ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

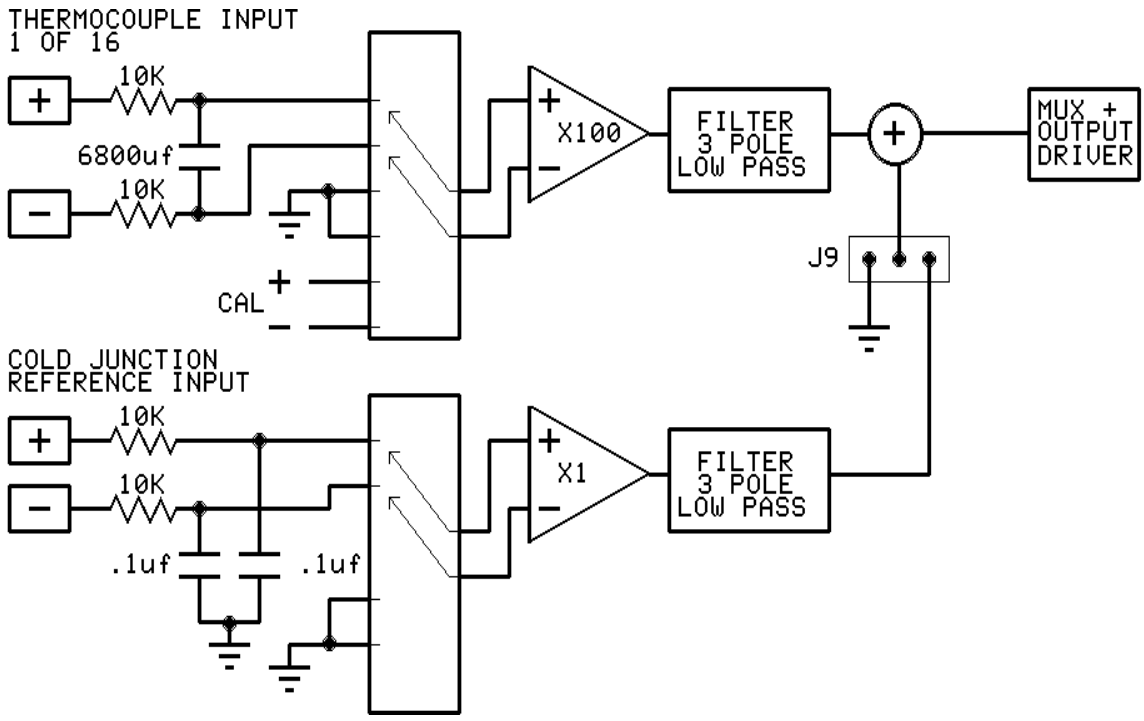
Find the *LDS / Optim Electronics Megadac 5406DC* at our website: *Click HERE*

AD 816TC

SPECIFICATIONS

The AD 816TC Thermocouple Input Module (16 independent channels) works with the JP 816 jack panel (16 thermocouple jacks with a common thermal mass and cold junction compensation). Interconnections between the JP816 and the AD 816TC are made using standard copper wire. Figure 1 shows one of the channels with differential input terminals, input protection, fixed gain of 100, and 3 poles of filtering. The green LED indicates at least one channel on the module is being scanned. Detailed specifications are in Table 1.

FIGURE 1 AD 816TC CHANNEL DIAGRAM



INSTALLATION

The following jumpers must be installed before putting the module in your MEGADAC.

CHANNEL ADDRESS Each module must have a different address. Install the address jumpers according to Figure 2 and Table 2. Label the module front panel with its address.

Your ADC module must be in the leftmost position. Put the AD 816TC in any other available slot. Press firmly to fully seat the module and tighten the top and bottom 1/4 turn fasteners by pushing in and rotating CCW. Enter your AD 816TC in the MEGADAC Map.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CONNECTIONS

Remove the two screws on each thermocouple plug and connect each plug to the end of your thermocouple wires with the red wire to "**-**". Label the jack panel with the proper address labels (see Figure 3). Make sure all surfaces are clean as well as your fingers. You can label the plugs also. The connection form is on page 11. Make copies of this form and use them to plan, wire and document your test.

RACKMOUNT JACK PANEL are available. Contact your OPTIM sales representative for additional information.

