

3

REFERENCE
ONLY

AEROTECH
BUFFERED READOUT
D690-1086
INSTRUCTION MANUAL

NOVEMBER, 1984



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(412) 963-7470 **TWX 710-795-3125**

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SECTION 1.0 GENERAL DESCRIPTION

The Aerotech Buffered Readout is a 5 digit (6 digit optional) plus sign LED readout. This readout is capable of counting rates up to 1 MHz and will operate in either CL/Dir or the CW \overline{CL} /CCW \overline{CL} mode of operation. Buffered outputs are available through a 16 pin DIF socket. The Aerotech Buffered Readout consists of 2 PC Boards: the Counter and Logic Board and the Display card. The Counter and Logic Board contains the power section, control logic, counter and the output buffers. The display card, which plugs into the Logic Board, contains the display LEDs, their drivers, and current limiting resistors.

SECTION 2.0 INSTALLATION

A. DC POWER REQUIREMENTS

The readout can be operated from either 40 VDC or 12-14 VDC. **NOTE:** For 40 volt operation, do **NOT** jumper 7-8. Operation with this jumper will result in damage to readout if 40 volts is applied.

POWER REQUIREMENTS FOR READOUT

1. 40 Volts at 310 mA.
2. 12-14 volts at 275 mA (Jump 7-8)
3. Power connection to Readout
4. 40/12-14V - J2, Pin 1
5. Com - J2, Pin 2

B. SIGNAL REQUIREMENTS

The signals required by the Readout are Reset and CW CL/CCW CL or CL/Dir. All 3 inputs operate at 0V for LO and 5V for HI. Selection of CW CL/CCW CL or CL/Dir is accomplished by 2 jumpers as shown below.

MODE	JUMPERS
CL/Dir	1-2, 4-6
CW <u>CL</u> /CCW <u>CL</u>	2-3, 5-6

Input Connections to Readout

SIGNAL	PIN #
CW $\overline{\text{CL}}/\text{CL}$	J2-3
CCW $\overline{\text{CL}}/\text{Dir}$	J2-4
$\overline{\text{Reset}}$	J2-5
Signal Common	J2-6 (as required)

C. READOUT OUTPUT CONNECTIONS

A 16 pin DIP Socket provides a multiplexed BCD type output of the readout. Refer to section 3-5 in this manual for information concerning these signals.

Pin Configuration of J1

	<u>SIGNAL</u>	<u>PIN #</u>
	DIR	3
	1	13
	2	4
Digit	3	12
	4	5
	5	11
	6	6
	1	1
BCD	2	15
	4	2
	8	14

$\overline{\text{SET}}$	10
GND	7
GND	16
Spare	8
Spare	9

SECTION 3.0 OPERATION

NOTE: Before applying power, refer to section 2-1, as damage to readout may result if not done properly.

A. RESET

To reset readout, Reset line must be placed LO (0V), all other times Reset line must be HI (+5V).

B. CL/DIR

To operate in the CL/DIR mode, use jumpers 1-2, and 4-6 (jumpers 2-3 and 5-6 are out). Positive going clock pulses with a minimum pulse duration of .5 uSec. are required by the clock input line. The count occurs on the negative going edge of the clock, and because of this the direction line should not be changed until the clock pulse has returned LO (0V). The counter will count up with the direction line HI (5V) and down when the direction line is LO (0V).

C. CW \overline{CL} /CCW \overline{CL}

For CW \overline{CL} /CCW \overline{CL} mode, jumpers 2-3 and 5-6 are required (jumpers 1-2 and 4-6 are out). Apply negative clock pulses with a minimum duration of .5 uSec. to CW \overline{CL} to count up or to CCW \overline{CL} to count down. Counting occurs on the positive transition of the clock pulse. Both clock lines must be HI (5V) when not receiving clock pulses.

D. DISPLAY

The display used in the Aerotech Buffered Readout is a 5 digit (6 optional), with sign, LED readout.

The sign is represented by a single LED which, when lit, indicates a minus number (CCW rotation of motor).

