



Durham Geo-Enterprises, Inc.

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Durham Geo-Enterprises Inc.

**DIGITAL READOUT
AND SERIAL ACQUISITION SYSTEM**

E-415/E-416

**Operator's
Manual**

All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. We reserve the right to make changes at any time without notice and without incurring any obligation.

FIRST RECORD THIS INFORMATION

Locate your machine's Model and Serial Number.

Should you ever need to call for service, you will need these numbers. You'll find them on a the rear of your equipment.

Model # _____

Serial # _____

•Both of these numbers will be needed if you ever need to call for service.

You will also find it convenient to have the following information.

Sold by: _____

Date Purchased: _____

THE OPERATOR SHOULD READ THIS ENTIRE MANUAL CAREFULLY BEFORE ATTEMPTING TO OPERATE THIS MACHINE.

- | | |
|----------------|---|
| DANGER | Indicates serious injury or death WILL result if instructions are not followed. |
| WARNING | Indicates a strong possibility that serious personal injury or death may result if instructions are not followed. |
| CAUTION | Indicates a possibility that minor injury could result if instructions are not followed. |
| NOTICE | Indicates that equipment or property damage could occur if instructions are not followed. |
| NOTE | Gives helpful information. |
| WARNING | Do not attempt to remove any panels with the unit plugged in. Before examining the |

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interior of this equipment, disconnect all power to the equipment. 110V and 220V can be painful and cause serious injury to yourself and the equipment.

SAFETY SUMMARY

This instrument is designed to prevent accidental shock to the operator when properly used. However, no engineering design can ensure the safety of an instrument used negligently. Therefore, read this manual carefully and completely prior to operating this equipment. Do not remove the instrument from its enclosure or use it for purposes other than that for which it was intended without consulting the factory. Failure to do so could cause seriously damage the equipment or injure the operator.

UNIT DESCRIPTION

This unit is a microprocessor-based, intelligent digital panel meter, with a +-9999 (1) display. It features 3 front panel soft keys that allow the user to select various setup features and to access various software features of the device.

AUTOCALIBRATION

An internal self-calibrating circuit replaces the need for potentiometer adjustments of the A/D section. The unit will self-calibrate once every 4 seconds to compensate for the internal drift that would be expected of the electronics.

SPECIFICATIONS

Power:	115V AC (220V AC on request)
Display Rate:	2 updates per second nominal
Response Time:	750 ms typical for input step change
Environment:	0 to 45 degrees C operating temperature -40 to 85 degrees C storage temperature 20-80% relative humidity, non condensing
	Range: +-100mV

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INSTALLATION

This unit has been setup and calibrated at the factory. Further adjustment by the user is not necessary and should not be attempted until you have read and completely understand this manual. Any unauthorized changing of scale factors, offsets, or other internal settings will void all written or implied warranties and calibrations certifications.

USING THE E-415/E-416

Congratulations! You have purchased a Durham Geo-Enterprises E-415 series Digital Readout. Before using your readout, please read the following sections carefully. The basic operation of the unit is simple, however by taking a few minutes to familiarize yourself with the unit and its many features, you will be able to use the device to its full capabilities.

SETTING UP

To set up the readout, remove it from its packaging and place it on a flat, level surface. The handle is designed to be used as a stand. To turn the unit on, first plug it into a grounded 110V AC outlet. Activate the power switch, located on the rear panel, the display will come on. Attach the mating transducing device by plugging it into the input socket on the back panel of the Readout. The unit will now display a stable reading around "0".

EACH READOUT AND TRANSDUCER HAS BEEN CALIBRATED AT THE FACTORY AND ARE A MATCHED PAIR. BE SURE THAT YOU HAVE PLUGGED THE TRANSDUCING DEVICE INTO THE PROPER INPUT SOCKET. CHECK THE SERIAL NUMBERS OF THE TRANSDUCERS WITH THE CALIBRATION CERTIFICATE ISSUED WITH EACH TRANSDUCER.

The units displayed by the Readout are standard English engineering units (unless otherwise requested). Table 1 lists the readability of the standard transducing devices.