BENCH TOP/DIN RAIL MOUNT The following JPs are available in a 3.28 inch wide by 5.64 long by 1.82 high table top box:

JP 816TC Type J	PL2180
JP 816TC Type K	PL2181
JP 816TC Type T	PL2182

The box has rubber non-skid feet for bench top use. To convert it to DIN rail mount:

1. Remove the four front panel screws.
2. Remove the front panel with a rocking motion, which allows the connector to rock back through its hole.
3. The three DIN rail clips can be unscrewed from the bottom of the box. Reinstall them on the bottom of the box with their screws inside the box.
4. Reinstall the front panel

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

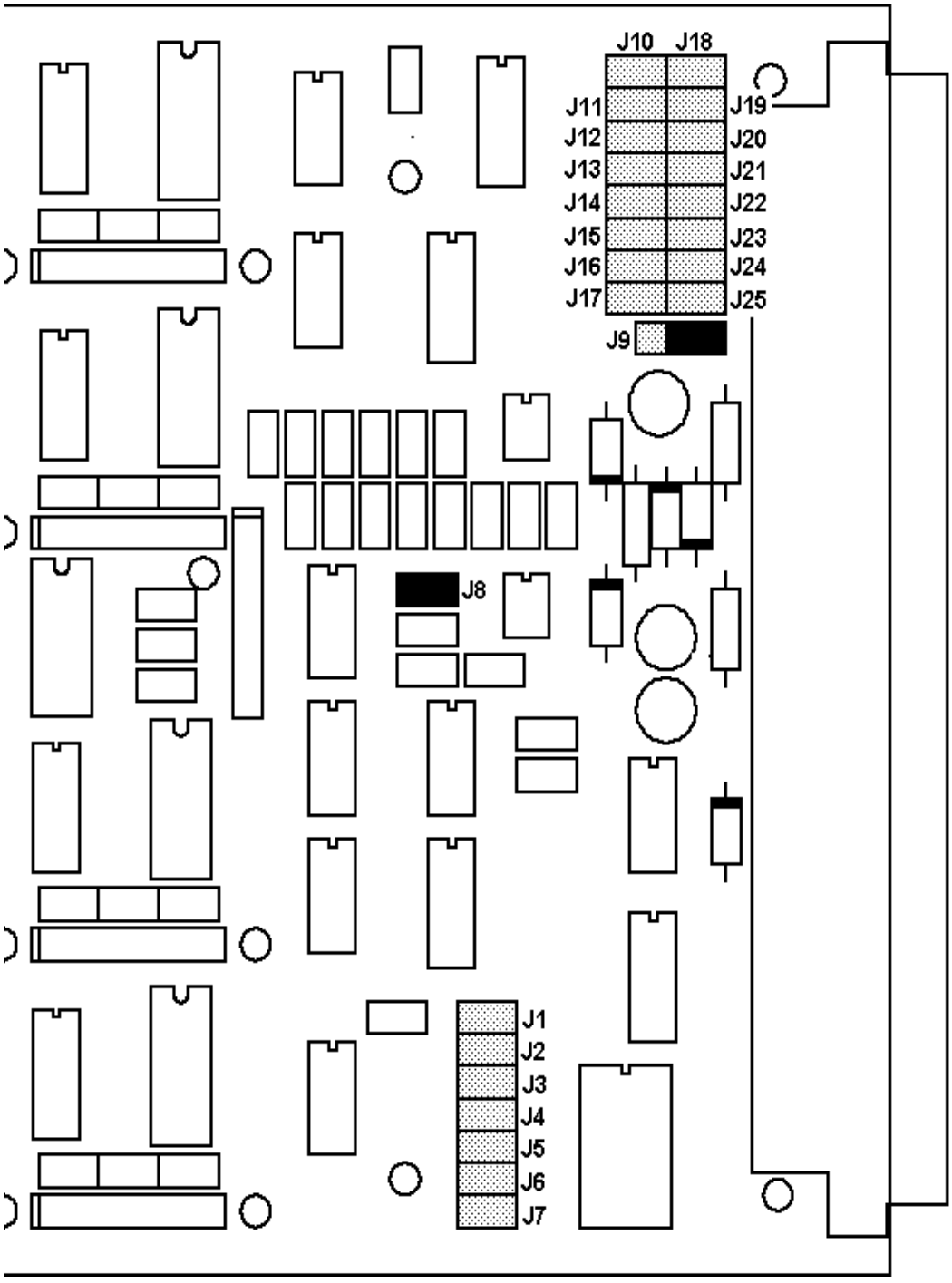
TABLE 1 AD 816TC SPECIFICATIONS

INPUT	
Input impedance	> 10 MegOhms
FS input voltage	+/- 100 mV
Input protection	+/- 50 V continuous; brief surges to 1 kV
Common mode range	+/- 8 V
