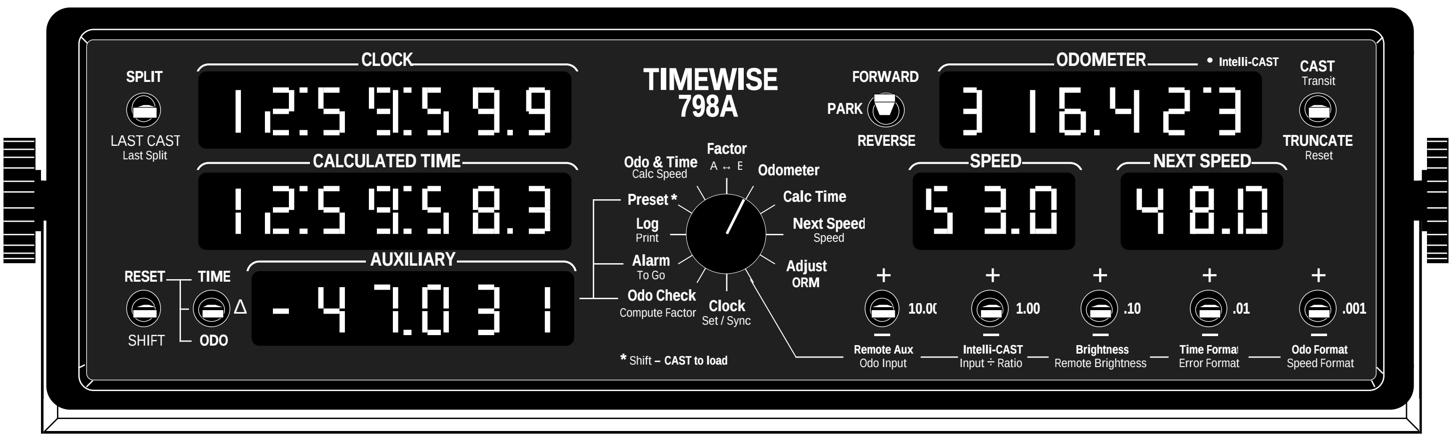
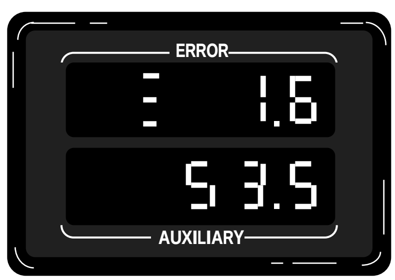
TIMEWISE 798A RALLY COMPUTER





USER’S MANUAL

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Part Number 1001–798A Rev 7.001

798A Operating Firmware History

Version 1.000beta October 18, 1999

Initial release for approval by outside testers.

Version 1.000 November 23, 1999

Finalized speedometer, auto-factor, and datalog firmware. Also added transducer Intelli-Sense™ capabilities. First product delivered.

Version 1.001 December 14, 1999

The **SPLIT** and **PARK/REVERSE** alarm beep lengths are now adjustable.

Version 1.002 December 20, 1999

Added new driver's remote auxiliary selection: The **TIME–Δ–ODO** switch can be used to select among the auxiliary calculated time, main odometer, or auxiliary odometer for the remote display.

Version 1.003 December 22, 1999

Corrected a speedometer calculation problem when the transducer pulse rate exceeded 107 pulses/sec (>150 mph in a typical magnet sensing application). The 798A speedometer now correctly displays speeds at transducer input pulse rates up to 250 pulses/sec.

Version 1.004 January 7, 2000

The **Load** function is no longer automatically disabled following a power-off condition. Similarly, once the Intelli-Sense™ system is armed (by changing odometer inputs), the system remains armed following a power-off condition. Previously, the **Load** function and the Intelli-Sense™ system had to be re-enabled following any power outage.

Also eliminated potential false transducer failure indications from occurring while making adjustments to the odometer factors.

Version 1.005 February 7, 2000

Changed the automatic LED display brightness level setting that occurs upon wake-up from idle mode. The main unit LEDs now re-illuminate at their mid-point if they were set to less than half the maximum brightness when the 798A entered the idle mode. The driver's module always re-illuminates at its prior setting.

Version 1.006 February 11, 2000

The power failure and odometer alarm visual notifications (showing in the **CLOCK** display) can now be dismissed by turning the rotary switch or actuating any toggle switch. Previously, only an actuation of the **SHIFT** switch dismissed the warnings.

Version 2.000 June 1, 2000

Added ability to execute the **Calc Factor** function without inserting the calculated value into the active factor. Thus, you can have the 798A compute a sample factor.

On units outfitted with the datalog (Option 1), the user may select whether the speed stored is the "changed to" or "changed from" CAST value. The choice is made while turning on the instrument. Also added eight additional datalog memories (for a new total of 56) and fixed a bug that prevented viewing some data when the log sequence number re-started (after reaching 250).

Now offer Option 6 allowing users to set CASTs with .01 mph resolution

Version 2.001 June 27, 2000

Fixed a firmware bug that occasionally prevented a speedometer reading of 0.0 [mph or kph] from being shown (in the driver's **AUXILIARY** display) after the vehicle stopped.

Version 2.002 July 18, 2000

Fixed a bug that prevented setting the "hundredths" digit of the **Preset** calculated time. Corrected truncation of the calculated time "tenths of units" digit when executing a preset **Load** after changing the time counting mode.

Added a new datalog review feature: each logging action automatically advance to the next newer data set. Previously the data set being viewed remained unchanged following each logging action, such as does a multi-split checkpoint clock (where a "first to last" review of logged data is required). The 798A can now also function like a traditional datalogger where a "last to first" review of logged data is expected.

Modified the display of logged calculated time and clock data to always show "tenths of units", regardless of the selected time resolution mode for live or split data.

Increased the settable **Alarm** resolution to 0.01 mile. Previously, the resolution was 0.1 mile.

Added ability to continuously display an alarm "countdown distance" in the main **AUXILIARY** display without holding down the **SHIFT** switch. Also added ability to display the countdown distance in the driver's **AUXILIARY** display.

Changed the alarm **To Go** function to an alarm "warning" distance. The **To Go** distance can range from 0.00 to 9.99 miles. Adjusting the **To Go** distance to a value other than 0.00 causes the beeper to sound at the selected distance prior to arriving at the alarm mileage. Previously, the alarm beeper could only sound at the alarm mileage. (Also previously, the **To Go** function simply served to temporarily display the alarm countdown distance in the **AUXILIARY** display.)

Altered the driver's module LED display circuitry re-initialization procedure to also include a re-initialization of the main LED display circuitry. The re-initialization procedure is now executed after a two-second **Last Split** activation rather than simply a two second **SHIFT** switch activation.

Version 2.003 August 18, 2000

Eliminated illumination of the "thousandths of miles" digit of an **Odo & Time** adjustment amount (in the **AUXILIARY** display) when thousandths of miles are not displayed in the main odometer. The log sequence number now counts to 255 before re-starting. Previously the sequence number counted to 250. You can now enter a **Preset** CAST with .01 mph resolution if Option 6 is installed.

Version 2.004 August 21, 2000

Implemented a flashing **ODOMETER** display when the **Remote Park** function is activated.

Version 2.005 September 7, 2000

Added an elective **ERROR** display offset of 0.45 second (or 0.45 hundredth). Some rallyists enable this offset to make it easier to arrive at a checkpoint "within the count" intended by the rallymaster.

Version 3.000 October 29, 2000

Fixed a bug that prevented the factors associated with the inactive odometer input from being corrected during the **Compute Factor** procedure if a sample factor was calculated first.

Added a visual warning that indicates when the odometer pulse rate is too fast (> 1000 pulses/second). Improved the Intelli-Sense™ transducer failure detection system. Changed the **AUXILIARY** display system to allow showing "tenths of units" when viewing a time parameter. Fixed an interrupt conflict introduced in version 2.002 that randomly produced a speedometer miscalculation.

Version 3.001 December 29, 2000

Fixed a bug in version 3.000 that prevented electronic synchronization to Timewise multi-split chronometers.

Changed the odometer pulse interrupt routine to allow an increase in the permissible odometer pulse rate. Continuous odometer pulse rates in excess of 5000 pulses/second are now tolerated, even without use of the 798A's built-in input signal divider. The visual warning indicating an overly rapid odometer pulse rate now occurs at rates in excess of 5000 pulses/second. (Pulse rates up to 640,000 pulses/second are allowed when using the input signal divider.)

Also raised the speedometer timing routine to a higher interrupt priority. This guarantees the accuracy of the speedometer calculation at extremely high speeds (>180 mph).

Version 3.002 January 3, 2001

Negative **Odo & Time** adjustment amounts (shown in the **AUXILIARY** display) are now displayed with a negative sign preceding the value. Previously, a negative adjustment amount was shown as a number decreasing from 1000.000 (e.g., a – 0.100 mile adjustment was shown as "**999.900**").

Version 3.003 February 22, 2001

Option 3 (Great Race testing) is now available.

Version 4.000 April 2, 2001

Fixed a bug that caused two problems with the use of the Last CAST odometer adjustment feature:

After exiting a transit zone (i.e., where the CAST had been 0.0 mph), any adjustment to the Last CAST odometer reading resulted in an incorrectly displayed value of the "updated" last CAST calculated time reading. This was a display anomaly only. The actual driving time error and the overall calculated time were not compromised.

Secondly, if the Intelli-CAST mode had been active upon a CAST change, the 798A saved the previous CAST (required if the Last CAST feature is applied) at a value 0.08 mph higher than the actual previous speed. As a result, Last CAST odometer reading adjustments resulted in a slightly inaccurate correction to the calculated time. Generally, the inaccuracy was less than 0.01 minute.

Version 4.001 September 20, 2001

Added an elective one second delay preceding execution of a main odometer truncate or main odometer reset.

Version 4.002 October 7, 2001

The elective truncate delay available as of version 4.001 no longer delays a main odometer reset.

Version 4.003 October 28, 2001

Allow use of an alternate LED interface circuit when manufacturing the driver's module.

Version 4.004 January 25, 2002

Allow use of an alternate LED interface circuit when manufacturing the main computer.

Version 4.005 February 20, 2002

Fixed a bug introduced in version 4.001 that prevented enabling/disabling of option 3 (Great Race testing) on units so outfitted. Option 5 (adjustable Auxiliary odometer) and option 7 (remote select for driver's **AUXILIARY** display) firmware developed

Version 4.006 March 13, 2002

Changed the firmware so that appropriate digits of the current speed, next speed, and preset speed are correctly "forced to a zero" after the **Speed Format** function is used to change the CAST resolution. In all previous firmware versions, the procedure was incorrectly implemented.

Version 4.007 April 7, 2002

Changed the "t-d-o" selection for the remote **AUXILIARY** display. The **TIME–∆–ODO** switch now selects the auxiliary odometer, the main odometer, or the alarm countdown distance. Previously, the selections were the auxiliary calculated time, the main odometer, or the auxiliary odometer.

Added an elective feature that requires the **SHIFT** switch to be depressed while exiting the **FORWARD** mode of operation. When enabled, this "shift to exit forward" feature will cause the 798A to disregard the selection of either **PARK** or **REVERSE** unless the **SHIFT** switch was depressed when the toggle switch handle was moved away from the **FORWARD** position. Should the **FORWARD-PARK-REVERSE** switch be accidentally moved out of **FORWARD**, this feature will keep the 798A odometers counting forward.

Version 4.008 September 4, 2002

While making Last CAST adjustments, actuating the **RESET** switch will revert Last CAST data to the original measured values. Previously, the **RESET** switch was inactive while making Last CAST adjustments.

Version 4.009 January 14, 2006

Option 8 firmware (1 Pulse per second output) developed, improved system reset routines.

Added "in-use" indicator for option 6 (0.01 resolution CASTs).

Added notification of odometer alarm in driver's display and increased the odometer alarm beep to 2 seconds.

Version 4.010 June 13, 2006

Option 9 (adjustable Error offset bias) firmware developed.

Version 4.011 September 29, 2006

Option 10 firmware (Intelli-Fix) developed. The "**ODO ALERT**" warning in the driver's **AUXILIARY** display is not displayed whenever a "**To Go**" distance other than 0.00 is set. The method used to show installed options while viewing system information has been changed.

Version 4.012 March 20, 2007

Option 11 (Auto-CAST) firmware developed.

Version 5.000 April 25, 2007

General compacting and cleanup of firmware.

FIRMWARE VERSION HISTORY

Version 5.001 July 24, 2007

Improved Option 10 firmware (Intelli-Fix) by displaying the Intelli-Fix adjustment amount in the **AUXILIARY** display. Also, using the **RESET** switch to revert Last CAST data to original measured values now also removes Intelli-Fix adjustments from the main odometer.

Version 5.002 September 3, 2009

Option 13 (remote reset of Auxiliary display) firmware developed.

Version 5.003 September 28, 2012

An initial main odometer truncate (or main odometer reset) subsequent to a normal CAST is no longer required for correct Intelli-CAST computations.

Version 5.004 February 24, 2013

Upon a Preset Load when loading of a CAST is disabled, the values in the **SPEED** and **NEXT SPEED** displays are not exchanged.

Version 5.005 (March 29, 2013) and Version 5.006 (July 24, 2013)

Firmware modified in display update, odometer pulse counting, and other routines to increase execution speed.

Version 5.007 August 11, 2013

Eliminated random driver's module display anomalies subsequent to an odometer alarm when a "**To Go**" distance other than 0.00 was set. The problem had existed since version 4.011 firmware.

Version 5.008 March 26, 2016

Option 16 released. The "tip" contact within the option 7 stereo jack can be used to reset the auxiliary odometer and simultaneously force it to be displayed in the driver's module **AUXILIARY** display.

Changed the "t-d-o" selections for the driver's module **AUXILIARY** display. The **TIME–∆–ODO** switch now selects the alarm countdown distance (**TIME**), the main odometer (∆), or the auxiliary odometer (**ODO**).

Version 5.009 July 8, 2016

Odometer transducer "Input x Suspect" warnings can be dismissed by turning the rotary switch or activating **SHIFT**.

When Option 6 is installed (CASTs with .01 mph resolution), the feature can be disabled and re-enabled.

Version 5.010 September 13, 2016

Whenever the **SHIFT** switch is activated for one second the LED display drivers are re-initialized. Previously, the display drivers were re-initialized following a two second activation of **Last Split**.

The live or split **ERROR** is shown in the **AUXILIARY** display with ∆ selected and the rotary switch turned to **Next Speed**.

Upon a Preset Load, the main computer is split as long as the CAST switch is activated. Previously the displays did not split.

Automatic CASTs (Option 11) are disabled unless the preset calculated time is hidden ("------" in the Auxiliary display).

Ability to instantly truncate the calculated time to whole minutes (Option 17).

Version 6.000 (October 3, 2016) and Versions 6.001 and 6.002 (January 2017)

A Semi-Intelli-CAST mode is available (Option 18).

Options 1, 3, 5, 6, 9, 10, 11, and 17 are now standard in newly manufactured 798As.

Version 6.003 (July 9, 2019)

Increased display update speed.

Version 6.004 (July 20, 2019)

Increased switch scan speed.

Version 7.000 (July 30, 2019)

Increased switch scan speed when using a trace modified main printed circuit board.

Version 7.001 (November 25, 2019)

Increased error computation speed. Option 7 and alternative LED drivers no longer mutually exclusive.

NOTICE!

Special Firmware for Developing a "Lost Time" Reference Table

Your 798A has been configured with specialized "Option 3" firmware. This custom configuration provides unique features that significantly simplify measurement of "lost time" errors while practicing for "speedometer only" rallies.

In the "speedometer only" class of rallying, the only measuring equipment allowed in the vehicle during the rally is an analog reading speedometer and an analog time of day clock. No mileage measuring device (odometer) is permitted during the rally itself. The driver and navigator must rely exclusively on the accuracy of the speedometer, the clock, and their knowledge of the responsiveness of the vehicle. Only one other tool is allowed in the vehicle during the rally: a custom developed "lost time" reference table that lists time adjustments needed for a variety of course maneuvers. Armed with this reference of itemized timing errors, the navigator can inventory errors that accumulate during a rally. This allows the navigator to appropriately tell the driver to speed-up or slow-down.

Using the perfect time computing features of the 798A prior to running a rally, timing errors associated with typical course maneuvers (non-instantaneous starts and stops, speed changes at signs, slowing for turns, etc.) can be measured. Although the standard 798A could be used to determine these timing errors, the special features provided by option 3 firmware greatly simplify the process. A 798A outfitted with option 3 firmware enables development of a lost time reference table within a period of hours or days, rather than weeks or months.