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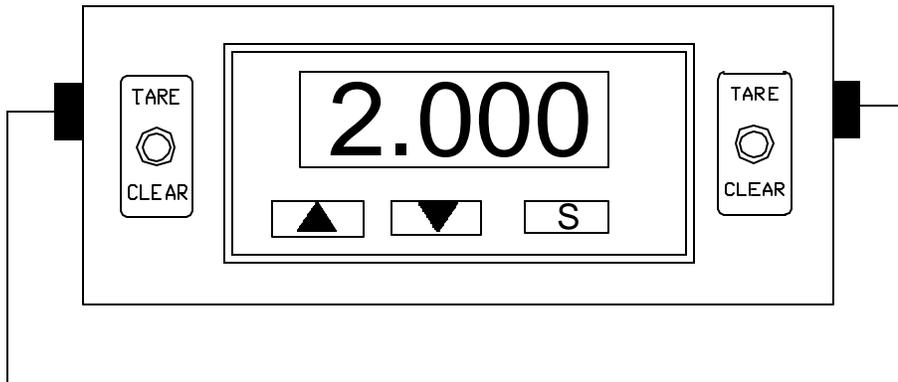
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Device	Readability	
E-110 Thru E-126	0.1 PSI	0.69 kPa
E-140	10 psi or 100 lb	69 kPa or 45 kg
E-210	0.1 lb	0.045 kg
E-212	1.0 lb	0.454 kg
E-214	1.0 lb	0.454 kg
E-216	10 lb	4.54 kg
E-310	0.0001 in.	0.0025 mm
E-311	0.001 in	0.0254 mm
E-312	0.001 in	0.0254 mm
E-314	0.001 in	0.0254 mm
(Table 1)		

USING THE SOFT-KEYS



Up arrow selects Ch-1

Down arrow selects Ch-2

The left "TARE \ CLEAR switch is for channel 1.

The Right "TARE \ CLEAR switch is for channel 2.

TECHNICAL INFORMATION

Power Supply

The E-415/E-416 generates 10V DC to energize its mating transducer. All Durham Geo pressure transducers, load cells, and LDT's are compatible with this excitation voltage. The E-415/E-416 has the capacity to supply 90 mA of current to its mating transducing devices. If the devices you are attaching to the indicator have a total resistance greater than 110 ohms, please check with the factory. Attachment of total resistance's greater than 110 ohms may result in damage to the readout or transducing devices.

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Note: If you are using non-Durham Geo products with your unit, please check with the manufacturer to insure that no damage will occur to the readout or transducer.

Input

The E-415/E-416 will accept a maximum of $\pm 100\text{mV}$ from a transducing device. An output of more than 100mV will result in a display of "OFLO".

Wiring Configuration:

The input socket on the back of the Readout is wired as follows:

- Pin 1 -Signal 100mV
- Pin 2 +Signal
- Pin 3 not attached
- Pin 4 -Supply 10V DC
- Pin 5 +Supply

The pin position is shown on the data sheet at the back of the manual. To prevent damage to the readout or transducer, please conform to this wiring specification when using non-Durham Geo transducers.

CALIBRATION AND SET-UP

The E-415/E-416 is classified as an intelligent digital display. The unit is controlled by a microprocessor, which allows the user a great deal of flexibility in setting up the readout for specific applications. The microprocessor allow for ease in changing engineering units, configuring options, and permits customization of calibration fits for specific needs.

The E-415/E-416 utilizes a single scale calibration fit for 2 transducers.

Using the Set-up Program

(refer to Fig 1)

The calibration data for the E-415 is contained in the SETUP program, which is permanently stored in memory. Access to the SETUP program is protected by a lockout code. The lockout code for this Readout is "28" for Ch-1, "29" for Ch-2, and "30" for channel selection.

To enter the SETUP program, depress the "S" key on the front panel of the readout. The display will prompt "SETUP", then go to "0". At this point, use the  and  keys to display the lockout code. Press "S" to enter the code. If you have entered the correct code, the display will flash "input", then display a numeric value. This value is the actual mV output of the attached transducing device.

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By depressing the "S" key, you can scroll through the menu of choices available in the SETUP program. These choices are:

Channel 1	Channel 2	
#28 DISPLAY	#29 DISPLAY	VALUE
InPut #1	INPUT #2	varies
SCAL 1	SCAL 2	varies
OFFS 1	OFFS 2	varies
dP	dp	varies (decimal pt.
Run	Run	flashes)

By using the ▲ and ▼ keys, the display value can be changed to the proper values. In the following calibration discussion and example, use of these keys and the "S" key allow movement through the program.

Calibration

To calibrate the E-415/E-416 and a transducing device, you will need a few items specific to the task. These include:

1. Some type of verifiable load application device.
For example: a deadweight tester for pressure, height gauges for displacement, calibration load cells for load.
2. Pencil and paper
3. Calculator

Calibrating the INDICATOR consists of gathering mV input data at 2 predefined loads and then using this data to calculate scale factors and offsets. In mathematical terms, the scale factor is the slope of a linear approximation of the gathered calibration points. The offset is the deviation of this line through the origin.