Common mode rejection	> 80 db at 60 Hz
Input noise	0.01 °C < 40 Hz (0.5 uV)
Offset	< 0.1 °C (5 uV)
Offset tempco	0.01 °C/°C (0.2 uV/°C)
GAIN	
Gain	100
Gain accuracy	300 ppm
Gain stability	100 ppm/year
Gain tempco	5 ppm/°C
Gain non linearity	25 ppm
Max. bandwidth	40 Hz (-3 db)
Settling time	80 mS to 0.02%
FILTER	
Type	1-pole RC on input 3-pole active Butterworth after gain
Frequency	20 Hz as shipped
Gain tempco	10 ppm/°C
Offset (RTO)	< 5 mV
Offset tempco (RTO)	10 uV°C
VCAL - ZERO	
VCAL	Voltage substitution calibration 50 mV
ZERO	<5 uV

Measurements given in °C are based on a E type thermocouple at 60.9 uV/°C

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FIGURE 2 AD 816TC ADDRESS JUMPER LOCATIONS



Always install J8 for CAL and J9 right

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

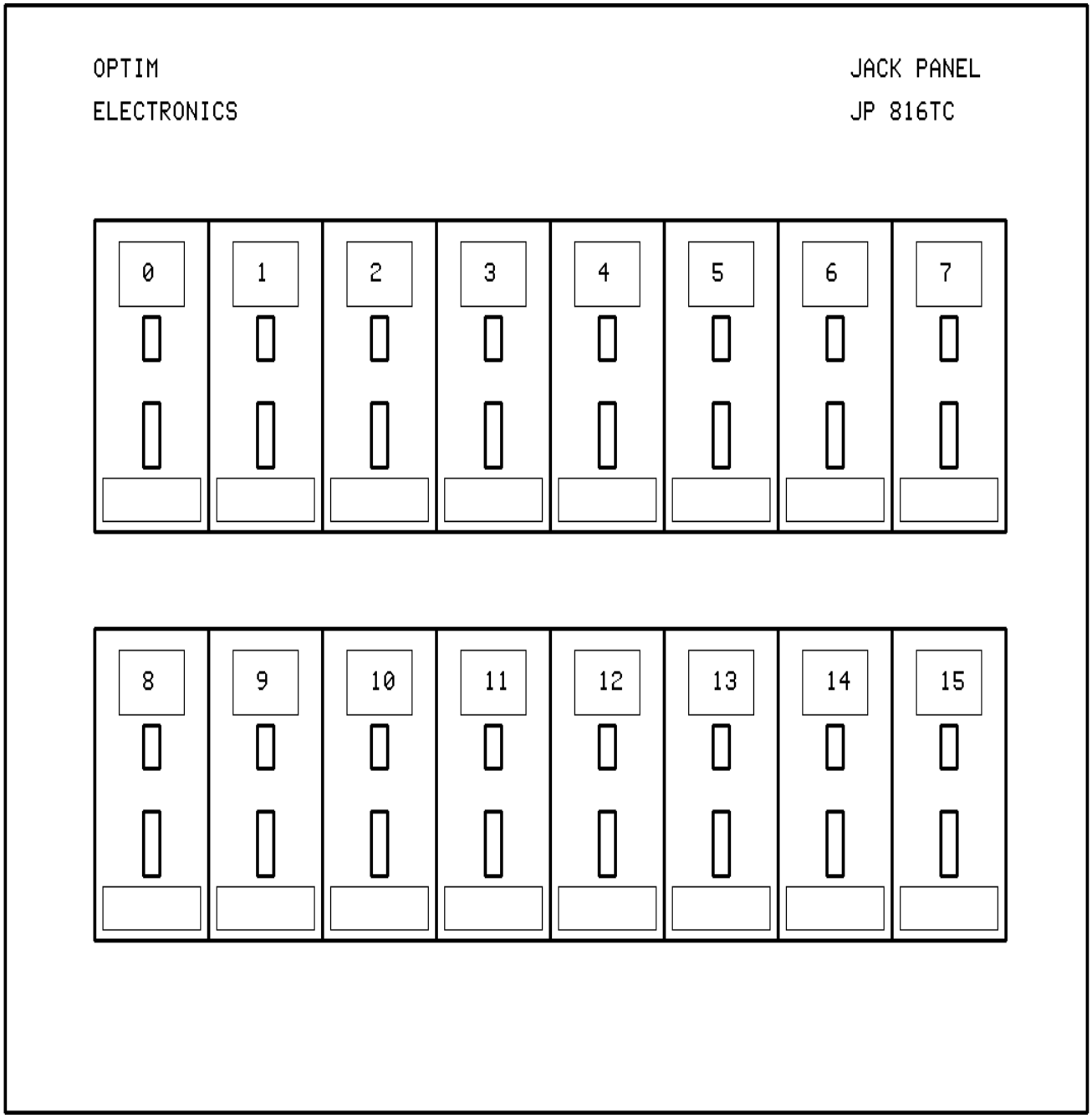
TABLE 2 AD 816TC ADDRESS RANGE SELECTION

