

Electronic Temperature Compensator for GTS Turbine Meter

Operation Instructions

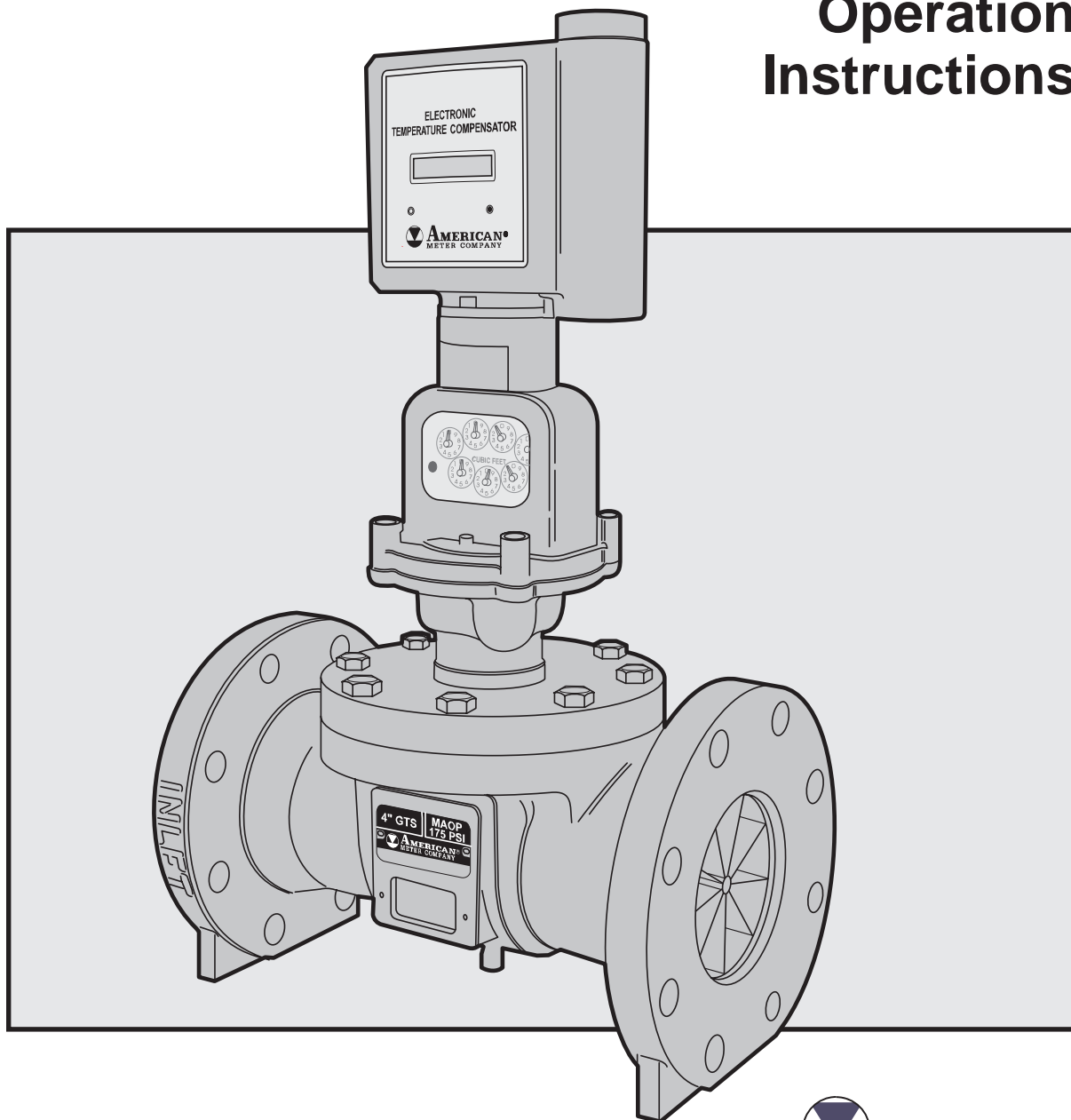


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Note: Due to continuous development, all information contained herein is subject to change.

Why Temperature Correction

WHY TEMPERATURE CORRECTION?

All commercially used non-temperature compensated natural gas meters are designed to meter gas at 60°F (15.6°C)(base temperature). At 40°F (4.4°C), that meter actually passes 1.04 cubic feet for every one cubic foot registered. When this happens, the customer receives 4% more gas than they are billed for. The lack of temperature compensated metering can be costly in lost and unaccounted for gas delivery.

EXAMPLE: A factory using 1.9 MSCFH a day in February (actual vs. billed)

The average temperature of metered gas in February in New England, is 40°F (4.4°C) which is a 4% change in volume from the 60°F base temperature ($\pm 5^\circ\text{F} = 1\%$ change in volume).

In the 28 days of February a non-compensated meter registered 1,866,816 ft³ of gas; however, because the flowing gas temperature was 40°F (4.4°C) the factory could have received 1,941,489 ft³; a loss to the supplier of 74,673 ft³ of gas for the month unless corrected for at the time of billing.

At \$.70 per 100 ft.³, the financial loss to the supplier for **one month gas delivery to the factory** if uncorrected was **\$522.71**. Correction at billing time can also be inaccurate as flowing gas temperatures can fluctuate by the hour during normal gas delivery. Temperature Compensation of the meter is by far the smart choice.

GENERAL DESCRIPTION

The electronic Temperature Compensator is a battery powered electronic device. It is designed to provide incremental temperature compensation and correct the index readings of gas meters.

The electronic Temperature Compensator's intrinsically safe design permits operation in hazardous locations. UL and CSA approvals are currently pending as of this printing.

The Temperature Compensator module measures actual flowing temperature, corrects meter readings, and constantly displays the corrected volume.

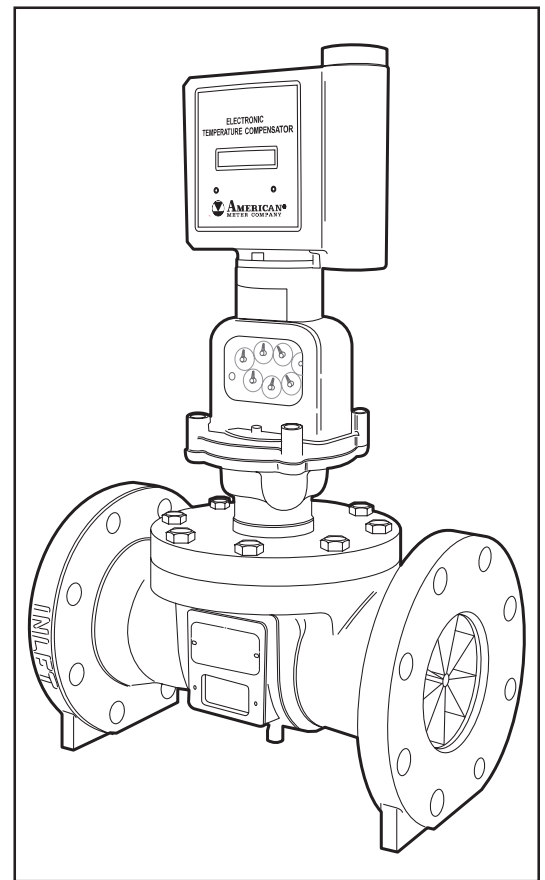


Fig. 1 Temperature Compensator

Initial Start-Up

Other displays and test screens are activated by a magnetic wand shipped with the unit. Alarm screens are displayed as necessary, i.e., Low Battery.

The Temperature Compensator stores in memory daily summation data of corrected and uncorrected volume for the current month in operation. In addition, a total monthly summation history file is retained for the same data for the six (6) previous months. A complete six (6) month history is available for access via the unit's downloading interface port to an on-site portable computer or transmitter via a customer supplied modem.

STANDARD OPERATION

As long as battery power remains connected, the electronic Temperature Compensator will record and update the display data on an incremental volume basis.

Screen #1 Corrected Volume in the Display Mode is displayed constantly without the use of the magnetic wand.

Whenever other data is to be observed, use the magnetic wand to access the desired data display as described in the start-up and display procedures.

INITIAL START-UP

CAUTION: Do not lift the meter by the Temperature Compensator.

Physical damage to the electronic Temperature Compensator or removal of the cover by unauthorized personnel may affect the intrinsically safe electrical design and operational integrity of the unit. If either is observed, the unit should be taken out of service and notify the factory.

Inspect the electronic Temperature Compensator and the turbine meter installation for any obvious physical damage. All damaged parts must be repaired or replaced prior to start-up of the electronic Temperature Compensator. Any damage may affect the intrinsically safe electrical design and operational integrity of the equipment.

Tamper-proof hardware secures the cover to the case. Assure the hardware lockwires have not been removed or tampered with before attempting to install the unit.

The display screen as received, displays the **Corrected Volume**. The unit is shipped with a lithium battery installed and

Display Mode

will begin to acquire and record meter index readings immediately upon installation. The average life of a single (DD)-lithium battery is shown on page 6.

The Temperature Compensator can display in two different modes. They are the **Display Mode** and the **Display Test Mode**. The first to be discussed is the the Display Mode. This is the mode which offers information on Corrected Volume, Uncorrected Volume, Flow Temperature, etc.

DISPLAY MODE

The Temperature Compensator constantly displays the **Corrected Volume** by default (Fig. 3). To activate additional screens within the Display Mode, remove the blue cap from the American Meter Magnetic Wand (Part No. 52797P001).

Momentarily swipe the magnetic end of the red wand past the **solid target** to the right of the display (Fig. 2). This will activate the second informational display screen or the **Uncorrected Volume** (Fig. 4).

The screens will appear in sequential order as long as the wand is swiped within 15 seconds or less. If more than 15 seconds elapses before the wand is swiped past the target, the display screen will return to the default **Corrected Volume** screen.(Fig. 3)

If the display is blank, check for proper battery connection or a dead battery. Refer to the Battery Replacement section of this manual for instructions (page 5).

The screen will sequentially display an additional four (4) informational readings as long as the wand is swiped within 15 seconds.

Swiping the wand past the target within the allotted 15 seconds or less will advance the Temperature Compensator to the third display screen, **Flow Temperature** (Fig. 5). The actual temperature of the temperature probe located in the meter will be displayed at this time in either Fahrenheit or Celsius.

Another pass of the wand will activate the fourth screen, the projected **Remaining Battery Life** (Fig. 6) as a percentage. This screen will also appear if a pass of the wand is initiated on either target if the Change Battery screen (all decimals with corrected volume (Fig. 18)) is active.

Passing the wand over the display within 15 seconds activates the fifth screen, or the **Fixed Pressure**, (Fig. 7) displaying the value in either PSI or BAR.

A final pass of the wand will activate the final screen or the

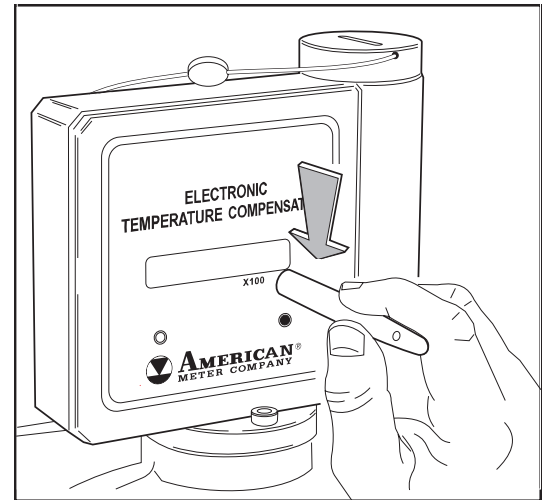


Fig. 2. Activation of Display Screens



Fig. 3. Default - Corrected Volume



Fig. 4. Uncorrected Volume



Fig. 5. Flow Temperature



Fig. 6. Remaining Battery Life (%)



Fig. 7. Fixed Flow Pressure

Display Test Mode



Fig. 8. Flow Constant

Flow Constant which is displayed in 8 digits. (Fig. 8).

Screens 4-7, 4-8, 4-11, 4-12, 4-13 display values that are factory pre-set per customer order specifications.

Should your application require any changes to the pre-set values after shipment, the American Meter TC DAS software must be used in conjunction with a compatible personal computer. (Ref. Item #97 TC DAS Software P/N 52699P021)

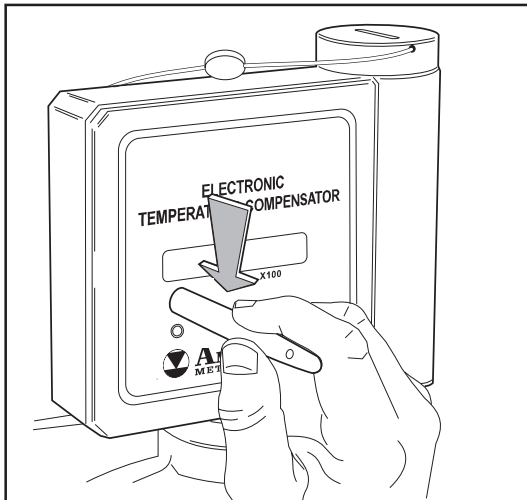


Fig. 9. Activation of Test Screens

DISPLAY TEST MODE

To Place the Temperature Compensator unit in the Display Test Mode, remove the blue cap from the American Meter Magnetic Wand (Part No. 52797P001).

Momentarily swipe the magnetic end of the red wand past the **open target** (Fig. 9) to the left of the display. This will start the display test. Susequent passes of the wand past the open target to the left within a 15 second period will toggle through the remaining (5) five screens.

The **Display Test** screen (Fig. 10) is the first screen to be activated. All of the digits on the screen with the exception of the first two will be displayed as eights. This is to assure accurate display registration. This test screen appears for a period of 15 seconds then automatically reverts to the Corrected Volume (default display in Display Mode).

If however, the open target is swiped with the magnetic wand within the allotted 15 seconds, the second screen of the Display Test Mode will be activated.

The second screen of the Display Test Mode is the **Corrected Multiplier** screen. The third screen is the **Uncorrected Multiplier** (Fig. 11). These screens displays the preset multiplying factor (x10, x100, x1000, x10,000).

Another pass of the wand will activate the fourth screen, **Software Revision & Battery Type** (Fig. 12). This screen shows the software revision number along with the type of battery contained in the Temperature Compensating unit. The two battery types available are AL -Alkaline or LI - Lithium. The battery type can be set through the TC DAS software.

Another pass of the wand will activate the fifth screen, displaying the **Supercompressibility Coefficient** (Fig. 13).

Another pass of the wand will activate the sixth screen, **Battery Reset** (Fig. 14). The Battery Reset screen will first show the estimated percent battery life remaining of the battery currently installed. Subsequent wand swipes will return to



Fig. 10. Display Test Screen



Fig. 11. Corrected or Uncorrected Multiplier of 10



Fig. 12. Software Revision/Battery Type



Fig. 13. Supercompressibility Coefficient

Battery Maintenance

screen one and toggle through the following screens. If no action is taken within 15 seconds, the screen automatically reverts to the Corrected Volume of the Display Mode.

NOTE: Moving to the (BR) Battery Reset screen will clear the (LB) Low Battery screen if set in error by momentary disconnect of the battery.

BATTERY REPLACEMENT

WARNING: Verify that the location is non-hazardous before opening the battery compartment. Failure to comply may result in serious personal injury.

Remove the battery compartment cap by unscrewing it.

CAUTION: Incorrect alignment, forcing of battery connectors, or pinching of wires, may cause irreparable damage.

See Fig. 15. Remove the old battery from the battery compartment. Press down on the male battery connector release tab (Fig. 16) with your thumb and pull the (2) two connectors apart. Note the connectors are keyed to assure proper electrical polarity of the battery to the RPM Temperature Compensator.

Carefully plug the new male battery connector into the female T/C connector. The connectors should slide together and latch into place when properly aligned.

Place the battery into its compartment with connectors toward the top. Then carefully push the lead wires and connectors into the compartment, assuring they are below the lip and clear of the cover threads. Thread the cover back onto the battery compartment and hand tighten.

Replacement of the battery using this procedure will not interrupt the continuous data acquisition by the RPM Temperature Compensator. PLEASE NOTE: Removing the battery will result in a Low Battery Alarm. To clear this alarm, simply scroll past the (BR) Battery Reset Test Screen (Fig. 14), using the left side open target (Fig. 9).

Dispose of used batteries in a safe and environmentally responsible manner. Refer to your company's disposal procedures or for Lithium battery disposal call 1 (800) 575-2191 for return instructions if purchased from American Meter Co.

Two factors will increase the battery change-out intervals:

1. Most meters are sized to run at 50% to 60% of Q-MAX.
2. The addition of a second "D" lithium battery will increase the life by a factor of 2.



Fig. 14. Battery Reset Test Screen



Fig. 15 Removal of the Battery

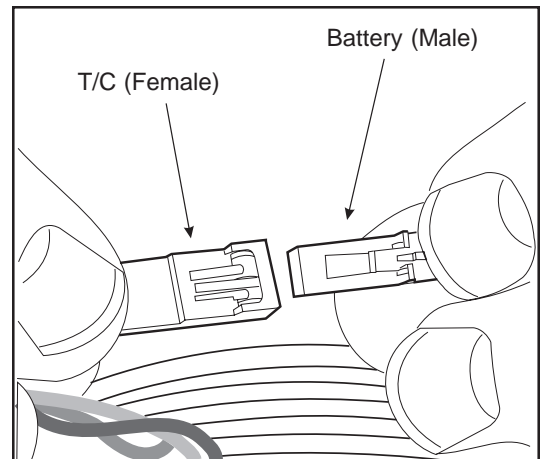


Fig. 16 Battery Connectors

Alarms

Once the new battery has been installed, the projected battery life must be reset to the default value. To reset the projected battery life see Change Battery section under Alarm section.

ALARMS

The Temperature Compensator monitors and displays three individual alarm conditions. Should any of the alarm conditions exist, passing the wand over the display will activate the appropriate alarm screen.



Fig. 17. Change Battery

Change Battery (Fig. 17). This alarm alerts the meter reader or maintenance personnel that the preselected projected battery life has expired. The display will show the Corrected Volume with all the decimals on. The battery should be replaced at this time.



Fig. 18. Percent Remaining Reset

Once the battery has been replaced, the Change Battery screen must be cleared. Scroll to test screen #5 (BR) Battery Reset (Fig. 14) - then hold the magnetic wand against the **solid target** on the right side of the display for a period of 3 seconds. The **Percent of Battery Remaining** (Fig. 18) will be reset to factory default of 100, based on battery type capacity; Lithium - 12AH default or Alkaline 8AH default.

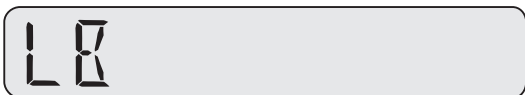


Fig. 19. Low Battery

Low Battery (Fig. 19). This alarm condition indicates the battery power is dangerously low and data acquisition has stopped as of the time the battery became low. Swiping the wand will not activate any other display screens at this time. The battery must be immediately replaced. Display capabilities of the Display Test Mode will resume upon installation of a new battery. Data acquisition will only begin after (LB) Low Battery alarm is cleared. To clear (LB) Low Battery alarm, after changing battery, go to test screen #5 (BR) Battery Reset and hold the magnet on the right target for 3 seconds.



Fig. 20. Probe Alarm

Probe Alarm (Fig. 20). This alarm condition indicates a problem with the RTD temperature probe. An intermittent connector condition may exist causing temperature readings in excess of 100°F (38° C) or less than -40°F (-40° C). When this alarm condition occurs, the unit ceases calculation of the corrected counts. The uncorrected counts will continue to be processed and stored. These readings can be obtained by activating the solid target with the magnet. The Probe Alarm can be reset using the TC meter reader software and a portable computer.



Fig. 21. Check Sum Error Alarm

Check Sum Error (Fig. 21). This alarm condition indicates the possibility of corrupted EEPROM data. When this alarm condition occurs, contact the factory for further instructions.

Remote Data Display

Should one or more alarm condition occur at the same time, the display will show the alarm of the highest priority. The order of priority is: 1) Low Battery, 2) Check Sum Error 3) Probe Error, and 4) Change Battery.

REMOTE COUNTERS

The electronic Temperature Compensator may be linked to remote counters.

Connection of a cable between the optically isolated 6-pin connector (located on the left rear of the Temperature Compensator, see figure 22) and the remote counters, will allow two counters to display corrected volume and one counter to display the uncorrected volume. The pre-selected values for the output pulse width and volume per output pulse can be set at the factory if specified with the order or in the field using TC DAS software.

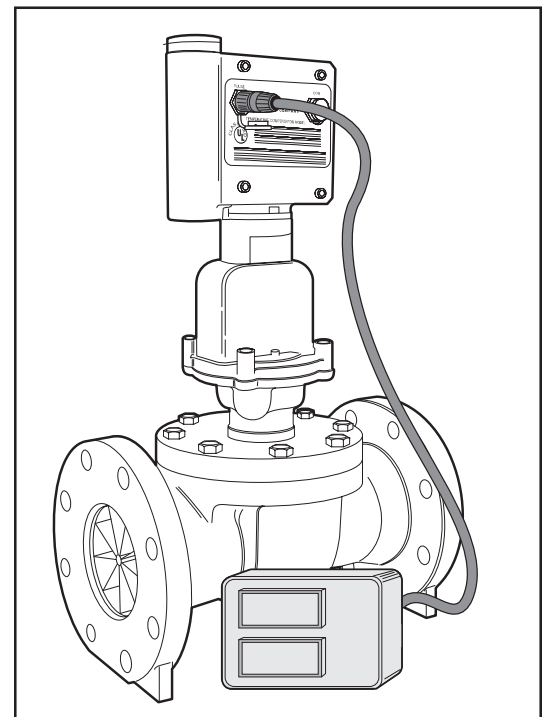


Fig. 22. Remote Counter Connection

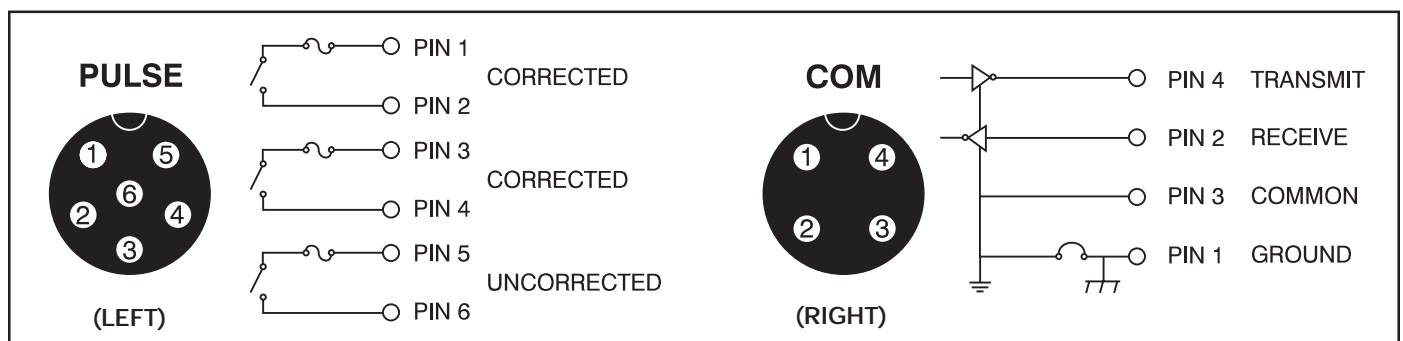


Fig. 23. Temperature Compensator Pin Configuration (rear view)

Data Acquisition

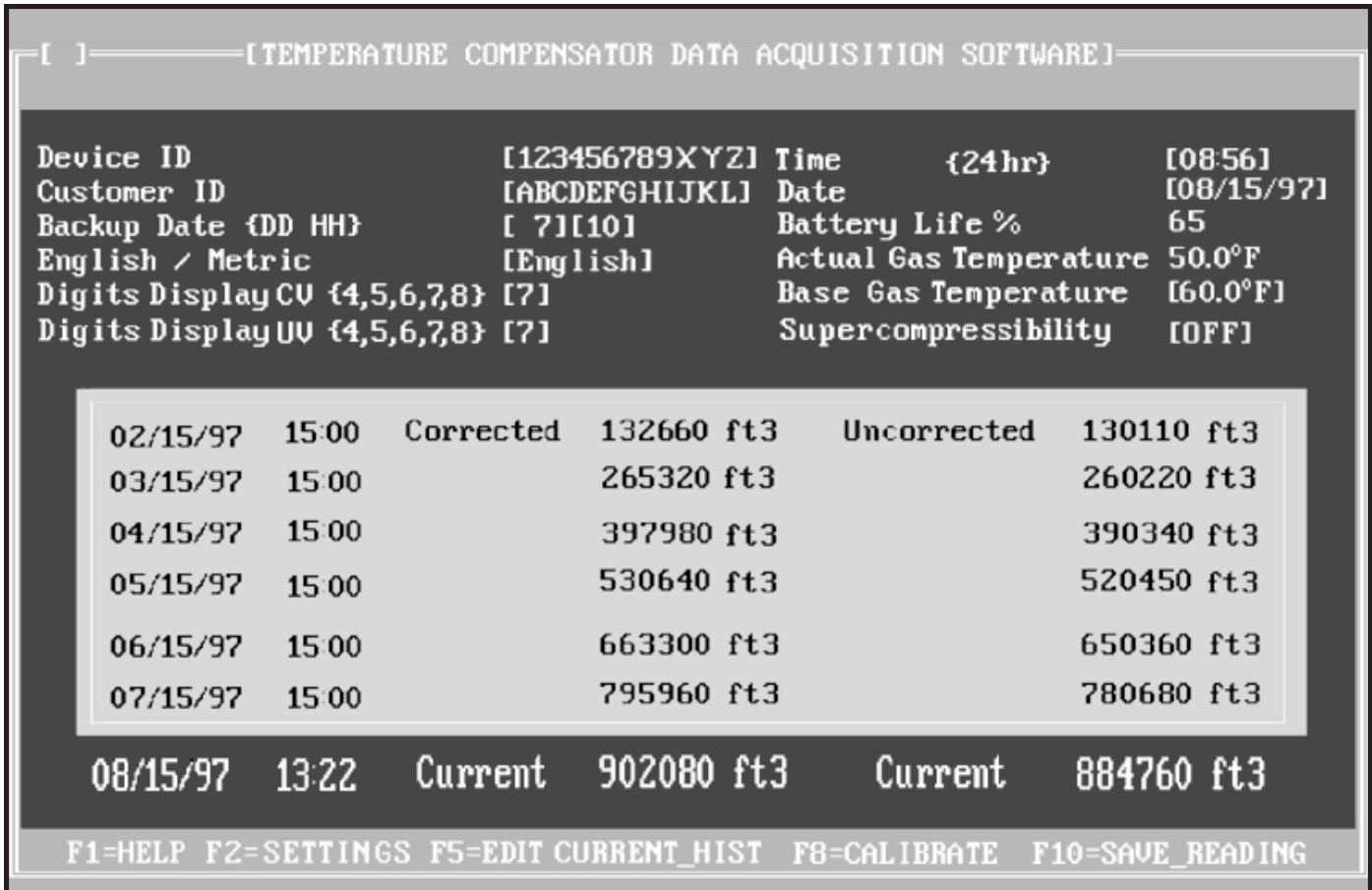


Fig. 24 Laptop Display Screen for Data Acquisition—6 Month History

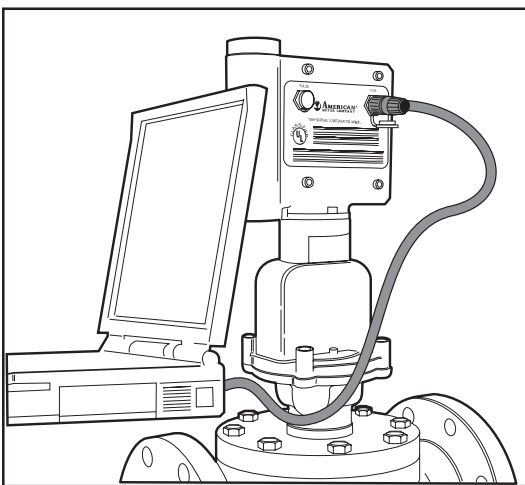


Fig. 25 Data Acquisition Connection

The Temperature Compensator stores in memory daily summation data of corrected and uncorrected volume for the current month in operation. In addition, a total monthly summation history file is retained for the same data for the six (6) previous months (Fig. 24) . A complete six (6) month history is available for access via the unit's downloading interface port located on the right rear of the Temperature Compensator (Fig. 25) to an on-site portable computer or transmitter via a customer supplied modem.

Complete operating instructions for TC data acquisition is included with the TC DAS Software Kit P/N 52699K001 for Windows 3.1x, and P/N 52699K002 for Windows 95/98.



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District Sales Offices

CALIFORNIA, Los Angeles

505 North Tustin Avenue #235
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Suite 311
Minneapolis, MN 55436
612-927-5485
Fax: 612-927-5301

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Building One
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Fax: 215-830-1891

PENNSYLVANIA, Pittsburgh

1725 Washington Road
Suite 605
Pittsburgh, PA 15241
412-833-2550
Fax: 412-833-0833

TEXAS, Dallas

1721 West Plano Parkway
Suite 221
Plano, TX 75075
972-422-2505
Fax: 972-422-2457

VIRGINIA, Richmond

530 Southlake Boulevard
Suite H
Richmond, VA 23236
804-379-0089
Fax: 804-379-0320

WASHINGTON, Seattle

3047 78th Avenue, SE
Suite 206
P.O. Box 950
Mercer Island, WA 98040
206-232-2261
Fax: 206-232-3586



AMERICAN METER

300 Welsh Road
Building One
Horsham, PA 19044-2234 U.S.A.
Phone: 215-830-1800
FAX: 215-830-1890



CANADIAN METER

3037 Derry Road, West
Milton, Ontario L9T 2X6
Canada
Phone: 905-878-2361
FAX: 905-878-5758