Analog Descriptor Page

Local Station Application

Mon, Jul 21, 2003

Introduction

An analog descriptor is the Local Station's static database for an analog channel device. The database is organized as an array of Pascal records. The fields of this 64-byte record are used to support the full functionality of an analog channel. This page allows access to any node's analog database.

Display layout

```
A ANALOG DESCRIPT 07/21/03 0947
CHAN<0613:0102>  -SE  FAM<0000>     ← Node:Chan
NAME<GR3MID> "                  "   ← Name

TITL<RF3 GRDIENT MANAUT>05/07/01    ← Date-of-last-change
CONV<08>  Z=4,C=2,G=8,P=9
A/D FS< 8.34  > +< 0.166 ><NRM >    ← Scale factors, units
D/A FS< 18000 > +< 0.199   >
ANLG CTRL <02> <A1> <B015>          ← Analog control specs
STAT INV/N<11>    BIT<01AF,-->      ← Associated digital status
CONTROL DT<01,--> BIT<01AF,-->      ← Associated digital control

 LIST DESC TO :03FF   DATA<0509>    ← Listing options
ALARM FLG$<A001>APIFBB-BSDM-TTTT    ← Alarm flag bits
*CLR TRIPS:     0  *RESET ALARMS    ← Reset local station alarms
 07/21/03 0707
```

The format is designed for fill-in-the-blanks interaction. On the second line, the node/channel is entered for the device whose analog descriptor is to be accessed; alternatively, the name can be entered on the third line. Interrupt after typing to request the current database information for that device to be displayed. The following lines include the various fields of the analog descriptor:

1. 18-character title
2. 6-character name
3. 4-character engineering units text
4. 1-byte "conversion type"
5. 4 floating point scaling constants
6. 4-byte analog control field
7. 2-byte family word
8. 4-byte associated digital status field
9. 6-byte associated digital control field

Field descriptions

Title text

This 18-character text field is a short description of the channel device in addition to the name. Due to the limited size of the small screen consoles, only 14 characters of the title are displayed by the parameter page. Those selected are the 14 characters following the first *word* of the title. The first word is often used to indicate the node of the device, which is often implied in the name. In the case that associated status/control fields are used, the last 6 characters of the title text (characters 13–18) are used to store two 3-characters status state texts. In the case that two bits of associated status/control are used, the entire title is preempted, as the second bit's

status text is stored in characters 6–11 of the title. So, in this case, the name alone must suffice to represent the device on the parameter page.

Name text

The 6-character name of a device must be unique on the network, not only within a single node. When a name is entered and the interrupt given to enter all fields into a given channel's descriptor, a broadcast request is simultaneously issued to find out whether the name already exists among the nodes of the network. If it does exist in some node, then its node/channel designation is displayed just to the left of the `NAME` prompt. The setting has already taken place, so at that point there is at least one duplication of the entered name. One may wish to remove the one indicated or use a different name for the channel.

Units text

The 4-character field is placed into the 4-byte units text field of the analog descriptor. The small screen parameter page aligns this field if possible.

Conversion type

This field is a byte that includes flags that mark the channel for various special treatments with certain Data Access Table entries. Bit #1 (mask=`0x02`) is set to mark capture data, which is used by DAT type `0x16`. Bit #2 (mask=`0x04`) is set to mark zero-subtracted data, which is used by DAT type `0x07`. Bit#3 (mask=`0x08`) is used to mark channels which need linearization, which is used by DAT type `0x06`. See the document entitled "RDATA Entry Formats" for more details on this.

Scale factors

Four floating point constants are used for engineering units scaling. A reading, nominal or tolerance value is scaled to engineering units by using the first fullscale and offset values. The setting value is scaled using the last two fullscale and offset values. The linear formula used is:

```
eng:= Float(raw)/32768.*fScale + offset;
```

The `raw` value is the 16-bit raw data word. The value (`raw/32768`) is therefore the fraction of fullscale. Both `fScale` and `offset` are in engineering units. More complex conversion formulae can be handled by pre-processing via a Data Access Table entry, for example, or by the logic in a local application. In any case, the raw data values are always scaled linearly.

