input Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>...<br>V+32 = Ch14<br>V+34 = Status 1<br>V+36 = Status 2<br><br>Status info is only available if T1F- 14THM is date code 1205 or later | No Software Configuration<br><br>THM Type Set by Jumpers<br><br>(see Status 1 Data table below) | Broken Thermocouple Indication.<br>The channel data goes to zero and ERM Workbench 'Slave Error List' shows error in 'Extended Error column. |

Status 1 Data (within Module Configuration Data for T1F-14THM):

| Status 1 Data | |
|---|---|
| Bits 0-3 | Number of Channels Enabled (Inverted)<br>0001 = All Channels<br>1110 = One Channel |
| Bit 4 | T/C Type Jumper 0<br>0=installed, 1=removed |
| Bit 5 | T/C Type Jumper 1 |
| Bit 6 | T/C Type Jumper 2 |
| Bit 7 | T/C Type Jumper 3 |
| Bit 8 | Units 0 Jumper |
| Bit 9 | Units 1 Jumper |
| Bit 10 | Calibrate Enable Jumper |
| Bit 11 | CJC Installed 0=Yes, 1=No |
| Bits 12,13 | Always ON |
| Bits 14, 15 | Always OFF |

Status 2 Data is the Temperature of the CJC with one implied decimal place.

| T1H-EBC(100) Analog Module Addressing - H2/4-ERM(100) | | | |
|---|---|---|---|
| **Part Number** | **Channel Data** | **Module Configuration Data** | | **Diagnostics Data** |
| T1F-16RTD | Input Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>...<br>V+34 = Ch15<br>V+36 = Ch16 | No Software Configuration<br><br>RTD Type Set by Jumpers | | Broken RTD Indication.<br>The channel data goes to zero and ERM Workbench 'Slave Error List' shows error in 'Extended Error' column. |
| T1F-8AD4DA-1 | Input Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>V+6 = Ch4<br>V+10 = Ch5<br>V+12 = Ch6<br>V+14 = Ch7<br>V+16 = Ch8<br><br>Output Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>V+6 = Ch4 | Analog Output Configuration (T1F-8AD4DA-1) | | No Built-In Broken Transmitter Detection<br>Monitor for counts less than 1638 when using 4 to 20mA |
| | | Y+0 | Output Enable<br>0: Outputs OFF<br>1: Outputs Enabled | |
| | | Y+1 | N/A | |
| | | Y+2 | N/A | |
| | | Y+3 | 0-20mA or 4-20mA<br>0: 0-20mA range<br>1: 4-20mA range | |
| | | Y+4 to Y+7 | Reserved | |
| | | Input Range Depends on Input Signal:<br>-20 to 20mA = -8192 to 8191<br>0 to 20mA = 0 to 8191<br>4 to 20mA = 1638 to 8191 | | |
| T1F-8AD4DA-2 | Input Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>V+6 = Ch4<br>V+10 = Ch5<br>V+12 = Ch6<br>V+14 = Ch7<br>V+16 = Ch8<br><br>Output Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>V+6 = Ch4 | Analog Output Configuration (T1F-8AD4DA-2) | | No Broken Transmitter Detection<br>(N/A for Voltage) |
| | | Y+0 | Output Enable<br>0: Outputs OFF<br>1: Outputs Enabled | |
| | | Y+1 | Unipolar/Bipolar<br>0: Unipolar<br>1: Bipolar | |
| | | Y+2 | 5V/10V Range<br>0: 5V Range<br>1: 10V Range | |
| | | Y+3 | N/A | |
| | | Y+4 to Y+7 | Reserved | |
| | | Input Range Depends on Input Signal:<br>0 to 5V = 0 to 4095<br>0 to 10V = 0 to 8191<br>+/-5V = -4095 to 4095<br>+/-10V = -8192 to 8191 | | |
| T1F-08DA-1 | Output Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>V+6 = Ch4<br>V+10 = Ch5<br>V+12 = Ch6<br>V+14 = Ch7<br>V+16 = Ch8 | Analog Output Configuration (T1F-08DA-1) | | None |
| | | Y+0 | Output Enable<br>0: Outputs OFF<br>1: Outputs Enabled | |
| | | Y+1 | N/A | |
| | | Y+2 | N/A | |
| | | Y+3 | 0-20mA or 4-20mA<br>0: 0-20mA range<br>1: 4-20mA range | |
| | | Y+4 to Y+7 | Reserved | |