J4 J3 J2 J1	**J7 J6 J5** 1 1 1	**J7 J6 J5** 1 1 0	**J7 J6 J5** 1 0 1	**J7 J6 J5** 1 0 0	On **J10** thru **J25** install two and only two jumpers
1 1 1 1	000-015	256-271	512-527	768-783	J10, J18
1 1 1 0	016-031	272-287	528-543	784-799	J11, J19
1 1 0 1	032-047	288-303	544-559	800-815	J12, J20
1 1 0 0	048-063	304-319	560-575	816-831	J13, J21
1 0 1 1	064-079	320-335	576-591	832-847	J14, J22
1 0 1 0	080-095	336-351	592-607	848-863	J15, J23
1 0 0 1	096-111	352-367	608-623	864-879	J16, J24
1 0 0 0	112-127	368-383	624-639	880-895	J17, J25
0 1 1 1	128-143	384-399	640-655		J10, J18
0 1 1 0	144-159	400-415	656-671		J11, J19
0 1 0 1	160-175	416-431	672-687		J12, J20
0 1 0 0	176-191	432-447	688-703		J13, J21
0 0 1 1	192-207	448-463	704-719		J14, J22
0 0 1 0	208-223	464-479	720-735		J15, J23
0 0 0 1	224-239	480-495	736-751		J16, J24
0 0 0 0	240-255	496-511	752-767		J17, J25

Where 1 = Jumper block installed
0 = No jumper block

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FIGURE 3 JP 816TC CHANNEL LOCATIONS



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

OPERATION

RANGE AND RESOLUTION The range and resolution of each channel is set by the **POST GAIN** as:

POST GAIN	16 Bit ADC VOLTAGE		TEMPERATURE (E = 60.9 uV/ °C)	
	RANGE	RESOLUTION	RANGE	RESOLUTION
1	100.0 mV	3.125 uV	1642.0 °C	0.0513 °C
2	50.0	1.5625	821.0	0.02566
4	25.0	0.78125	410.5	0.01283
8	12.5	0.390625	205.25	0.006414
16	6.25	0.1953125	102.627	0.003207
32	3.125	0.09765625	51.314	0.001604
64	1.5625	0.048828125	25.657	0.0008018

Both RANGE and RESOLUTION are divided by POST GAIN

Due to the wide dynamic range of the ADC, Optim recommends using a range twice as large as your expected maximum. This provides 100% overrange capability and leaves adequate resolution.

THERMOCOUPLES Table 3 lists the characteristics of commonly available thermocouples. Note that all minus (-) wires are red.

Although the error limit may seem large, the exact characteristics of a thermocouple depend on the alloy of the batch of metal from which it was made, and while thermocouples from the same batch are very similar, thermocouple characteristics vary for different batches.