In the case of tolerance, the offset term is omitted, since a tolerance is like a difference value.

Analog control field

The first byte of this 4-byte field is the analog control type#. Types currently supported are:

- `00` No analog control (parameter page will not mark it with a "–")
- `01` Datel Multibus board (obsolete)
- `02` Motor (setting value is desired reading, relative setting is #steps)
- `03` Bipolar multiplex D/A (obsolete)
- `04` Unipolar multiplex D/A (obsolete)
- `05` Memory word (accessed as two bytes)
- `06` i8253 timer (obsolete)

07 M6840 timer (obsolete)
08 1553 D/A (12-bit)—used in rack monitor
09 Analog Devices RTI-602 D/A board
0A Memory word (accessed as a word)
0B Message queue setting to another cpu (co-processor)
0C Unsigned 12-bit D/A (in short I/O space)
0D Burr-Brown MPV904 12-bit D/A board
0E 1553 D/A (16-bit)
0F AMD9513 timer (32-bits from pair of channels)
10 Memory byte (single byte no shift)
11 Memory byte (single byte w/shift in short I/O space)
12 Same channel reading word w/mask
13 Smart Rack Monitor analog control (12-bit)
14 Smart Rack Monitor analog control (16-bit)
15 IRM D/A with offset and 4-bit right shift
16 IRM D/A with offset but w/o right shoft
17 Unipolar 15-bit D/A clamped at zero
18 Unsigned 16-bit D/A or timer
19 PLC memory word via message queue
1A GreenSprings IP D/A board
1B IP timer board trigger event select/clear
1C Timer as memory word forced nonzero

Details of the meaning of the other 3 bytes available in the analog control field are found in the document entitled "Analog Control Types."

Family word

The family word is a delta channel# used to reference another channel which is in some way related to this one. By including the appropriate delta value for a set of related channels, one can form a family of channels which is accessible from any member of the family. Listype #49 may be used to request the list of channel numbers that comprise the family to which a given channel belongs. This is more fully described in the document entitled "Related Groups of Channels."

Associated digital status/control

One or two bits can be associated with an analog channel to show related status information such as on/off and allow digital control as well. This topic is more fully discussed in the document entitled "Digital Control Pulse Delays."

Database entry

After selecting the channel, change any of the fields displayed to the desired values and press interrupt (or the ESC key) with the cursor anywhere in the range of the 7 lines *following* the NAME line. The program reads *all* the fields that are alterable from the screen, including the node/channel number on the second line and the name on the third line, and it encodes the information into the internal format and issues a setting to install the descriptor record into that channel's local database. (Since it reads the channel number each time, one can easily move one channel's descriptor to another channel with minor editing.) It then requests the descriptor to be read back and displays the results. The date-of-last-change, displayed on the second line, should then reflect the current date. This field is not directly settable; it is automatically updated whenever a setting is made to any field in the channel's analog descriptor.

Separate from the analog descriptor fields for a channel device, there are alarm flag bits that can be set on the next to last line of the display. This flags word is shown in hexadecimal. Single characters are shown to the right as a reminder of each bit's meaning. The current set of flag bits available for setting are:

15	Active (1=enabled for alarm scan)
14	Pattern (1=composite status word)
13	Inhibit (1=inhibit beam while bad)
12	Floating (1=raw floating point values in FDATA table)
11	Beam (1=alarm scan only on beam pulses, when Bit# 009F = 0)
10	Bypass control—used internally to switch to inactive state
9	Alarms clear control bit
8	Good/bad (1=bad)—not settable
7	Silent (1=inhibit sending of alarm messages, but still count trips)
6	Invalid data flag (set for non-responsive SRMs)
5	Use upper/lower limits, not nominal/tolerance
4	(spare)
3–0	Tries-needed count = #times required to believe good/bad state change

To modify these flag bits for a given channel whose descriptor is being displayed, enter the desired hex pattern and interrupt on that line.