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| T1H-EBC(100) Analog Module Addressing - H2/4-ERM(100) | | | | |
|---|---|---|---|---|
| **Part Number** | **Channel Data** | **Module Configuration Data** | | **Diagnostics Data** |
| T1F-08DA-2 | Output Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>V+6 = Ch4<br>V+10 = Ch5<br>V+12 = Ch6<br>V+14 = Ch7<br>V+16 = Ch8 | Analog Output Configuration (T1F-08DA-2) | | None |
| | | Y+0 | Output Enable<br>0: Outputs OFF<br>1: Outputs Enabled | |
| | | Y+1 | Unipolar/Bipolar<br>0: Unipolar<br>1: Bipolar | |
| | | Y+2 | 5V/10V Range<br>0: 5V Range<br>1: 10V Range | |
| | | Y+3 | N/A | |
| | | Y+4 to Y+7 | Reserved | |
| T1F-16DA-1 | Output Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>...<br>V+34 = Ch15<br>V+36 = Ch16 | Analog Output Configuration (T1F-16DA-1) | | None |
| | | Y+0 | Output Enable<br>0: Outputs OFF<br>1: Outputs Enabled | |
| | | Y+1 | N/A | |
| | | Y+2 | N/A | |
| | | Y+3 | 0-20mA or 4-20mA<br>0: 0-20mA range<br>1: 4-20mA range | |
| | | Y+4 to Y+7 | Reserved | |
| T1F-16DA-2 | Output Data<br>V+0 = Ch1<br>V+2 = Ch2<br>V+4 = Ch3<br>...<br>V+34 = Ch15<br>V+36 = Ch16 | Analog Output Configuration (T1F-16DA-2) | | None |
| | | Y+0 | Output Enable<br>0: Outputs OFF<br>1: Outputs Enabled | |
| | | Y+1 | Unipolar/Bipolar<br>0: Unipolar<br>1: Bipolar | |
| | | Y+2 | 5V/10V Range<br>0: 5V Range<br>1: 10V Range | |
| | | Y+3 | N/A | |
| | | Y+4 to Y+7 | Reserved | |

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## T1F-14THM Example (Module in Slot 1)

Using ERM Workbench (below) and the 'T1H-EBC(100) Analog Module Addressing - H2/4-ERM(100) chart above, we can find all of the addresses associated with the T1F-14THM module in Slot 1. The addresses are listed in the tables below.
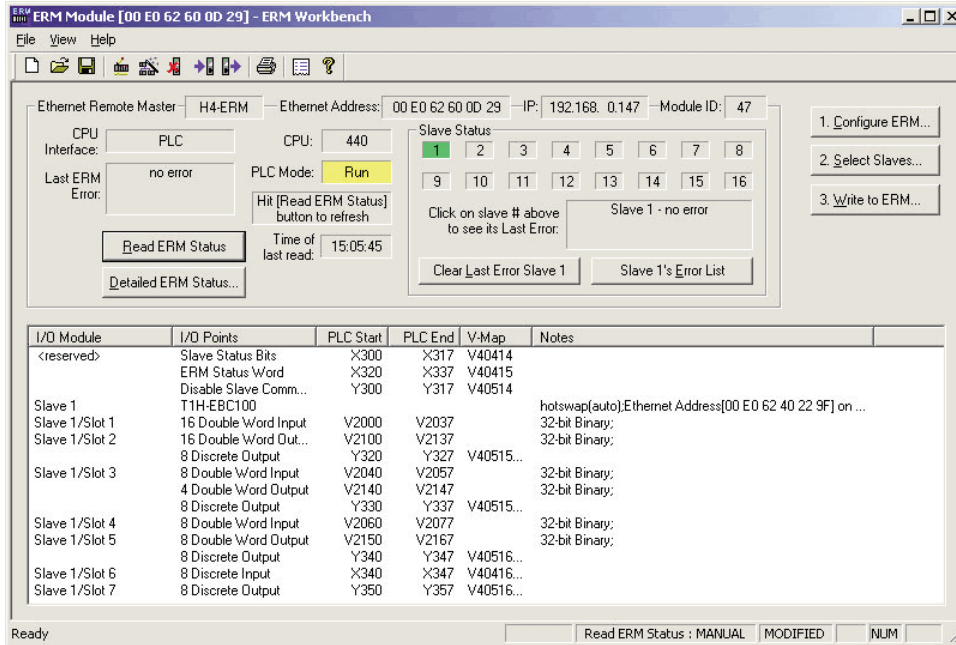