Note the response time constant is 1.6 seconds in water and even slower in air. This means, for example, that a 0 °C thermocouple put into 100 °C water will read the following:

63 °C after 1.6 seconds

93 °C after 3.2 seconds

97.4 °C after 4.8 seconds

99.0 °C after 6.4 seconds, etc.

TEMPERATURE COMPENSATION The thermal mass is located on the JP 816 and is thermally coupled to the input jacks. A temperature sensor in the mass converts the mass temperature into a voltage, which is added to each of the channels in the AD 816TC. Therefore, the MEGADAC measures a voltage which looks as if the **-** input (red wire) is connected to 0 °C. Although thermocouples are not linear throughout their range, the MEGADAC normally operates within a very small range, and this compensation produces negligible errors.

JP TYPE	COMPENSATION
E	60.9 uV/°C
J	51.7 uV/°C
K and T	40.6 uV/°C
R and S	6.00 uV/°C

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE 3 THERMOCOUPLE CHARACTERISTICS

Thermocouple Type	Thermocouple Material	Range in °C	Error Limit in °C	Insulation Color
J	Iron/Constantan	0 to 750	±2.2 or 0.75%	
K	Chrome/Alumel	-200 to 1250	±2.2 or 0.75%	
T	Copper/Constantan	-250 to 350	±1.0 or 0.75%	
E	Chromel/Constantan	-200 to 900	±1.7 or 0.50%	
R	Plat 13% Rhodium/plat	0 to 1450	±1.5 or 0.25%	
S	Plat 13% Rhodium/plat	0 to 1400	±1.5 or 0.25%	
JX	Iron/Constantan	0 to 200	±2.2 or 0.75%	
KX	Chrome/Alumel	0 to 200	±2.2 or 0.75%	
TX	Copper/Constantan	-60 to 100	±1.0 or 0.75%	
EX	Chromel/Constantan	0 to 200	±1.7 or 0.50%	
RX/SX	Plat 13% Rhodium/plat	0 to 150	±1.5 or 0.25%	

SEE OMEGA CATALOG FOR ANSI AND IEC COLOR CODE DESIGNATIONS

Size		Resistance in Ohms/double foot					
		J	K	T	E	S	R
20 AWG	0.0338 IN. DIA.	0.357	0.586	0.298	0.707	0.185	0.190

Response Time to 63% of final value		
Free air	60 ft/S air	Water
40 S	3.2 S	1.6 S

OPEN CIRCUIT DETECTION If a thermocouple wire breaks (open circuit), a 22 MegOhm resistor in the JP 816 channel will pull up the input and force a full scale positive reading within 60 mSec.

NOISE If you have unreasonable noise, follow this trouble-shooting procedure:

WIRING CHECK Exchange this plug with a plug from a good channel to see if the noise goes with the plug or stays with this channel. PLUG: check your thermocouple plug for tight screws. The wire should be neatly wrapped around the screw. CHANNEL: check the cable between the JP 816 and the AD 816TC.

AMPLIFIER NOISE Short the **+** and **-** inputs of a plug together with a bare wire. Amplifier noise should be approximately the following:

0.5 uV rms RTI card gain = 100, post gain = 8

1 mV rms RTO card gain = 100, post gain = 8

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CABLING NOISE Compare the noise from an input short (just connect the two plug screws together with copper wire) to the noise from a thermocouple short (short the thermocouple at the end of the cable when possible). The noise increase is due to the electrical pick-up in your cables. This can be reduced by:

1 Running **+** and **-** in a twisted pair, directly to the sensor. Noise picked up by the **+** wire will be the same as that of the **-** wire, and the common mode signal will be rejected.

2 Verify a low impedance ground connection between the thermocouple and the MEGADAC. This reduces the size of the common mode signals. A single ground braid between the structure under test and the ground tab on the rear of the MEGADAC is excellent.

3 Shielding the **+** and **-** twisted pair reduces common-mode noise pick-up. Connect the shield to the MEGADAC chassis ground.

THERMOCOUPLE NOISE Compare the noise from a thermocouple short to the noise when fully operating. A significant increase indicates a poor weld in the thermocouple.