Option 3 Features

Option 3 provides the following specific features:

1) An "Event Timer" is shown in the **CLOCK** display in place of the time of day clock.

2) A "Calculated Time Counter" is shown in the **CALCULATED TIME** display in place of the calculated time.

3) The Error can be shown continuously in the main unit's **AUXILIARY** display, where it may be split.

4) A single switch activation can simultaneously reset the Error, Calculated Time Counter, Event Timer, and Odometer.

The main unit display of the error will be split when the **SPLIT** switch is actuated. As a result, the timing errors accrued during individual maneuvers can be noted. In addition, split values for the distance driven during the maneuver, the actual elapsed time, and the perfect driving time can be recorded.

Activating Option 3 Firmware

Because the features provided by option 3 might be inappropriate when using the 798A during a rally, the option can be enabled or disabled as needed.

To enable option 3 follow this procedure: turn on the 798A while holding down both the **SHIFT** switch and the "minus" position of the "**+ / –**" **1.00** toggle switch. Once enabled, option 3 will be active whenever you turn on the 798A. When you want to disable option 3, repeat the "**SHIFT**" and "**– 1.00**" toggle switch turn-on procedure.

You can determine whether or not option 3 is enabled by observing the **CALCULATED TIME** and **CLOCK** displays. If the hour before one o'clock is displayed as "0" hours (rather than "12"), then option 3 is enabled.

Displaying the Timing Error in the AUXILIARY display

To show the timing error in the main computer **AUXILIARY** display, select **TIME** on the **TIME–Δ–ODO** switch, and either **Adj ORM**, **Next Speed**, **Calc Time**, or **Odometer** on the rotary switch.

The timing error shown is the same as that displayed in the **ERROR** display of the driver's module. However, because you can choose different time display formats (seconds/hundredths, units/tenths, etc.) for the main and remote displays, the two error values may visually appear different. Nevertheless, the actual error magnitude is the same.

When the 798A is split, the timing error in the **AUXILIARY** display is split, whereas the error in the driver's module is not.

Important! When option 3 is active, the Auxiliary Calculated Time cannot be seen in the **AUXILIARY** display of the main computer because the timing error is shown in its place.

Note: When option 3 is not enabled, the timing error is still visible in the main unit's **AUXILIARY** display when "Δ" is selected on the **TIME–Δ–ODO** switch if (and only if) the 798A is split and **Next Speed** is selected on the rotary switch.

The Event Timer and Calculated Time Counter

With option 3 enabled, the time of day clock becomes a twelve-hour event timer. This timer counts from 0:00:00.0 to 11:59:59.9 (or 11:59.99.9 when operating in the "hundredths of minutes" mode).

Similarly, the calculated time becomes a twelve-hour calculated time counter. The calculated time counter also counts from zero.

Resetting the Error, Event Timer, Calculated Time, and Odometer

When you are viewing the error in the **AUXILIARY** display, activating the **RESET** function will force the error to zero. This is accomplished by resetting both the event timer and calculated time counter. The odometer is also reset to zero.

As long as you hold the **RESET** switch up, the error, event timer, calculated time, and odometer will be kept at zero.

Simultaneously resetting the error, event timer, calculated time, and odometer during practice runs makes it easy to measure timing errors that accumulate during a course maneuver. The technique is simple: Prior to the start of the maneuver, actuate and hold the **RESET** switch. At the start of the maneuver, release the **RESET** switch. When the maneuver is complete, split the 798A. Then record the timing error, elapsed time, computed time, and distance traveled during the maneuver.

NOTICE!

Special Firmware for Setting CASTs with 0.01 MPH Resolution

Option 6 firmware in your Timewise 798A allows you to set average speeds (CASTs) with a resolution of .01 miles per hour. All other functions in the 798A operate as usual.

Setting Speeds with 0.01 MPH Resolution

In a standard 798A, the "**+ / – .01**" toggle switch is inactive when setting a **SPEED** or **NEXT SPEED** value. The "**.01**" toggle switch is made inactive because the displays show a maximum resolution of **0.1** mile per hour.

Although is it rare for a rally speed to be given with higher resolution, there may be situations (such as emergency speeds that are a percentage of the original CAST) when setting a speed with **0.01** mile per hour resolution is desired.

With option 6 firmware, the adjustment lock-out of the "**+ / – .01**" switch is removed, and you can set the non-visible "hundredths" digit (the "**– – . – x**" digit) of the **SPEED** or **NEXT SPEED** parameters. (This extra resolution is not available in the 0 to 399 speed range.)

When you adjust the hundredths digit for the **SPEED** or the **NEXT SPEED** to any value other than "**0**", the far right radix point in that speed display will illuminate. In addition, as of version 5.004 firmware, the hundredths digit will momentarily flash every four seconds in place of the other digits of the set speed. In case you lose track of the numerical value of the hundredths digits, just wait for up to four seconds and the hundredths digit will be briefly shown in the display.

You can also see the hundredths digit of the **SPEED** display in the driver's **AUXILIARY** display. To do so, display the current CAST in the driver's **AUXILIARY** display. On 798A's with option 6 installed, the displayed CAST will be shown to **0.01** miles per hour resolution.

If you increment (or decrement) the **SPEED** or the **NEXT SPEED**'s hundredths digit 10 times, you will see the tenths digit change appropriately.

A quick method to set a speed's hundredths digit to zero ("**xx.x0**") is to change any other digit in the speed display. When you do this, the 798A will automatically "set to zero" the hundredths digit of the speed display being adjusted. That is, whenever a "**+ / – 10.00**", "**+ / – 1.00**", or "**+ / – 0.1**" toggle switch is activated (while adjusting a speed), the 798A automatically truncates the speed to **xx.x0** resolution.

As a result, in order to set a speed with a hundredths digit value other than "**0**", you must first set all the other digits to their required values. Then, lastly, adjust the hundredths digit. Were you to set the hundredths digit, and subsequently change any other digit in that speed display, the hundredths digit will automatically be returned to zero ("**0**").

When you execute a CAST, the hundredths digits are transferred between the **NEXT SPEED** and **SPEED** displays. Thus, you can set a next speed with high resolution and transfer that value to the active speed upon a CAST. Likewise, the value in the **SPEED** display is transferred to the **NEXT SPEED** display...including the non-visible hundredths digit.

As a safety measure, the 798A does not repeatedly increment (or decrement) the hundredths digit of the speed displays when the **.01** switch is held in place for more than a half second. You must activate the switch multiple times to change the hundredths digit multiple counts.

Setting the Odo & Time Calculation Speed with 0.01 MPH Resolution

The hundredths digit adjustability also applies to the calculation speed used by the **Odo & Time** function. That is, while using the **Calc Speed** function, the **.01** toggle switch will be active. As when setting the current speed and next speed values, the hundredths digit will momentarily flash every four seconds in place of the other digits of the **Odo & Time** calculation speed.

Also, as before, activating a "**+ / – 10.00**", "**+ / – 1.00**", or "**+ / – 0.1**" toggle switch (while adjusting the calculation speed) automatically "zeros" the hundredths digit.

Setting the Preset Data Speed with 0.01 MPH Resolution

Lastly, the hundredths digit adjustability also applies to the speed you can load for the **Preset** function. In this case, however, because the **AUXILIARY** display has a "hundredths" digit, you can see the extra digit of resolution at all times as you set the preset speed.

As before, activating a "**+ / – 10.00**", "**+ / – 1.00**", or "**+ / – 0.1**" toggle switch (while adjusting the preset speed) automatically "zeros" the hundredths digit.

NOTE:

The hundredths digit is not saved in the datalog. As a result, when viewing logged data, a speed recalled from the log and shown in the Speed display will not illuminate the far right decimal point. That is, the log does not indicate that a high resolution speed had been in use.

Disabling and Re-enabling Option 6

Because the features provided by option 6 might not be desired at all times when using the 798A, the option can be disabled and re-enabled while turning on the 798A.

To disable option 6 follow this procedure: Turn on the 798A while both the **SHIFT** and the "plus" position of the "**+ / – 0.01**" toggle switch are activated. Option 6 will thereafter be disabled. When you want to re-enable option 6, repeat the "**SHIFT**" and " **+ 0.01**" toggle switch turn-on procedure.

NOTICE!

Special Firmware for Adjusting the Driver's ERROR Offset Bias

In a standard 798A, a fixed offset bias can be added to the driver's **ERROR** display. The discretionary application of this offset adds a fixed positive 0.45 seconds (or 0.45 hundredths) to the driver's error value. See page 60 in the Instruction Manual for details.

Option 9 firmware in your Timewise 798A allows you to apply a offset bias of an amount you choose to the driver's **ERROR** display. The offset bias is adjustable from + 0.9 to – 0.9 units (seconds or hundredths).

Whether or not you use the offset bias, and the amount you apply, is a matter of personal preference.

Adjusting the ERROR Offset Bias for the Driver's Display

To adjust the offset bias, turn the rotary switch to **CALC TIME**, and hold the **SHIFT** switch down. Then activate the "**+ / –**" **0.001** switch, up or down. Each time you do this, the bias will change by 0.1 second (or 0.1 hundredth). While making the adjustment, the calculated time display will show the current setting:

biAS .9
biAS .8
:
biAS .0
:
biAS – .8
biAS – .9

A bias of zero means that no offset is being applied to the driver's **ERROR** display.

The timing units, seconds or hundredths, for the offset bias are the same timing units as chosen for the driver's **ERROR** display.

After setting an offset for the driver's **ERROR** display, a radix point at the far right of the calculated time will be illuminated (e.g., **12:59.999.**). When a bias of zero is selected, the radix point will not be illuminated (e.g., **12:59.999**). Whenever you wish to confirm the actual amount of the applied offset, actuate the **CALC TIME/SHIFT** switch combination.

A positive offset bias is like a permanent "pause". That is, if the offset is positive, and you cross a checkpoint timing line with the driver's error reading **0:00.0**, you will actually arrive late by the offset amount you select (from 0.1 to 0.9 seconds/hundredths).

A negative offset bias is like a "gain". That is, if the offset is negative, you'll arrive early (0.1 to 0.9 seconds/hundredths) if you cross the timing line with the driver's error at **0:00.0**.

Note!

The offset bias visually shifts the driver's **ERROR** display. It does not alter either the calculated time or the time of day clock. The split error that can be seen in the **AUXILIARY** display is also not affected. Data recalled from the optional datalog, or displayed upon activation of **Last Split** or **LAST CAST**, are also unaffected.

Selecting an Appropriate Offset Bias

When you arrive at a checkpoint at what you know to be the perfect time, there is still a chance your arrival will be recorded as one count early or late. This may not be the fault of the timing crew. Rather, it can be the result of imperfect correlation between the 798A clock and the checkpoint clock. Limited display resolution and basic uncertainties affect all timing systems. The electronic response time of checkpoint triggering hardware can also be at fault.

For example, even when everyone's clocks are supposedly in "perfect synchronization", arriving at a checkpoint exactly when a second ticks might be recorded as one count early. This is due to timing uncertainties within the clocks. To counter this problem, rallyists often run "a little late" by inserting a positive offset (a slight "pause") into the driver's error. The theory is that even though the driver's display is showing **0:00.0** as you cross the checkpoint in-line, the slight positive offset will actually make you arrive a fraction of a count late. This helps you arrive "within the count" intended by the rallymaster.

As mentioned, a standard 798A can insert a fixed positive bias of 0.45 seconds (hundredths). Many rallyists feel this "pause" offset improves their chances of zeroing the checkpoint.

On the other hand, rallyists also know that checkpoint workers typically exhibit a small delayed reaction as they split a checkpoint clock when a car crosses a timing line. A slight negative offset (a "gain") can be used to account for such a "late" split.

And if the rallymaster hadn't located the timing line exactly at the truncated mileage used in the official course calculations, an additional level of a negative offset would be needed.

Further, when a pneumatic hose is used at a timing line, there is generally a small delay as air compresses within the hose. Here again, a slightly negative offset is needed.

Finally, even a checkpoint mirror system that dramatically darkens as a rally car passes (as the vehicle interrupts a reflection of the bright sky) can produce a late split. No checkpoint worker can react instantly as the mirror changes from bright sky to dark car silhouette. Plus, the fact that such systems often locate workers a slight distance from the timing line aggravates the problem. Anticipating when a distant oblique angled mirror will darken can be difficult. To compensate for this delay, a slight negative offset may be needed.

OK…What's the Bottom Line?

So how much offset bias should be used, and in which direction? It's up to you. Option 9 allows you to adjust for the uncertainties within all checkpoint timing equipment. And your knowledge of human response time and the experience level of regional checkpoint workers may dictate whether or not an offset is needed during a specific rally.

Confirming Operation of the Offset Bias

OK, so you've decided to use the error offset, and you want to be sure the system works as you'd expect. Here's a simple test which you can use to see the offset bias in operation.

First, select the timing mode for both the main and driver's module as "tenths of seconds". This is so that the time displays do not count as fast as they would in "thousandths of minutes". This makes it easier to read the display values.

Then adjust the calculate time to display an exact even minute (**xx:xx.000**). This step is not absolutely necessary, but it does make subtraction easier should you wish to compute the error yourself. Also, select a + 0.5 or – 0.5 offset bias. This, too, will make it easier to compute "on-the-fly" comparisons between the driver's **ERROR** and the split error in the main computer's **AUXILIARY** display.

Then set the **CLOCK** to a value that is a minute or so behind the calculated time.

Finally, select **NEXT SPEED** on the rotary switch and put the **AUXILIARY** display selection toggle is in its middle position. This lets you capture a split value of the error. As mentioned, the split error will not have the bias offset applied to its value.

Now watch the driver's **ERROR** display count down. When the error on the driver's display reaches **:00.0**, split the 798A.

Look at the error value in the **AUXILIARY** display. The split error shown there will confirm the offset you selected. If the offset was + 0.5 (in effect, you inserted a small "pause"), the split error will be **– :00.5**, indicating that you are actually late.

If the offset was – 0.5 (in effect, you inserted a small "gain"), the split error will be **:00.5**, indicating that you are actually early.

To do another comparison, add an exact minute or two to the calculated time and wait for the error to count down to zero again.

You need not wait until the driver's error reaches **:00.0**. After a few attempts, you'll become comfortable splitting at any driver's error value and comparing that value to the split error in the main computer's **AUXILIARY** display.

Making this comparison is easy whether the offset is positive or negative, *providing the driver's error is between* **:03.9** *and* **– :03.9**.

However...

When the magnitude of the error is greater than or equal to 4 full counts, there is a counting oddity that you might notice. Here's what you might observe:

Recall that when the driver's error is greater than or equal to 4 units (seconds or hundredths), the error is displayed with a resolution of only "whole units". Since the driver's display is not showing tenths of seconds (or thousandths of minutes), you can get a false perception of the error's real value.

For example, when the driver's error decrements from **:06** to **:05**, it is actually changing from :06.0 to :05.9 – but you cannot see the ".9". That is, the error really changed by 0.1 count even though it appeared to change by a whole count. If you split the 798A at that moment, you might be splitting 0.9 earlier than you expected.

As a result, if you compare the driver's **ERROR** display to the split error in the **AUXILIARY** display (or compute the difference between the clock and calculated time), the following will be observed:

With an offset of zero, splitting the 798A at the exact moment the error decrements (to a positive whole number) will freeze the time of day clock 0.9 earlier than anticipated. In the example above, when the error visibly decrements from **:06** to **:05**, the error is still actually :05.9, and the clock would have been split 0.9 early.

Now what happens if you use an offset of + 0.9? The offset makes you run 0.9 late. As such, if you split just as the driver's error decrements (to a positive whole number), the time of day will be split 0.9 counts later than it would have without the offset bias in use. In this situation, the difference you compute between the time of day clock and the calculated time will match the "whole units" error you see the driver's display. Thus, to continue with the example above, when the offset is + 0.9 and the driver's error visibly decrements from **:06** to **:05**, the true error really is :05.0. The split clock will be exactly as you expect.

And if you do this test with an offset of – 0.9, splitting the 798A just as the driver's error decrements (to the next positive whole number) will actually freeze the time of day clock 1.8 units early. The negative offset of – 0.9 (a "gain" of 0.9), plus the fact that you split 0.9 counts early (when the error just decrements from **:06** to **:05**), adds up to 1.8 counts early.

Now let's consider what happens when the remote display is showing a whole negative error (i.e., a negative error is greater in magnitude than – 3.9).

Let's assume the bias is set to 0.0, and the driver's display is changing from **–:05** to **–:06** (actually – :05.9 to – :06.0). If you split exactly when the error changes, a zero bias setting would show the frozen time of day clock exactly as you'd expect…the observable difference between the time of day clock and the calculated time will be exactly 6 counts.