E. BUFFERED OUTPUT SIGNALS

Multiplexed BCD coded outputs are available from J1 (refer to section 2.3 for pin configuration). J1 contains 6 digit strobe lines, 4 BCD lines, 1 direction line, and 1 SET line. The 6 digit strobe lines are sequentially scanned from MSD to LSD at a rate of 2K to 6.8K digits per second. The 4 BCD lines represent the magnitude of the digit being strobed (made HI). To decode the number represented by the multiplexed BCD outputs, begin with digit #6 (MSD). When this digit goes HI the BCD lines will represent the value for digit #6. After #6 returns LO, digit #5 will go HI and is decoded the same as digit #6. Decoding is continued in this same manner to digit #1 (LSD), after which the digit strobe rolls over from digit #1 back to digit #6. Following is an example of one readout cycle. Example:

		HI (5V) = 1	LO (0V) = 0							
DIGIT LINES		BCD LINES		DECIMAL						
6	5	4	3	2	1					
		8		4		2		1		Equivalent
1	0	0	0	0	0	0		1	(MSB)	
0	1	0	0	0	0	0		2		
0	0	1	0	0	0	0		4		
0	0	0	1	0	0	0		8		
0	0	0	0	1	0	0		9		
0	0	0	0	0	0	1		5	(LSD)	

