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digital
benchtop
meter



installation manual

CE model
no. DR601

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The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, patient-connected applications.

1.0: Index

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2.0: Safety Summary

This Equipment is designed as Safety Class I apparatus to comply with EN61010-1.

Service Safety

This equipment has been designed and tested to meet the requirements of the Low Voltage Directive (1997) and has been supplied in a safe condition. This manual contains information and warnings that must be followed by the user to ensure safe operation and to retain the apparatus in a safe condition.

Terms in this Manual

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

Symbols in this Manual



This symbol indicates where applicable cautionary or other information is to be found.

Power source

Apply no more than 265V rms (AC) between supply conductors or conductor and ground.

2.0: Safety Summary (continued)

WARNING: Do not operate in an explosive atmosphere

WARNING: Do not remove covers or panels

To avoid personal injury, do not remove covers and panels. Do not operate the equipment without the covers and panels fitted. There are no internal adjustments required during commissioning the equipment.

Warning: Danger arising from loss of ground

During a fault condition and upon loss of protective ground (earth) connection, all accessible conducting parts - including controls that might appear to be insulated - can render an electric shock.

CAUTION: Use correct Fuse



To avoid a fire hazard, use the correct fuse type, voltage and current rating as specified for the equipment. Refer fuse replacement to qualified service personnel.

Grounding the equipment

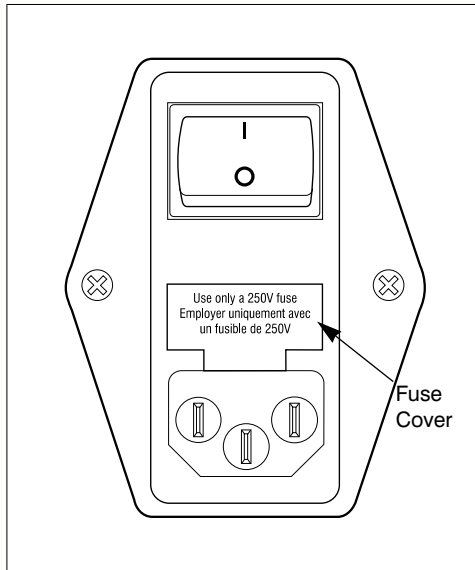
The unit is grounded through the mains lead: to avoid electric shock, plug the power lead into a properly-wired receptacle before connecting to the input or output terminals. A protective ground connection by the way of the grounding conductor in the power lead is essential for safe operation.

3.0: Service & Repair

Replacing the fuse



At the rear right of the Digital Readout remove the fuse cover of the IEC320 connector and replace the fuse with the same type and value.



This equipment contains no user serviceable parts other than the fuse.

This equipment must be returned to your Omega dealer for all other service and repair.

Dismantling the unit will invalidate the warranty.

4.0: Measurement Configurations

Individual probe - connection of one Linear Encoder or Digital Probe.

Refer to Digital Benchtop Meter User Manual to configure the options.

Probe pair - connection of 2 probes configured as A+B or A-B.

To connect more than 2 probes to the Digital Readout, use the Orbit Network Connection System.

Probes may be plugged directly into the rear panel recessed receptacle.

When more than 10 probes are connected to the Digital Readout a supplementary power supply interface module will be required (Omega Part No. LDN-PS).

Multiple probes - up to 10 individual probes or probe pairs (A+B or A-B) each allocated to a program.

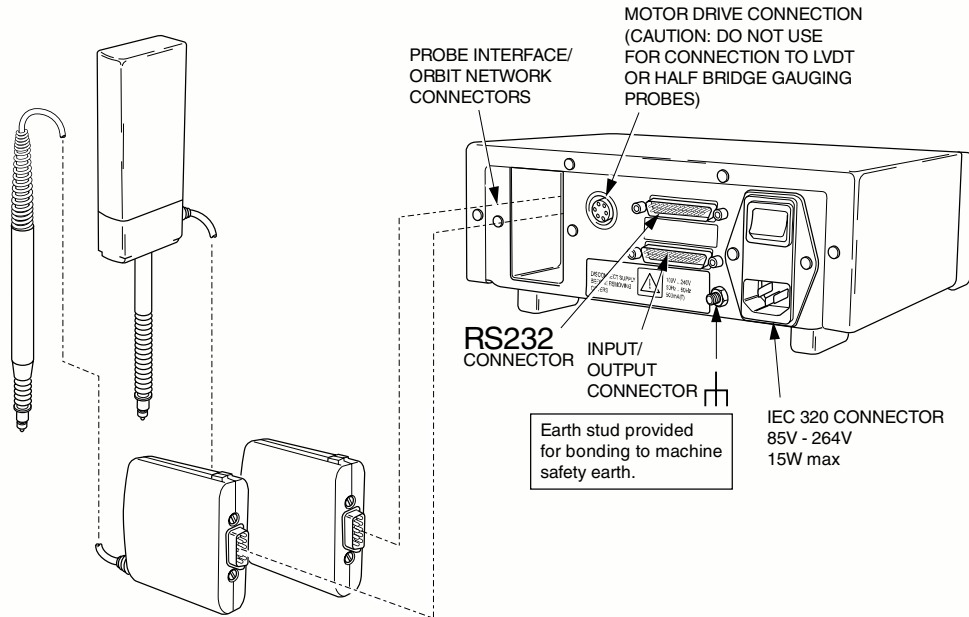
Scan - connection of up to 30 probes (Linear Encoders and/or Digital Probes) and allocated to a single program.