Had you selected a positive bias of + 0.9 and split exactly when the error changed from **–:05** to **–:06**, you will be 0.9 counts late on the time of day clock…exactly what you'd expect.

Finally, if you use a – 0.9 bias and split exactly when the error changes from **–:05** to **–:06**, you will arrive 0.9 early on the time of day clock…again, exactly what you'd expect.

What is important to note is that regardless of whether the offset is positive or negative, when the driver's error is between 3.9 and – 3.9, (i.e., the error is shown with the extra digit of resolution) you will observe the offset bias system operating as you'd expect. Likewise, when the error is more than 4 counts negative, the offset operates as you'd expect.

But if the error is greater than 4 counts positive when you split, you may feel that the offset bias is not working properly. However, it is the lack of "tenths of units" in the driver's **ERROR** display that is misleading you.

Here's another easy way to confirm that the ERROR offset bias is working.

Lastly, here's another simple way to confirm operation of the offset bias.

Set the calculated time to an exact even minute (**xx:xx.000**).

Then hold the driver's module next to the main displays and watch the counting rhythm of the driver's **ERROR** and the **CLOCK**. The clock and error will count in unison when the offset is zero. Otherwise the error will lead or lag the clock by the amount of offset you select.

A positive offset will make the error lead the clock.

A negative offset will make the error lag the clock.

NOTICE!

Special Firmware for automatically executing a CAST at a preset distance

Option 11 firmware in your Timewise 798A allows you to preset a distance at which a CAST is automatically executed. The rally speed that is used upon execution of the CAST is also preset. This optional feature for the 798A is called an “AutoCAST”.

AutoCAST is useful when the rally instructions give both a distance and a new rally speed at which an instruction is to be executed. You can enter such information into the 798A before the main odometer reaches the instruction execution point. When the odometer matches the preset value, a CAST is automatically executed without any intervention.

Entering the AutoCAST distance and new speed

The AutoCAST function uses the value in the **Preset** distance memory while making its comparison to the main odometer. The new CAST that will be used (inserted into the **SPEED** display) upon the AutoCAST execution is the value set in the **Preset** speed memory.

To set the AutoCAST distance, turn the rotary switch to **Preset** and place the **TIME–Δ–ODO** toggle switch in the **ODO** position. The preset distance will be shown in the **AUXILIARY** display. Use the “**+ / –**” toggle switches to adjust the preset distance.

To set the AutoCAST speed, turn the rotary switch to **Preset** and place the **TIME–Δ–ODO** toggle switch in its center “delta” (the “Δ” symbol) position. The preset speed will be shown in the **AUXILIARY** display. Use the “**+ / –**” toggle switches to adjust the preset speed.

Once a preset distance has been set, you must rotate the rotary switch away from the **Preset** position…even if just momentarily…before the 798A begins to compare the distance in the main odometer to the preset distance.

VERY IMPORTANT! New as of Version 5.010 Firmware

As of version 5.010 firmware for the 798A, an important modification has been incorporated into the AutoCAST functionality.

Although the 798A will continuously compare the main odometer to the preset distance when an AutoCAST preset distance is set, as of version 5.010 firmware the AutoCAST will be executed only if the **Preset Calculated Time** is hidden from view (i.e., replaced by dashes “– – – – – –“ in the **AUXILIARY** display). To hide the preset calculated time, momentarily select **RESET** while viewing the preset calculated time. (Page 52 of the instruction manual gives details on “hiding” a preset value.)

To repeat: As of version 5.010 firmware, the **Preset Calculated Time** must be hidden from view (i.e., replaced by dashes “– – – – – –“ in the **AUXILIARY** display) to enable AutoCAST functionality. Or, to state it with the opposite reasoning, if the preset calculated time value is not hidden, the AutoCAST function will not be executed.

When the main odometer matches the preset distance - providing the preset Calculated Time is hidden from view - an AutoCAST is automatically executed. At that time the beeper will sound for approximately one second.

After an AutoCAST is executed, you must change the preset distance before the function will operate again.

Disabling the AutoCAST option

As just discussed, the preset calculated time (set in the **AUXILIARY** display while the **TIME–∆–ODO** toggle switch is in the **TIME** position) must be hidden from view to enable the AutoCAST function. That is, if the preset calculated time value is not hidden, the AutoCAST function will not be executed.

Another way to disable the AutoCAST function is to set a preset distance to a value that is far outside the expected distance the main odometer will reach (e.g., 900 miles).

A third way to disable the AutoCAST function is to hide from view either the preset distance or the preset speed. If either the preset distance or the preset speed are hidden, an AutoCAST will not occur when the preset distance and main odometer match. If you make both the preset distance and preset speed visible after the main odometer has counted beyond the preset distance, the AutoCAST will still not be executed.

The original Preset Load function can still be used

The AutoCAST function does not preclude the use of the original **Preset** function. The same distance and speed values you set for the AutoCAST, as well as the preset calculated time, can be loaded into the 798A via the **Preset** function's "**SHIFT – CAST to Load**" procedure. See page 52 of the instruction manual for a detailed description of the **Preset** function.

Please take note that after setting predetermined values for use with the original **Preset** function, it is possible to accidentally execute an AutoCAST should the main odometer eventually match the **Preset** distance. As stated earlier, "hiding" the preset distance or preset speed will disable the AutoCAST function altogether.

The AutoCAST distance resolution

Note that the AutoCAST preset distance can be set to a resolution of "thousandths of miles". However, even though the thousandths digit can be set to something other than a "0", the AutoCAST function only uses "hundredths of miles" when it compares the preset distance to the main odometer. The "thousandths" digit is completely disregarded by the AutoCAST function.

The reason for allowing a preset distance to be set to "thousandths" is so the original **Preset** function can load such a precise value into the main odometer.

But why, you may ask, does the AutoCAST option only use "hundredths" resolution when making the mileage comparison? Here is the reason…

A magnet sensing transducer system that uses two magnets mounted on a wheel generally requires that you set an odometer factor somewhere around 065000. If one of the two magnets should dislodge during the rally, the factor would need to be doubled...in this case to 130000...so you could continue running.

With a factor of 130000, each pulse adds 0.00130000 to the odometer. Therefore, the odometer's counting sequence, starting from 0.000 miles, for example, would be (internal digits are in parentheses):

0.000 (00000)
0.001 (30000)
0.002 (60000)
0.003 (90000)
0.005 (20000)
etc.

Because each pulse represents a distance of slightly greater than 0.001 mile, the odometer visually skips a count of 0.004 miles. No measuring system would ever display 0.004 miles when a vehicle travels 0.00130000 miles between odometer transducer pulses.

Therefore, if the AutoCAST system required a match in the "thousandths" place, and the preset distance were set to 0.004, the main odometer and preset distance would never match. The AutoCAST would never be executed.

Fortunately, the AutoCAST system disregards the thousandths digit, and the automatic CAST would occur as expected.

Note that even if the preset distance has a value other than "0" in the thousandths place, the AutoCAST will be triggered as soon as the higher order digits match. For example, an AutoCAST distance setting of 50.009 miles will be executed as soon as the odometer reaches 50.000 miles. To confirm this after the AutoCAST is executed, you can use the **LAST CAST** function to observe that the CAST was actually triggered at a distance of 50.000 miles.

If the rallymaster had, in fact, stipulated that the CAST was to executed at 50.009 miles, use the **LAST CAST** Post-Alignment feature to correct the CAST mileage to the value desired...including the thousandths digit.

It should also be mentioned that when an AutoCAST does occur, the main odometer is not changed in any way. The odometer retains its full original value, including all of its internal digits (i.e., the non-visilble internal five digits: **– – –.– – – xxxxx**) just as it does upon execution of a manual CAST. This differs from a **Preset** load where the main odometer is truncated to thousandths of miles upon the distance being loaded (**– – –.– – – 00000**). (Again, see page 52 in the instruction manual for a detailed description of the **Preset** function.)

Logged AutoCAST information

Lastly, note that when reviewing data in the 798A's optional datalog, an AutoCAST execution is identified by the word "**Auto**" in the **AUXILIARY** display. This distinguishes an AutoCAST from a manual CAST which is identified by the word "**CASt**".

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Copyright and Trademark Notification for this Manual and the Operating Firmware of Timewise Equipment

Limitation on Warranty and Liability

Timewise warrants this equipment to be free from defects in material and workmanship for a period of two years from the date of shipment to the original purchaser. This warranty is limited to the repair and replacement of parts and the necessary labor and services required to repair the equipment. This warranty is made in lieu of all other expressed or implied warranties, whether written or oral.

Except as specified below, this warranty covers all defects in materials and workmanship. The following are not covered: Damage as a result of accident, misuse, abuse, or as a result of installation, operation, modification, or service on the equipment; damage resulting from failure to follow instructions contained in the User's Manual; damage resulting from the performance of repairs by someone not authorized by Timewise; damage caused by direct exposure to liquids, solvents, salty air, or corrosive gases; damage caused by exposure to excessive amounts of dust or dirt; damage caused by exposure to temperatures above or below the storage or operating limits of the equipment; or normal wear of the instrument enclosure, connectors, or cables.

While under warranty, Timewise will service, repair, replace, or adjust any defective part(s) free of charge, when the instrument is returned freight prepaid to Timewise. The purchaser is responsible for insuring any equipment returned, and assumes the risk of loss during shipment.

Limitation of Implied Warranties and Exclusion of Certain Damages

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

In no event will Timewise be liable to the purchaser or any user for any damages, including any incidental or consequential damages, expenses, lost profits, lost savings, lost income, or other damages arising out of the use or inability to use this equipment. This exclusion includes damages that result from any defect in the firmware or manual.

How to Obtain Repair Service

If your Timewise equipment requires service, return it to Timewise directly. Do not return it to your dealer. Include a detailed description of the problem. Timewise must be able to verify the problem in order to repair it. Please include telephone numbers at which you can be reached during the day and evening.

Equipment to be repaired must be returned freight prepaid to Timewise. All equipment must be packaged with sufficient protection against shipping damage. You are responsible for transportation charges when returning equipment to Timewise. Insuring the shipment is recommended. Warranty repairs will be returned via UPS ground freight prepaid. Non-warranty repairs will be returned via UPS ground COD (repair charges, freight, and COD collection fee), cash only, unless prior arrangements have been made. Alternate shipping methods can, or will, be used as necessary to assure a prompt and safe delivery.

Repairs on equipment beyond the effective date of warranty or when abnormal usage has occurred will be charged at applicable rates. Timewise will submit an estimate for such charges before commencing repair, if so requested.

Disclaimer

Although every effort has been made to make this User's Manual technically accurate, Timewise assumes no responsibility for any errors, omissions, inconsistencies, or misprints within this document.

For Further Information

Please feel free to contact Timewise should you have any comments about this equipment. We encourage suggestions for product improvements. Special applications or customization of Timewise equipment to individual needs will also be entertained.

TIMEWISE
32 Old Barn Road
Hawthorn Woods, Illinois 60047 USA
(847) 550-5052

Users Manual 1001–798A Rev 7.000 July 30, 2019

THANK YOU...

for choosing the Timewise 798A Class A TSD rally computer! Your Timewise 798A is the most powerful and sophisticated rally computer ever developed. Its unparalleled accuracy, versatility, ease of operation, and rugged construction give you the competitive edge.

This manual will guide you during installation of the 798A and teach you the function of each control on the instrument. The information presented in this manual is structured for first time users of electronic rally equipment, so even basic procedures used to install and operate rally equipment are presented.

If you've used traditional rally computers, you'll really appreciate the improved quality, additional features, and expanded resolution provided by the 798A. There are some new features in the 798A that bring significant benefits to the world of rallying, so please take the time to learn all of its capabilities.

What This Manual Will Tell You

- what the 798A does
- mounting procedures for the 798A
- how to electrically connect the 798A
- what an odometer transducer is and how to install one
- the function of each switch on the 798A
- how to use the features of the 798A
- simple troubleshooting and how to prevent problems

How to Use This Manual

For a brief description of what the 798A does, read the **INTRODUCTION**. Study the **INSTALLATION** section of the manual for suggestions of various 798A mounting methods. Then carefully follow the electrical connection procedure for safe and dependable operation of the instrument.

The **INSTALLATION** section also describes odometer transducers and how distance is measured. Here you will find several guidelines to assist you in the proper selection of an odometer transducer, suggested mounting locations, and recommended installation procedures.

The section covering the **OPERATION** of the 798A will teach you the meaning and use of each switch on the instrument. Some brief examples of specific applications are given in the section on **APPLICATIONS**.

Technical references are given in the **APPENDICES**. Here you can find information on rear panel connections, how to adapt custom made transducers, and specifications of the 798A. Please read the discussion in **Appendix B** about preventing problems and troubleshooting.

Also, take note of the **Quick Reference Guide** in **Appendix J** that briefly describes most of the procedures required to operate the 798A.

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- External activation of Park, CAST, and Split (Taylor split of auxiliary odometer)
- Battery backed Real Time Clock
- Built-in odometer input frequency divider for direct hook-up to OEM odometer signals
- Easy-to-use, ergonomic design with non-slip toggle switch actuators
- Sturdy metal case with mounting bracket
- EMI/RFI protection designed-in

FOR YOUR INFORMATION...

The 798A is designed with the demanding requirements of professional road rallying in mind. Non-slip switch actuators on detent action toggle switches give positive operator feedback, even on the worst of roads. Switches are logically grouped by function and are placed far enough apart so that accidental activation of the wrong switch is minimized. A single rotary switch eliminates a confusing array of closely spaced pushbuttons, some of which would only be used infrequently during a rally.

All course parameters are shown on ultra-bright 0.4" tall LED displays to assure easy readability, even in bright light. For nighttime use, the LEDs can be dimmed to lower intensity levels.

The use of large scale integrated CMOS technology keeps component count and power dissipation to a minimum, while simultaneously providing increased reliability. The 798A uses a microcomputer designed for industrial environments where speed, efficiency, adverse ambient conditions, and electrical noise play a significant role in product specification and selection. Every safeguard was used to assure continual operation in the harsh environment of a rally vehicle.

What the 798A Does

The 798A rally computer provides the rallyist with precise distance and time information needed during the course of a rally. A quartz crystal oscillator and full featured, custom programmed microcomputer control all functions of the instrument.

Dual odometers measure distance to a resolution of 0.001 mile. Distance on the main odometer reads a maximum 999.999 miles before reverting to 0.000 miles. An auxiliary odometer also reads to 999.999 miles. These two odometers count up or down in unison, or they may be frozen (parked) at their current values. The odometers may be separately adjusted to any value, and independently reset to zero.

Two odometer inputs are provided. There are also two adjustable odometer factors per input: one for dry pavement, the other for gravel or snow. Distance measuring accuracy is assured by the use of a six-digit factor, allowing adjustments to one part in one hundred millionth of a mile. An odometer input pulse signal conditioner/divider allows you to connect the odometer input of the 798A directly to high pulse rate electronic speedometer signals now available on many vehicles. Automatic odometer factor calculation is also provided.

Time of day is displayed in hours, minutes, and hundredths/thousandths of a minute (12:59.999). Optionally, the rallyist can select the standard format of hours, minutes, and seconds/tenths (12:59:59.9). This time of day clock can be set to any hour, minute, or hundredth (second). You can switch between counting in hundredths or seconds at any time; and, you can synchronize the beat of the clock to a time standard at any time. If a Timewise multi-split checkpoint clock is accessible, the 798A can be automatically synchronized to the checkpoint clock via a simple cable connection.

A battery-backed real time clock (RTC) is standard. This feature keeps the clock counting whenever primarily power is removed from the 798A.

Another display shows the ideal time of arrival at every point along the rally course. This calculated figure is derived from distance measurements taken by the 798A, and from course speeds (CASTs) entered into the 798A by the rallyist. The calculated time can be held at its present value even while measuring distance, thus providing transit zone and warp speed capabilities.

The computed course time is also used to provide a calculated time stopwatch. This auxiliary time display will measure an ideal course time between any two points.

A remote driver's module displays a driving time error of –9.999 to 59.999 minutes (optionally, minutes:seconds.tenths). This constantly updated figure is computed from the data in the real and calculated time clocks within the 798A. Keeping this figure at 0.000 means you are "on time".

A second display in the driver's module can show one of the following: the active CAST, the vehicle's actual speed (resolved to 0.1 mph), the difference between the CAST and your actual speed, the countdown distance to a predetermined alarm mileage, a duplicate of the main odometer, or a duplicate the auxiliary odometer. Vehicle speed is mathematically corrected to official course mileage and is updated approximately twice per second.

