world leaders in the art of linear measurement

Orbit® Measurement Systems

Solartron's solution to industrial transducer networking

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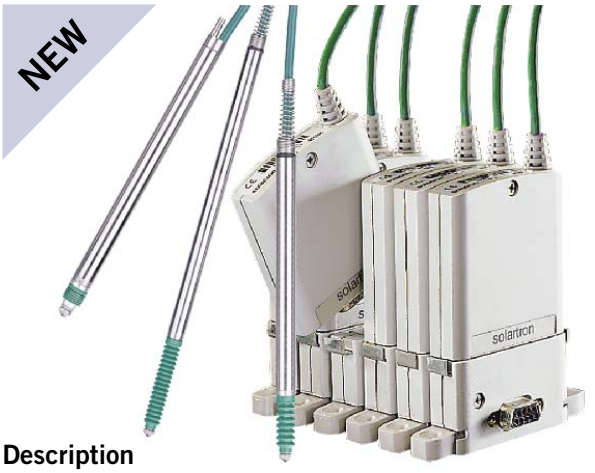


Features

- Integrated Probes and Electronics
- A Variety of Technologies
  (Inductive, Optical and Third Party Sensors)
- Up to 31 Probes on a Single Network
- Programmable Resolution
- Digital Linearity Correction
- Up to 3906 Readings/Second
- PC and PLC Interfacing
- Driver Software for PC Applications

Description

Solartron Metrology's Digital Products and the Orbit® Network combine to provide a complete dimensional measurement and data acquisition system. In addition to interfacing Solartron's own products, the Orbit Network can also host a variety of third party sensors.

Orbit is comprised of controllers and modules, these are used to perform measurements as well as some control functions. The modules and controllers can be networked together to form a highly versatile plug and go measurement system. Each module is identifiable through a unique address to simplify the data acquisition task especially in large multichannel networks.

Orbit can be hosted in a PC using the Orbit network card or the USB interface module, it can also be connected to a PLC via the RS232 Interface Module. There is also a range of Solartron's proprietary Orbit digital readouts which can in turn plug into a PLC.

Orbit Diagram

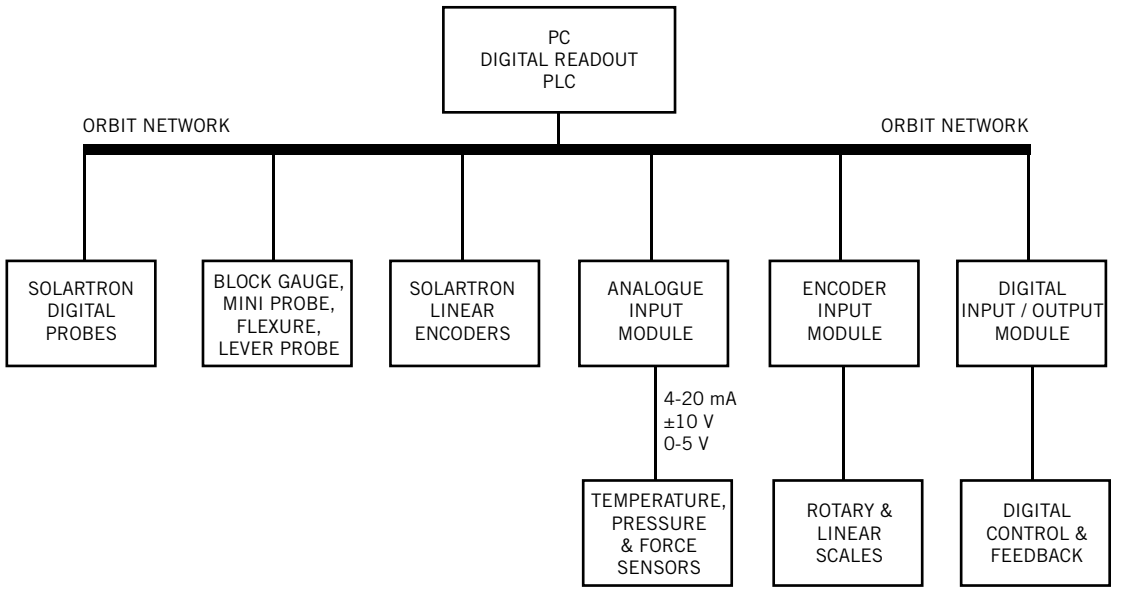


Figure 1, Measurement example using Orbit

1. General Description of Orbit

The Orbit network is essentially a means of building large flexible gauging systems. The data transfer rates are sufficiently high to provide some dynamic and synchronisation capabilities required for measuring moving parts. Furthermore, the Orbit network can also host a variety of third party physical sensors through new modules such as the Analogue Input Module.