To facilitate the inspection of families of channels, one can interrupt under the FAM area on the display to sequence to the next channel in the family (if there is one). A value of `0x0000` in the family word means there is no next channel in the family.

Setting enable flag—important!

When the page is entered, an internal flag is set to "disabled" to prevent any settings from being made accidentally while browsing. To toggle this flag to enable settings, interrupt in the `—SE` field in the middle of the second line. The response to show that the flag is enabled is `*SE`. If an attempt is made to change a descriptor without the flag enabled, the `—SE` field will flash a few times as a reminder that settings are not enabled.

Raise/lower switches

One can use the raise/lower push-buttons to increment/decrement the current channel# in order to scan through a sequence of channels. A delay is introduced so the data displayed can be seen by the human eye. Incrementing beyond the maximum channel# shown on the listing line wraps to channel 0.

Error status

An error status code number is displayed as a single character at the end of the second line. If there are no errors, this character will be blank; otherwise, its value is displayed in inverse video. Likely values that may be displayed are:

8	The target node is not responding to the request for data.

When no reply is received from a name lookup request, the same code will be shown immediately following the name field on the third line. Recently, it has been found necessary to enter a name to be looked up twice, in order to properly prime the network hardware for successful multicast delivery.

Alarm info

The next to last line shows the alarm trip count for the channel, which is the number of times the channel has been observed by the alarm scanning logic to change state from good to bad. This value is limited to 2047. Interrupt on this line to clear the trip counts. The time of last clearing is shown on the last line.

Interrupt on the right side of the next to last line to reset the alarms for the target node, resulting in zeroing the good/bad alarm flag bits for all analog channels (and binary bits) in that node. On the next alarm scan, then, every device which is in the alarm scan and in the bad state will report an alarm message. It is more usual for a host system to issue a broadcast setting to reset alarms in all nodes.

Listing options

Two listings of analog database entries are provided on a listing line. On the left-hand part of the line, an interrupt produces a listing of each channel's `ADESC` entries, just as they are shown on the page. On the right-hand part of the line, an interrupt produces a listing of the `ADATA` table entries (the reading, setting, nominal and tolerance values). The listing starts with the channel currently selected on the page and ends with the channel# (in hex) indicated on the listing line, which is by default set to the maximum channel# available in that node. The data for each channel is encoded into a single line, and a heading is output at the beginning that shows the target node# and the current time-of-day. The display is updated as the channels are scanned in sequence over the selected range. When a channel is accessed that is not used (meaning the name starts with a blank or a null byte, and the number of associated status bits is zero, and the analog control type is zero, and the channel is not in the alarm scan), it is skipped and omitted from the listing. The channel's data is displayed very briefly to at least give a visual hint of what's there.

The output of the serial port can be plugged into any RS-232 device, so that one can archive the contents of a node's local database in this way. It could be stored on a host's disk or captured by a Macintosh terminal emulator program or whatever. The serial output from a Local Station is spooled through dynamic memory to the serial output port. This means that the listing process may finish before all the characters have been transferred out the serial port. To stop the listing process, merely interrupt again on the listing line while it is active. Note that the serial port of any node can be targeted. In the example shown in the Display Layout section above, `node0509` is being targeted for serial output, because that test node is connected to a terminal emulator program in order to be able to capture the listing output.

Here is a brief example of the two listing formats for node `0613`, channels `0100—012F`:

Analog descriptors listing

```
NODE=0613  ANALOG DESCRIPT 07/22/03 0953
 CHAN# NAME   TITLE       ..... UNIT  ANLG CTRL  CVT ADFS   OFFS   DAFS   OFFS    FMLY   DATE    DIGITAL STATUS/CONTROL
 :0100 IN3PHS T3 2 INTERTKMANAUT V     00 .. .... 00  10     0      0      0              05/07/01  11 01AB,--   01,--  01AB,--
 :0101 GR3LO  RF3 PICKUP LOOP  1 NRM   00 .. .... 08  8.34   0.166  0      0.199          05/07/01  00
 :0102 GR3MID RF3 GRDIENT MANAUT NRM   02 A1 B015 08  8.34   0.166  18000  0.199          05/07/01  11 01AF,--   01,--  01AF,--
 :0103 GR3HI  RF3 PICKUP LOOP  3 NRM   00 .. .... 08  8.34   0.166  0      0.199          05/07/01  00
 :0104 PA3F   RF3 PA FWD     CBR MW    00 .. .... 09  29.08  0      0      0.315          05/07/01  11 0115,--   84,--  0195,--
 :0105 PA3R   RF3 PA REV POWER   MW    00 .. .... 09  26.959 0      0      0.281          05/07/01  00
 :0106 DR3F   RF3 DRVR FWD POWER KW    00 .. .... 09  1856   0      0      0.315          05/07/01  00
 :0107 DR3R   RF3 DRVR REV POWER KW    00 .. .... 09  290.89 0      0      0.245          05/07/01  00
 :0108 AD3CK8 RF3 A D ZERO CHK 8  V    00 .. .... 00  10     0      0      0              05/07/01  00
 :0109 AD3CK9 RF3 A D ZERO CHK 9  V    00 .. .... 00  10     0      0      0              05/07/01  00
 :010A LL3F   RF3 LL FWD POWER   W     00 .. .... 09  23.01  0      0      0.299          05/07/01  00
 :010B LL3R   RF3 LL REV POWER   W     00 .. .... 09  19.99  0      0      0.281          05/07/01  00
 :010C IPA13F RF3 IPA1 FWD PWR   W     00 .. .... 09  2353   0      0      0.318          05/07/01  00
 :010D IPA13R RF3 IPA1 REV PWR   W     00 .. .... 09  1999   0      0      0.281          05/07/01  00
 :010E IPA23F RF3 IPA2 FWD PWR   KW    00 .. .... 09  18.58  0      0      0.259          05/07/01  00
 :010F IPA23R RF3 IPA2 REV PWR   KW    00 .. .... 09  22.11  0      0      0.305          05/07/01  00
 :0110 PH3ADJ RF3 PHASE ADJUST   DEG   02 A1 B013 00  400    0      2500   0              05/07/01  00
 :0111 TU3POS      LOW    HGH    IN    00 .. .... 00  4      0      0      0              05/07/01  12 010A,09   00,00  0000,00
```

```
:0112 RF3LML RF3 LOSS MON LOWER V     00 .. .... 00  10     0      0      0           05/07/01  00
:0113 RF3LMU RF3 LOSS MON UPPER V     00 .. .... 00  10     0      0      0           05/07/01  00
:0114 TO3IN  T3 TOROID IN       MA    00 .. .... 04  100    0      0      0           05/07/01  00
:0115 TO3OUT T3 TOROID OUT      MA    00 .. .... 04  100    0      0      0           05/07/01  00