| Input Channel | Address |
|---|---|
| Channel 1 Temperature | V2000 |
| Channel 2 Temperature | V2002 |
| Channel 3 Temperature | V2004 |
| Channel 4 Temperature | V2006 |
| Channel 5 Temperature | V2010 |
| Channel 6 Temperature | V2012 |
| Channel 7 Temperature | V2014 |
| Channel 8 Temperature | V2016 |
| Channel 9 Temperature | V2020 |
| Channel 10 Temperature | V2022 |
| Channel 11 Temperature | V2024 |
| Channel 12 Temperature | V2026 |
| Channel 13 Temperature | V2030 |
| Channel 14 Temperature | V2032 |
| **Status Words** | **Address** |
| Status1 | V2034 |
| CJC Temperature | V2036 |

In this example, 24VDC is applied to the T1F-14THM in Slave 1 Slot 1 and all channels are shorted CH+ to CH-. As seen in the DirectSoft Data View window below, all channels will read the terminal block ambient temperature when shorted (degrees F in this configuration). All V-memory values in this DirectSoft Data View window are displayed as Decimal DWORDs except V2034 which is displayed as a Binary WORD.

V2036 is the CJC temperature reading in degrees C with one implied decimal place. So 27.2°C = 80.9°F.

| | Element | Status |
|---|---|---|
| 1 | | |
| 2 | V2000 | 806 |
| 3 | V2002 | 809 |
| 4 | V2004 | 811 |
| 5 | V2006 | 815 |
| 6 | V2010 | 811 |
| 7 | V2012 | 819 |
| 8 | V2014 | 821 |
| 9 | V2016 | 813 |
| 10 | V2020 | 799 |
| 11 | V2022 | 803 |
| 12 | V2024 | 805 |
| 13 | V2026 | 809 |
| 14 | V2030 | 806 |
| 15 | V2032 | 788 |
| 16 | V2034 | 0011010000000001 |
| 17 | V2036 | 272 |

| V2034 Status 1 Word | |
|---|---|
| Bits 0-3 | All Channels Enabled (0001) |
| Bit 4 | T/C Type Jumper 0 Installed (0) |
| Bit 5 | T/C Type Jumper 1 Installed (0) |
| Bit 6 | T/C Type Jumper 2 Installed (0) |
| Bit 7 | T/C Type Jumper 3 Installed (0) |
| Bit 8 | Units 0 Jumper Installed (0) |
| Bit 9 | Units 1 Jumper Installed (0) |
| Bit 10 | Calibrate Enable Jumper Removed (1) |
| Bit 11 | CJC Installed Yes (0) |
| Bits 12,13 | Always ON |
| Bits 14, 15 | Always OFF |

## T1F-14THM Example (Broken Thermocouple)

In this example, 24VDC is applied to the T1F-14THM in Slave 1 Slot 1 and all channels are shorted CH+ to CH- except Channel 8 which is open.

| | Element | Status |
|---|---|---|
| 1 | | |
| 2 | V2000 | 807 |
| 3 | V2002 | 810 |
| 4 | V2004 | 812 |
| 5 | V2006 | 815 |
| 6 | V2010 | 812 |
| 7 | V2012 | 820 |
| 8 | V2014 | 821 |
| 9 | V2016 | 0 |
| 10 | V2020 | 801 |
| 11 | V2022 | 804 |
| 12 | V202 | |
| 13 | V202 | |
| 14 | V203 | |
| 15 | V203 | |
| 16 | V203 | |
| 17 | V203 | |

