

d-Tech - Primer

YieldPoint Inc.

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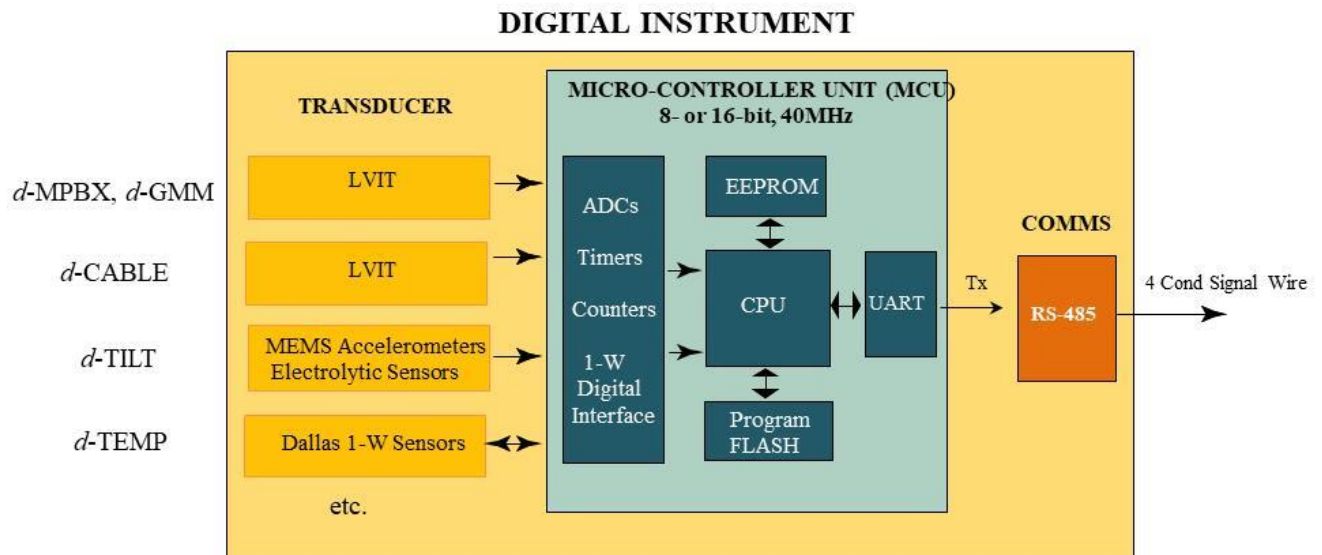
What is *d*-Tech?

d-Tech is digital instrumentation platform developed by YieldPoint Inc. that embeds a microcomputer in every instrument so creating truly SMART geotechnical and structural instruments. The microcomputer performs tasks such as:

1. Sensor excitation
2. Sensor multiplexing
3. A-D data conversions
4. Temperature compensation
5. Digital signal transmission (RS485).
6. Provides a unique instrument ID for every instrument.

d-Tech represents the modern approach to instrumentation that enables clusters of instruments to be easily networked together using technologies such as WiFi and Ethernet. With simplicity comes lower cost especially with respect implementation and maintenance. The advantages permeate to all aspects of data monitoring and management.

Instrument Architecture



d-Tech Instrument architecture involves interfacing a myriad transducer technologies (some SMART digital, some analog) with an embedded microcontroller running at 40MHz, and an output transceiver, usually RS485 or Zigbee/Bluetooth wireless.

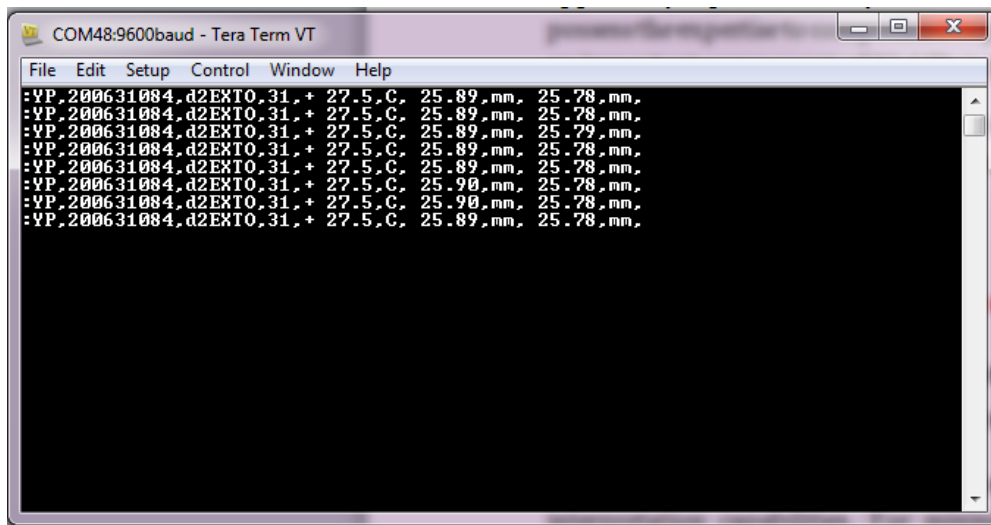
RS485 Output signal/Lead-wire

The interested reader can discover the intricacies of RS485 in the papers provided on this website. The key points are:

1. The digital signals can be sent using RS485 long distances, theoretically up to 1200m but YieldPoint recommends over 500m. Also, if severed lead-wires can be twisted back together.
2. Signals are transmitted on a balanced twisted pair of wires designated RS485-A and RS485-B.