At the heart of the network is Solartron's digital probe technology coupled to a robust RS485 multi-drop communications link. A system of 9 pin lockable mechanical connectors (T-Cons) is used to channel the output of each input/output device present on the network into the receiver electronics for analysis and display.

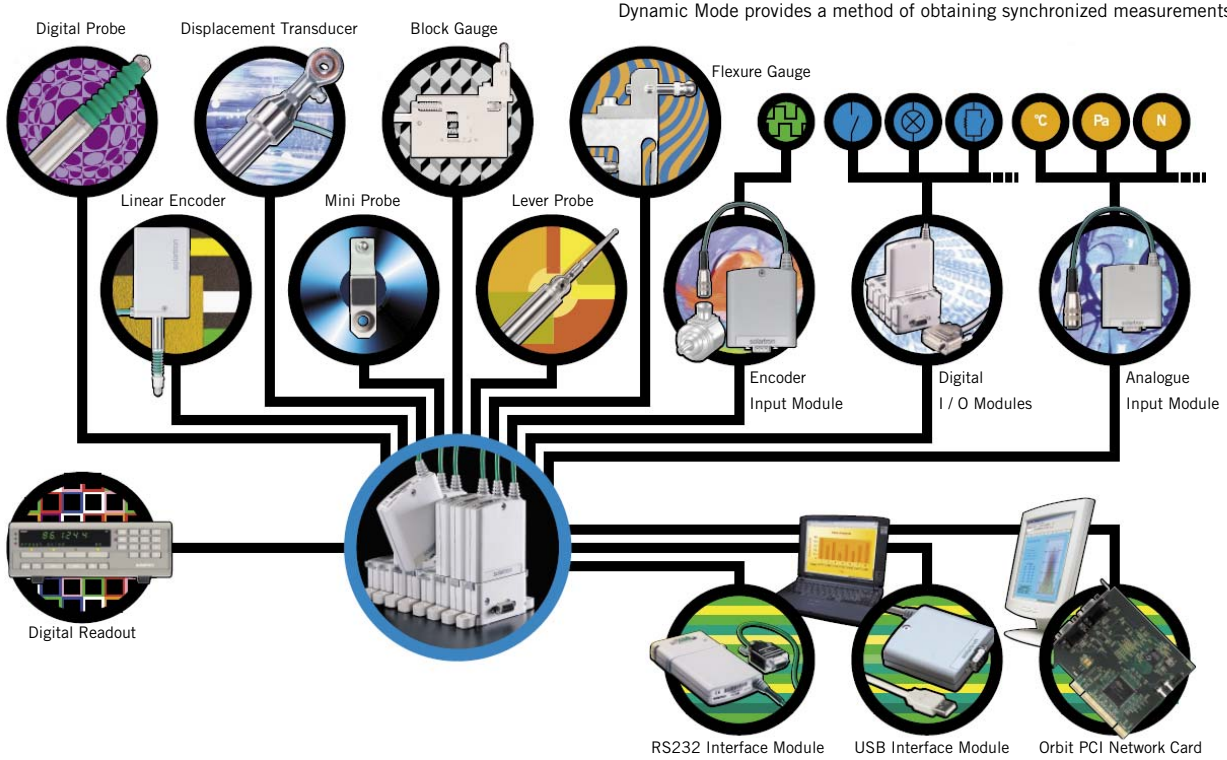
2. Fundamentals of the Orbit Network

Each module connected on the network serves to translate data at its input, be it AC, DC or digital into digital data which is transmitted on an RS485 network using Asynchronous transmission (poll/response). The RS-485 is a half-duplex multi-drop network, which means that multiple transmitters and receivers may reside on the line, however, only one transmitter may be active at any given time. It is the Orbit protocol that designates the identity of the active transmitter. Orbit was designed for use within small to medium size industrial networks with a data rate up to 1.5Mbaud.