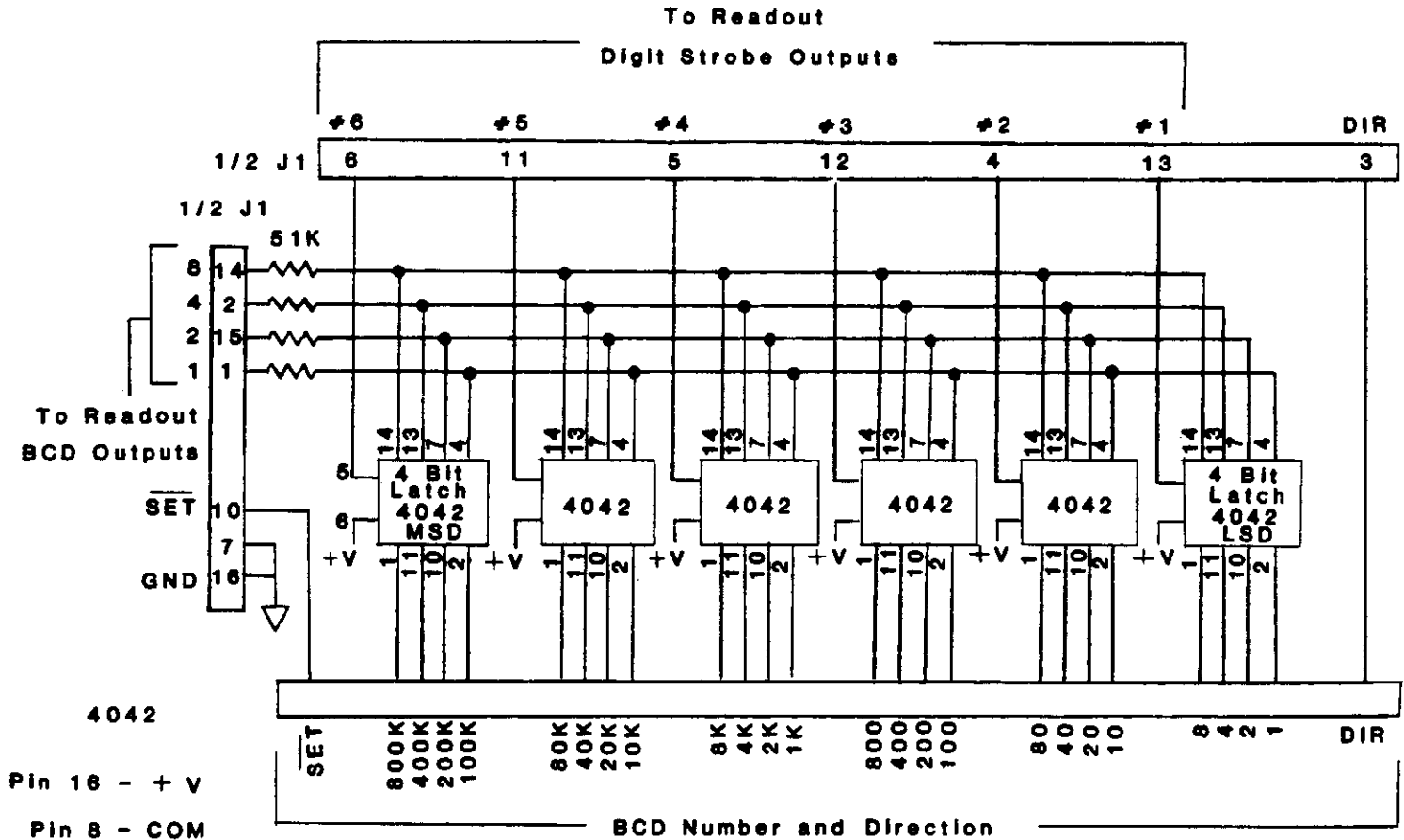
Value of Number = 124895

A DIR line is also present at J1 which tells whether the number from the readout is positive (CW) or negative (CCW). If the DIR line is high, the number is positive; if LO, the number is negative.

The $\overline{\text{SET}}$ line is used to $\overline{\text{SET}}$ the digit strobe to the MSD, it also disables the display. The

main purpose of this is to allow synchronization of the start of the scan with external devices. SET is activated by making its line LO (0V). When SET is made HI (5V) again, scanning will begin starting from the MSD (#6), and the display will be visible again. The SET input should not be held LO for more than a second when operating from a 40 volt supply.

Following is an example circuit which will convert the sequentially scanned digit outputs to a parallel form.



SECTION 4.0 CIRCUIT DESCRIPTION

A. RESET

The Reset circuit is composed of a level shifter (M5) and inverter (M4) which resets counter (M7).

B. CL/DIR

In the CL/DIR mode CL pulses are applied to the CL input (J2-3) and are sent to level shifter M5. The clock pulses are then inverted by M3. From M3 the inverted pulses are applied to M4 which acts as a very short delay to help insure that the counter receives the direction signal before the clock pulse. From M4 the clock signal is applied to the COUNT input of the counter (M7).

The direction signal is applied to the DIR input (J2-4) and is sent to level shifter (M5). The output from the level shifter is used to latch the direction latch, which is composed of 2 nand gates (M3). The outputs of this latch are applied to 2 nand gates (M2) which are gated by the ZERO output from the counter. The ZERO output is HI when counter is equal to zero. The outputs of the nand gates are sent to the sign latch which is composed of 2 nand gates (M2). Finally exclusive or gate (M4) determines the direction the is required to count and applies this direction to the UP/DOWN input of the counter (M7).

C. CW \overline{CL} /CCW \overline{CL}

In CW \overline{CL} /CCW \overline{CL} operation, both clock inputs are sent through level shifters (M5) after which the clock signals are applied to the inputs of nand gate (M3). The output of nand gate (M3) is applied to inverting nand gate (M3), then to delay gate (M4) and finally to the counter (M7) COUNT input.

The counter UP/DOWN signal is obtained in the following manner.

CW \overline{CL} and CCW \overline{CL} are applied to the direction latch (M3) which becomes set with the direction. The outputs of the direction latch are sent to gated nand gates (M2). These nand gates are gated by the zero signal which occurs when the counter is equal to zero. The outputs of the nand gates are used to latch the sign latch (M2). Exclusive OR (M4) now determines the direction the counter must drive and applies the UP/DOWN signal to the counter (M7).

D. DISPLAY

The display is multiplexed 5 digit (6 optional), plus sign LED readout. The LED drive signals are sent from counter (M7) to the digit drivers (M8) and segment drivers (M1). Resistors (R8-R15) limit display current. The sign lamp is driven by M8 which obtains its input from the sign latch M2.

E. BUFFERED OUTPUT CIRCUIT

The serial BCD outputs from the Readout are buffered by non-inverting level shifters (M1, M6). The SET input is sent to level shifter (M5) to the SET input of counter (M7).