A split mode visually freezes all parameters on the main computer. After having released the 798A from the split mode, figures update to current values. A data recall mode lets you subsequently recall the latest split values. Parameters displayed in the driver's module continue to update whether or not the main computer is split.

After switching to a new CAST, you may subsequently change the CAST value to correct an erroneous entry. Two CAST displays are provided: one for the active speed, and the other for the next expected speed.

Virtually all parameters within the 798A can be altered by the rallyist, either independently or in combination. For example, when correcting the main odometer, automatic computation and entry of a correction for course time is possible. Changes can be made while course parameters are split or free running. A confirmation of the change is available in a resettable "amount of change" display.

Subsequent to a CAST change, you may recall values that were present in the 798A at the moment of that CAST. Further, you can adjust the CAST execution mileage to a new value and the 798A will automatically correct the calculated time, appropriately using the old and new CAST speeds in the re-computation.

As an option, the 798A can be supplied with a battery backed datalog memory that will store parameters present upon execution of the last 56 Splits and CASTs. You can review this logged data at any time via the front panel. Another option provides an RS-232C serial interface, allowing you to download the logged data to a printer or computer.

Lastly, rear panel inputs allow you to remotely execute a CAST, remotely split all values (with internal reset of the auxiliary odometer to zero), or remotely enter the Park mode.

WHEN YOU'RE READY TO BEGIN…

Plan on spending an entire afternoon installing the 798A. Some transducer installations require that you wait overnight for epoxy to fully cure, so make allowances for that time, too. You will also need to spend additional time learning how to use the instrument.

Do not attempt to run a rally on the same day you install the 798A. In fact, it is highly recommended that you use the instrument under simulated rally conditions before running an actual rally. Without the pressure of having to stay on time, familiarization and confidence in the instrument will develop rapidly. As with everything else: Practice Makes Perfect. When you are comfortable using the 798A, you will be able to concentrate on navigating the rally course rather than the front panel of the instrument.

IMPORTANT! READ THIS BEFORE YOU BEGIN!

Do not mount the 798A in such a location where it may interfere with the possible deployment of a supplemental restraint airbag system present in the vehicle!

Mounting the 798A

The 798A can be mounted by fastening the bracket provided to the vehicle dashboard using screws or bolts. The bracket has several pre-drilled holes, but you may want to drill others. When selecting bolts for mounting, note that the head of a large bolt may interfere with the bezel of the 798A when it is tilted, perhaps making final positioning difficult. Two or three #12 pan head tapping screws (you may need washers) usually provide sufficient mounting stability, without causing any interference. Use short screws that won't damage wiring or ductwork, or interfere with any airbag system or controls below the surface of the dashboard. Drill shallow pilot holes for the same reason. If you examine the dashboard, you may find that you can hide the mounting holes along the edge of decorative trim or camouflage them within the design. When the bracket is removed later, you don't want your "bodywork" on the dashboard to ruin the appearance of the vehicle.

Many rallyists prefer Velcro® fastening strips to attach the mounting bracket to the dashboard. Velcro is available at most hardware stores. Purchase Velcro with pre-applied adhesive on its back, rather than the style that requires an application of glue. Glue often fails after a short time because of temperature extremes within the vehicle. The glue also leaves a hard to clean mess when you remove the strips later.

Another attachment method is to use Scotch™ brand (3M) double-sided adhesive foam tape (picture hanging tape). This material forms a more rigid mount than Velcro strips. Applying two or three short strips of foam tape, instead of a single long piece, allows the bracket to straddle a slightly curved surface on the dashboard.

If you do use either Velcro or foam tape for mounting, thoroughly clean the area of the dashboard where you intend to apply the strips. Adhesives will not reliably stick to surfaces contaminated with dirt or oil. Vinyl conditioners must be completely removed. Use a good household cleaner or mild solvent. ***Caution!*** *Some solvents may damage the dashboard!*

To remove Velcro or foam tape from the dashboard after its adhesive has baked in the sun, Timewise suggests you apply a general purpose cleaner. Isopropyl alcohol will usually soften dried-on, hardened adhesive, allowing you to completely remove the Velcro or tape. Cleaners that are more aggressive are available at industrial electronic suppliers. ***Caution!*** *Some formulations use chemicals that will destroy plastics!* A blend of isopropyl alcohol and denatured ethyl alcohol usually is not a problem. Do not use cleaner formulations that contain unspecified lubricating oils and additives without thorough testing. Sometimes damage to plastics will show up only after a while, and then it can be disastrous.

When selecting a mounting location, avoid placing the 798A high on the dashboard out of easy reach. Most navigators cannot comfortably operate the instrument with an extended arm. A lower position, perhaps just above the glovebox, usually provides easier access. Such a location is also out of sunlight much of the time, thereby keeping the instrument cooler. Choose a location that will not present a safety hazard during hard braking or sudden turns.

As an alternative to mounting the 798A on the dashboard, some rallyists place it within the glovebox. Such a location can provide a degree of security against theft. However, heat generated by the instrument will be confined to the close quarters of the glovebox. Fresh air is needed to cool the 798A. (Please read **Appendix B** for warnings about overheating.) Note that the driver may have difficulty glancing at the displays if they are partially hidden within the glovebox. In addition, it may be difficult to reach the power switch on the rear panel.

The 798A driver's module is generally mounted with Velcro. The mounting location does not necessarily have to be on top of the dashboard directly in front of the driver. Some rallyists position the module slightly to one side of the instrument cluster or place it on the steering column in front of the instrument panel.

When locating the driver's module, avoid laying the cable that attaches it to the 798A directly over a blower motor that may be located within the dashboard. Blower motors radiate incredible amounts of electrical interference that can enter the cable and cause a malfunction in the 798A. (See **Appendix B** for more details.)

Regardless of the mounting method you select, make certain both the main computer and driver's module are mounted securely. If they are loosely attached, they may become dislodged by a bump, sudden acceleration, or hard braking. Also, avoid mounting them at such an angle that sunlight reflects off the panels into your eyes. Don't forget this warning when installing the 798A while in a garage or at night.

Electrical Connection

The 798A operates from a nominal 12 volt, negative ground vehicle supply. A voltage range of 8 to 15 volts is tolerated continuously. Additional allowance is made for short duration drops to 7 volts, as well as the high voltage transients typically found in a vehicle.

WARNING!

Do not connect the 798A to a positive ground vehicle! Also, do not connect the 798A to a 24 volt electrical system!

If your vehicle uses a positive ground, or operates on 24 volts, return the 798A to Timewise for modifications that allow operating under these conditions.

IMPORTANT! You Must Properly Ground the 798A!

There are three electrical connections that you should make to assure proper operation of the 798A. In addition to the standard positive and negative electrical connections, it is also important to attach a heavy gauge ground wire to the .250" male spade lug terminal on the rear panel of the instrument. A proper ground assures that electrical noise and static discharges to the front panel of the 798A are dissipated along a path that doesn't interfere with the power supplied to the instrument. If you do not properly ground the 798A, it may fail in the presence of radio transmissions and other electrical noise.

Grounding the 798A is accomplished in a similar manner to grounding the radio in your vehicle. All you have to do is run a length of heavy gauge wire from the rear panel to a nearby screw or bolt on the chassis. The heavier gauge the wire, the better. You can't get too thick. Also, the shorter the wire, the better. **A foot is long, here. Three feet is too long!**

The power connections of the 798A must also be made with the utmost of care. The black wire must be connected to the negative (–) potential of the battery. The red wire must be connected to the positive (+) potential of the battery. The red wire must make continuous contact to a circuit that is not switched off anytime during driving, starting, or parking. Attaching both leads securely is mandatory. ***Do not use a cigarette lighter adapter plug! Such a loose fitting connector is just inviting trouble.***

A good attachment point for the red wire is at the fuse box. There, the positive potential cable from the battery brings uninterrupted power to all circuits in the vehicle. The red wire is supplied with a slip-in connector that may fit between a fuse and its holder. Several other attachment methods include: attaching to the power distribution panel screw terminals provided in some vehicles, removing the fuse box and attaching to a terminal on its underside, or tapping a circuit that always powers an electrical accessory (e.g., a clock or cigarette lighter).

Connecting directly to the 12 volt terminal on a battery within the engine compartment is not recommended, as the wire must then often wind its way next to electrically noisy components and wiring. See **Appendix B** *for more information.*

If you attach the positive (red) wire to a circuit already protected by a fuse, keep in mind that a problem elsewhere in the vehicle may open that fuse and disable the 798A. Also, make certain the vehicle fuse is free of corrosion and makes continuous contact with its holder.

Connection of the negative (black) wire can be to a screw or bolt on the chassis *that is near the point of attachment for the red wire*. The connection must be free of dirt, oil, grease, and paint. Do not overtighten the connection, as you may weaken the wire by breaking some of its fine strands.

IMPORTANT! The red and black wires must be attached to points that are as close to each other as reasonably possible. In addition, the two wires must be twisted around each other approximately one turn for every inch of travel. Do not attach the black wire to some point on the chassis directly behind the computer and run the red lead a long distance to the fuse box or battery! By doing so, you create a huge antenna that can pick up all manner of radiated energy. Such energy cannot be filtered out of the power line without prohibitively expensive electronics. See **Appendix B** for more information. The connection for the black wire must be near the attachment point for the red power lead!

Take particular care when connecting the black wire to the vehicle. The outside of the 798A is electrically connected to the black wire. **If you connect the black wire to the positive potential of the vehicle when the instrument case or bracket is touching any metal on the vehicle, you will cause a direct short in the electrical system of the vehicle!** There is no fuse between the black wire and the instrument case. You may damage the electronics within the 798A, and the short could possibly start a fire. Should the black wire contact a fused circuit in the electrical system, you would, as a minimum, blow the fuse protecting that portion of the electrical system of the vehicle.

Make sure the cable between the negative terminal of the battery and the chassis is clean and secure. If the vehicle chassis is isolated from the negative side of the battery, choose a connection point for the black wire at a convenient location along a negative potential line. In such a case, run a separate heavy gauge wire from the spade lug ground connector on the rear of the 798A to the same negative potential connection.

IMPORTANT! When routing the red wire, make certain that the in-line fuse holder has some freedom of movement. A spring inside the fuse holder can be compressed if the red wire is pulled. The fuse will then lose electrical contact within the housing. (This may occur only when the vehicle is jarred by a bump in the road.)

On the other hand, do not let the wires hang so loose that the navigator can snag the wires with her or his foot. Also, be careful when routing wires around the glovebox or among movable cables and levers. The wires may be pulled when the glovebox is opened or control levers are moved. Wires placed below floor mats or carpeting can likewise be pulled when the covering is stepped upon.

If you need to extend the electrical power wires of the 798A, extension cables are available from Radio Shack as part number 270-026. If you need to replace the entire fused power cable, ask for part number 270-025. The 798A uses a 2 amp 3AG fast blow fuse.

Note that the power wires *may* be fed through a dark gray metallic ring prior to entering the rear panel. There may also be rings on the cables of the driver's module and odometer transducer. These rings, termed "ferrite beads", help to prevent radio frequency interference (RFI) from entering the 798A. Overly strong RFI can interfere with the operation of the 798A. For the ferrite beads to be most effective in attenuating RFI, they must be located next to the 798A. See **Appendix B** for more information. Most 798As do not have ferrite beads.

ODOMETER TRANSDUCERS

The 798A will operate from a wide variety of odometer transducers (often referred to as **probes**, **pick-ups**, **sensors**, **impulse units**, or **senders**). An odometer transducer is an electromechanical device that produces an electrical signal indicating the passage of distance. There are two common types available: photoelectric and magnetic.

Photoelectric odometer transducers are supplied as a one-piece assembly consisting of a housing, a source of light, a slotted disk, and a light sensitive transistor (a phototransistor). The "closed" self-contained mechanism is constructed such that it can be attached to the speedometer cable of the vehicle. The speedometer cable turns the disk as the vehicle moves. The light source and phototransistor are placed on opposite sides of the rotating slotted disk, so that a beam of light flashes on the phototransistor. As the flashing beam of light strikes the phototransistor, electrical signals are sent to the 798A.

Magnetic odometer transducers use a semiconductor that is sensitive to magnetic fields. Magnetic transducers turn on and off in the presence and absence of this magnetic field, each time sending a signal to the 798A. Two styles are available: a "closed" self-contained module similar to the photoelectric unit, and an "open" two-piece arrangement consisting of a housing containing the sensing element and a separately mounted permanent magnet. Timewise manufactures both types of magnetic odometer transducers.

If you plan on using a transducer not supplied by Timewise, you will need an adapter cable to connect to the "eight-contact unkeyed modular jack" used on the 798A. ***Do not use a four- or six-contact modular plug! Such plugs will damage the eight-contact jack!*** Refer to **Appendix C** for transducer connector pin assignments. Timewise can provide adapter cables with (or without) a mating connector for another manufacturer's transducer.

Note that there are two odometer inputs on the rear of the 798A. To use both inputs, you need two odometer transducers. The transducers may be of different types. One may be from the electronic speedometer of the vehicle, the other from a transducer you have installed.

If you have only one odometer transducer, install the supplied jumper plug into the unused input. This allows that input to use the signal from the other transducer input. In this manner, you can have one transducer connected to both inputs.

NOTE: There is a resettable PTC (Positive Temperature Coefficient) fuse inside the 798A that will disconnect power to the odometer inputs if the transducer(s) draw more than 170 milliamps in total. After 2 to 5 minutes, the fuse will reset, allowing the odometer transducers to operate once again. If the transducers continue to draw too much current, the fuse will disconnect power again. This safety feature protects the 798A if you cause a short circuit when installing a defective transducer. (See **Appendix C** for additional information.)

Connecting to an Electronic Speedometer

Most automobile manufacturers are now installing electronic speedometers in their vehicles as standard equipment. These systems use an electronic sending unit attached to the transmission — some are similar to the closed magnetic transducer; others are effectively small electrical generators. Such systems can be used as the odometer signal source for the 798A. If you intend to use an electronic speedometer system as your signal source, you must understand the needs and limitations of the 798A, as well as the electrical system of your vehicle. (Odometer input specifications are discussed in **Appendix C**.)

Electronic speedometer signals must be properly conditioned before they can be used by the 798A. To do so, the 798A uses a built-in signal conditioner and pulse divider (the pulse divider is for **ODOMETER INPUT 2** only) that will buffer and reshape high speed electronic signals from the vehicle's system without interfering with normal vehicle functions.

NOTE: While the 798A's built-in frequency divider circuitry does buffer and reshape low amplitude signals from electronic speedometer systems, many such systems do not reliably provide signals at low speeds. As of this writing, many electronic systems on US manufactured vehicles cease to function at low speeds. Bosch electronic systems (on many European vehicles) typically use electronic circuitry that outputs logic level signals at any speed. Signals from such systems should work fine. The 798A circuitry will not normally interfere with operation of any electronic speedometer, although this is not guaranteed.

Usually, a single electrical connection to the electronic speedometer circuitry of your vehicle is all that is required when connecting the signal to the 798A. Locate the correct wire in the vehicle's electronic speedometer circuitry and connect that wire to contact number 4 in the modular jack for **ODOMETER INPUT 2**. (Timewise can supply an odometer input cable with a modular plug on only one end. See **Appendix C** for more information.)

Generally, a signal ground connection (contact 7 in the modular jack) is not required when operating the 798A from an electronic speedometer source. In fact, unless you connect the electronic speedometer signal ground to the same location as the negative power lead for the computer, you may create a "loop antenna" that causes the 798A to count erratically.

NOTICE! Where you connect to the vehicle's electronic speedometer circuitry must be determined by you. Timewise has no information in this regard for any vehicle, and will not assist in locating a wiring diagram. Timewise assumes no liability associated with the use of this feature.

TRANSDUCER SELECTION

Which type of odometer transducer is the best? Unfortunately, there is no clear-cut winner. There are advantages and disadvantages to each. When selecting a transducer, you'll have to weigh the following features for each type and decide which are important to you.

Measurement accuracy is definitely on everyone's list of required features. So which type of transducer can provide the greatest accuracy? There are two schools of thought on this. Some rallyists argue that wheel slippage during acceleration rules out any transducer attached to the drive train or to a speedometer cable mechanism driven by the transmission. These rallyists believe that a transducer sensing the rotation of an undriven wheel is required.

Other rallyists argue, however, that during braking (especially on gravel) an undriven wheel can lock up more easily. In such a case, a transducer sensing the rotation of an undriven wheel will miss pulses more often than a wheel connected to the drive train.

On all-wheel drive vehicles, when *any* wheel looses traction the transmission will turn erroneously. In such cases, when using a speedometer cable transducer, extra pulses are produced regardless of which wheel spins. Nevertheless, it has been suggested that, on the average, measurement of erroneous pulses are reduced by a factor of four on AWD vehicles.