At the receiver end of this communications link, the user has a choice of *controllers*:

- PCI bus card for use with a PC
- USB interface module for PC applications
- RS232 interface module for PC or PLC applications
- Solartron's own digital display

The choice of interface is dependent on the application and *the Orbit operating mode.*



3. Orbit Operating Modes

An Orbit Measurement System can be used in three different operating modes, these are standard, dynamic and buffered.

In **standard mode** the modules are addressed via the application software which may request the current measurement or send set up information. This mode is used for the majority of static measurement applications; i.e., where the rate of measurement is less than 240 readings per second.

In **dynamic mode** the system may be configured so that all of the modules return their measurement at the same point in time with reading rates of up to 3906 readings per second this allow accurate measurement of moving parts.

Buffered mode allows the modules to take readings at a high data rate and store them in internal memory to be retrieved later.

4. Orbit Controllers

The Orbit Measurement System has three basic controllers:

	Nº of Devices Supported	Description	Mode Supported
Network Card	Up to 31 per channel in standard mode	The Network Card allows a PC fitted with an PCI slot to control an Orbit Measurement System	Standard and Dynamic
USB or RS232 Interface Module	Up to 31	USB allows connection to a PC RS232 allows connection to a PC or PLC	Standard and Buffered
Digital Display	Up to 31	A range of Digital Readouts	N/A

Table 1, Controllers Operating Modes

5. Orbit Dynamic Mode

Dynamic Mode provides a method of obtaining synchronized measurements at high speed from DP's and other compatible Orbit products such as the AIM. This mode is required in the measurement of moving objects, it gives the user the ability to take measurements from a set of transducers which are sampled at the same point in time.

During each measurement time the probes or modules may be synchronized and the data transferred to the computer, this method of synchronization and data transfer is only possible using the PCI bus Network Card.

Each synchronisation pulse command causes all of the probes and modules on the network to synchronise their internal electronics. These then capture the existing reading in their register, which is updated every 256µs, and transmit it within the Measurement Update Time.

6. Orbit Dynamic Mode System Considerations

In Dynamic Mode the maximum number of modules and the measurement update time on the network are dependent on the operating mode. Therefore, to prevent loss of information the parameters should be programmed compliant with the table below. The programming of these parameters is the responsibility of the user, as the modules do not provide any error checking.

Mode	Number of Probes / Dynamic Modules	Readings per Second	Measurement Update Time (µS)	Maximum Measurement Bandwidth (Hz)
4K	8	3906	256	460
2K	16	1953	512	420
1K	31	976	1024	320

Table 2, Dynamic Mode System Constraints

7. Advantages of Orbit Digital Devices

Traditional gauging probes operate in the analogue domain and require conditioning electronics with the additional need for adjustments at the probe level (mechanical) as well as at the electronics level.

The digital probe is a refinement of the LVDT, which uses Solartron's proven mechanical design and integrates error-compensating electronics. The use of a robust communication protocol results in an industry leading method to construct scalable dimensional measurement systems.

Digital probes are verified using a traceable laser interferometer (figure 2) and are digitally linearized, this results in a greatly improved absolute measuring performance. Furthermore, each digital probe is given a unique electronic identity thus simplifying the multiplexing of several different probes and sensors.