All YieldPoint instruments, regardless of the number of channels have 4 conductor lead-wire. Two of these conductors carry +Pwr (red) and GND(black), the other two are RS485-A(white) and RS485-B(green).

There is no option to multidrop YP instruments on a modbus like polled bus. The instrument will begin to operate as soon as power is supplied. The instrument does not sleep after a reading but cycles to take another reading.



```
COM48:9600baud - Tera Term VT
File Edit Setup Control Window Help
-VP,200631084,d2EXTO,31,+ 27.5,C, 25.89,mm, 25.78,mm,
-VP,200631084,d2EXTO,31,+ 27.5,C, 25.89,mm, 25.78,mm,
-VP,200631084,d2EXTO,31,+ 27.5,C, 25.89,mm, 25.79,mm,
-VP,200631084,d2EXTO,31,+ 27.5,C, 25.89,mm, 25.78,mm,
-VP,200631084,d2EXTO,31,+ 27.5,C, 25.89,mm, 25.78,mm,
-VP,200631084,d2EXTO,31,+ 27.5,C, 25.90,mm, 25.78,mm,
-VP,200631084,d2EXTO,31,+ 27.5,C, 25.90,mm, 25.78,mm,
-VP,200631084,d2EXTO,31,+ 27.5,C, 25.89,mm, 25.78,mm,
```

Figure 1: Output string for a 2 point dEXTO (3 channels, T(C), disp(mm), disp(mm)).

The output signal is a standard serial (9600,8,N,1) Ascii string of the form:

The start delimiter is a colon.

Manufacturer

The first entry represents the sensor manufacturer , in this case YP standing for YieldPoint.

Unique Serial Number

The second csv field is the unique SensorID which is constructed:

2006	31	084
YYMM	TYPE	ID

The first 4 digits are the year and month of manufacture.

The next 2 digits represent the Sensor_Type with the 5th digit representing the number of data channels (3). If more than 10 channels exist then the sensor type will become a three character string (e.g. 129 for 12 channels) and the unique serial number will comprise 10 characters.

The final 3 digits are a factory assigned sequential ID (e.g. 084), so that every instrument manufactured has a Unique serial number

Sensor_Type

The next CSV represents an alphanumeric of the Sensor_Type: e.g. d2EXTO, d4CABLE, dGMM

Sensor_Type (Numeric)

The first character of Sensor type numeric represents the Number of channels and the second represents the type of channel (1=displacement, 5-load).

Data, Units

The remaining data represents the data from the instrument with alternating values and unit. The values relate directly to the units. The length of the string depends on the number of channels.

End Delimiter

CRLF(ascii 13,10)

There is no Checksum or error checking but the user application engineer should check that each output string is well ordered.

The *d*-Tech Advanatage

In summary *d*-Tech sensor architecture provides the following advantages over legacy analog geotechnical instrumentation systems:

1. Improved Accuracy (i.e. Linearity, Temperature Compensation)
2. Improved Reliability (e.g. non-contact technology, MEMS sensors)
3. Output in Real World Units. All digital sensors have standard readout signal.
4. Output signal includes unique SensorID+ SensorType
5. MUX many channels on a single leadwire pair.
6. Simplified Low-cost Peripherals (e.g.Dataloggers)
7. Simplified Data Transmission(Ethernet running TCP/IP,WiFi)
8. Simpler Data Management

d-Tech product map

Yieldpoint Product Device Map and Protocol Specification

PRODUCT	SENSOR TYPE	NUM CHANNELS	MEASURAND	Units
dUMP or GMM	11	1	d	mm
TEMP-1W	13	1	T	C
d-GMM/dUMP	21	2	T,d	C,mm
d-micro	23	2	T,u	C,um
dPiezo, dPress	28	2	T,p	C,kPa
BluVibe(VW)	29	2	T, f	C,Hz
d2MPBX/EXTO	31	3	T,d,d	C,mm,mm
d3MPBX/EXTO	41	4	T,d,d,d	C,mm,mm,mm
d3CABLE	41	4	T,d,d,d	C,mm,mm,mm
d4MPBX/EXTO	51	5	T,d,d,d,d	C,mm,mm,mm,mm
d4CABLE	51	5	T,d,d,d,d,	C,mm,mm,mm,mm
d5MPBX/EXTO	61	6	T,d,d,d,d,d	C,mm,mm,mm,mm,mm
d5CABLE	61	6	T,d,d,d,d,d	C,mm,mm,mm,mm,mm
d6MPBX/EXTO	71	7	T,d,d,d,d,d,d	C,mm,mm,mm,mm,mm,mm
d6REBAR	75	7	T,u,u,u,u,u,u	C,um,um,um,um,um,um
d6BOLT	75	7	T,u,u,u,u,u,u	C,um,um,um,um,um,um
dADICT(MDT)	89	8	T,dig,dig,dig,dig,dig,A	C,bit,bit,bit,bit,bit,bit,microA
TEMP 10-1W	106	10	TTTTTTTTTT	C x 10

Temperature (T):

T - °C (-40.0 to +125.0)

Displacement(d)

d- mm (0.00 to 250.00)

u- um or microns (-10000 to 10000) no decimal point

Frequency(f)

f- Hz (500.000 to 5000.000)

Pressure(p)

p-kPa (0.00 to 1000.00)

ADICT (MDT)

dig - 16 bit digital integer code (0-65535) no decimal point

microA – potentiometer current draw in microamps.