Two data points should be taken. Typical behavior of transducing elements suggests that readings should be taken at no load (0) and at full load. For example, on a 150-psi transducer, input mV readings would be taken at 0 PSI and 150PSI. Set up a chart like the one below to record data.

 load (psi) mV(input)

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0	-38
30	1810
60	3662
90	5523
120	7405
150	9298

The MV are recorded by placing the readout in the "INPUT" mode of the the SETUP program. The values displayed in "INPUT" are actual mV coming from the transducer. For example, a display of 1382 is a 13.82mV signal from the transducer.

After recording the input data, the next step in calibrating is to calculate the scale factors and offsets. The scale factors are calculated by using the following formulas.

$$\text{SCALE} = \frac{\text{HI (DISPLAY)} - \text{LO (DISPLAY)}}{\text{HI (mv)} - \text{LO (mv)}}$$

When putting the values for (DISPLAY) into the equation, ignore the decimal point. For example, a HI (DISPLAY) of 150.0 PSI would be entered into the formula as 1500.

For the example above:

$$\text{SCALE} = \frac{\text{HI (DISPLAY)} - \text{LO(DISPLAY)}}{\text{HI(mv)} - \text{LO(mv)}} = \frac{1500 - 0}{9298 - (-38)} = \frac{1500}{9336} = .1606$$

The offsets are calculated by the following formula:

$$\text{OFFSET} = \text{LO(DISPLAY)} - [(\text{SCALE}) \cdot \text{LO(MV)}]$$

The same rule of ignoring decimal points when entering DISPLAY values into the formulas applies here. The "OFFS" feature will only allow you to enter an integer, so we will round off our final answer to the nearest whole number. For our example:

$$\text{OFFSET} = \text{LO(DISPLAY)} - [(\text{SCALE}) \cdot \text{LO(mv)}] = 0 - [(.1606) \cdot (-38)] = 0 - (-6.1)$$
$$\text{OFFSET} = +6$$

You will need to repeat the above procedure for each transducer that will be attached to the readout. Write each scale factor and offset down, and mark the transducer with the number of the socket it is attached to.

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With these values calculated, we can now enter them into the SETUP program. For Channel 1, enter "28" and by depressing the "S" key, scroll through the menu until you see "OFFS1". Using the "up arrow" and "down arrow" keys, enter the value you have calculated for OFFS1 (transducer #1). Press the "S" key to enter this value and to scroll to "SCAL1". Enter the calculated value for "SCAL1". Depress the "S" key and scroll to "dP". Change the Decimal Point by using the UP and Down keys. Depress the "S" key again and release it at the "run" prompt. The unit will go blank, flash "run" again, then display numeric data. The E-415 has now stored the calibration settings and is ready to use. A quick check of the unit should verify that it is displaying the proper readings.

In summary, the following steps should be taken to set the calibration of the unit.

1. Place the E-415/E-416 in the "INPUT" mode of the "SETUP" menu
2. Take two readings of mV input and record them. Suggested readings are at 0 and full load. Do this for each transducer. Ensure you select the correct channel for the transducer you are calibrating, (channel one setup code "28")(channel two setup code "29") on the front of the readout case before taking the readings.
3. Calculate OFFS1, SCAL1, OFFS2, SCAL2
4. Enter the calculated values for the scales and offsets.
5. Set the decimal point.
6. Exit the SETUP mode into the RUN mode and test your calibration.

Hopefully, these instructions have provided you with some insight into the operation of the E-415/E-416. If you have any questions about this manual, your readout or applications, please contact Durham Geo-Enterprises:

E-41520 "S.A.S." SOFTWARE

July 1, 1994

Version 4.01

Welcome. The following pages will introduce you to the E-41520 software. Should you have any problems in loading the software into your P.C. or with the collection of data from the transducer, please call 1-800-837-0864.

The E-41520 S.A.S. software is supplied on a 3-1/2" high density disk. Please read section 1 before loading disk.

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1. SETUP

- a. Create a directory (SAS) on your main drive. Place the SAS disk in drive "A" and copy "SAS2.EXE" into the directory you have created.

NOTE: When using DOS or Windows 3.1:

You must have the following driver installed in the configuration system
File of your hard drive: "Device = C:\DOS\ANSI.SYS". Use any text editor to make the required change.

NOTE: When using Windows 95 or Windows 98:

You must have the following driver installed in the configuration system
File of your hard drive: "Device = C:\Windows\Command\ANSI.SYS". Use any text editor to make the required change.