5.0: Digital Readout Interface

Probe(s) must be identified to the Digital Readout when first installed. Simply press probe tip when prompted.

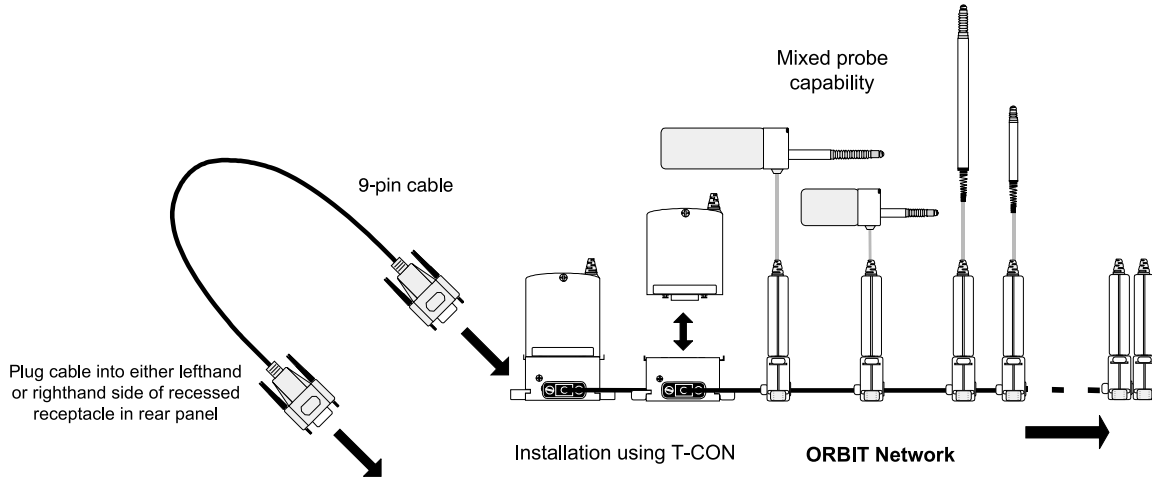
5.1 Connecting 1 or 2 Probes

To connect a Linear Encoder or Digital Probe ensure cable from Probe Interface Electronics (PIE) is at bottom of unit and plug into either left hand or right hand side of recessed receptacle.



5.0: Digital Readout Interface (Continued)

5.2 Connecting up to 30 probes



- Accessories

T-CON part number

LDN-CON

9 pin (m/f) cable 1.5 m / 5 ft

006869

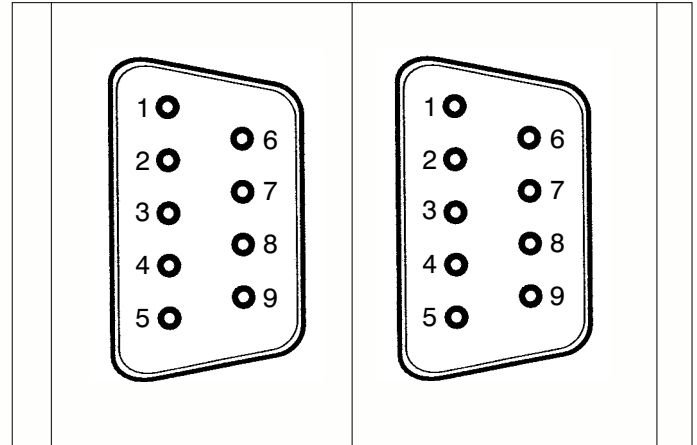
9 pin (m/f) cable 5 m / 16 ft

803664

6.0: Probe Interface/Orbit Network Connections

Connector type: 9 pin D-sub female

Pin	Function
1	0V
2	RS485(A)
3	RS485(B)
4	0V
5	0V
6	+5V
7	+5V
8	+5V
9	0V

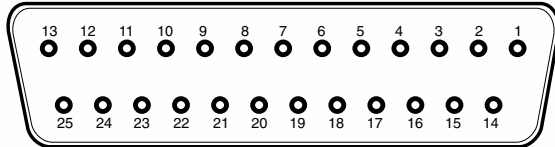


View from rear of unit

7.0: RS232

(Allows measurement readings to be sent to printer or PC)

Connector type 25 pin D-sub female



7.1 Pin Assignment

Pin	Signal	Assignment
1	CHASSIS GND	Chassis ground
2	TXD	Transmitted data
3	RXD	Received data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	SIGN GND	Signal ground
20	DTR	Data terminal ready

7.2 Voltage levels

TXD and RXD voltage levels

logic level (active) -3V to -15V

logic level (not active) +3V to +15V

RTS, CTS, DSR and DTR voltage levels

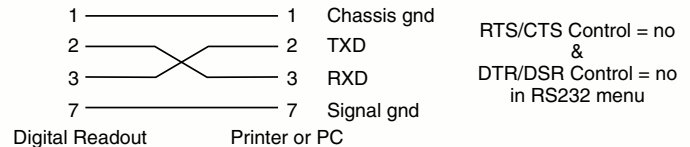
logic level (active) +3V to +15V

logic level (not active) -3V to -15V

7.3 Connection cable

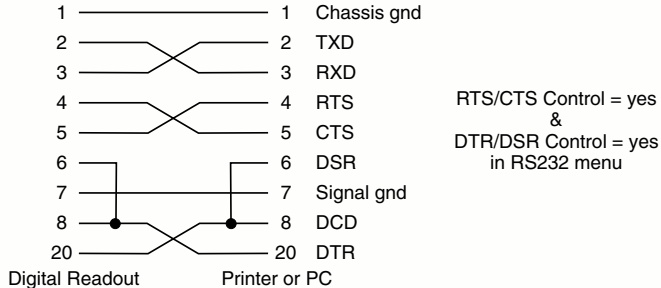
Simple connection between Digital Readout and printer or PC

(No flow control or Xon/Xoff flow control)



7.0: RS232 (Continued)

Connection between Digital Readout & printer or PC using RTS/CTS and DTR/DSR



7.4 Baud Rate 300, 600, 1200, 2400, 4800,
 9600, 19200, 28800, 57600

7.5 Data Format 1 start bit
 7 data bits
 none/odd/even parity
 1 or 2 stop bits

Note: Baud rate and data format options are defined in RS232 menu. Ensure settings are the same as on the connected serial device.

7.0: RS232

7.6 Message format

Digital Readout to PC or printer

Message: <Displayed Measurement>

Initiated by <Send Measurement> command or by pressing **print** key

1	9	10	20	21	22	23
Text		Reading			U	R

Message terminated by [carriage return] [line feed]

Key:

Text: ASCII text dependant on mode of operation
 (Bytes 1 to 9)

Reading: ASCII representation of the reading, leading
 zero's replaced by spaces
 (Bytes 10 to 20)

U = units " for inches (Byte 21)
 space for mm

R = range lamps '>' out of tolerance - high (Byte 23)
 '=' in tolerance
 '<' out of tolerance - low

7.0: RS232 (continued)

PC or printer to Digital Readout

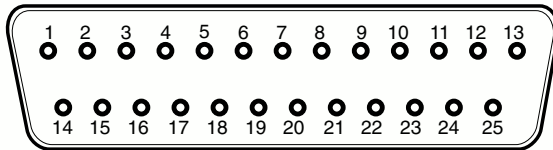
Command	Character	Description
<Send Measurement>	STX	Requests displayed measurement to be sent
<X OFF>	DC3	Stop transmission of message
<X ON>	DC1	Restart transmission of message

- Freeze display
The numeric display reading can be programmed to 'freeze' when RS232 option is selected in ext menu.
- Display frozen and updated by each freeze = RS232
<Send Measurement> command on RS232 interface in ext menu

8.0: Input/Output Connections

Allows remote switches or inputs to be used in place of Digital Readout keys and displayed value to be frozen.
Range Lamp status can be used to control external relays.

- Input/Output (25 pin D-sub Male connector)



Viewed from rear of unit.

Inputs

High +3.9V to +15V (max)





Low -0.5V to +0.9V(lo ~5mA)

Pin	Function
2	Remote ZERO
3	Remote LOAD
4	Remote PRINT
5	Remote Reset MAX/MIN/DIFF registers
6	Remote display MAX/MIN/DIFF/ACTUAL, key press cycles
7	Remote Freeze Display
8	Remote Program Up
9	Remote Program Down
22	Remote MOTOR ▲
23	Remote MOTOR ▼
24	Unassigned
25	Unassigned

8.0: Input/Output Connections (Continued)

- Remote ZERO: Performs same function as pressing **zero** key when input is taken low then high.
- Remote LOAD: Performs same function as pressing load soft key when input is taken low then high in Operation mode preset or Max/min menu.
- Remote PRINT: Performs same function as pressing **print** key when input is taken low then high.
- Remote MAX/MIN/DIFF: Performs same function as pressing soft key that cycles through actual/maximum/minimum/difference in Operation mode Max/min menu, when input is taken low, then high.
- Remote RESET: Performs same function as pressing reset soft key in Operation mode Max/min menu, when input is taken low, then high.
- **Remote Freeze**
The Digital Readout can be programmed to freeze the displayed reading as follows:
 - Display frozen and updated by each negative going edge on Remote Freeze Display signal.
freeze = remote neg edge in ext menu.
 - Display frozen while Remote Freeze Display signal is low.
freeze = remote low in ext menu.

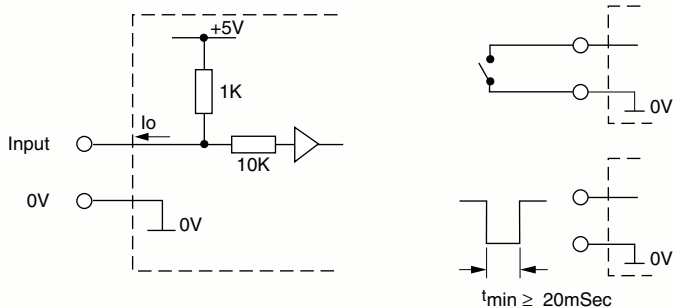
8.0: Input/Output Connections (Continued)

- Remote Program Up/Down performs the same function as pressing the **program**  keys when input is taken low then high.
- Motor /Motor  performs the same function as pressing the **motor**  keys when input is held low.
- Input Schematic**

- Active low, edge triggered.
- Only one input to be active at a time.
- If a series of functions is being processed then t_{min} may be prolonged.

Outputs

- High +32V (max)
 $I_c \leq 10\mu A$
- Low $\leq +0.4V$
 $I_c \leq 100mA$



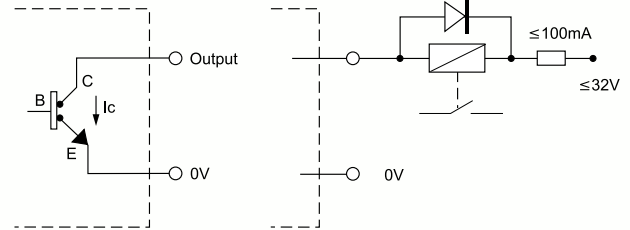
Pin	Function
15	Not assigned
16	Range lamps: Within tolerance
17	Range lamps: Low
18	Range lamps: High
19	Do not connect
20	Do not connect

8.0: Input/Output Connections (Continued)

- Misc.

Pin	Function
1	0V
10	0V
11	Unused
12	Unused
13	Unused
14	Unused
21	Unused

- Output schematic



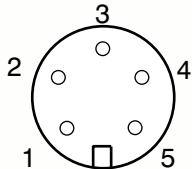
- Open Collector, active low
- Range lamps within tolerance/low/high operate on actual limit set values with no hysteresis
- Delay until signal output: $\leq 50\text{mSec}$
(If a series of functions is being processed this may be prolonged)

9.0: Motor Drive Connections

Provides dc power for probe motor drive.

Pin	Function
1	Motor +
2	Motor -
3	12V
4	0V
5	Spare

5 pin DIN female connector viewed from rear of unit.



- When key or remote Motor ▲ selected then
Motor + = +12V
Motor - = 0V

- When key or remote Motor ▼ selected then
Motor + = 0V
Motor - = +12V
- When no motor keys or inputs selected then
Motor + = 0V
Motor - = 0V
- Maximum current from +12V is 100mA

10.0: General Specification

ENVIRONMENTAL

Operating Temperature (°C)	0 to 40°C / 32 to 104°F
Storage Temperature (°C)	-20 to 60°C / -4 to 140°F
Humidity	0 to 95% non condensing
Safety Rating	EN61010-1

IP Rating

Front panel module	IP65
Complete unit	IP40

EMC

Emission	EN50081-1
Immunity	EN50082-2

Power supply	via IEC 320 Connector
Line voltage	85V to 264V
Line frequency	47Hz to 440Hz
Power	15W max
Line fuse	2A T
Fuse size	20mm

Nominal Dimensions

Width	235mm / 9.26 in
Height w/o feet	80mm / 3.15 in
Height w/ feet	96mm / 3.78 in
Depth	190mm / 7.49 in
Weight	2.3kg / 3.3 lbs

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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