FILTER Figure 3 shows the characteristics of the factory 20 Hz filter. Note that the amplitude is down 3 db (down to 70.7%) at 20 Hz. Also note that it is still down slightly (roughly 2%) at 10 Hz (one octave down). The step response is the result of a step input. Note the characteristic overshoot of the Butterworth filter and the way it damps on each successive overshoot/undershoot of the 100% mark. Settling is to 1% in 0.06 S and 0.2% in 0.09 S.

BALANCE OPERATION FOR ADC 816TC CHANNELS

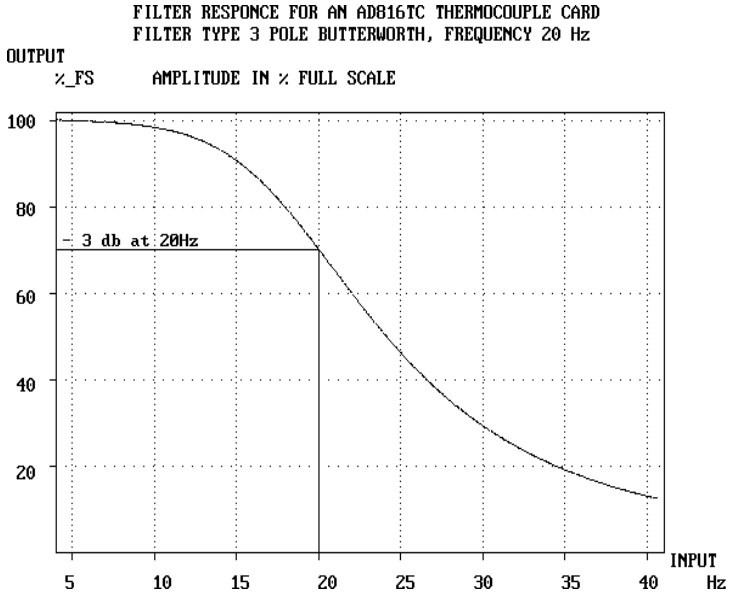
Special balance conditions apply to **AD 816TC** modules. Set the Sensor Balance field to **NO** for the channels where initial Sensor values are to be left alone, such as thermocouples or other channels where you are only interested in ***absolute*** measurements.

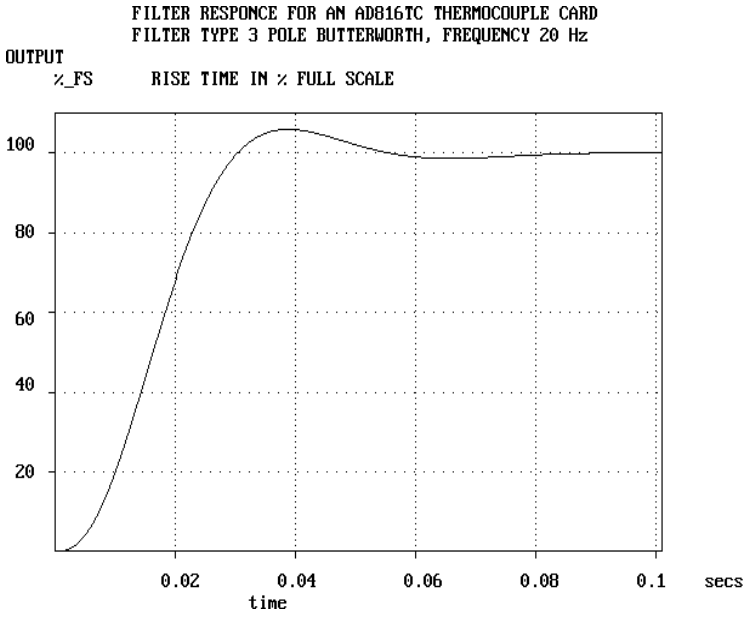
*NOTE: Although the Sensor's initial loads will be left alone when the Sensor Balance = **NO**, some of the **MEGADAC**'s modules will automatically eliminate any **Internal System Offsets** during the **MEGADAC**'s balance operation. Therefore, it is recommended that the Balance Function be activated, either manually or through **AutoBalance**, so that these **Internal System Offsets** can be corrected.*

MEGADAC "Internal System Offsets" are related to the input Card (Channel Offset) and ADC Module (ADC Offset), rather than those offsets generated by sensor (Sensor Offset) loading conditions.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