:0116 T3VACL TANK 3 VAC LEE      V.   00 .. .... 00  10     0      0      0           05/07/01  00
:0117 T3VACH TANK 3 VAC HEE      V.   00 .. .... 00  10     0      0      0           05/07/01  00
:0118 MD3IV  RF3 MOD INPUT VLTS V     00 .. .... 00  10     0      0      0           05/07/01  00
:0119 MD3OV  RF3 MOD OUTPUT VLT KV    00 .. .... 00  100    0      0      0           05/07/01  00
:011A MD3OI  RF3 MOD OUTPUT CUR A     00 .. .... 00  1000   0      0      0           05/07/01  00
:011B DR3SV  RF3 DR SCREEN VOLT V     00 .. .... 00  4000   0      0      0           05/07/01  00
:011C RF3HV  RF3 HI VLTS  ONOFF KV    00 .. .... 00  100    0      0      0           05/07/01  11 0116,--   86,--  0197,--
:011D RF3PAI RF3 7835 FIL  CURR A     00 .. .... 00  10000  0      0      0           05/07/01  00
:011E DR3PAV RF3 4616 FIL  VOLT A     00 .. .... 00  10     0      0      0           05/07/01  00
:011F LV3MON LRF3 120 VOLTAGE M VAC   00 .. .... 00  127.58 0      0      0           05/07/01  00
:0120 QPS301 T3 QUAD PS1    RST A     13 A1 0200 00 -312.5  0      312.5  0           05/07/01  11 0118,--   84,--  0194,--
:0121 QPS302 T3 QUAD PS  2      A     13 A1 0201 00 -312.5  0      312.5  0           05/07/01  00
:0122 QPS303 T3 QUAD PS  3      A     13 A1 0202 00 -312.5  0      312.5  0           05/07/01  00
:0123 QPS304 T3 QUAD PS  4      A     13 A1 0203 00 -312.5  0      312.5  0           05/07/01  00
:0124 QPS305 T3 QUAD PS  5      A     13 A1 0204 00 -312.5  0      312.5  0           05/07/01  00
:0125 QPS306 T3 QUAD PS  6      A     13 A1 0205 00 -312.5  0      312.5  0           05/07/01  00
:0126 QPS307 T3 QUAD PS  7      A     13 A1 0206 00 -312.5  0      312.5  0           05/07/01  00
:0127 QPS308 T3 QUAD PS  8      A     13 A1 0207 00 -312.5  0      312.5  0           05/07/01  00
:0128 QPS309 T3 QUAD PS  9      A     13 A1 0208 00 -312.5  0      312.5  0           05/07/01  00
:0129 QPS310 T3 QUAD PS  10     A     13 A1 0209 00 -312.5  0      312.5  0           05/07/01  00
:012A QPS311 T3 QUAD PS  11     A     13 A1 020A 00 -312.5  0      312.5  0           05/07/01  00
:012B QPS312 T3 QUAD PS  12     A     13 A1 020B 00 -312.5  0      312.5  0           05/07/01  00
:012C QPS313 T3 QUAD PS  13     A     13 A1 020C 00 -312.5  0      312.5  0           05/07/01  00
:012D QPS314 T3 QUAD PS  14     A     13 A1 020D 00 -312.5  0      312.5  0           05/07/01  00
:012E QPS315 T3 QUAD PS  15     A     13 A1 020E 00 -312.5  0      312.5  0           05/07/01  00
:012F QPS316 T3 QUAD PS  16     A     13 A1 020F 00 -312.5  0      312.5  0           05/07/01  00
```

