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AMI MODEL 151 LIQUID HELIUM LEVEL METER

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS

I. INTRODUCTION

The AMI Model 15l is designed to operate with an AMI liquid helium (LHe) level sensor up to 60 inch (152.4 cm) in length for 4.2K operation only.

The Model 151 includes an optional 0-100 mV input from an external source for displaying a corresponding 0-100% LHe level.

The Model 151 also includes a optional gauge pressure port for 0-5 psig display.

The Model 151 includes a replaceable COTS lithium battery pack with an external charge port. Battery status is conveniently displayed to the nearest 10% of remaining capacity.

The display is an e-ink style which maintains the last measurement display after the power is removed.



A USB connector is provided that functions as a Virtual COM Port (VCP) when connected to a computer. The USB interface is interactive in a standard serial terminal emulating app. USB features include the ability to perform user calibrations for sensor lengths other than the default 60 inches, calibrate the digital voltmeter input, and set the local time.

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II. SPECIFICATIONS

Specification		Value	
Sensor Input Connector		Female DB-9	
Compatible Sensor Type		AMI LHe level sensor ^a	
Compatible Active Length	Minimum	1	
(L _A) (inches)	Maximum	60 ^b	
LHe Temperature (K)		4.2	
Sensor Nominal Excitation Current (mA)		75	
Sensor Nominal Maximum Voltage (V)		52	
Sensor Linearity		0.5% of full scale	
Sensor Absolute Calibration		2% of full scale (from 0 to 50°C) ^c	
0-100mV Input Accuracy		0.5% of full scale	
Battery	Туре	Lithium-ion rechargeable cell, 18650, flat top (no button)	
	Nominal Capacity	≥ 3000 mAh	
	Approved Batteries	Samsung INR18650-35E Samsung INR18650-30Q Panasonic NCR18650BD Panasonic NCR18650BF Molicel INR-18650-M35A Murata US18650VTC6	
Nominal Battery Charging Voltage/Wattage		19 VDC, 35 W	
AC Charging Adapter Power Requirements		100-240 VAC, 1.5A, 50-60 Hz	
Pressure Port		1/4 inch OD pneumatic, ISO14743	
Pressure Accuracy		±0.1 PSIG	
Enclosure	Size, W x L x H	110 x 210 x 75 mm 4.33 x 8.27 x 2.95 inches	
	Protection Level	Dust/Water proof: IP66/67, NEMA 4X; Impact test: IK07/08	
	Certification	UL508A(PC), CE, TUV, RoHS	
	Flammability Rating	PC: UL94-V-0, 5VA, 94-HB	
	Materials	Fiberglass reinforced polycarbonate base ^d ; clear polycarbonate lid, stainless steel latches	



Specification		Value	
Weight	Instrument	1.9 lbm [867 g]	
	Charger and detachable line cord	1.0 lbm [454 g]	
Environmental Conditions	Location	Intended for indoor use only	
	Altitude	\leq 2000 m	
	Ambient Temperature	Operating: 0 °C to 50 °C (32 °F to 122 °F) Nonoperating: -20 °C to 70 °C (-4 °F to 158 °F)	
	Relative Humidity	0 to 95%; non-condensing	
	Installation Category	Pollution Degree 2, Overvoltage Category II as defined by IEC664	

- a. Only 4.2K operation is supported.
- b. Default calibration is for 60 inch (152.4 cm) active sensor length.
- c. Under extreme radiated electromagnetic field conditions (3 V/m @ 80 MHz to 1 GHz) the accuracy may be degraded by an additional ±1.2%.
- d. The base contains 10% glass fiber for reinforcement.

 Δ Caution symbol: necessary instructions in this document in order to protect against damage to the product.

III. INSTALLATION

A. With the Model 151 powered OFF (i.e. the READ LEVEL button is not lit), and if using with an AMI LHe level sensor, connect the sensor male DB9-pin connector to the LHe LEVEL SENSOR connector on the face of the Model 151.

Wire Color	DB-9 Pin	Signal
Red	1	I+
Yellow	6	V-
Black	7	I-
Blue	8	V+

<u>NOTE</u>: The sensor pinout is identical to the standard configuration of an AMI LHe level sensor.



CAUTION: Do not attempt to measure a sensor in a vacuum. Operating an AMI sensor in a vacuum may cause thermal damage and/or destruction of the superconducting filament sensor.



B. If using with an external 0-100mV source, leave the LHe LEVEL SENSOR disconnected and connect two banana-style jacks from the external source to the 0-100mV INPUT on the face of the Model 151.

<u>NOTE</u>: If the 0-100mV source is <10mV, the Model 151 will display "<10.0" as the percent level reading. If the mV source is rapidly changing, the unit may display "..." until the source stabilizes.

<u>NOTE</u>: The 0-100mV source leads should be limited to a maximum of 2 meters length.

C. If measuring gauge pressure, use a push-to-connect, ISO14743-compatible pressure tube to the 1/4 inch OD PRESSURE port on the face of the Model 151.

NOTE: The gauge pressure will only be displayed if the measured value is greater than or equal to 0.1 psig while the READ LEVEL function is ON.

IV. OPERATION

A. Press the red READ LEVEL button to show a brief launch banner and begin measurements. The large red button will be lit and measurements will refresh every 5 seconds.

NOTE: If the sensor is not in a helium vapor environment, the instrument may display "Burnout Protection." This indicates the sensor excitation current is temporarily turned OFF (for approximately 5 seconds) to prevent possible overheating and damage of the superconducting filament in the sensor. Level measurements will resume once the sensed sensor resistance is less than 110% of the maximum expected for the specified active sensor length.

B. The displayed level will temporarily show three dots (. . .) if the LHe level is rapidly changing or is unstable.

NOTE: If the 0-100mV source is connected, the Model 151 will display and hold the last stable level measurement until the power is cycled with the READ LEVEL button.

- C. Each measurement is displayed with the date and time at the bottom of the screen.
- D. Readings are updated every 5 seconds until the READ LEVEL is depressed and held for two seconds, which will power OFF the device. The display will maintain the last reading.

NOTE: The unit will automatically power OFF after 10 minutes of operation unless connected to the charger. The unit will remain on until the READ LEVEL button is depressed and held for two seconds if the charger is connected.



E. Note the present battery charge level and connect the CHARGE port of the device to the provided charger if necessary. The battery status will display as CHARGING or CHARGED if the CHARGE port is properly connected to external power. The Model 151 can be operated with the CHARGE port connected, or disconnected with adequate remaining battery capacity.



<u>CAUTION</u>: Only use the 19VDC, 60W charger provided with the Model 151 with the CHARGE port.

V. USB INTERFACE

- A. Use a standard USB-A to USB-B, USB 2.0 rated cable to connect a computer to the Model 151 USB connector. The port should automatically be detected by the host computer as a Virtual COM Port (VCP).
- B. Identify the assigned COM port (i.e. use Devices and Printers in Windows) and use a serial terminal emulation application such as PuTTY, HyperTerminal, or TeraTerm to connect. The specifics of the serial port setup are not critical for VCP connections.
- C. Press the ? key to display the interactive menu as shown below:

COM3 - Tera Term VT	_	×
File Edit Setup Control Window KanjiCode Help		
? - Executing: Show Menu		
Model 151 USB Menu v1.01		
? Show Menu		
a Get Sensor ADC		
b Get DMM ADC		
c Cal DMM @10mV		
d Cal DMM @100mV		
e Show RTC		
f Set RTC		
g Enable RTC		
h Set Sensor Len		
i Cal Sensor @0%		
2 Show Page 2		
Done		
Ready>		

- D. Select a function using the associated key as shown at the start of each line, such as *e* to *Show RTC* (Real Time Clock).
- E. Follow the prompts to perform the selected function and/or observe the output.
- F. The Model 151 should normally arrive pre-calibrated by AMI with the RTC preenabled and the sensor length set. The local RTC (Real Time Clock) setting is typically the only setting the customer should need to adjust. Time zones are not



supported, therefore using UTC is suggested. An example session for setting the RTC is shown in the graphic on the following page.

GOM3 - Tera Term VT	—	×
File Edit Setup Control Window KanjiCode Help		
Ready> ? - Executing: Show Menu		
Model 151 USB Menu v1.01		
? Show Menu		
a Get Sensor ADC		
b Get DMM ADC		
c Cal DMM @10mV		
d Cal DMM @100mV		
e Show RTC		
f Set RTC		
g Enable RTC		
h Set Sensor Len		
i Cal Sensor @0%		
2 Show Page 2		
Done.		
Ready> e - Executing: Show RTC		
Date/Time(24) = 08/28/2024 10:53:39		
Done.		
Ready> f - Executing: Set RTC		
Enter Date/Time(24) [MM/DD/20YY hh:mm:ss]: 08/28/2024 1	0:45:00	
RTC set!		
Ready>		

Setting the Real Time Clock (RTC) example

G. Use the *j Read EEPROM* function (enter *2* to show page 2 for more options) to perform a persistent memory integrity check and display of the stored values.

NOTE: The *i* Cal Sensor @0% is performed at the factory using a calibration resistance reference for AMI 4.2K liquid helium sensors and should not need normally need recalibration. The DMM 100mV input (*c* and *d*) and the pressure input (*m* and *n*) are also factory-calibrated.

VI. TROUBLESHOOTING

- A. Display shows "Burnout Protection":
 - 1. Ensure the sensor is operating in a helium vapor environment and not at room temperature or in a vacuum. Burnout protection is displayed if the sensed sensor resistance rises to more than 110% of the maximum expected value for the specified active sensor length.
- B. No level reading:
 - 2. Ensure level meter has remaining battery capacity or is plugged in with the charger connected to the CHARGE port.
 - 3. Ensure the sensor or 0-100mV leads are connected to the proper terminals.



- 4. Cycle the READ LEVEL power button.
- 5. Ensure all lead wires are secure and are not broken.
- 6. Ensure the vessel is cold and capable of collecting helium.
- C. Erratic or erroneous level reading:
 - 1. Ensure there is no ice formations around sensor.
 - 2. Ensure sensor is not installed in a restricted area.
 - 3. Ensure the sensor is operating in a 4.2K LHe dewar.

If the cause of the problem cannot be located please call an AMI technical support representative at +1 (865) 482-1056 or support@americanmagnetics.com.

VII. MAINTENANCE

The Model 151 prototype requires no maintenance other than periodic recharging of the internal lithium battery pack.

VIII.WARRANTY

All products manufactured by AMI are warranted to be free of defects in materials and workmanship and to perform as specified for a period of eighteen months from date of shipment. In the event of a failure occurring during normal use, AMI, at its option, will repair or replace all products or components that fail under warranty, and such repair or replacement shall constitute a fulfillment of all AMI liabilities with respect to its products. All warranty repairs are F.O.B. Oak Ridge, Tennessee, USA.

IX. RETURN AUTHORIZATION

Items to be returned to AMI for repair (warranty or otherwise) require a return authorization number to ensure your order will receive the proper attention. Please call an AMI representative at +1 (865) 482-1056 or contact technical support at support@americanmagnetics.com for a return authorization before shipping any item back to AMI.