As it happens, the distance measuring accuracy of the 798A is often not predictably improved by the choice of transducer or mounting position. Unless you install an undriven, non-braking, “fifth wheel” you will always experience missing or erroneous pulses from some manner of wheel slippage. Only by precise determination of the odometer factor (explained later) and a conscious effort to minimize wheel slippage is accuracy improved.

Photoelectric Transducers

Photoelectric transducers are generally attached to the speedometer cable mechanism of your vehicle. Alternatively, some rallyists install a mechanical cable drive to the hub of a wheel and attach the photoelectric transducer to the end of that cable.

The photoelectric transducer is easy to install providing it has the correct mechanical fittings for your vehicle. Occasionally, because of the variety of odometer cable fittings in use, transducers with appropriate fittings are not available. Short adapter cables must then be used.

There are some potential problems with photoelectric transducers. Many of these transducers use an incandescent bulb as a light source. Proper designs use a bulb rated at a higher voltage than the voltage supplied by the rally computer. This greatly increases bulb life. Unfortunately, it is still possible for the light bulb to burn out in the middle of a rally.

Photoelectric transducers generally must be mounted inside the vehicle since weather and high levels of ambient light can adversely affect their operation. This restriction limits your selection of mounting locations.

Another problem exists with many photoelectric transducers: They often do not output “clean” pulses (i.e., pulses with sharp rising and falling edges) when the vehicle is moving very slowly. The 798A can generally accommodate these slowly changing transducer signals. However, if the signal varies excessively between “on” and “off” states before settling, the 798A can mistakenly count more than one pulse. (This problem will <u>not</u> occur if the transducer is designed with a “photo-darlington” output transistor.)

Note: Using two photoelectric transducers may cause an internal fuse to disconnect power to the odometer input connectors. (Photoelectric transducers typically draw between 60 and 90 milliamps of current.) After about 2 - 5 minutes, the fuse will reset. The fuse will then open, again, moments later, repeating the cycle.

Magnetic Transducers

There are two general types of magnetic transducers: “closed” and “open”.

The most reliable transducer is the closed (or “self-contained”) magnetic style. As for photoelectric transducers, appropriate mechanical connectors must be used to attach the self-contained transducer to your vehicle. Timewise self-contained magnetic transducers are available with a variety of speedometer cable fittings. The 5/8"–18, 7/8"–18, 22mm–1.5mm, and 18mm–1.5mm thread sizes are the most common, but a host of other manufacturer-specific styles are also available.

Closed magnetic transducers are often sealed and may, therefore, be mounted outside the vehicle. These transducers also have operating hysteresis (different “on” and “off” sensing points), so you won’t have a problem counting extra pulses when the vehicle rocks slightly while parked. When properly fitted to a vehicle, closed magnetic transducers will provide years of trouble free service.

Then there is the open (or “two-piece”) magnetic transducer. An advantage of the open magnetic transducer is that it can be installed in a location where wheel slippage is less often a concern. Open magnetic transducers are also generally less expensive. A disadvantage of the open magnetic transducer is the greater effort required in its installation. The components are generally mounted under the vehicle. Choosing a location for the transducer requires considerable planning and understanding of the mechanics of the vehicle. The installation also requires critical alignment of the two components. If not correctly located, open “two-piece” magnetic transducers can be damaged or dislodged during rough driving.

Even with the difficulties mentioned, open magnetic transducers are by far the most popular. They have been installed on virtually every type of vehicle.

TRANSDUCER INSTALLATION

Anyone with average mechanical abilities can install an odometer transducer. Household tools are generally all that is required. Jack stands are necessary if you work under your vehicle. If you don’t feel comfortable working on or under your vehicle, enlist the aid of friends or hire a mechanic. Make sure your assistants understand the seriousness of the sport and your intent on winning. Insist on perfection. You don’t want a poorly installed transducer to fail during a rally.

Depending on the type of transducer, anywhere from one hour to twenty-four hours (if you’re waiting for epoxy to cure) may be required for proper installation.

Read the following procedures and choose the method that you prefer. If you plan to use a signal from the electronic speedometer of your vehicle, you will have to plan your own installation method.

Closed Self-Contained Transducers

Generally, photoelectric transducers are mounted inside the vehicle since water, dirt, and ambient light levels can affect their operation. As mentioned, closed “self-contained” magnetic transducers may be mounted outside the vehicle if they are weatherproofed. Check with the manufacturer to determine if you are restricted to passenger compartment mounting locations. Timewise closed magnetic transducers use a gasketed housing that weatherproofs the transducer, allowing it to be mounted outside the vehicle.

Installation of a closed transducer is rather straight forward. Locate and disconnect the speedometer cable at one end, attach one end of the transducer to where the cable was removed, and re-connect the cable to other end of the transducer. Generally, the speedometer cable is disconnected from the back of the speedometer, and the transducer is attached (with adapters, if required) to the speedometer. If your vehicle is equipped with a cruise control, the transducer may also be connected at the cruise control interface module. The transmission end of the cable is sometimes used if the transducer is weatherproof. All these mounting methods are termed an “in-line” installation.

In some vehicles, a formed metal cavity surrounds the speedometer. This metalwork may prevent you from attaching the transducer directly to the rear of the speedometer. In such a case, you can purchase short extension cables that will allow the transducer to be located a few inches away from the speedometer.

When installing a weatherproofed closed transducer, you may choose to attach the transducer directly to the hub of an undriven wheel. Your rally equipment dealer can supply you with the correct hardware to do this.

Avoid sharp bends in the speedometer cable when installing the transducer. If necessary, push the speedometer cable back through the firewall. You could also have the speedometer cable shortened or purchase a replacement cable that is shorter than the original. Local speedometer repair shops can assemble custom speedometer cables.

Open Two-Piece Magnetic Transducers

The permanent magnet and sensing probe of an open “two-piece” magnetic transducer are mounted under the vehicle. The magnet is epoxied to a rotating shaft or to a wheel rim. The sensing unit (the actual transducer) is rigidly mounted to a non-rotating part of the vehicle. The mounting locations for these items are chosen such that the permanent magnet rotates past the sensing end of the transducer.

The standard Timewise two-piece magnetic transducer (a.k.a. the Permalloy “sensitive” Model 217-15) is activated by either the North or South pole of a magnet. The transducer is 2" long and 0.375" in diameter. The body of the transducer is threaded along its entire length, allowing you to adjust its axial position after installation.

When installing the transducer, position it so the magnet will pass approximately 3/8" to 5/8" from its sensing end. Stronger magnets can activate the transducer at greater distances.

The distance between the magnet and transducer may be reduced to the point at which the two pieces nearly touch each other. However, since there is always some vibration of the elements in the installation, a very small gap increases the risk that the magnet and transducer will hit each other. Mounting the magnet and transducer too far apart will cause the transducer to work erratically or not at all.

You can use common magnets found at many hardware stores and electronic distributors. Radio Shack sells a small “button” magnet (0.5" dia. x 0.2" thick; part number 64-1883, package of 5) that will activate the transducer at a distance of 3/8" or more. When you purchase magnets, make sure you get the standard two-pole type; do not use multi-pole “ring” magnets or plastic magnetic sheet. Don’t use magnets with holes, either; the odd shape magnetic field they produce can cause double pulses. Common household message holder magnets on your refrigerator will not work. If you cannot find appropriate magnets at a local source, contact your rally equipment dealer. Many sizes and shapes are available.

Note: Long rectangular magnets whose North/South orientation is transverse (i.e., the poles are along the long sides of the rectangle, rather than at the ends) have an unusual magnetic field very close to the material’s surface. A transducer may be activated twice if it passes too close to such magnets. When using these magnets, mount the transducer so that it passes no closer than 5/8" from the magnet. The more uniform field at that distance will properly activate the transducer.

Selecting a Mounting Location

Since every vehicle model is unique, there are many possible attachment locations for the open magnetic transducer. Use your own judgement when selecting a mounting location by studying the undercarriage of the vehicle. The time spent evaluating possible locations can save hours of aggravation later. A hastily chosen mounting location may turn out to be too close to a moving suspension arm or susceptible to debris thrown up by a wheel.

A custom designed mounting bracket to hold the transducer must be attached to the vehicle. To maintain the correct distance between the magnet and transducer, the mounting bracket must be attached to a part of the vehicle that does not move relative (axially and radially) to the rotating member holding the magnet. Remember that you will be installing the transducer on a stationary vehicle. Poor mounting locations are not always apparent.

A popular attachment location for the transducer is to a disc brake caliper or a drum brake backing plate. The magnet is then epoxied to a wheel. (Do not epoxy the magnet to a brake drum or brake disc—they get so hot during hard braking that the magnet will demagnetize.)

Another popular method is to mount the transducer directly to the transmission or differential housing. The magnet is then epoxied to the flange of a universal or constant velocity joint. This location is well under the vehicle and out of the way of any debris that might be thrown up by the wheels.

Don’t attach the transducer to the chassis and the magnet to the transmission output shaft. Since the transmission is mounted on rubber bushings, both the transmission and the drive shaft will twist and vibrate as the engine applies torque to the drive train. When that happens, the gap between the transducer and magnet will change. There may be enough movement to cause damage to the transducer. This same warning applies to mounting the transducer on the chassis next to the differential with the magnet on a half shaft.

On rear wheel drive vehicles that have an independent rear suspension, the differential is often attached directly to the chassis. In such a case, the transducer can be mounted to the chassis, with the magnet(s) epoxied to a flange on the drive shaft or half shaft. However, be forewarned that some independent rear suspension differentials are supported by hard rubber bushings that isolate drive train vibrations from the chassis. The differential will still vibrate during severe road conditions. Do not assume the differential does not move.

Be careful when attaching the transducer to a McPherson strut shock absorber. The apparent solid assembly may be isolated from the suspension arm with a hard rubber bushing that compresses during severe road conditions. Also note that straight axle suspensions and independent suspension differentials may have semi-flexible arms supporting them.

Remember that the suspension will be fully extended while the vehicle is raised. What appears to be an unobstructed location for the transducer may actually be the headroom for part of the suspension mechanism. Make certain that the suspension will not hit the transducer, bracket, or cable when encountering severe road conditions. Be careful of seemingly fixed objects in the suspension. A stabilizer bar will change shape and position when the suspension moves.

As mentioned, when installing the transducer, you will need to position it so the magnets will pass approximately 3/8" to 5/8" from the transducer’s sensing end.

Mounting the Transducer

CAUTION! When working under a raised a vehicle, always use jack stands or another approved vehicle support system! Never use several boards of lumber, cinder blocks, or the tire changing jack that comes with your car! **Serious injury or death will result if you are under your vehicle when an improper support mechanism fails.**

Mount the transducer to the vehicle before you epoxy the magnet in place. You may have to relocate the magnet if the intended mounting position for the transducer doesn't work out. While you are mounting the transducer, temporarily hold the magnet in its expected mounting location with adhesive tape. On steel, the magnet will hold itself to the surface.

Determine the path that you will use to route the transducer cable. The cable may have to run through the firewall or other metal obstruction. It is usually easier to start inside the vehicle and feed the transducer through any required holes, rather than pushing the plastic modular plug through the opening. The transducer is considerably more durable than the plug.

A bracket for the transducer must be attached to the vehicle. Timewise can supply a bracket with several pre-drilled 1/4" holes for mounting bolts and a 3/8" hole for the transducer. You can also fashion your own bracket from a steel mending plate. Mending plates with pre-drilled holes are available at most hardware stores. You can cut, bend, or drill additional holes as necessary. Your particular installation will dictate the exact size and shape you need. Keep the bracket as short as possible to reduce transducer vibrations.

If you mount the bracket to the brake or suspension mechanism, use thread-locking compound when reseating any bolts you remove. The bolt must be re-tightened to the correct torque. Also, the added thickness of the bracket may require the use of a longer bolt. Always replace a loosened expansion bolt with a new one.

When mounting the transducer to part of the suspension, allow enough slack in the cable so that it can flex with maximum wheel movement. Don't let the cable get entangled in the steering mechanism. Also, route the cable along a path that protects it from debris. If the cable follows the brake fluid line, these problems can generally be solved.

To hold the cable in place, use electrical tape or cable ties. Cable ties are available at electronic, electrical, hardware, and automotive parts stores. If you route the transducer cable through a hole with sharp edges, place a protective grommet around the cable.

Mounting the Magnet

Rallyists have traditionally used two magnets in open magnetic transducer installations. This has been done for several reasons. First, having two magnets provides redundancy. If, by some misfortune, a magnet is dislodged, the remaining magnet can be used to measure distance. Secondly, two magnets mounted radially opposite each other helps keep a rotating component dynamically balanced.

Lastly, rallyists use two magnets in an attempt to improve measuring accuracy. As is turns out, however, overall accuracy is not improved by using more than one magnet. Accuracy is improved only by good driving habits (i.e., no wheel slippage) and precise determination of the odometer factor (explained later).

Using two magnets does, nevertheless, increase the frequency of odometers pulses. You will, as a result, be able to identify a specific point on the course with greater assuredness. On wheel mounted installations, pulses will occur approximately every 3 feet, instead of every 6 feet. (Note: Using more than two magnets may make the speedometer on the driver's module malfunction. This is due to the timing method used to determine your speed.)

For most rallyists, the advantages of using two magnets outweigh the extra effort of the installation. By the way, when mounting magnets on a wheel, you should also put magnets on your spare tire. Should you get a flat tire on the wheel chosen for the transducer, the magnets on the spare tire will allow you to measure distance.

IMPORTANT! Magnets are generally very brittle. Be careful when handling them near ferrous metals or other magnets. Should a magnet slip from your fingers, it may shatter on impact with another surface. Even if the magnet doesn’t break, the physical shock will often reduce its magnetic field strength.

When mounting the magnets, do not recess them in a hole drilled in a metal surface, or locate them in a depression in metal. Doing so will change the shape of the magnetic field, drawing it closer to the surrounding surface. When the magnetic field does not extend far away from the magnet, you may not be able trigger the transducer. Also, do not machine a magnet to fit a particular location. Cutting, drilling, or grinding a magnet will reduce its strength in two ways: by material loss and by stress induced demagnetization. The magnetic field of the remaining material may not be sufficient to stimulate the transducer.

If you need magnets of a different shape, size, or magnetic orientation, contact Timewise.

When installing the Timewise Model 217-15 transducer, you need not be concerned which pole of the magnet faces the transducer. However, do make certain that one of the two poles (North or South), not a non-pole side, passes by the sensing end of transducer.

Even though it isn’t absolutely necessary to install magnets with a specific pole facing the transducer, Timewise does suggest that you consider placing the South pole toward the transducer. Doing so assures you that, should you subsequently install a “south pole only” transducer, the magnets will be appropriately oriented. (“South pole only” transducers are sold elsewhere.)

Note: The South pole of a magnet can be determined with the aid of a compass. The South pole will attract the end of the pointer in a handheld compass that normally points to the North pole of the earth. An automotive compass that shows you the direction you are heading will turn to have the “S” designation face toward a permanent magnet’s South pole.

When mounting the magnet to a wheel, it may be easier to do so with the wheel removed from the vehicle. Locate the magnet onto the wheel at the required position and then carefully remove the wheel. Don’t bump the transducer while doing this.

The epoxy used for attaching the magnet must firmly bond it to the selected mounting surface. Make sure you use an epoxy designed to adhere to the materials being bonded. Use a gap filling, non-shrinking type. Consult your rally dealer or your local hardware store for recommendations of a long lasting, strong epoxy. “Five minute” epoxies are usually not strong enough, so avoid using those.

A word of caution: Reliable attachment of the magnet to an aluminum or magnesium wheel can be a problem. The epoxy will adhere well to the oxide film that rapidly forms on those metals, but the microscopic film may “peel” off the base metal, causing the magnet and epoxy to fall off. You must epoxy the magnet to the wheel *immediately* after the surface has been sanded to roughen the surface and cleaned with a strong solvent. Methyl ethyl ketone (MEK) or acetone can be used as they dry the surface and leave no residue. ***Careful!*** *These solvents remove paint and damage plastics!*

Carefully mark the location of the magnet using crosshairs. Remove the magnet and thoroughly clean the attachment area so it is free of all dirt, rust, grease, oil, and paint. You can use navel jelly or a little vinegar to remove small amounts of surface rust. Use emery paper or a wire brush to remove paint and heavy deposits of rust. Following this, clean the surface with alcohol to remove all residues. Clean the magnet also, removing all the dirt, grease and oil that have accumulated during handling.