B

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Display, 3-1, 4-2

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Input connections, 2-2
Installation, 2-1

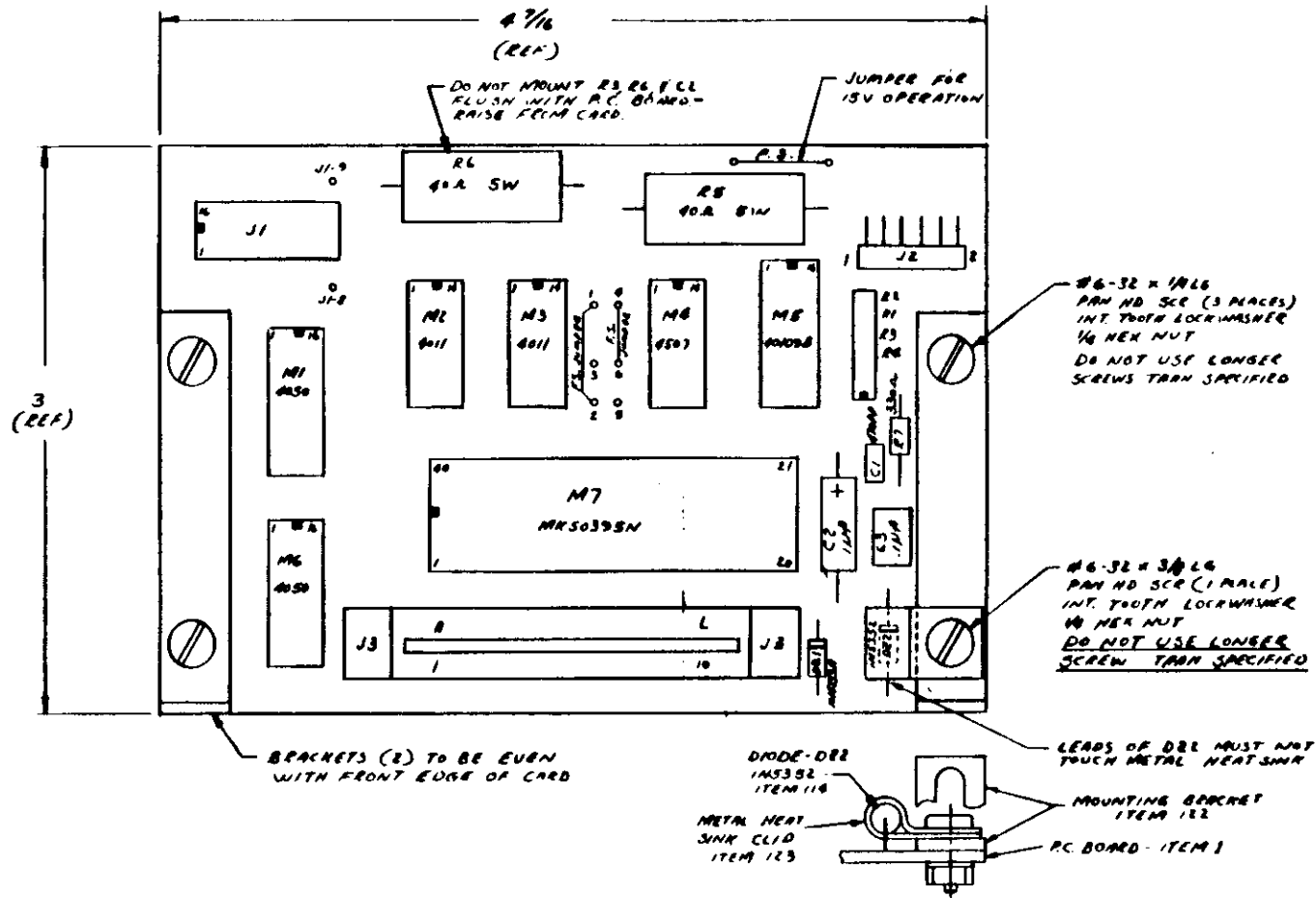
R


Readout output connections, 2-2, 2-3
Reset, 3-1, 4-1

S

Signal requirements, 2-1

REV	DATE	DESCRIPTION	DATE	APPROVAL
#		RELOCATED C1, C2, R6, R7 ADDED MET SINK CLID DBL	11/73	DJS



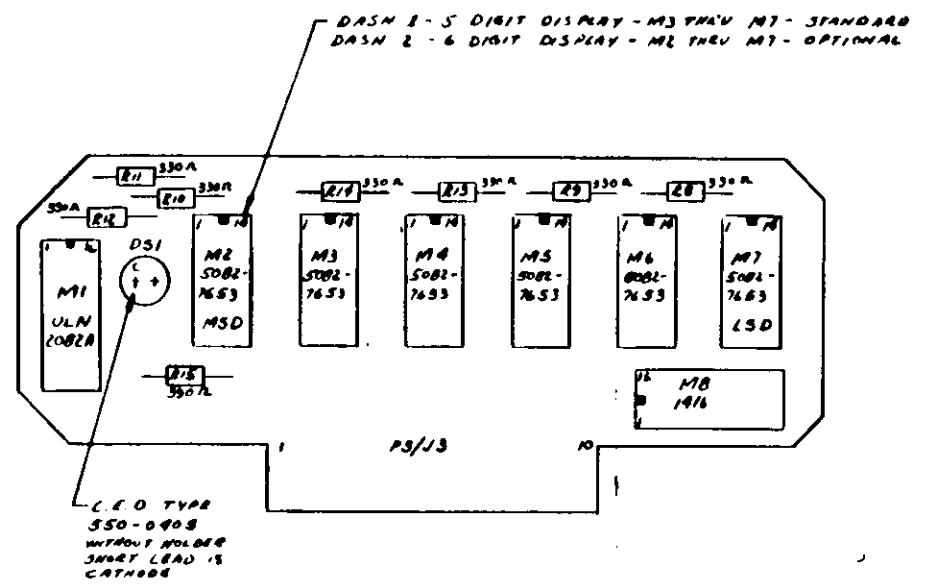
ITEM NO	PART OR IDENTIFIED NO	DESCRIPTION	QTY	MATERIAL OR NOTE	QTY REQD
LIST OF MATERIAL					
<p>BACKGROUN TOLERANCE UNLESS SHOWN OTHERWISE SPECIFIED</p> <p>FINISHES OR <input type="checkbox"/> POLISHED <input type="checkbox"/> BRASS <input type="checkbox"/> ANODIZED <input type="checkbox"/> 20 <input type="checkbox"/> 1/2 <input type="checkbox"/> 1/4 <input type="checkbox"/> 1/8 <input type="checkbox"/> 1/16 <input type="checkbox"/> 1/32 <input type="checkbox"/> 1/64 <input type="checkbox"/> 1/128</p> <p>DRY POWER <input checked="" type="checkbox"/> <input type="checkbox"/> WET POWER</p>					
 <p>AEROTECH, INC. 101 East Street Pittsburgh, Pa. 15228 412 953 1470</p>					
<p>POSITION READOUT CARD A) ASSEMBLY</p>					
DATE		REV	APP	CODE IDENT. NO.	QTY
				12	c
APPLICATION		QTY REQD		690-1086	
				SCALE 2/1	REV 5

MATERIAL		FINISH		PAINT	
<input type="checkbox"/> STEEL	<input type="checkbox"/> CASTING	<input type="checkbox"/> BLACK ENDS	<input type="checkbox"/> CLEAR ANODIZE	DO NOT PAINT SURFACES MARKED	
<input type="checkbox"/> ALUM.	<input type="checkbox"/> TUBING	<input type="checkbox"/> BLACK ANODIZE	<input type="checkbox"/> SEE NOTE	PER AEROTECH SPEC	
<input type="checkbox"/> CBRD	<input type="checkbox"/> SPRAY	<input type="checkbox"/> ALUMINE	<input type="checkbox"/> SEE NOTE	OR PER _____	
<input type="checkbox"/> SEE L&E OR PL.	<input type="checkbox"/> SEE NOTE				