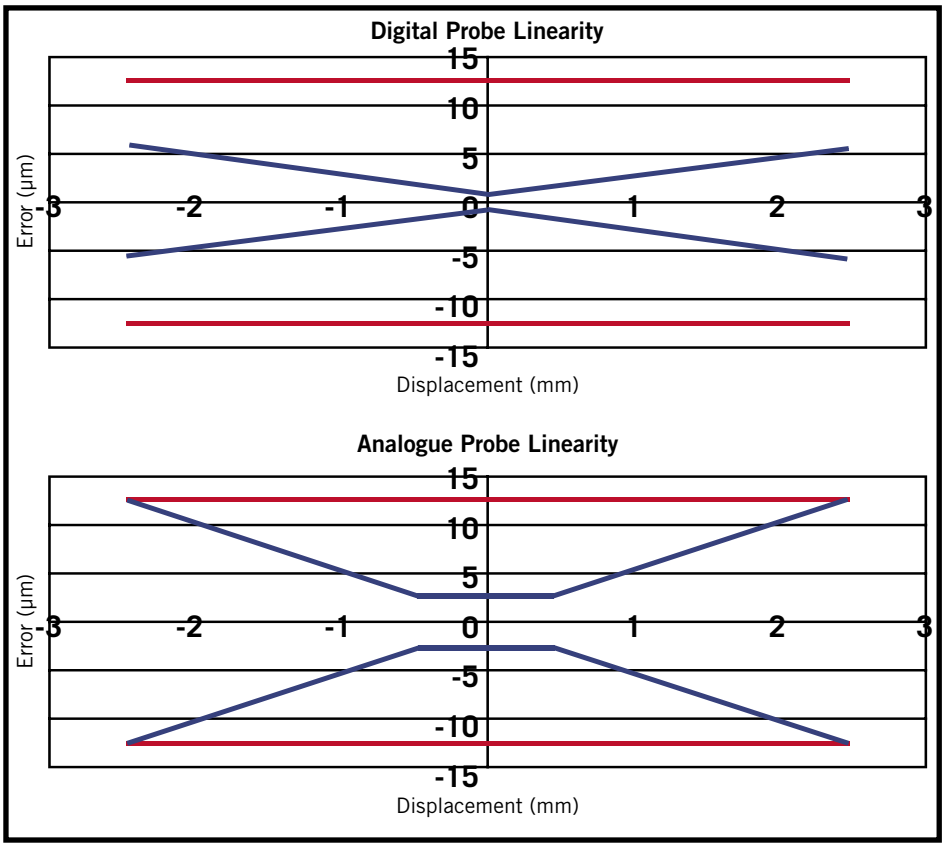


Figure 2, Comparison between a 5 mm analogue transducer and a 5 mm digital transducer

All digital products are supplied with a standard module connector which houses the conditioning electronics. With the exception of the displacement products, all digital products are calibrated along the entire measuring range thus can be used with a single mean setting master. This brings a large cost benefit since it removes the need for a max and min setting masters.

Some of the advantages of ***the digital probes*** include

- Eliminating the need for third party electronics.
- No amplifier adjustment required to offset variations in probe sensitivity.
- The end user does not need to calibrate, repair or seek spares support for the electronics.
- The amount of cabling between the gauge and computer is reduced to a single cable.
- Programmable resolution and measurement bandwidth. (Quasi-static measurands can be acquired with a higher resolution thus reducing quantization errors and minimising the detected noise by narrowing the bandwidth)
- Flexible gauge design is possible because it is not imperative to use a probe with a short measuring range to attain a high resolution.

8. Orbit Software

Solartron Metrology provides support software for Windows 95/98/NT and XP. This software includes a COM object library for COM applications and DLL's for lower level programming. Support is provided for all of major programming languages such as, VBA, VB, C++, Borland C Builder and Delphi.

9. Orbit Digital Devices

Solartron Metrology offers a host of modules for connection to Orbit, table 3 summarizes the current Orbit range. The modules include a comprehensive range of digital pencil probes which combine all of the best qualities of Solartron's analogue gauging probes with enhanced linearity, digital versions of Solartron's Displacement Probes, a Lever Probe, a Mini Probe, a Flexure Gauge, a range of Block Gauges and incremental Linear Encoders. Furthermore, there is an Analogue Input Module for easy connection of third party transducers to the Orbit Network (e.g. temperature, force, pressure), a Digital Input/ Output Module for interfacing to switches or control lines and Encoder Input Modules allowing the interface of rotary or line scale type encoders.

	Mechanical Orbit Devices		
	Measuring Range (mm)	**Actuation**	**Measurement Modes**
Digital Probe	1, 2, 5, 10, 20	Spring Push, Pneumatic, Feather Touch	Standard, Dynamic, Buffered
Mini Probe	0.5	Spring Push	Standard, Dynamic, Buffered
Block Gauge	2, 5 and 10	Spring Push, Pneumatic	Standard, Dynamic, Buffered
Flexure Gauge	2	Spring Push	Standard, Dynamic, Buffered
Lever Probe	0.5	Spring Push, low tip force (5 g minimum)	Standard, Dynamic, Buffered
Linear Encoder	12, 25, 50, 100	Spring Push, Pneumatic	Standard
Digital Displacement	2 to 200	Free, Spring Push	Standard, Dynamic, Buffered