Prepare the epoxy according to the directions on the package. Now carefully coat the surface of the magnet that will lie against the mounting surface. Use a thin layer of epoxy—just enough to fill small gaps. Too much epoxy here and the magnet may not lie flat. Precisely place the magnet in position and use additional epoxy to fill-in along the sides of the magnet. Apply a liberal amount here, but be careful not to cover the upper surface; and don't form a ridge around the magnet that will interfere with the transducer.

If you have attached the magnet to a shaft or flange (as opposed to a wheel), you may wish to wrap nylon-reinforced tape around the rotating member to hold the magnet in place while the epoxy is curing. Keeping this tape in place after the epoxy cures provides additional holding power should the epoxy bond fail. Always wrap the tape in the direction opposite the normal turning motion of rotating member. ***Caution!*** *Improperly applied tape may begin to unravel and get caught between the transducer and rotating member, possibly damaging the transducer and/or magnet.*

If you have epoxied the magnet to a wheel that was removed from the vehicle, replace the wheel only after the epoxy has cured. This will prevent accidental movement of the magnet. Be careful not to bump the transducer when locating the wheel on the hub.

CAUTION! If you spin balance a wheel that has a magnet attached, be forewarned that an improperly epoxied magnet could come off.

Finally, re-align the transducer. The body of the transducer is threaded along its entire length to aid in adjustment to the required spacing. The magnets should pass approximately 3/8" to 5/8" from the transducer's sensing end.

Once everything is in place, the open magnetic odometer transducer will provide years of reliable service. The transducer is not affected by water, dust, or extreme weather. In fact, the transducer will operate from –40°C to 100°C.

FINAL INSTALLATION PROCEDURES

After installing the 798A and the transducer(s), plug the transducer(s) into the odometer input jack(s) on the rear of the 798A. If you have only one odometer transducer, install the supplied jumper plug into the unused input. This allows that input to use the signal supplied to the other transducer input. In this manner, you will have one transducer feeding two inputs. Selecting either input effectively selects the same transducer.

Also, plug the driver's module into the **REMOTE DISPLAY** jack on the back of the main computer.

WARNING!

The driver's module display must be plugged into the 798A before turning on the instrument. The LED displays can be damaged if the driver's module is plugged in after the 798A is already powered up!

If you plan on using the remote input features on the rear panel, attach the necessary hardware now (see **Appendix A**).

START-UP PROCEDURE...

The **ON–OFF** switch for the 798A is located in the lower central area of the rear panel. When the 798A is turned on, the displays always illuminate at their brightest setting, the clock displays the current time, and other parameters in the 798A are restored to the values present when the unit was turned off. All of your personal setup selections are automatically restored when the 798A is powered up, so you may begin using the 798A immediately.

If you turn the 798A on with the **SPLIT–LAST CAST** toggle switch in the **SPLIT** position, you will see coded information in the displays. This information indicates the date of manufacture (in the **CLOCK** display), the operating firmware version (in the **AUXILIARY** display), as well as the serial number of your 798A (in the **CALCULATED TIME** display). The **ODOMETER**, **SPEED**, and **NEXT SPEED** displays show information regarding options installed in your 798A and the quality of 12 volt power you are supplying to the instrument. De-select **SPLIT** or depress **SHIFT** to remove the system information from the displays.

This manual describes version 6.000 through 7.000 firmware. Not all features described in this manual were incorporated in earlier versions of firmware. If you contact Timewise about your 798A, please be familiar with the firmware version in your 798A.

These instructions generally use the timing mode of hundredths of minutes when describing the operation of the 798A. When timing in seconds, substitute “seconds” in any reference to “hundredths of a minute”.

Similarly, you may measure distance in miles or kilometers. If you use kilometers as your unit of measure for distance, you must use kilometers/hour as the unit of measure for speed. The computed time will then be correct.

Automatic LED Display Turn Off

To conserve power while the 798A is idle, the LED displays automatically turn off after 16 minutes of total inactivity.

To re-illuminate the displays when they automatically turn off, actuate any switch or drive the vehicle (to input an odometer transducer pulse).

Note: When the displays are off, the “**+ / –**” toggle switches will not change a parameter in the 798A. Instead, the switch activation only re-illuminates the displays.

You’ll note that the LEDs in the main unit re-illuminate at their mid-point brightness level if they were set to less than half the maximum brightness at the time the displays turned off. The driver’s module, on the other hand, always re-illuminates at the LED brightness level being used prior to entering the power savings mode.

If you do not want the displays to automatically go off while the 798A is idle, turn the rotary switch to the **Next Speed** position. The displays will then not turn off after 16 minutes.

IMPORTANT!

Fresh air must be allowed to cool the 798A and to circulate through the instrument. Normally, there is enough air movement circulating in the instrument while driving. However, if the 798A is placed in the glove box or recessed into the dashboard, air circulation will be restricted and the instrument may overheat. ***Do not block the ventilation panels on the top and bottom of the instrument.***

ADJUSTING PARAMETERS

Throughout this manual you will be directed to alter the values of rally parameters in the 798A. To do so, you must understand how to use the "**+ / –**" toggle switches as well as the rotary switch and the **RESET–SHIFT** switch. Read the following information carefully.

Using the "+ / –" Toggle Switches

Each of the five "**+ / –**" adjustment toggle switches alter a rally parameter by a specific amount:

The **.001** switch increases (+) or decreases (–) the selected parameter .001 unit with each activation of the switch. If this switch is held in the up or down position for approximately one second, the parameter will change 12.5 times per second until the toggle handle is released. This switch is inactive when setting a rally speed.

The **.01** switch increases (+) or decreases (–) the selected parameter .01 unit with each activation of the switch. If held up or down for approximately one second, the parameter will change 12.5 times per second. This switch is inactive when setting a rally speed unless Option 6 is installed and enabled. **†** See footnote

The **.10** switch increases (+) or decreases (–) the selected parameter .10 unit with each activation of the switch. If held in the up or down position for approximately one second, the parameter will change 12.5 times per second. This switch is inactive when setting a rally speed if you are using the 1 – 399 mph (kph) speed range.

The **1.00** switch increases (+) or decreases (–) the selected parameter 1.00 unit with each activation of the switch. If held in the up or down position for approximately one second, the parameter will change 12.5 times per second.

The **10.00** switch increases (+) or decreases (–) the selected parameter 10.00 unit with each activation of the switch. If held in the up or down position for approximately one second, the parameter will change 12.5 times per second.

The Rotary Switch

The rotary switch selects which parameter will be altered when you actuate the "**+ / –**" switches. The function of each rotary switch position will be explained throughout this manual while describing the operation of the 798A.

The 5 o'clock position of the rotary switch does not have an identifying descriptive label. Instead, an extended indicator line points to a selection of functions below the "**+ / –**" toggle switches. These special functions are available for execution whenever the rotary switch is in the 5 o'clock position. Throughout this manual, the 5 o'clock position of the rotary will be referred to as either the "5 o'clock" or the "special function" position.

WARNING!

The rotary switch has a rotational stop between the 4 o'clock (**Adjust ORM**) switch position and 5 o'clock (special function) switch position. Do not force the switch to turn past this built-in stop! You will break the switch!

† When the 798A is outfitted with the **High Resolution CASTs** option (identified as Option 6 - installed as a standard feature as of version 6.000 firmware), the "**+ / –**" **.01** toggle switch will be active when setting a rally speed. See the option 6 supplement inserted in the manual for more information. When Option 6 is installed, it can be enabled or disabled – see Option 6 supplement and/or page 98.

The RESET–SHIFT Switch

The **RESET–SHIFT** toggle switch serves two primary purposes: the **RESET** position clears (resets to zero) selected parameters, while the **SHIFT** position enables a secondary function assigned to several switches. Both the **RESET** and **SHIFT** positions of the switch are momentary acting, i.e., the toggle handle will spring back to its center position upon release.

RESET is used to clear (to 0.000 units) the value shown in the **AUXILIARY** display. The **TIME–Δ–ODO** switch next to the **AUXILIARY** display determines which parameter will be reset. (The specific parameters that the **AUXILIARY** display can show will be discussed in detail later.) **RESET** acts similar to the trip odometer reset button that is in most cars.

The **RESET** switch also serves to prevent accidental adjustment of the time of day clock. Setting the clock can only be executed after the **RESET** switch is momentarily actuated.

The **SHIFT** switch enables an alternate function assigned to many switch positions. This alternate function is printed in italics below the regular function label for the switch. Examples include selecting the remote display brightness level, or resetting the main odometer to zero.

Specific procedures for using the **RESET** and **SHIFT** functions will be described as needed.

SPLITTING PARAMETERS

When **SPLIT** is selected on the **SPLIT–LAST CAST** toggle switch, the information in the **ODOMETER**, the **CLOCK**, the **CALCULATED TIME**, and **AUXILIARY** displays is frozen. While you are in the split mode, the 798A continues to keep track of time and the passage of distance internally. When you de-select **SPLIT**, the displays automatically update to current course values. It will be as if you had never entered the split mode at all.

NOTE: If you have the rotary switch in the **Next Speed** position when the 798A is split, and put the switch next to the **AUXILIARY** display in its middle "Δ" position, a split value of the driving time **ERROR** (see page 58) will be shown in the **AUXILIARY** display. (**Note:** As of version 5.010 firmware, the "live" error will be shown when the 798A is not split.)

Whenever the 798A is split, the **CLOCK** display will momentarily blink off every other second, and a beeper will briefly sound every ten seconds. †

The 798A is also split as long as **CAST** is selected on the **CAST–TRUNCATE** switch.

Temporary Recall of "Live" Parameters while Split

If you turn the rotary switch to the **Clock** position when the 798A is split, all the displays become "live" again. When you de-select the **Clock** position, the displays return to the split values previously shown. You can use this feature to check the accuracy of the 798A clock if there is a dispute regarding your split in-time as recorded by checkpoint workers.

If the rotary switch is turned to the **Clock** position when you actuate **SPLIT**, the 798A will be split, but you won't see the split parameter values until you de-select the **Clock** position.

† You can adjust the length of time each beep sounds when the 798A is split. To do so, select **ALARM** on the rotary switch and momentarily actuate **RESET**. The number at the left of the **AUXILIARY** display is the length of time (in tenths of seconds) the "split beep" sounds every ten seconds. Use the "**+ / –**" **10.00** toggle switch to adjust the split beep time from 0 to 15 tenths of seconds. Select **SHIFT** to hear a sample beep indicating the newly selected split beep time.

Adjusting a Split Parameter

You may adjust a parameter using the "**+ / –**" toggle switches whether or not you are in the split mode. When you adjust the split value of a parameter, the internal "live" value is also adjusted by that same amount. Upon exiting the split mode, the live parameter value will include the changes you have made as well as the normal advances that have occurred.

As an example, you can use this feature to set the main odometer to a particular value, even while you are moving. Here's how:

1. Split the 798A when you get to a point on the course with an official mileage.
2. As you drive away from that location, adjust the split odometer mileage to the value it should have been at the point you split the 798A.
3. Exit the split mode.

After exiting the split mode, the updated odometer will include your manual adjustment as well as the distance driven since you entered the split mode.

Recall of Previous Split Values

After exiting split, you may subsequently review the latest split values by concurrently selecting both **SHIFT** and **LAST CAST**. (You can activate the switches in any order.) Notice the label "**Last Split**" for the shifted function of the **LAST CAST** switch position.

Recalled **Last Split** values are those values that existed at the moment the **SPLIT** switch was most recently actuated. Adjustments you may have made during the split are <u>not</u> included in recalled **Last Split** values. This is intended. You cannot adjust recalled **Last Split** values.

THE TIME OF DAY CLOCK

The **CLOCK** display shows a twelve-hour time of day clock. This clock is derived from a quartz crystal oscillator that has a specified accuracy of ± 0.01 minute after a twelve-hour period. (Actually, when the clock is initially calibrated by Timewise, the oscillator is set to an accuracy of ± 0.01 minute after 48 hours.) If you participate in a rally lasting several days, Timewise suggests that you carry a receiver that can be tuned to an official time broadcast. You can then re-align the clock if necessary.

The clock may be run in either hours, minutes, and hundredths of minutes (11:59.99), or hours, minutes, and seconds (11:59:59). Notice the colon (:) between the minutes and seconds digits when running in the "seconds" mode. You may also select whether or not a "tenths of units" (thousandths of minutes, or tenths of seconds) digit is displayed. The mode of operation you select will be a matter of convenience. If the rallymaster has used "seconds" in the instructions, you might find it easier to operate in that mode; or, you might wish to use "hundredths" anyway, to increase your timing resolution.

A unique feature of the 798A is that the counting mode of the clock may be changed at any time without introducing <u>any</u> timing inaccuracy. To change the mode of the clock, turn the rotary switch to its 5 o'clock, or special function, position. Then actuate the "**+ / –**" **.01** switch. Notice that beneath the "**+ / –**" **.01** switch there is the designation **Time Format**. This is the function of that switch when the special function position of the rotary switch is chosen. Each time you actuate **Time Format**, moving the toggle switch either up or down, the 798A will change from one counting mode to another. The various modes are: seconds, tenths of seconds, hundredths of minutes, and thousandths of minutes. (Later in this manual you will learn that the driver's **ERROR** timing display mode can be different from the time mode on the main unit.)

If the 798A is split while making your selection of the counting mode for the clock, you will select the time display resolution (e.g., seconds or tenths of seconds) applicable when the instrument is split. The split resolution may be different from the non-split resolution. Thus, you can display time in hundredths of minutes when the instrument is not split, yet automatically show thousandths of minutes whenever split. This is a great convenience for making accurate time notations at split locations, while eliminating incessant high speed counting in the displays when the 798A is free running.

One benefit to changing the counting mode of the clock is evident when setting the clock at the beginning of the rally. You can use the "seconds" mode when aligning to WWV or another time standard, and switch to "hundredths" to run the rally.

An important point to note is that you can select the clock counting mode at any time. There is no introduction of any timing inaccuracy when you switch between time counting modes.

Setting the Clock

Setting the clock in the 798A consists of a sequence of steps that safeguard against accidentally changing the time. Once learned, the steps will become second nature.

To set the clock in the 798A, start by turning the rotary switch to the **Clock** position. Then momentarily select the **RESET** position of the **RESET–SHIFT** toggle switch. This enables, or "unlocks the door to", the time setting procedure.

The next step is to note the time of day as you select the **SHIFT** position of the **RESET–SHIFT** toggle switch. By this action you enter the clock **Set** mode. Continue holding the **SHIFT** toggle handle down. (The clock setting functions are identified in italics ("**Set/Sync**") below the rotary switch **Clock** label.)

Note: If you do not activate **RESET** prior to selecting **SHIFT**, the 798A will display "**SELECt rESEt FirSt**" in the **CLOCK, CALCULATED TIME,** and **AUXILIARY** displays. The requirement to "select **RESET** first" is a security measure that prevents accidental changing of the clock. Select **RESET** (or turn the rotary switch) to remove the warning.

If you correctly execute the clock set procedure, the clock will be split and the **AUXILIARY** display will show the word "**SEt**". Continue holding the **SHIFT** toggle handle down.

After having entered the **Set** mode, use the "**+ / –**" toggle switches to adjust the clock to the time noted when you initially depressed **SHIFT**. You may take as much time as necessary to do this. Once you have adjusted the clock to the noted time value, release the **SHIFT** switch. The **CLOCK** display will become "live" again, and the time of day will be correct.

To summarize, here's the step by step method for setting the clock:

1. Turn the rotary switch to **Clock**.
2. Momentarily select **RESET**. This unlocks the clock setting function.
3. At a noted the time of day, actuate and hold **SHIFT**. This selects the clock **Set** function. The time of day will be split.
4. Use the "**+ / –**" toggle switches to adjust the clock to the time noted in step **3**.
5. Release the **SHIFT** switch.

If your reaction time was a bit slow between mentally noting the time of day and selecting the **SHIFT** position, you may find the live clock to be off by one count. If so, actuate **SHIFT** again and adjust the clock by that one count.

You may set the clock at anytime.

Synchronizing the Clock

Setting the clock does not alter the beat of the clock. That is, although the clock setting procedure just described corrects the numerical value of the clock, the "ticking" pulse of the clock is not changed. If the clock is "out of sync" with the official time standard, you should also synchronize the clock to that time standard.

To do so, turn the rotary switch to the **Clock** position. Then actuate the **RESET** position of the **RESET–SHIFT** toggle switch. As mentioned previously, this "unlocks" the clock setting procedure. It also simultaneously activates the clock **Sync** function. Continue to hold the **RESET** switch up. The **AUXILIARY** display will show "**SYnc**" and the clock will be live.