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DATE	REV	APP	QTY	FINAL

REV	DATE	DESCRIPTION	DATE	APPROVAL
A		CHANGED CARD SIZE ELEMENT M1, M2, R11, R12	1/16/64	DLS



SCHEMATIC 15 D690-1086

NOTE

ITEM NO	PART OR IDENTIFIED NO	DESCRIPTION	SPEC	QUANTITY OR NOTE	QTY REQD
LIST OF MATERIAL					
AEROTECH, INC. 101 Zales Street Riverside, Pa. 15086-412 603 7470					
POSITION READOUT (CARD B) ASSEMBLY					
PROPRIETARY INFORMATION THIS DRAWING IS THE PROPERTY OF AEROTECH, INC. AND IS LOANED TO YOU IN CONFIDENCE AND SHALL NOT BE REPRODUCED NOR COPIED FOR DISCLOSURE TO OTHERS. DRAWN <u>DIS</u> BY <u>MM</u> CHECKED <u>ABP</u> BY <u>MM</u> DATE <u>2/11</u>			MATERIAL <input type="checkbox"/> STEEL <input type="checkbox"/> CASTING <input type="checkbox"/> ALUM. <input type="checkbox"/> TUBING <input type="checkbox"/> CRG. <input type="checkbox"/> STRUCT. <input type="checkbox"/> SEE L&M OR P/L <input type="checkbox"/> SEE NOTE FINISH <input type="checkbox"/> BLACK ANOD. <input type="checkbox"/> CLEAR ANOD. <input type="checkbox"/> BLACK ANOD. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> ALDRG. <input type="checkbox"/> SEE NOTE PAINT <input type="checkbox"/> DO NOT PAINT SURFACES MARKED <input type="checkbox"/> PER AEROTECH SPEC.		
APPLICATION		QTY REQD			
TOTAL 2/11			PAGE 5		
CODE IDENT. NO.			12 C 690-1087		



Warranty and Field Service Policy

Aerotech, Inc. warrants its products to be free from defects caused by faulty materials or poor workmanship for a period of one year from date of shipment from Aerotech. Seller's liability is limited to replacing, repairing or issuing credit, at its option, for any products which are returned by the original purchaser during the one-year period. Seller makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to seller in specifications or drawings previously or subsequently provided seller, and whether or not seller's products are specifically designed and/or manufactured by seller for buyer's use or purpose. Aerotech's liability on any claim for loss or damage arising out of the sale, resale or use of any of its products shall in no event exceed the selling price of the unit.

Returning Goods Procedure

Claims for incorrect or defective materials must be filed within thirty (30) days from delivery at buyer's place of business. No units or systems may be returned, in or out of warranty, without first obtaining approval from the seller, and no claim will be allowed nor credit given for units or systems returned without such approval.

Returned Goods Warranty Determination

If possible, after approval from Aerotech, the defective unit or system is to be returned to the factory with statement of problem and transportation prepaid (no c.o.d. or collect freight shipments will be accepted). After Aerotech's in-plant examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination of such unit or system, warranted defects exist, then the unit or system will be repaired at no charge and shipped, prepaid, back to the buyer. If an out-of-warranty situation exists, the buyer shall be

notified of the repair cost immediately. At such time, the buyer must issue a purchase order to cover the cost of the repair or authorize the unit or system to be shipped back as is, at the buyer's expense.

On-Site Warranty Repair

If the system or unit cannot be made functional by telephone assistance or by sending and having customer install replacement parts, and cannot be returned to the Aerotech factory for repair, and if it is determined that the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a bona-fide purchase order to Aerotech covering all transportation and subsistence costs. For warranty repairs, customer will not be charged for cost of labor and material.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-Site Non-Warranty Repair

If system or unit cannot be made functional by no-charge telephone assistance or purchased replacement parts cannot be returned to the Aerotech factory for repair, then the following field service policy applies:

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a bona-fide purchase order to Aerotech covering all transportation and subsistence costs and the prevailing cost per hour including travel time necessary to complete the repair.

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