As seen in the DirectSoft Data View window, all channels will read the terminal block ambient temperature when shorted (degrees F in this configuration) except the open Channel 8 which reads 0.
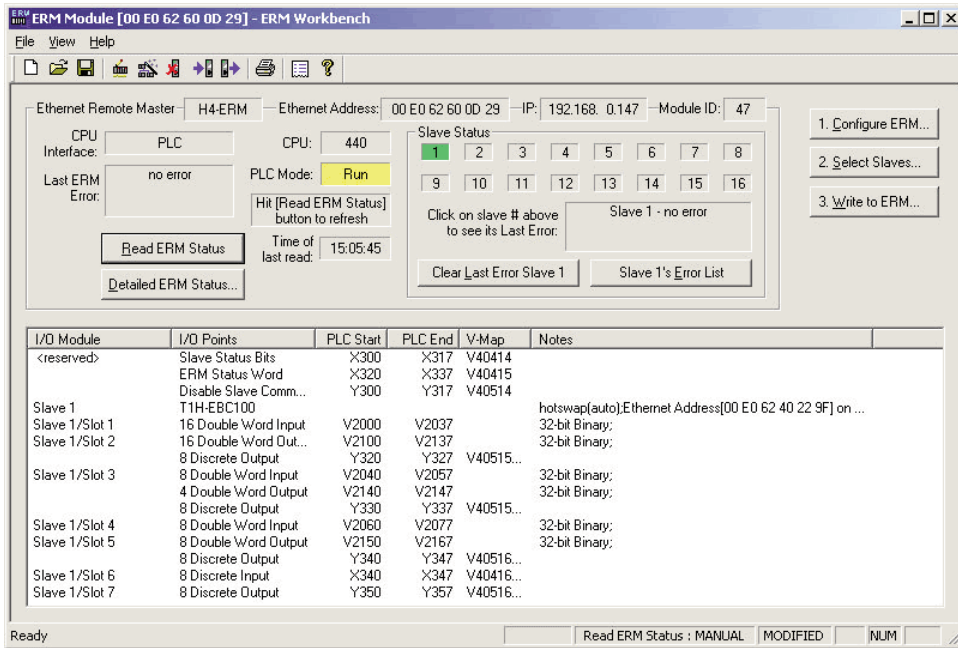
The ERM Workbench page will also indicate an error on Slave 1 as seen below.

## T1F-16DA-2 Example (Module in Slot 2)



In this example, 24VDC is applied to the T1F-16DA-2 in Slave 1 Slot 2 and a multi-meter is used to measure the output. The outputs are enabled and configured for -5 to +5V range.

All V-memory values in this DirectSoft Data View window are displayed as Decimal DWORDs.

| Data1 | | |
|---|---|---|
| Decimal ▼ DWORD ▼ | | |
| Element | Status | Edits |
| 1 | V2100 | 0 | 0 |
| 2 | V2102 | 270 | 270 |
| 3 | V2104 | 525 | 525 |
| 4 | V2106 | 780 | 780 |
| 5 | V2110 | 1035 | 1035 |
| 6 | V2112 | 1545 | 1545 |
| 7 | V2114 | 1800 | 1800 |
| 8 | V2116 | 2055 | 2055 |
| 9 | V2120 | 2310 | 2310 |
| 10 | V2122 | 2565 | 2565 |
| 11 | V2124 | 2820 | 2820 |
| 12 | V2126 | 3075 | 3075 |
| 13 | V2130 | 3330 | 3330 |
| 14 | V2132 | 3585 | 3585 |
| 15 | V2134 | 3840 | 3840 |
| 16 | V2136 | 4095 | 4095 |
| 17 | Y320 | ON | ON / OFF |
| 18 | Y321 | ON | ON / OFF |
| 19 | Y322 | OFF | ON / OFF |
| 20 | Y323 | OFF | ON / OFF |
| 21 | Y324 | OFF | ON / OFF |
| 22 | Y325 | OFF | ON / OFF |
| 23 | Y326 | OFF | ON / OFF |
| 24 | Y327 | OFF | ON / OFF |