	Electrical Orbit Devices		
	Input / Output	**Description**	**Measurement Modes**
Network Card	2 channel PCI card	Can interface 31 modules per card channel	Standard, Dynamic, Buffered
USB Interface Module	1 channel USB	Can interface 31 modules	Standard and Buffered
RS232 Interface Module	1 channel RS232	Can interface 31 modules	Standard and Buffered
Digital Readout	Display Module	Can interface 31 digital probes, mini probes, block gauges, flexure gauges, lever probes or linear encoders	N/A
Analogue Input Module	4-20 mA Current Loop (2 wire or 3 wire) 0-10 VDC or ±10 VDC	Interfaces to physical sensors with DC output	Standard, Dynamic, Buffered
Encoder Input Module	TTL	Interfaces rotary and linear scale encoders	Standard and Dynamic
Digital Input / Output Module	8 digital lines	Interfaces to discrete switches and provide switch outputs	Standard
Power Supply Interface Module	AC input 90 V to 246 V DC input 10 V to 30 V	Provides power to Orbit modules	N/A
Motor Drive Module	Motor drive control	For use with motorised version of the linear encoder	N/A

Table 3, The Orbit Product Range

10. Part Numbers

Standard Digital Probes

	Nylon Tip	T/C Tip
D6P/2/S	-	971155-1
DP/1/S	-	971140-1
DP/2/S	-	971100-1
DP/5/S	-	971130-1
DP/10/S	-	971110-1
DP/20/S	-	971160-1
DP/2/P	-	971105-1
DP/5/P	-	971135-1
DP/10/P	-	971115-1
DP/20/P	-	971165-1

Feathertouch Digital Probes

	PUR Cable Axial Outlet		Braided Cable Axial Outlet		PUR Cable Right Angle Outlet		Braided Cable Right Angle Outlet	
	Nylon Tip	**T/C Tip**	**Nylon Tip**	**T/C Tip**	**Nylon Tip**	**T/C Tip**	**Nylon Tip**	**T/C Tip**
D6T/2/S	-	971222-1	971221-1	971223-1	-	-	-	-
DT/2/S	971200-1	971202-1	-	-	971204-1	971226-1	971201-1	971203-1
DT/5/S	971230-1	971232-1	-	-	971229-1	971227-1	971231-1	971233-1
DT/10/S	971210-1	971212-1	-	-	971214-1	971228-1	971211-1	971213-1
DT/20/S	971280-1	971282-1	-	-	971290-1	971291-1	971281-1	971283-1
DT/2/P	971205-1	971207-1	-	-	971240-1	971241-1	971206-1	971208-1
DT/5/P	971235-1	971237-1	-	-	971250-1	971251-1	971236-1	971238-1
DT/10/P	971215-1	971217-1	-	-	971260-1	971261-1	971216-1	971218-1
DT/20/P	971285-1	971287-1	-	-	971295-1	971296-1	971286-1	971288-1

Linear Encoders

	IP Rating		
	IP 40	**IP 50**	**IP 65**
LE/12/S	-	961000	961050
LE/25/S	-	961300	961350
LE/12/P	-	-	961100
LE/25/P	-	-	961400
LE/50/F	961600	-	-
LE/100/F	961800	-	-
LE/50/M	961650	-	-
LE/100/M	961850	-	-

Additional Orbit Modules

	Part Number
Digital Block Gauge	See datasheet 502514
Digital Lever Probe	See datasheet 502583
Digital Flexure Gauge	See datasheet 502623
Analogue Input Module AIM	See datasheet 502584
Digital Mini Probe	See datasheet 502597
Motor Drive Module MDM	911285
Digital I / O Module DIOM	911221
Encoder Input Module EIM	See datasheet 502647
Digital Displacement Transducers	See datasheet 502637

Orbit Accessories

	Part Number
T-Con	971000
Orbit Network Kit (PCI)	911232
Orbit Network Kit (PCI – Mk2)	911288
USB Interface Module	911320
RS232 Interface Module	911174
Power Supply Interface Module PSIM (AC)	911173
Network Terminator	802968
Happy Light	971020

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