NOTE: When using Windows NT 4.0 Service pack 6:

You must have the following driver installed in the configuration system for NT 4.0, (config.nt) File of your hard drive:
"Device = C:\Winnt\system32\ANSI.SYS". Use any text editor to make the required change. Always reboot after making these changes

NOTE: The SAS software is a dos program and will not function properly in Windows 2000.

- b. To open S.A.S. through DOS, type "SAS" within the directory you have created on your hard drive. Please call 800-837-0864 if you need further assistance.
- c. Read the instruction manual supplied with the E-41520 software to familiarize yourself with the setup procedures for this software.

2. Make the connections between the E-415 digital readout and your PC.

NOTE: Your PC may have a 9 pin or 25 pin port connector. The E-415 has both types of plugs supplied.

- a. Connect the supplied cable to either COM 1 or COM 2 on the back of your PC. Make sure that the connecting cable is not close to the AC power cord or magnetically-charged devices.

NOTE: The connecting cable from the E-415 to your PC cannot be longer than

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20 ft. for satisfactory data transfer. Consult the factory if you require longer cable lengths.

3. b. The connections to the E-415 are to be made as follows:
First you have been supplied with a 5 pin din plug that has no wires externally visible. This plug is necessary and the unit will not operate if not installed correctly! Plug the 5 pin din (Terminating plug) into the Output of the last unit in the series. If just one unit is used, the Terminating plug is to be placed into the output of that unit. **See Cabling for SAS system.**
- c. Connect the supplied Computer cable to the "IN" on the first SAS unit in the series. The other end of this cable should already be in COM 1 or COM 2 of your PC.
- d. When a second unit (E-416) is ordered a connecting cable with a 5 pin din plug on both ends, this cable should be plugged into the out of your first unit and IN of the second unit. The terminating plug will now be plugged into the out of the second unit.
- e. Connect any new units in the same way. The SAS system allows 4 total Units , 8 Channels cumulative.

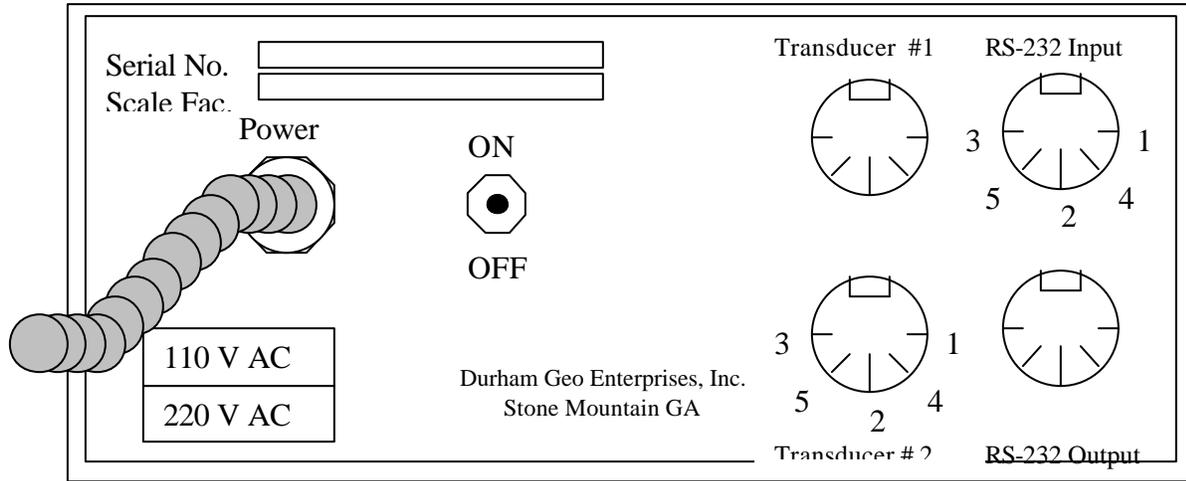
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WARNING:

Disconnect Power before removing cover

Transducer input: 5 Pin Din Socket (180°)

WIRING CONFIGURATION – TRANSDUCERS

Socket Pin	Load Cells	Pressure	Displacement
Supply + 5	Red	Red	Red
Supply - 4	Black	Black	Yellow
Signal + 2	White	Green	Blue
Signal - 1	Green	White	Green