FIGURE 3 AD 816TC FILTER RESPONSE



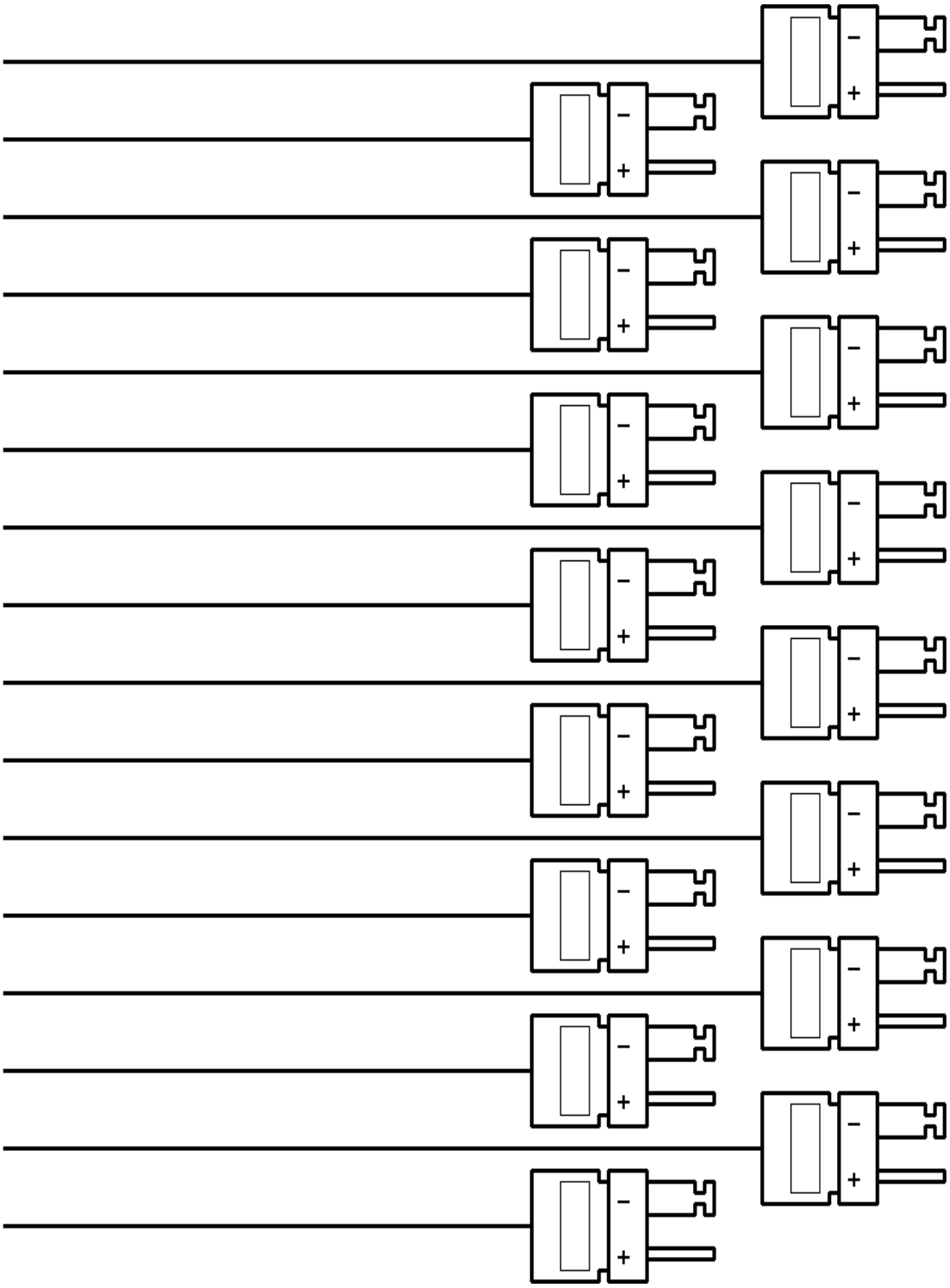


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TEST NAME / DATE _____PAGE ____ OF _____

CHANNEL RANGE _____ CONNECTS TO _____

CABLE _____



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP