Time • Temp • ID

Model TTI-2

– INSTALLATION AND OPERATION –

This documentation is valid for
Time•Temp•ID hardware version 2.00 with firmware version 2.00

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Table of Contents

Section 1 — Safety Information

WARNING!

The Time/Temp/ID unit should be installed only by qualified technical personnel. An attempt to install this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the TTI-2 or other equipment. Please ensure that proper safety precautions have been made before installing this device.

The TTI-2, as any electronic device, can fail in unexpected ways and without warning. Do not use the Time/Temp/ID in applications where a life-threatening condition could result if it were to fail.

The TTI-2 is designed for indoor use in a dry location. Installation and operation in other locations could be hazardous. Use only the original wall-plug power supply supplied with the unit.

The purchaser and user of the TTI-2 bears the sole responsibility for determining suitability of this equipment for their intended use. Because this equipment can fail in an unpredictable or unexpected way, even in normal use, Sine Systems, Inc. cannot be held responsible for damages, either direct or indirect, resulting from use of this equipment.

Section 2 — System Description

2.1 General Description

The Time/Temp/ID is a talking clock/thermometer that is typically used with a program automation system. The TTI-2 will deliver the time, the temperature, or both on command from the automation system. When time and/or temperature delivery is complete, the TTI-2 gives an end-of-message signal to the automation system to resume programming. The Time/Temp/ID can be programmed to give the temperature in Fahrenheit or Celsius. The time is reported to the nearest minute.

The TTI-2 can record and store two audio messages of up to 30 seconds each in nonvolitile memory. These can be used for station ID's or sign on/sign off messages, etc.

The TTI-2 measures 19 inches wide and 1.75 inches tall and can be mounted in a a single space (1U) of a standard EIA equipment rack. The front panel has three pushbuttons for setup and control, and four LED indicators for system status. The rear panel contains 15 screw-terminal connections for the various inputs and outputs.

The TTI-2 comes with one temperature sensor for air temperature measurement. It should be mounted in a standard enclosure for the most accurate temperature measurement. Details of the standard enclosure are provided later in this manual.

There is an internal connector for a rechargable 9 volt battery that can maintain TTI-2 operation for short time periods when AC power is lost. Since the TTI-2 is typically used on-air, it may be appropriate to power the unit from a battery or generator backed power supply that powers other program audio source devices.

The internal clock is synchronized to the incoming AC voltage to ensure long-term accuracy of the time. The clock speed can also be adjusted in firmware if the TTI-2 is powered by a power source other than AC wall current.

To make the Time/Temp/ID more natural sounding, it does not speak the time and temperature the same way each time. The output script is automatically rotated each time it speaks. Here are the possible output scripts:

Time Only	*Length*
It's 3:27	1.5 seconds
The time is 3:27	2.0 seconds

Temperature Only	*Length*
The temperature is 72 degrees	2.0 seconds
It's 72 degrees outside	2.0 seconds

Time and Temperature	*Length*
It's 3:27 and the temperature is 72 degrees	3.0 seconds
It's 72 degrees outside at 3:27	3.0 seconds
At 3:27 the temperature is 72 degrees	3.0 seconds
The time is 3:27 and the temperature is 72 degrees	3.5 seconds

2.2 Front Panel Switches and Indicators

The front panel of the TTI-2 has three momentary pushbutton switches that are used to adjust the system and four LEDs that indicate the status of the system.

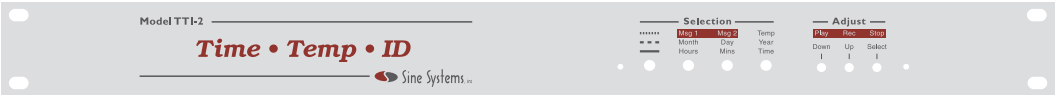

Figure 2.1; Time/Temp/ID front panel

2.2.1 Front Panel Switches

The front panel switches are as follows:

- SELECT selects an item to adjust. Items are indicated by the LED indicators as described below.
- UP increments one unit
- DOWN decrements one unit

While recording messages the buttons have an alternate function as shown by the highlighted text:

- STOP ends message recording
- REC starts message recording
- PLAY plays back the recorded message

2.2.1 Front Panel Indicators

The front panel of the TTI-2 has a four LED indicators to display system status. The leftmost LED does not have a text label. It is denoted by a series of lines and dashes. In normal operation this LED indicates system power and is illuminated continuously. It blinks off very briefly every minute at the top of the minute (0 seconds). The other LEDs indicate one of three modes depending on the state of the power LED.

When the power LED is not flashing, the programming LEDs indicate

- HOURS pressing up or down will increment or decrement the clock hours
- MINS pressing up or down will increment or decrement the clock minutes
- TIME pressing up or down will increment or decrement the clock speed calibration

When the power LED is flashing slowly, the programming LEDs indicate

- MONTH pressing up or down will increment or decrement the calendar month
- DAY pressing up or down will increment or decrement the calendar day
- YEAR pressing up or down will increment or decrement the calendar year

When the power LED is flashing rapidly, the programming LEDs indicate

- MSG 1 the buttons operate in recording mode as play, record and stop
- MSG 2 the buttons operate in recording mode as play, record and stop
- TEMP pressing up or down will increment or decrement the temperature sensor calibration

2.3 Rear Panel Connections

The rear panel of the TTT-1 contains all the I/O connections to the device. Power, control I/O and program audio connect through depluggable screw terminal connections. Unbalanced user message audio recording and audition playback is through two 3.5mm phone connectors.

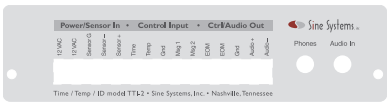

Figure 2.2; Time/Temp/ID rear panel

2.3.1 Time/Temperature

Two sets of input terminals on the rear-panel of the TTI-2 are used to make it deliver the time and/or temperature. These terminals are pulled-up to +5 volts and are activated by momentarily pulling them to ground. This can be done with a contact closure, an open-collector, an optocoupler, or a 5 volt logic-level signal. Grounding the “Time” terminal causes the TTI-2 to deliver the time and grounding the “Temp” terminal causes it to deliver the temperature. Grounding both terminals at the same time causes the TTI-2 to deliver both the time and the temperature.

These inputs are internally de-bounced and have transient-voltage and RFI protection. Optocoupler isolation should not be required except in cases of extremely long wire runs.

2.3.2 Message1/Message 2

Two sets of input terminals on the rear-panel of the TTI-2 are used to make it deliver user recordable message 1 or message 2. These terminals are pulled-up to +5 volts and are activated by momentarily pulling them to ground. This can be done with a contact closure, an open-collector, an optocoupler, or a 5 volt logic-level signal. Grounding the “Msg 1” terminal causes the TTI-2 to deliver user programmable message 1 and grounding the “Msg 2” terminal causes it to deliver user programmable message 2.

These inputs are internally de-bounced and have transient-voltage and RFI protection. Optocoupler isolation should not be required except in cases of extremely long wire runs.

2.3.3 Audio Output

The Time/Temp/ID has two audio outputs. Both audio outputs are always active and they are fed by the same audio source. A transformer balanced, 600 ohm, +4 dBm line-level output designed for connection to an automation system appears on the rear-panel at the terminals labeled “Audio +” and “Audio -”.

The secondary unbalanced output is available for driving a small speaker (at low level) or a pair of headphones. This output provides audition audio when recording user programmable messages or when calibrating the clock and thermometer. It appears on a 3.5mm phone plug labeled “Phones”.

2.3.4 Audio Input

The Time/Temp/ID has one audio input that is the source audio when recording the user programmable messages. This input is designed for unbalanced, mic-level audio. The 3.5mm phone plug is labeled “Audio In”.

2.3.5 Temperature Sensor

There are three terminals on the TTI-2 main unit for the outboard temperature sensor. They are labeled “Sensor G”, “Sensor –” and “Sensor +”. Shielded cable should be used to connect the “G”, “–” and “+” termimals on the sensor to the equivalent terminals on the TTI-2 rear panel.

2.3.6 End-of-Message (EOM) Output

The end-of-message (EOM) output is a pair of floating, single-pole relay contacts. The relay contacts are normally open--they close for 0.5 seconds at the end of audio. The contacts are labeled “EOM” on the rear-panel.

2.3.7 Power

The TTI-2 is powered by a 12VAC wall plug transformer. It connects at the two terminals labeled 12VAC. Naturally, these connections are not polarity sensitive.

Section 3 — Installation and Setup

WARNING!

The Time/Temp/ID unit should be installed only by qualified technical personnel. An attempt to install this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the TTI-2 or other equipment. Please ensure that proper safety precautions have been made before installing this device.

3.1 System Includes

The Time/Temp/ID package contains these items:

- Time/Temp/ID model TTI-2
- temperature sensor
- headphones
- 12 volt AC power supply
- operation manual

3.2 Installing the Unit

The TTI-2 is designed to be mounted in a standard 19 inch EIA equipment rack. It is 1.75 inches (1U) high. The TTI-2 generates little heat and can be mounted in just about any convenient location where the ambient temperature does not exceed 140°F.

Connections to the TTI-2 are made via 15 removable screw terminal connectors and two 3.5mm phone connectors located on the rear of the unit. These connections include:

- Temperature sensor
- Time/Temp delivery control inputs
- User programmable message delivery control inputs
- EOM output
- Audio input/output
- Power supply

3.2.1 Temperature Sensor

WARNING!

Single pair, foil shielded cable such as Belden 8451 should be used for the connection. It is very important to use foil-shielded cable. Braid-shielded cable is inadequate. The shield conductor is electrically offset from ground by 0.7 volts so take care to connect it only to the appropriate terminals on each end. Be particularly careful not to cut or puncture the outer insulating jacket of the cable anywhere that it is outdoors except where it connects to the sensor.

The temperature sensor consists of a small PC board with three screw terminals labeled “G”, “–” and “+”. Connect the sensor the the TTI-2 main unit with foil shielded cable. The shield connects sensor “G”, the black conductor connects sensor “S” and the red conductor connects sensor “+” . The sensor may be located up to 150 feet from the TTI-2 main unit.

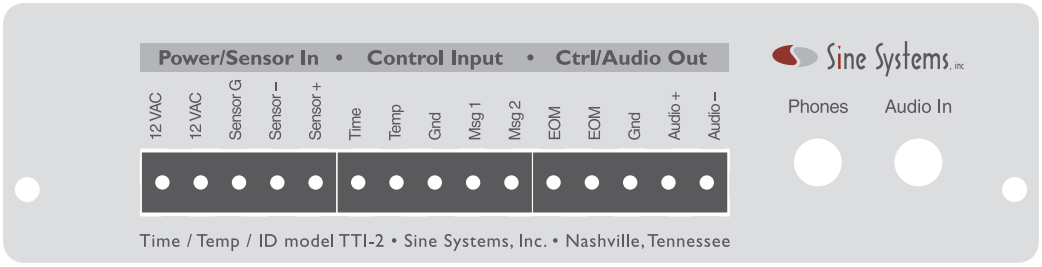

Figure 3.1; TTI-2 Rear Panel Connections

3.2.2 Audio Outputs

The main audio output is a transformer-balanced, 600 ohm, +4 dBm source designed for direct connection to external equipment. This audio output appears on rightmost two terminals of the rear-panel screw terminals. These terminals are labeled “Audio +” and “Audio –”.

An optional headphone audio output appears on a 3.5mm phone connector labeled “Phones”. This output is capable of driving a pair of headphones or a small 8 ohm speaker at low volume level. This output is typically used to audition audio during system setup.

3.2.3 Audio Input

The TTI-2 audio input is designed for unbalanced, line-level audio. The audio signal on this input is the source for recording the user programmable messages. The 3.5mm phone plug is labeled “Audio In”.

The audio storage device has a relatively low bandwidth (~4kHz). The system is suitable for recording voice messages such as station ID’s or sign on/sign off messages.

3.2.3 Control Inputs

The control inputs are used to trigger the Time/Temp/ID to deliver the time, the temperature, both time and temperature, user programmable message 1 or message 2. In Figure 3.2, switch contacts are shown as the trigger mechanism. The TTI-2 is typically triggered by an automation system. Wiring options are usually dictated by the availability of control signals from the automation system.

Either floating relay contacts or a ground referenced open collector output may be used as a trigger signal.

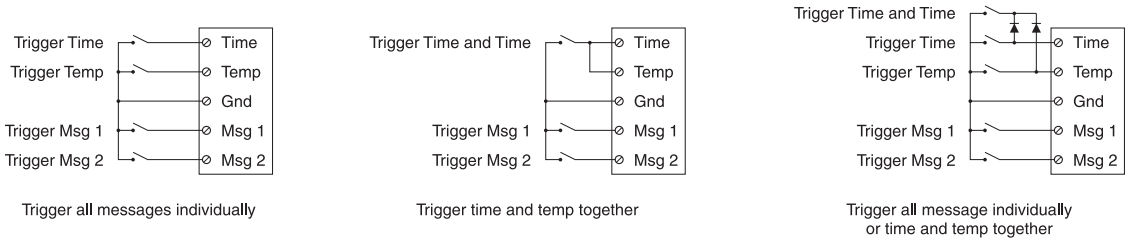

Figure 3.2; Example external trigger wiring

A user message can be played immediately following the time/temp message by providing a momentary ground connection on the time/temp input followed by a momentary ground connection on the appropriate message input. It is not necessary for the first message to end before the triggering the second input. The TTI-2 will deliver the second message after the first message is complete. Alternating time/temp and user message can be played back to back in any order depending on the order that contact closures are provided. For back to back play, messages must alternate between time/temp messages and user messages. The EOM contact will only trigger when the final message is complete.

3.2.4 End-of-Message (EOM) Output

When the Time/Temp/ID completes delivery of any spoken message, it provides a momentary (50ms) relay closure across the terminals labeled "EOM". This closure can be used to cue the automation system to resume programming.

3.2.5 Power Supply

The included wall-plug power supply should be used to supply 12 volts AC to the TTI-2. If the power supply has a connector, cut it off and strip the leads. Connect the supply leads to the two terminals labeled “12 VAC” on the rear panel of the TTI-2.

3.2.6 Back-Up Battery

The Time/Temp/ID can use an internal, rechargable battery to power the system for short periods in the event of a power failure. A battery is not supplied with the unit and must be purchased separately. A 9 volt NiCad rechargable battery is preferable since the TTI-2 provides charging current to the battery. The TTI-2 will charge the battery when power is available. A fully charged NiCad battery will keep the TTI-2 running for about 2 hours under normal use. Alkaline or other non-rechargable or specialty rechargable batteries should not be used in the Time/Temp/ID. The Power LED will flash when the TTI-2 is powered by the backup battery.

Do not install the battery until the TTI-2 is ready to be powered-up permanently. To install the battery, remove the two screws on the rear panel. Slide the rear panel, plastic bezel, and PC board out the back of the case. Install the battery in the holder on the PC board. Reinstall the board, bezel and rear panel.

3.3 Setting up the System

A small speaker or headphones should be connected to the appropriate audio output when making adjustments to the system so that you can hear the system respond.

Figure 3.3; TTI-2 front panel controls and indicators

The front panel of the TTI-2 holds three push button switches and four LED's as shown in figure 3.3 above. After the unit is setup and operating normally, the leftmost LED indicates power and it will be illuminated continuously except at the top of the minute when it will blink once to indicate the rollover of the minute.

The labels over the 'power' LED refer to three possible states of the LED.

- the continuous line indicates that the LED is illuminated continuously
- long dashes indicate that the LED is flashing slowly
- short dashes indicate that the LED is flashing rapidly

The three states of the LED are used to indicate which set of labels you should use when making system adjustments.

- when the power LED is illuminated continuously, use the labels Hours, Mins, Time
- when the power LED is flashing slowly, use the labels Month, Day, Year
- when the LED is flashing rapidly, use the labels Msg 1, Msg 2, Temp

Pressing the Select button will cause the TTI-2 to rotate through the system options. The rotation is left to right and bottom to top. The first time Select is pressed, the power LED will light continuously and the Hours LED will light. This indicates that the clock hours will be adjusted when the Up/Down buttons are pressed. Pressing Select again will extinguish the Hours LED and light the Mins LED. Pressing Select again will extinguish Mins and light Time.

From 'Time', pressing Select again will make the power LED flash slowly indicating a shift up to the middle row of labels (indicated by the long dashes). The Time LED will extinguish and the Month LED will light. The LED now indicates Month instead of Hours because the power LED is flashing slowly. Pressing Select again will extinguish the Month LED and light the Day LED. And, pressing Select again will extinguish the Day LED and light the Year LED.

From 'Year', pressing Select will make the power LED flash rapidly indicating a shift up to the top row of labels (indicated by the short dashes). The Year LED will extinguish and the Msg 1 LED will light. Predictably, pressing Select again will select the Msg 2 LED and pressing Select again will select the Temp LED.

From 'Temp', pressing Select one more time will cause the power LED to illuminate continuously and all other LED's will extinguish to indicate that the system has exited the setup mode. As a precaution, if the system is left idle in setup mode for more than 5 minutes it will automatically exit the setup mode and return to normal operation.

When the TTI-2 is delivering a user programmable message or delivering the time or temperature, pressing the Select button one time will stop all audio output immediately and provide an EOM relay contact closure.

3.3.1 Setting the Clock

When the TTI-2 is first powered up, the three setup mode indicator LED's will flash indicating that the clock has not been set. To set the time in the TTI-2:

- press the Select button until the Hours LED is illuminated
- press the Up/Down buttons until the system says the correct hour (using 24 hour time)
- press the Select button until the Mins LED is illuminated
- press the Up/Down buttons until the system says the correct minute

The seconds are reset to zero each time the minute is changed.

3.3.1 Setting the Calendar

The TTI-2 has an internal calendar that allows the system to automatically adjust for daylight savings time. If you do not want the TTI-2 to automatically adjust the clock for daylight savings time, do not set the calendar or set the calendar month to 0. To set the calendar and enable automatic daylight savings adjustment:

- press the Select button until the Month LED is illuminated
- press the Up/Down buttons until the system says the correct month
- press the Select button until the Day LED is illuminated
- press the Up/Down buttons until the system says the correct date
- press the Select button until the Year LED is illuminated
- press the Up/Down buttons until the system says the correct year

The year is based on the value 00 as the year 2000.

3.3.3 Recording User Messages

The TTI-2 can store two messages up to 30 seconds each. These messages are stored in non-volatile memory and will not be lost during a power failure even if the backup battery is not present. The procedure for recording both messages is the same except: select 'Msg 1' to program message 1 or select 'Msg 2' to program message 2.

When recording user messages, the buttons function as Play, Rec and Stop instead of Down, Up and Select. This is indicated on the front panel of the TTI-2 by the shaded text for the labels Msg 1, Msg 2 and Play, Rec and Stop.

- connect the appropriate audio source into the Audio In jack on the rear panel of the TTI-2
- press the Select button until the appropriate Msg LED (1 or 2) is illuminated
- press the press Rec button, the Msg LED will flash to indicate recording in progress
- start the audio source playback
- press the Stop button (one time only) when playback is complete, the Msg LED stops flashing
- press the Play button to verify the recorded message

During recording or playback, pressing the Stop button stops the operation and silences the audio. When there is no record or playback in progress, this button operates as the mode Select button.

You may want to use a production studio to pre-record the TTI-2 messages. Music can be added to the messages and audio processing equipment can be used to tailor the audio. The audio level should be kept in the low to moderate range and audio bandwidth should be limited and/or compressed due to the limited bandwidth of the audio storage IC.

3.3.4 Calibrating the Clock

Because the clock is synched to AC line power, the TTI-2 clock will operate with very little long term drift over time. However, if the TTI-2 is not powered by AC wall current it may drift over time due to variances in components. The TTI-2 can be adjusted to compensate for this and minimize drift.

The clock speed is adjustable in increments of 1/3 of a second per 24 hours. It is possible to adjust the clock up to 127 increments in either direction. Thus, the clock can be sped up or slowed down up to 42 seconds per day.

To adjust the clock speed:

- press the Select button until the Time LED is illuminated
- press the Up button one or more times to speed the clock up
- press the Down button one or more times to slow the clock down

The midpoint (factory) of the adjustment scale reads 'zero'. Faster clock speed settings read a positive value 'xxx' from the zero point. Slower clock speed settings read 'minus xxx' from the zero point. If the clock adjustment reads '6', the clock speed will gain 2 seconds per 24 hour period--but only when the system is not synched to AC line power.

This setting is stored in non-volatile memory and will not be lost during a power failure even if the backup battery is not present.

3.3.5 Calibrating the Thermometer

Place a thermometer as close as possible to the TTI-2 temperature sensor. Give the thermometer a few minutes to stabilize in temperature. Then set the TTI-2 to read the same temperature as the thermometer.

To adjust the temperature:

- press the Select button until the Temp LED is illuminated
- press the Up button one or more times to increase the temperature reading
- press the Down button one or more to decrease the temperature reading

The maximum calibration range is ten degrees (F) positive and negative. If this range is not adequate to calibrate the sensor then there is probably a sensor malfunction.

If an accurate thermometer is not available, fill a styrofoam cup with crushed ice and water. Insert the sensor (weather-proofed) into the cup and allow several seconds or more for the temperature to stabilize. Using the procedure above, set the TTI-2 to read 32 degrees if using Fahrenheit or 0 degrees if using Celsius.

This setting is stored in non-volatile memory and will not be lost during a power failure even if the backup battery is not present.

3.3.6 Setting to Fahrenheit/Celsius

To toggle the thermometer between Fahrenheit and Celsius, press Select until the Temp option is selected. Press the Up and Down buttons at the same time. The TTI-2 will respond with “32 degrees” to indicated Fahrenheit or “0 degrees” to indicate Celsius.

This setting is stored in non-volatile memory and will not be lost during a power failure even if the backup battery is not present.

3.3.7 Read Software Version

In the normal operating mode (no setup option selected), press the Up and Down buttons at the same time to read the software version.

3.4 Placing the Temperature Sensor

WARNING!

Two-conductor-with-foil-shield cable, such as Belden 8451, should be used for the connection. It is very important that foil-shielded cable be used. Braid-shielded cable is inadequate.

The TTI-2 temperature sensor can be placed up to 150 feet from the main unit. Single-pair foil-shielded cable should be used to connect the sensor to the main unit. The shield conductor is electrically offset from ground by 0.7 volts so care should be taken that it connect only to the appropriate terminals on each end. Be particularly careful not to cut or puncture the outer insulating jacket of the cable anywhere it is outdoors except where it connects to the sensor.

3.4.1 Standard Enclosure

To get readings that correspond to those reported by the nearest NOAA weather station, it is important to measure the temperature the same way they do. Just hanging the sensor out a window will almost surely produce temperatures that fluctuate wildly. The key measuring the temperature accurately is to mount the sensor in a standard enclosure. It provides very accurate air-temperature readings.

An alternative to buying a standard enclosure is to make one using inexpensive materials. The primary raw material is two 12 inch wide louvered wood shutters—louvered doors might also work. Cut the shutters so you end up with four equal lengths of shutter about 13 to 16 inches long. A little improvising may be required depending on the style of shutter or door. Some can be cut along a solid horizontal reinforcement piece and others will require the end louvers to be stabilized with glue or a piece of wood. In either case, you will build a box with the four pieces of shutter using them for the four walls. The floor and roof of the box are made of 3/8 inch exterior grade plywood.

Attach three of the four sides together with glue and nails or screws. The pieces of shutter should be oriented so the louvers will drain outside of the enclosure. Attach this assembly to the floor. The roof should overhang about 3 inches on all sides. Attach the roof with a couple of 1/4 inch spacers near the front so that it slopes slightly to the rear. This will prevent water from standing on top. The remaining wall should be attached with two hook-and-eye sets so it can be removed.

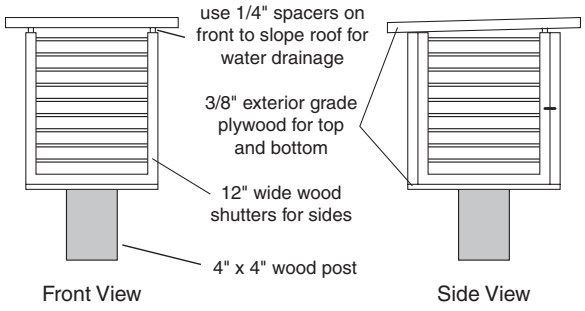

Figure 3.4; Standard enclosure for temperature sensor

Mount the enclosure on a 4 inch square wooden post. The floor of the enclosure should be 4 feet above the ground. Drill a small hole in the floor near the edge of the post for the sensor cable to come through. A 1/4 inch hole drilled in one of the walls about an inch above the floor makes an easy way to insert a calibration thermometer without removing the louvered panel (see section 3.3.2). The enclosure should be given at least two coats of white exterior paint inside and out.

Place the enclosure at least 20 feet from the nearest building, preferably on grass covered soil. It should be as far away as possible from concrete and pavement. Do not place the enclosure near air-conditioner compressors or under trees.

Run the cable for the sensor up the post and through the hole in the floor. Lay the sensor in the center of the floor of the enclosure. Be careful not to cut or puncture the outer insulating jacket of the cable. The inner conductors must be protected from the weather. If an extension cable is used, wrap electrical tape around the connectors to seal out moisture.

When visiting the enclosure during the summer months you might want to take a can of wasp and hornet killer with you. They love to build nests in these enclosures.

Section 4 — Circuit Description, Warranty and Repair

4.1 Repair Safety Warnings

WARNING!

The Time/Temp/ID should be installed or repaired only by qualified technical personnel. An attempt to repair this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel, and/or damage to the Time/Temp/ID unit or other equipment. Please ensure that proper safety precautions have been made before installing or repairing this device.

4.2 Circuit Description

The TTI-2 is powered by 12 volts AC. This supply is rectified and regulated to 5 volts DC to power most of the system. A 12 volt DC supply is generated as a reference for the temperature sensor. A sample from the 12 volt AC supply is fed to the microcontroller to sync the time clock to the AC line.

U4 is a single-chip microcontroller that contains program ROM, RAM, EEPROM, timers, I/O, etc. The timebase is a 8.0 MHz crystal oscillator. U6 is a low voltage interrupt that shuts down the microprocessor when the supply voltage drops below 4.5 volts. The front panel switches and indicators are controlled directly by U4 as are the message trigger inputs. U8 drives the EOM relay.

U2 is the speech synthesizer chip which operates under control of U4 and draws data from U3. This chip is responsible for the pre-recorded time and temperature delivery system. U5 is a self-contained recording device that stores the user programmable messages. The audio output of U2 passes through an unmodified auxiliary audio path of U5. U7 is a power amplifier which drives both the audio output transformer and the unbalanced output.

The temperature sensor supplies a 10 millivolt per degree Fahrenheit signal on pin 2, referenced to pin 1. Pin 1 is elevated above ground 0.65 volts to allow for negative temperature readings. The microprocessor measures the voltage at pin 1 and pin 2 and then computes the temperature.

4.3 Factory Service Policy

These policies are effective August 1999 and are subject to change without prior notice.

4.3.1 Factory Warranty

Sine Systems, Inc. guarantees our products to be free from manufacturing defect for a period of one year from the original date of purchase from Sine Systems, Inc. This warranty covers the parts and labor necessary to repair the product to factory specifications. This warranty does not cover damage by lightning, normal wear, misuse, neglect, improper installation, failure to follow instructions, accidents, alterations, unauthorized repair, damage during transit, fire, flood, tornado, hurricane or acts of God and/or nature.

4.3.2 Factory Return Policy

The factory return policy only applies to equipment purchased directly from Sine Systems, Inc. Equipment purchased through a third party (dealer) is subject to the return policy of the dealer and arrangements for return or exchange must be handled through the dealer.

Sine Systems policy on returns and exchanges with the factory is broken down according to the following schedule:

30 days "no questions asked"

During the first thirty days from the date that equipment ships from our factory we will accept it back for a full refund less shipping charges provided that the equipment is still in new, resellable condition with no cosmetic damage. This does not constitute an evaluation program. It is for legitimate purchases only.

less than 60 days, may be returned less 15% restocking fee

Between 31 and 60 days from the time we ship the equipment, we will accept unmodified equipment back for a refund less shipping charges and 15% of the invoice cost. This is to cover the cost of restocking the items which must then be sold at a discount as reconditioned instead of new.

no return after 60 days

We will recondition the equipment for you according to our repair rates but we will not accept it for refund or exchange after 60 days from the initial purchase.

4.3.3 Factory Service Policy

Sine Systems is proud to offer same day repair service on all of our products. When we receive damaged equipment, we will repair it and ship it back the same day it arrives. Because we offer immediate service, we do not send loaner equipment. If we cannot immediately repair equipment and return it, we may ship a loaner unit at our discretion.

While we do not require prior authorization on repairs, we suggest that you verify our shipping address before returning equipment for repair. Sine Systems is not responsible for items lost in transport or delivered to the wrong address. Emergency service may be made available on weekends or holidays, at our discretion, if arrangements are made with us in advance.

4.3.4 Warranty Service

There is no charge for repair service on items covered under warranty. You are responsible for shipping charges to return damaged equipment to us for repair. Damage due to negligence, lightning or other acts of nature are not covered under warranty.

4.3.5 Service Rates

For service not covered under warranty we have a flat rate repair fee. Flat rate repairs cover only components that fail electrically. Mechanical damage will be assessed on a per repair basis. Repair charges typically fall into one of these categories. Shipping fees are not covered in the repair rate.

Minor programming adjustments or no damage, $50 plus shipping

Sometimes a system works exactly like it is supposed to when we get it or it can be fixed through a simple adjustment in firmware. We will do our best to identify intermittent hardware problems and correct them. The fee covers the time it takes our technician to thoroughly inspect and test the equipment.

Minor repairs are up to $150 plus shipping

Five or fewer defective components are replaced in a minor to moderate repair. This accounts for most of our repairs. These repairs may cost less depending on the components replaced and the amount of time required to complete the repair.

Moderate repairs are $250 plus shipping

Six to ten defective components are replaced in a major repair. Again, we may charge less depending on the components replaced and the amount of time required to complete repairs.

Major repairs cost more than $250 plus shipping

This occurs rarely but it can happen. If the equipment has blown traces and scorch marks from burned components, it's a safe bet that it will take several components and quite a bit of bench time to repair. We assess this type of repair on a per incident basis.

Damaged beyond recognition, assessed on a per case basis

Hopefully you have insurance. In cases where the board is so badly damaged that it is not worth repairing we may, at our discretion, offer to replace the destroyed circuit board. The options and costs vary widely in these cases so we will call with options.

All repairs must be billed to a credit card or shipped COD. Specify which you prefer with your request for service. At your request, we will call with the total amount of the repair (including applicable shipping charges) so that suitable payment can be arranged before a COD shipment. If you need a COD total, do not forget to include a telephone number where you can be contacted.

4.3.6 Instructions for Factory Service

Please include a note with any specific information available about the equipment failure as an aid to our technicians. Pack equipment carefully to avoid further damage in shipping. We are not responsible for damage during transport.

When returning a system with multiple components, we strongly suggest that you return the entire system. We will repair the parts that are returned but lightning is rarely selective enough to damage only a single part of a system.

Be sure to include a street address for return shipping by UPS. The repair will be delayed if you neglect to give us enough information to return your equipment. If you prefer a carrier other than UPS or wish us to bill to your shipping account, we can usually accommodate these requests. Many carriers do not accept COD shipments so credit card billing may be required for carriers other than UPS. If you do not specify otherwise, return shipments will be made by the UPS equivalent of the received shipping method (i.e. Ground shipment, 2nd Day, Overnight).

We suggest that you verify our shipping address before sending equipment for repair. Same day service does not apply if you ship to an incorrect address and/or the carrier delivers the equipment too late in the day for repairs to be completed. Sine Systems is not responsible for equipment that is not delivered to our factory. It will be your responsibility to contact the carrier to retrieve your improperly delivered equipment.

Section 5 — Specifications

5.1 Electrical Specifications

Ports

Power Input (5.0mm screw terminal connectors)
Temperature Sensor (5.0mm screw terminal connectors)
Trigger Inputs (5.0mm screw terminal connectors)
EOM Output (5.0mm screw terminal connectors)
Audio Outputs (5.0mm screw terminal connectors)

Audio Input (3.5mm phone connector--mono)
Headphone Output (3.5mm phone connector--dual mono)

Line level audio output is transformer balanced, +4 dBm nominal level. Load impedance should be 600 ohms or more.
Headphone audio output is unbalanced, low level audio to drive headphones or a small 8Ω speaker.
Audio input is unbalanced, consumer line level.
EOM relay output contacts are rated at 0.5 amperes, 24 volts AC/DC. EOM relay closure lasts one-half second.

Switches

Up/Rec (momentary pushbutton)
Down/Mins (momentary pushbutton)
Select/Stop (momentary pushbutton)

Indicators

Power/Select LED (green)
Hours/Month/Msg 1 LED (green)
Mins/Day/Msg 2 LED (green)
Time/Year/Temp LED (green)

Adjustments

Temperature scale (˚F/˚C) and calibration (in firmware)
Clock speed adjust (in firmware)

Sensor

Operating range: -40°F to 150°F (-40°C to 65°C) ambient air temperature
Absolute accuracy (at 72°F): ±1°F

AC Power

Input: 100-240 Volts AC, 50-60 Hz, 5 watts
Output: 12 Volts AC, 200 mA max

5.2 Mechanical Specifications

Dimensions

19.0” (w) x 6.0” (d) x 1.75” (h) mounts in standard 19” EIA rack (1U)

Weight

3 lbs.