Supply Voltage 10.00V DC at Maximum 90 ma

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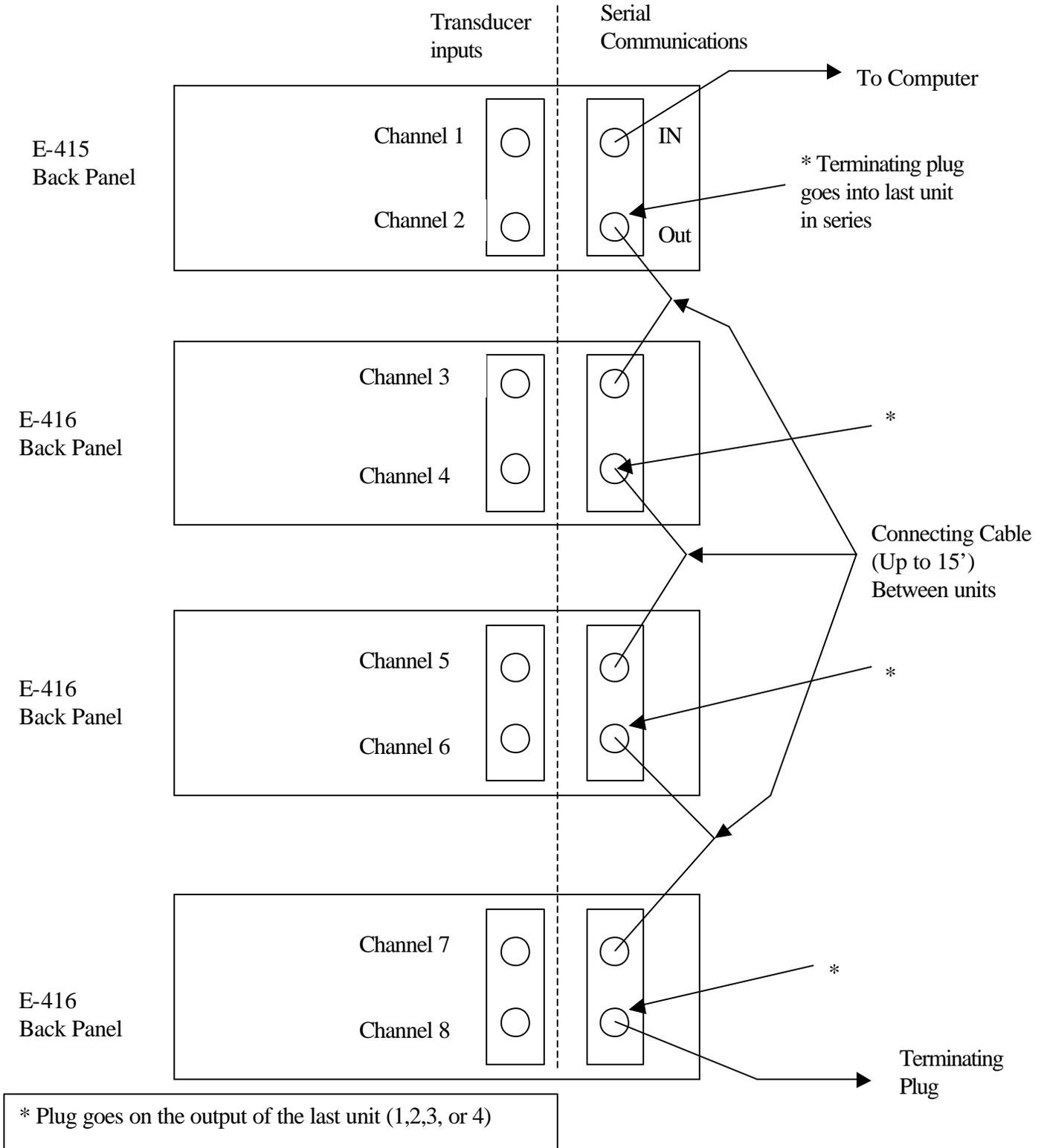
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Cabling For SAS System



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WARRANTY STATEMENT

Durham Geo-Enterprises warrants that equipment shall be free from defects in material and workmanship for a period of **90 days** from the time the equipment is put into service. In any event, the warranty period will not exceed **6 months** from the date of shipment.

Durham Geo liability shall be limited to replacement of components or equipment (at the manufacturer's discretion) that has been determined by the manufacturer to be faulty. No claims in excess of component replacement value will be recognized. Durham Geo will not be held liable for damages or lost business relating to a warranty claim.

Specifically excluded from this warranty are claims deemed by the manufacturer to have resulted from normal wear and tear, improper use, or abuse of the equipment.

For complete warranty disclosure, please call 1-800-837-0864(outside GA) or 770-465-7557 (inside GA).