| Output Channel | Address | Value |
|---|---|---|
| Channel 1 | V2100 | 0 = -5V |
| Channel 2 | V2102 | 270 = -4.34V |
| Channel 3 | V2104 | 525 = -3.71V |
| Channel 4 | V2106 | 780 = -3.09V |
| Channel 5 | V2110 | 1035 = -2.47V |
| Channel 6 | V2112 | 1545 = -1.22V |
| Channel 7 | V2114 | 1800 = -0.60V |
| Channel 8 | V2116 | 2055 = 0.01V |
| Channel 9 | V2120 | 2310 = 0.64V |
| Channel 10 | V2122 | 2565 = 1.26V |
| Channel 11 | V2124 | 2820 = 1.88V |
| Channel 12 | V2126 | 3075 = 2.50V |
| Channel 13 | V2130 | 3330 = 3.13V |
| Channel 14 | V2132 | 3585 = 3.75V |
| Channel 15 | V2134 | 3840 = 4.37V |
| Channel 16 | V2136 | 4095 = 5V |

| Discrete Bits | Value |
|---|---|
| Y320 | ON for Output Enable |
| Y321 | ON selects Bipolar output |
| Y322 | OFF selects 5V output range |
| Y323 to Y327 | N/A |

## T1F-08AD-2 Example (Module in Slot 4)
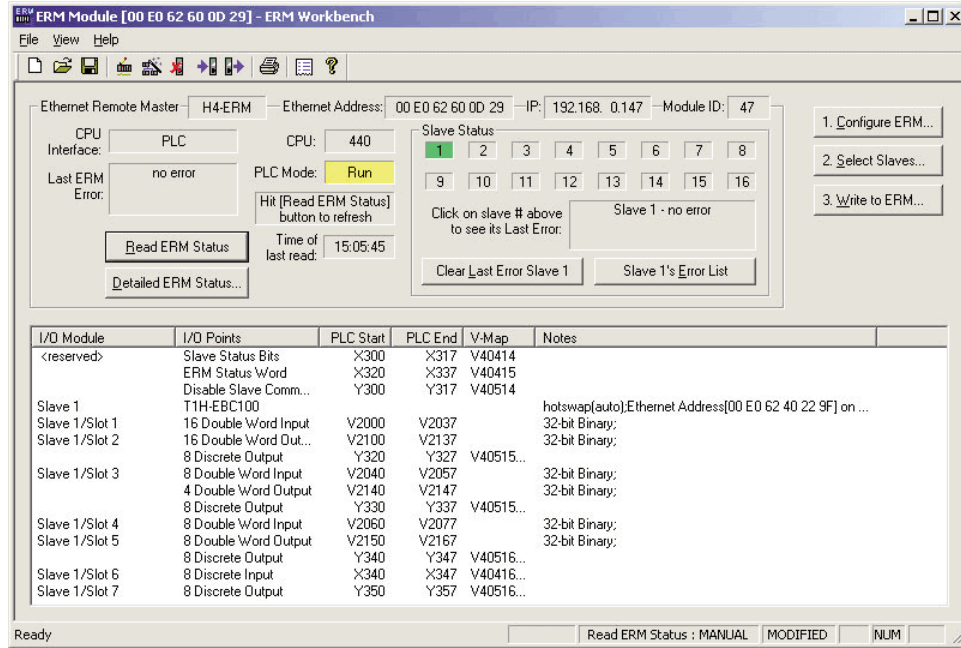


In this example, 24VDC is applied to the T1F-08AD-2 in Slave 1 Slot 4. Voltage is applied to all eight channels.

V2060 and V2062 are displayed as both Signed Decimal DWORD and BCD/Hex DWORD in this DirectSoft Data View. V2064-V2076 are displayed as Signed Decimal DWORD.



| Input Channel | Address | Value |
|---|---|---|
| Channel 1 | V2060 | -4097 = -5V |
| Channel 2 | V2062 | -4097 = -5V |
| Channel 3 | V2064 | 1 = 0V |
| Channel 4 | V2066 | 1 = 0V |
| Channel 5 | V2070 | 4097 = 5V |
| Channel 6 | V2072 | 4097 = 5V |
| Channel 7 | V2074 | 8190 = 10V |
| Channel 8 | V2076 | 8190 = 10V |

## Notes:

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