Now actuate any "**+ / –**" toggle switch to "nudge" the clock's ticking pulse closer to the pulse of the time standard. Each "+" actuation advances the live clock 1/50th of a second; each "**–**" actuation retards the live clock 1/50th of a second. Repeat as needed until you are satisfied that the counting rhythm of the clock is synchronized to the time standard. (Holding a "**+ / –**" switch up/down will repeatedly advance/retard the clock. The clock is nudged about five times each second as you hold the switch in place. Thus, holding a "**+ / –**" switch up for ten seconds will have shifted the clock counting rhythm one full second ahead.)

When you have finished synchronizing the clock, release the **RESET** switch.

To recap, follow this procedure to synchronize the 798A clock to an official time standard:

1. Turn the rotary switch to **Clock**.
2. Actuate and hold **RESET** to select the clock **Sync** function. (The clock will be live and the **AUXILIARY** display will show the word "**SYnc**".)
3. Actuate any "**+ / –**" switch to advance (+) or retard (–) the clock. Repeat as needed.
4. Release the **RESET** switch.

You may synchronize the clock as often as you like.

Always check the numerical value of the clock after synchronizing. You may find the time to be off by a count because you advanced or retarded the clock so much during the procedure that the clock has been shifted by a full second. If necessary, use the clock **Set** procedure to correct the clock to match the official clock. The synchronization will not change.

Automatically Setting the Clock

As a convenience, the clock in the 798A can be automatically set and synchronized to the exact time of day within a Timewise Model 610, 650, or 660 Multi-Split Chronometer.

To do so, start by selecting **RUN** on the chronometer. Then insert a 1/8" stereo phone plug cable between the **Remote Split** stereo jack on the chronometer, and the **SPLIT/SYNC** stereo jack on the back of the 798A. (Upon inserting the cable, the chronometer may become split as contacts within the jacks are shorted together. You can un-split the chronometer, if you wish, although having it split during this procedure does not matter.)

On the 798A, select **Clock** on the rotary switch and actuate the **RESET** switch. This enables the clock **Sync** function. Continue holding the **RESET** switch up. When the 798A electronically senses the presence of an attached 610, 650, or 660, the time of day will be automatically downloaded and the 798A will display "**donE**" in the **AUXILIARY** display. (If you release the **RESET** switch too soon, the synchronization will nevertheless correctly finish, but you won't see the "**donE**" notification.)

You'll note that activating the automatic clock setting procedure is identical to enabling manual clock synchronization. The only difference is that when a 610, 650, or 660 is sensed by the 798A, the time of day is automatically downloaded from the chronometer.

To recap, follow this procedure to synchronize the 798A to a Model 610, 650, or 660 chronometer:

1. Select **RUN** on the chronometer.
2. Insert a 1/8" stereo cable between the Remote Split jack on the chronometer and the **SPLIT/SYNC** jack on the 798A.
3. Select **Clock** on the 798A rotary switch.
4. Actuate **RESET** to enable the automatic clock setting function. Continue to hold the **RESET** switch up. The **CLOCK** display will freeze as data is read from the master chronometer.
5. Wait until the 798A indicates "**donE**", and the clock becomes "live" again.
6. Release the **RESET** switch.

The 798A will remain in the same counting mode (hundredths of minutes or seconds) as it was prior to the automatic setting procedure, regardless of the counting mode of the master 610, 650, or 660. Contact Timewise if this is not desired.

A 798A cannot be used as a master clock for setting another instrument.

THE ODOMETER

The main odometer on the 798A displays distances from 0.000 to 999.999 miles. Every 1000 miles the odometer overflows to 000.000 mile.

The **ODOMETER** display blanks leading zeros when the distance displayed is less than one hundred miles. Leading zero blanking will not occur after the thousand mile point. Blanking leading zeros at each thousand mile point has been disabled, as there would be a sudden major change in the appearance of the display, potentially startling the navigator.

In addition to the main odometer, the 798A has an auxiliary "trip" odometer. The auxiliary odometer is visible in the **AUXILIARY** display when **ODO** is selected on the switch to the left of the display. Use the auxiliary odometer to measure free zones, actions keyed to a mileage interval after a reference, pauses over a distance, etc. The auxiliary odometer can range from 0.00 to 999.999 miles. Every 1000 miles it overflows to 0.000 mile.

The odometers actually measure distance to a resolution of 0.000**00001** mile (one hundred millionth of a mile), but the five least significant digits (shown in bold type) are internal to the instrument and cannot be seen. (Note that 0.00000001 mile is equal to 0.006336 inches.)

Selecting the Direction of Travel

The **FORWARD–PARK–REVERSE** toggle switch is used to select the counting direction of both the main and auxiliary odometers.

FORWARD makes the odometers increase with each odometer transducer pulse. Use this mode when you are "on-course" or whenever you want distance to count up as you drive. When in **FORWARD**, the calculated time (explained later) will increase as you drive.

REVERSE is used when you want the odometers to decrease as you drive. Use this mode while returning from an "off-course" excursion. If you back up to check a reference, use **REVERSE** to tell the 798A that you are going backwards. **REVERSE** also subtracts the correct amount from the calculated time.

PARK is used when you don't want to count pulses from the transducer. While in **PARK** the calculated time, as well as the odometers, will not change as you drive. (Note, however, that the speedometer in the driver's module will continue to function.)

Selecting **PARK** can be useful when you need to make a U-turn or jockey your vehicle during a three-point turn. For example, if you realize that you are off-course, here's what you can do: Look for an easily identifiable landmark such as a mailbox or utility pole. As you pass the landmark switch to **PARK**. Then turn around at a safe opportunity and select **REVERSE** as you pass the landmark again. This procedure removes the guesswork out of where to switch into reverse. When you return to the location where you left the correct course, switch directly to **FORWARD**. The odometers and calculated time will again equal official course values. The time of day clock will have continued counting normally, of course, so you'll have to drive faster than the given rally speed to make up for lost time.

Preventing Accidental Selection of PARK or REVERSE

An elective feature is available to help prevent accidental selection of **PARK** or **REVERSE**. When this feature is enabled, the **SHIFT** switch must be depressed while you move the odometer direction switch from **FORWARD** to **PARK**. This "shift to exit forward" requirement causes the 798A to disregard the selection of **PARK** (or, subsequently, **REVERSE**) unless the **SHIFT** switch had been depressed as **FORWARD** was exited. Thus, should the direction switch be bumped, with the result that **FORWARD** is accidentally de-selected, the odometer (and calculated time) will continue to count up, even though the switch actuator is actually in the **PARK** or **REVERSE** position.

To enable the "shift to exit forward" feature, turn on the 798A while actuating both **SHIFT** and the "**+ .001**" position of the "**+ / –**" **.001** switch. Repeat to return to the standard mode.

Note: When the "shift to exit forward" feature is enabled, switching between **PARK** and **REVERSE** does <u>not</u> require actuation of the **SHIFT** switch. Nor is it necessary to actuate **SHIFT** when moving from **PARK** to **FORWARD**.

PARK and REVERSE Warning Alerts

When either **PARK** or **REVERSE** is selected, the **ODOMETER** display will blink off momentarily every other second and a beeper will briefly sound every ten seconds. This is a reminder that you are operating in a non-standard mode. The importance of selecting **FORWARD** after returning from an off-course excursion is evident when the **ODOMETER** is flashing and the alarm repeatedly beeps.†

NOTE: When the "shift to exit forward" feature is enabled, selection of **PARK** (or **REVERSE**) without concurrent actuation of the **SHIFT** switch, will cause the **ODOMETER** display to flash once every second (twice the normal warning rate).

Disabling the Beeper while in PARK or REVERSE

If the beeper becomes bothersome during long periods of being in **PARK** or **REVERSE**, you can stop it from sounding every ten seconds by momentarily selecting **LAST CAST** on the **SPLIT–LAST CAST** toggle switch. Repeat the procedure if you want to re-enable the beeper. The beeper is automatically re-enabled when you return to **FORWARD**, so the next time you chose **PARK** or **REVERSE**, the alarm will again sound every ten seconds even if you had previously disabled it.

† You can adjust the length of time each beep sounds when the 798A is in park or reverse. To do so, select **ALARM** on the rotary switch and momentarily actuate **RESET**. The number at the <u>right</u> of the **AUXILIARY** display is the length of time (in tenths of seconds) the "park/reverse beep" sounds every ten seconds. Use the "**+ / –**" **.001** toggle switch to adjust the park/reverse beep time from 0 to 15 tenths of seconds. Select **SHIFT** to hear a sample beep indicating the newly selected park/reverse beep time.

Displaying Thousandths of Miles

A standard feature of the Timewise 798A is that it allows you to display and adjust the odometer in thousandths (.001) of miles.

To display "thousandths of miles" resolution in the odometers, turn the rotary switch to the special function (5 o'clock) position, and actuate the "**+ / –**" **.001** toggle switch, either up or down. The rightmost digit of both the main and auxiliary odometers will illuminate, revealing thousandths of miles. Notice that beneath the "**+ / –**" **.001** switch there is a designation **Odo Format** that identifies the function of the switch when the rotary switch is in its special function position. With each activation of **Odo Format**, the thousandths digits will switch between on and off.

If the 798A is split while selecting the odometer display resolution, you will set the resolution applicable whenever the 798A is split. The split resolution may be different from the non-split resolution. Thus, you can keep the odometer resolution at hundredths of miles when the instrument is not split, but automatically show thousandths of miles when split is activated. This allows you to make precise distance notations at split locations, while eliminating high speed counting in the odometer display when the 798A is free running.

Note: When the **Adjust ORM** (Official Rally Miles) position of the rotary switch is chosen, the thousandths digits in the odometers are always displayed, whether or not you have selected to view that digit in the split or non-split modes.

Adjusting the Main Odometer

With the rotary switch in the **Odometer** position, the "**+ / –**" toggle switches can be used to change the value of the main odometer. Use this function to align the main odometer to an official mileage (e.g., an outmarker or other mileaged reference).

Important! The calculated time (described in detail later) will not change when you change the main odometer while using the **Odometer** position of the rotary switch. To automatically correct the calculated time as you adjust the main odometer, use the **Adjust ORM** function (see below) or the **Odo & Time** function (see **AUTOMATIC CALCULATED TIME ADJUSTMENTS**). You can, of course, manually calculate a required change to the calculated time and separately modify that parameter.

When changing the main odometer, the "**+ / –**" **.001** toggle switch is inactive if you are not viewing distance with thousandths of miles resolution. If you display "thousandths of miles" only when split, you will be able to adjust the thousandths only when split.

The auxiliary odometer is unaffected by adjustments to the main odometer.

Adjusting the Main Odometer and Calculated Time Concurrently

With **Adjust ORM** (Official Rally Miles) selected on the rotary switch, the "**+ / –**" toggle switches can be used to adjust the main odometer, *and the calculated time will be corrected as appropriate to coincide with the distance change*.

When changes to the main odometer are made using the **Adjust ORM** function, the 798A accumulates those changes in a manner similar to distance accumulated while driving. In fact, the 798A has no way of distinguishing between distance entered using the **Adjust ORM** function and distance accumulated while driving. The **Adjust ORM** function effectively allows you to change the distance measured by the 798A.

You may use the **Adjust ORM** function whether or not the 798A is split. If split, the correction to the calculated time will be apparent as you enter the distance adjustment.

The auxiliary odometer is unaffected by adjustments made with the **Adjust ORM** function.

Details, Details, Details...

You may need to read the following information a few times before it becomes meaningful:

The 798A totals distance separately for each "speed section". (Each segment of the route driven at an assigned rally speed is referred to as a "speed section".) As mentioned, the 798A doesn't distinguish between distance accumulated via transducer pulses and distance entered via the **Adjust ORM** function. To be precise, distance entered via the **Adjust ORM** function is considered part of the "active" speed section (i.e., the current speed section).

As will be explained in detail later, the active speed section distance is used when employing the **Retro-CAST**™ function. Should a **Retro-CAST** be executed, all **Adjust ORM** changes, as well as the actual driven distance, will affect the re-computation of the calculated time.

Therefore, when you don't want odometer adjustments to be part of the active speed section (and used by the **Retro-CAST** function, should that feature be employed), do not use the **Adjust ORM** function. Instead, use the **Odo & Time** function as explained in detail later.

Whew! What the…? Don't worry. This information is restated later in a slightly different manner. It will become clearer when you read about the **Retro-CAST** and **Odo & Time** functions. And if you're a driver, rather than a navigator, you may not care anyhow.

Adjusting the Auxiliary Odometer (Option 5)

As of version 6.000 firmware, the 798A is always outfitted with an adjustable auxiliary odometer. To adjust the auxiliary odometer, make it visible in the Auxiliary display, turn the rotary switch to **Odometer**, select **SHIFT**, and use the "**+ / –**" toggles. There is no italicized label below the word **Odometer** that indicates the auxiliary odometer adjustment function.

Note: You can adjust the auxiliary odometer only when the auxiliary odometer is visible.

The 798A disables adjustments to the main odometer for about one second following an adjustment to the auxiliary odometer. This prevents changes to the main odometer should you accidentally release the **SHIFT** switch while making an auxiliary odometer adjustment.

Auxiliary odometer adjustments do not alter either the main odometer or the calculated time.

Truncating the Main Odometer

As mentioned, the 798A measures distance to a resolution of 0.000**00001** mile. The five least significant digits (shown in bold type) are internal to the instrument, and cannot be seen. These internal digits are generally not of concern to the rallyist since official distances are most often given to a resolution of 0.01 or .001 mile.

Still, there are occasions when the internal digits of the odometer can be important. For example, when resetting the odometer at the beginning of the rally, the internal digits must also be cleared to all zeros. Although you can use the "**+ / –**" switches to adjust the main odometer to show 0.000 miles in the **ODOMETER** display, the values of the internal digits would be unknown. You must zero the internal digits to measure from exactly zero miles.

To clear the internal digits of the main odometer, momentarily select **TRUNCATE** on the **CAST–TRUNCATE** toggle switch.† When **TRUNCATE** is actuated, the internal digits of the main odometer, *as well as the thousandths of miles digit in the display*, are reset to zero. The main odometer is, thusly, truncated to an exact hundredth of a mile (xxx.xx000000).

† If desired, you can enable a short delay before a truncate action is recognized. To implement the delay, turn on the 798A while holding down the **SHIFT** and **TRUNCATE** switches. With the delay enabled, you must depress the **TRUNCATE** switch for 1 second to execute the truncate. The beeper will signal when the delayed truncate occurs. (Repeat the described turn-on procedure to revert to the "no delay" factory setup.)

Obviously, **TRUNCATE** should be used at the start of a rally. Less obvious is that you should also consider using **TRUNCATE** at the beginning of each leg, whether or not the official rally mileage restarts at 0.00 mile. Here's why:

Rallymasters generally design a rally course over a period of time. Since each leg may be measured separately, and often only to a precision of 0.01 mile, there is usually a small distance (<0.01) that remains unaccounted for at the end of each leg. When the individual leg measurements are added together to form a cumulative distance for the entire rally, these small distances are typically not carried over from one leg to the next. To exactly match the rallymaster's measurements you must similarly discard this small distance. Activating **TRUNCATE** at the start of every leg accomplishes this. If you do not truncate the main odometer, there will possibly be an error (albeit slight) in the odometer throughout each leg.

Even when the rallymaster had measured the entire route in a continuous run, you probably should still activate **TRUNCATE** at each outmarker. This is because **TRUNCATE** also truncates the calculated time. See **Truncating the Calculated Time** for more information.

IMPORTANT! As long as you have the **TRUNCATE** function selected, the 798A will not accumulate any distance in the main odometer, nor will the calculated time change. As an option, Timewise can reprogram your 798A so that subsequent to a truncate being executed, the main odometer will immediately count distance (and count calculated time) even while the **TRUNCATE** switch continues to be depressed.*

Activating **TRUNCATE** does not affect the auxiliary odometer.

Resetting the Main Odometer

The main odometer can be reset to exactly 0.00000000 by actuating the **SHIFT** switch and then *concurrently* depressing the **TRUNCATE** switch. This executes the main odometer **Reset** function.†

You must actuate the switches in the prescribed order. After the reset, the main odometer will be held at 0.00000000 as long as you depress the **TRUNCATE** switch.‡

IMPORTANT! Resetting the main odometer also truncates the calculated time. See the discussion in **Truncating the Calculated Time** for further information.

Resetting the main odometer does not affect the auxiliary odometer.

Resetting the Auxiliary Odometer

The auxiliary odometer has non-visible internal digits just like the main odometer. When you select the **RESET** position of the **RESET–SHIFT** toggle switch, *while the auxiliary odometer is being displayed*, the auxiliary odometer will be reset to 0.00000000 mile. In this way, you can measure precise distances between physical references.