Analog data listing

```
NODE=0613  ANALOG DESCRIPT 07/22/03 0953
 CHAN# NAME   TITLE       ..... UNIT  READNG SETTNG NOMINL TOLRNC  AFLG   TRIP
 :0100 IN3PHS T3 2 INTERTKMANAUT V     -0.0146        0      0.08   A001      0
 :0101 GR3LO  RF3 PICKUP LOOP  1 NRM    1.01          1.0184 0.0501 8001      0
 :0102 GR3MID RF3 GRDIENT MANAUT NRM    1.0059        0.9899 0.0499 A001      0
 :0103 GR3HI  RF3 PICKUP LOOP  3 NRM    1.0191        1.0148 0.0501 8004      0
 :0104 PA3F   RF3 PA FWD     CBR MW     2.5452        2.3997 0      0040      0
 :0105 PA3R   RF3 PA REV POWER   MW     0.0963        0.3299 0.4994 8001      0
 :0106 DR3F   RF3 DRVR FWD POWER KW     165.05        175.93 17.898 8001      0
 :0107 DR3R   RF3 DRVR REV POWER KW     0.1864        0.0444 0      0040      0
 :0108 AD3CK8 RF3 A D ZERO CHK 8  V     0.0006        0.0006 0      0040      0
 :0109 AD3CK9 RF3 A D ZERO CHK 9  V     0.0006        0      0      0040      0
 :010A LL3F   RF3 LL FWD POWER   W      2.898         2.7807 0.9999 0040      0
 :010B LL3R   RF3 LL REV POWER   W      0.3038        0.0085 0      0040      0
 :010C IPA13F RF3 IPA1 FWD PWR   W      337.28        341.59 19.963 8000      0
 :010D IPA13R RF3 IPA1 REV PWR   W      56.063        0      0      0040      0
 :010E IPA23F RF3 IPA2 FWD PWR   KW     3.6017        3.9703 0.5999 8004      0
 :010F IPA23R RF3 IPA2 REV PWR   KW     0.0155        0      0.0196 0040      0
 :0110 PH3ADJ RF3 PHASE ADJUST   DEG    261.33        265.23 5.0293 8009      1
 :0111 TU3POS      LOW    HGH    IN     1.8575        0      0      0040      0
 :0112 RF3LML RF3 LOSS MON LOWER V     -9.9994        0      0      0040      0
 :0113 RF3LMU RF3 LOSS MON UPPER V     -9.9991        0      0      0040      0
 :0114 TO3IN  T3 TOROID IN       MA     0       0.2075 0      0      0040      0
 :0115 TO3OUT T3 TOROID OUT      MA     0       0.0153 0      0      0040      0
 :0116 T3VACL TANK 3 VAC LEE      V.   -2.4493        0      0      0040      0
 :0117 T3VACH TANK 3 VAC HEE      V.   -2.3318        0      0      0040      0
 :0118 MD3IV  RF3 MOD INPUT VLTS V      2.8589        0      0      0040      0
 :0119 MD3OV  RF3 MOD OUTPUT VLT KV     19.217        19.266 0      0040      0
 :011A MD3OI  RF3 MOD OUTPUT CUR A      216.61        200.99 0      0040      0
 :011B DR3SV  RF3 DR SCREEN VOLT V      698.61        694.7  34.668 8001      0
 :011C RF3HV  RF3 HI VLTS  ONOFF KV     37.781        38.547 10.001 8000      0
 :011D RF3PAI RF3 7835 FIL  CURR A      6542.1        6698.3 159.61 0040      0
 :011E DR3PAV RF3 4616 FIL  VOLT A      0.7904        0      0      0040      0
 :011F LV3MON LRF3 120 VOLTAGE M VAC    113.25        116.37 5.9998 0040      0
 :0120 QPS301 T3 QUAD PS1    RST A      150.6  157.44 151.5  2.9945 A001      0
 :0121 QPS302 T3 QUAD PS  2      A      159.9  164.19 157.77 2.9945 A001      0
 :0122 QPS303 T3 QUAD PS  3      A      128.46 131    129.99 2.9945 A001      0
 :0123 QPS304 T3 QUAD PS  4      A      126.47 133    127.99 2.9945 A001      0
 :0124 QPS305 T3 QUAD PS  5      A      125.54 128.5  126    2.9945 A001      0
 :0125 QPS306 T3 QUAD PS  6      A      125.53 130.12 125    2.9945 A001      0
 :0126 QPS307 T3 QUAD PS  7      A      126.44 129.8  126.99 2.9945 A001      0
 :0127 QPS308 T3 QUAD PS  8      A      122.16 127.03 120.48 2.9945 A001      0
 :0128 QPS309 T3 QUAD PS  9      A      123.37 130.69 123.99 2.9945 A001      0
 :0129 QPS310 T3 QUAD PS  10     A      127.63 132.8  128.99 2.9945 A001      0
 :012A QPS311 T3 QUAD PS  11     A      122.74 126    123    2.9945 A001      0
 :012B QPS312 T3 QUAD PS  12     A      115.86 119.07 116.47 2.9469 A001      0
 :012C QPS313 T3 QUAD PS  13     A      121.8  122.58 121.99 2.9945 A001      0
 :012D QPS314 T3 QUAD PS  14     A      122.25 125.8  121.99 2.9945 A001      0
 :012E QPS315 T3 QUAD PS  15     A      117.97 123.73 118.49 2.9945 A001      0
 :012F QPS316 T3 QUAD PS  16     A      120.55 123.89 120.99 2.9945 A001      0
```