Resetting the auxiliary odometer does not affect the main odometer or the calculated time.

* If the delayed truncate mode is enabled, the main odometer (and calculated time) will advance during the 1 second delay prior to the truncate function actually being executed. Also, the odometer (and calculated time) will count immediately after the truncate is executed, even if the **TRUNCATE** switch continues to be depressed.

† There is never a delay when resetting the odometer, whether or not the delayed truncate mode is enabled.

‡ When the delayed truncate mode is enabled, the main odometer will accumulate distance immediately following the reset, even if you continue to depress the **TRUNCATE** switch. The calculated time will also advance immediately following the reset.

SELECTING THE ACTIVE ODOMETER TRANSDUCER INPUT

There are two odometer transducer inputs on the 798A, labeled "**ODOMETER INPUT 1**" and "**ODOMETER INPUT 2**" on the rear panel. The inputs are independent of each other. Either can be used without the other one having a transducer attached.

There are two methods available to select which transducer input is to be used. One way is to turn the rotary switch to its special function position, depress (and hold) **SHIFT**, and then activate the **Odo Input** select function by toggling the "**+ / –**" **10.00** switch. Each time you actuate **Odo Input**, the 798A will toggle the active input from one to the other. The **CALCULATED TIME** display will show which input is active: "**InPut 1**" indicates that odometer transducer input 1 is active; "**InPut 2**" means that input 2 is active

Alternatively, you can select **Factor** on the rotary switch, actuate (and hold) the **RESET** switch up, and then actuate any "**+ / –**" switch. The 798A will begin using the other odometer input. As before, the **CALCULATED TIME** display shows the active input. (The **RESET** switch will not reset any parameter when the rotary switch is in the **Factor** position.)

The 798A remembers your selection of the active input when the instrument is turned off. Don't forget to connect to the appropriate input when re-installing the 798A at a later date.

THE ODOMETER FACTOR

Whenever **Factor** is selected on the rotary switch, the time of day in the **CLOCK** display is temporarily replaced by the odometer factor.

The odometer factor is the distance, in decimal parts of a mile (or kilometer), that your vehicle travels between each pulse generated by the odometer transducer. The factor is six digits long. By using an appropriate factor, the 798A will correctly measure distance as it senses pulses.

To understand how the odometer factor is used, a brief description of the distant measurement methodology used by the 798A is helpful:

The odometers are internally resolved to 0.00000001 mile (kilometers). When a transducer pulse is received by the 798A, the six digit factor is added to the six rightmost (internal) digits of the odometers. When a sufficient number of pulses are received, the summation mathematically carries into the higher order (visible) digits. (Note that the leftmost digit of the factor (**x**xxxxx) carries a numerical significance of thousandths of miles (kilometers). If that digit is non-zero, each pulse will increase the thousandths digit in the odometers.)

The odometer factor is initially set to a value of 050000 at the factory. This value represents 0.00050000 mile. With a factor of 050000 the odometer will increase exactly 1.000 mile after receiving 2000 transducer pulses. (This default value was selected because two-piece transducers, when sensing magnets attached to a wheel, output about 2000 pulses each mile. The odometer factor for your vehicle will probably to be close to the default value.)

Selecting the Active Odometer Factor

There are actually four odometer factors in the 798A, two each associated with the two odometer transducer inputs. When you use **ODOMETER INPUT 1**, the two factors associated with that input are available. Two different factors are available when you use **ODOMETER INPUT 2**.

To change from one factor to another, while continuing to use the same odometer input, turn the rotary switch to the **Factor** position and depress **SHIFT**. This enables the **A ↔ B** factor select function, allowing you to choose which factor is to be used. With the **SHIFT** switch depressed, actuate any "**+ / –**" toggle switch, either up or down. Each time you do so, the

798A will alternate between the two factors for the active odometer input. The **AUXILIARY** display shows which factor is in use: When odometer input 1 is being used, "**Fctr. A**" and "**Fctr. b**" are available. When odometer input 2 is being used, "**Fctr. C**" and "**Fctr. d**" are available. The factor letter designations are arbitrary, as there is no operational difference between the factors. The **CLOCK** display changes to show the value of the selected factor.

After selecting a factor, release the **SHIFT** switch. Then, use the "**+ / –**" toggle switches to adjust the factor's value. But note: after using the **A ↔ B** factor select function, the 798A disables adjustments to the factor itself for about one second following the release of the **SHIFT** switch. This prevents an accidental adjustment to the factor if you should temporarily release the **SHIFT** switch while making the factor selection.

When you adjust an active factor, the inactive ones are not adjusted. You must separately select and adjust both factors if you expect to use both of them with one odometer input. Similarly, the two factors associated with the other odometer input must be separately adjusted. (See **Automatic Factor Calculation** for an exception to this rule.) Remember that the **CALCULATED TIME** display shows the active input whenever **Factor** is selected: "**InPut 1**" indicates that odometer input 1 is active; "**InPut 2**" means input 2 is active.

The 798A saves all factors in non-volatile memory. The factor values you enter will remain unchanged until you subsequently change them, even if the 798A had been turned off.

Determining Your Base Factor

The procedure described below is used to compute a unique "base factor" for your installation. When your base factor has been determined, enter that value into the 798A. A correct base factor will make the 798A accurately measure statute distances.

To determine a base factor, you must drive an officially measured distance. Most rallyists use the statute mileage posted along major highways. Alternatively, measure a course with the standard odometer in your vehicle. Select a course of about five to ten miles.

(Note: Although you will have an opportunity to compute a new factor at the start of each rally, it is advisable to ascertain an accurate base factor. Should you make a course error during the odometer check, your base factor can be used to run, or at least start, the rally.)

After having driven a selected official route, compare the official distance for the route to the distance measured by the 798A. Then use this formula to compute a new factor:

$$\text{New Factor} = \frac{\text{Official Distance} \times \text{Old Factor}}{\text{Measured Distance}}$$

In this formula, the **Old Factor** is the factor that was in the 798A as you traversed the official measured route. When the 798A is delivered, the "old factor" is 050000.

After you compute a new factor, select **Factor** on the rotary switch and use the "**+ / –**" toggle switches to adjust the factor to the new value.

If you are using both odometer transducer inputs you will have to separately calculate base factors for both inputs. Don't forget to re-select your primary odometer transducer input after setting the factors for the other input.

A bigger factor makes the 798A display more miles after driving between two points. That is, to accumulate more miles during passage of a route, increase the odometer factor. Conversely, a smaller factor makes the 798A display fewer miles after traversing the route.

The factor can be set to any value in the range 000000 to 999999, although most installations use a factor from 010000 to 090000. Recheck your computations if you calculate a factor greater than 090000. If your computations are correct, a poorly installed or defective transducer may be indicated.

Using the Built-in Odometer Pulse Divider

Although the odometer factor can be set to a value less than 010000, using such a small factor means that the 798A is receiving more than 10,000 pulses per mile. Under such conditions, when traveling at high speeds, the 798A might receive pulses so quickly that it won't be able to process every pulse. Such high pulse rates often occur when using OEM (Original Equipment Manufacturer) electronic speedometer systems as the signal source.

If odometer transducer pulses arrive too rapidly for the 798A to assimilate (> 1500 pulses per second on the active input), the 798A will display the warning "**PULSES ArE too FASt**" in the **CLOCK**, **CALCULATED TIME**, and **AUXILIARY** displays. The warning is displayed until the pulse rate is lowered. †

Use the 798A's built-in odometer signal "divide-by" circuitry when connecting to such high pulse rate signals. The "divide-by" circuitry allows the use of high frequency signals that originate from electronic speedometer systems. Using the built-in divider, odometer pulses applied to **ODOMETER INPUT 2** may be divided by 1, 2, 4, 8, 16, 32, 64, or 128.

To display the current "divide-by" ratio for **ODOMETER INPUT 2**, turn the rotary switch to the special function position and depress the **SHIFT** switch. Provided input 2 is selected as the odometer signal source, the **CLOCK** display will show **xxx:1**, with xxx indicating the current "divide by" setting for *odometer input 2*.

To select a different divide-by ratio, start by displaying its current setting. Then activate the "**+ / –**" **1.00** toggle switch, either up or down. Notice the shifted designation **Input ÷ Ratio** beneath the "**+ / –**" **1.00** switch. Each time you activate the **Input ÷ Ratio** function, you'll select a different division ratio.

The divide-by setting is only applicable to **ODOMETER INPUT 2**. The divide-by ratio for **ODOMETER INPUT 1** is never displayed and is fixed at 1:1

You must experimentally determine the correct signal division ratio for your installation. Drive your vehicle slowly (20 to 25 mph) for a short distance (an 1/8th mile or so) and compute a new odometer factor. If the factor is below 020000, select a higher division ratio and re-try. For electronic speedometer systems, the 4:1 or 8:1 ratio is usually appropriate.

The divide-by circuitry in the 798A also conditions the input signal in an attempt to correct for deficiencies in the quality of an electronic speedometer signal. Unfortunately, many early electronic speedometers do not provide a reliable signal when traveling slowly. These older systems use small generators, or magnet and coil inductive designs, that ceased to function at low speeds. Signals from those early electronic speedometers can produce erratic results.

Fortunately, most new electronic speedometer systems output logic level signals at any speed. Signals from such newer designs should work fine.

† Actually, the 798A has been experimentally operated at an odometer signal rate of 10,000 pulses per second without missing a single pulse. The "divide-by" circuitry extends this rate to 1,280,000 pulses per second. No land based vehicle electronic speedometer system comes anywhere close to this limit.

You must determine where you connect to the OEM electronic speedometer circuitry. Timewise cannot assist in locating a wiring diagram of your vehicle or a specific connector under the dash. Although the 798A signal conditioning will not normally interfere with operation of the OEM electronic speedometer, this is not guaranteed. Timewise assumes no liability associated with the use of this feature.

Note: The duplicated transducer signal that is <u>output</u> on pin 8 of the **ODOMETER INPUT 1** modular jack (**Appendix C** has details) is the "divided" signal from **ODOMETER INPUT 2**. Therefore, if you place the odometer signal duplicator jumper plug (described shortly) into **ODOMETER INPUT 1**, the divided signal from input 2 is fed back to input 1.

Determining a New Factor at a Rally

An accurate base factor will make the 798A measure distance according to the official standard you select. Unfortunately, since each rallymaster uses a different "official" standard (and measurement technique), your factor will need to be changed a little at each rally.

The **New Factor** formula shown earlier is also used to compute a new factor for each rally. When figuring a new factor at a rally, the odometer check distance is the **Official Distance** and your base factor is the **Old Factor**. After driving the odometer check route, the 798A's measurement for the route becomes the **Measured Distance**.

If you plan on using only one factor and a single odometer transducer, you need to calculate only one new factor. After determining the new factor, change the active factor to that new value. From then on your distance measurements will match the rallymaster's. If you wish, you can set all unused factors to that same value. By doing so, you will continue to count mileage correctly should you accidentally switch factors or inputs (assuming you install the odometer signal duplicator jumper plug mentioned below).

If you had valid base values for the other factors in the 798A, you can use the same odometer check measurement value to calculate new values for the other factors. However, if those factors do not have valid base values, you would have to retrace the odometer check once for each of those other factors. This applies to the second factor for the odometer input used during the odometer check, as well as the factors of the unused odometer input. (If you do adjust the other factors, don't forget to re-select your primary factor and input.)

Using Four Factors with One Odometer Transducer

Designed into the 798A is a system that allows you to choose among all four factors (two each associated with the two odometer inputs) while using only one odometer transducer. This feature is enabled via a special "jumper plug" provided with the instrument.

The jumper plug is a custom wired RJ45 modular plug that causes a signal from one transducer to be applied to both odometer inputs. By inserting the jumper plug into an "unused" odometer input, pulses from the transducer attached to the other odometer input are simultaneously re-directed to both inputs. Selecting either odometer input will access the same signal. And since each input has its own pair of factors, you can select among four available factors. You can use this feature, for example, if you experience a variable amount of wheel slippage under four different road conditions: gravel on straight roads, gravel with a lot of turns, wet pavement, and dry pavement.

(By the way, the signal duplication circuitry also allows you to connect a single odometer transducer to two different Timewise computers. To do so, you'll need to attach a cable from an unused odometer transducer input on the 798A to an odometer input on a second computer. **Appendix C** describes a special cable required to do this.)

Automatic Warning of an Odometer Transducer Failure

If you are operating with two odometer transducers, a unique **Intelli-Sense**™ system in the 798A can determine if one of those installations is failing.

In order for the **Intelli-Sense**™ warning system to function correctly, there are a few requirements. First, you must start with two functioning transducers. Secondly, the active factors for each transducer must have been set to approximately correct values. And lastly, both transducers must operate correctly for a short distance (about 0.03 mile). (The 798A uses these conditions to initially correlate the distance measured by both transducers.)

If the 798A detects a problem with an odometer input, the **CLOCK** and **CALCULATED TIME** displays will show the warning "**InPut 1 SUSPECt**", or "**InPut 2 SUSPECt**", indicating that a particular transducer installation appears to have failed.

The failure warning can be dismissed by activating **SHIFT**, adjusting the factor, changing odometer inputs, or (as of version 5.009 firmware) by turning the rotary switch. It is up to you to determine if there really is a failure and, if necessary, change the input transducer.

After acknowledging a suspected failure by operating the **SHIFT** switch or adjusting the factor, the warning system will not be reactivated until you change odometer inputs. If you do change inputs, but do not correct the problem, the warning will likely re-appear.

The failure detection system is designed to allow as much leeway as is reasonable when correlating the way two different transducer installations sense distance, without causing unnecessary warnings during hard braking, heavy acceleration, or sharp cornering. **The intent of the warning system is primarily to give rapid warning should a magnet be dislodged from a wheel, or when a transducer fails completely.**

The transducer failure warning system is not intended to warn you of random missed pulses. You can, however, often use the driver's speedometer readout for that purpose. If a pulse is skipped while the 798A is measuring your speed, the speedometer value will momentarily decrease by 5% to 10%. (The 798A measures your speed approximately twice per second. If a pulse is skipped between speed measurements, the missing pulse will not be evident.)

Automatic Factor Calculation

Instead of manually calculating new odometer factors, you can let the 798A compute new factors for you. The **Odo Check** and **Compute Factor** functions are used for this purpose.

Whenever **Odo Check** is selected on the rotary switch, the **AUXILIARY** display shows an "official odometer check distance" — a value you set in the 798A. (The odometer check distance is automatically displayed regardless of the **TIME–Δ–ODO** switch position.) At the same time, the active factor is shown in the **CLOCK** display. With **Odo Check** selected on the rotary switch, the "**+ / –**"switches will adjust the official odometer check distance.

To correctly carry out the automatic factor calculation, here's what you have to do:

At the start of the odometer check, reset the main odometer (to 0.00000000 mile). Then begin driving the route. Prior to finishing the odometer check, select **Odo Check** and enter the official odometer check distance into the **AUXILIARY** display. This value can range from 0.001 to 99.999. (You can enter the odometer check distance at anytime. The value is saved in memory when the rotary switch is rotated away from the **Odo Check** position.)

As you approach the end of the odometer check route, select **Odo Check** on the rotary switch. Then depress (and hold) the **SHIFT** switch. This arms the **Compute Factor** function. At the exact point on the course that is the end of the odometer check, actuate any

"**+ / –**" toggle switch to execute the function. The 798A will compute your new odometer factors. The currently active factor (visible in the **CLOCK** display) will be updated to its new value, and the official odometer check distance will be entered into the main odometer.

Note*: The other factor in the 798A associated with the active odometer input will also be corrected. If you subsequently select the other factor, don't be surprised to see that it, too, has a new value. Contact Timewise if you don't want this feature.*

Here's the step by step method to execute the automatic factor calculation:

1. Reset the main odometer at the start of the odometer check.
2. Select **Odo Check** and adjust the **AUXILIARY** display to show the official odometer check mileage.
3. Drive the odometer check route.
4. At the end of the odometer check make certain **Odo Check** is selected, depress and hold **SHIFT**, and then actuate any "**+ / –**" toggle switch.

When executing the **Compute Factor** function, the 798A internally resolves distance to ten thousandths of a mile (.0001). If you decide to double check the accuracy of the 798A by manually computing the factor, you will not have such resolution available. As a result, you may compute a slightly different value than does the 798A. After a ten mile odometer check, the factor calculated by the 798A can be 0.01% smaller than the value you calculate (using a resolution of .001 miles). A greater difference is possible if the distance is shorter.

IMPORTANT!

There are three major items to note when using the automatic factor calculation.

First, ***the calculated time remains unchanged following an automatic factor calculation.*** Do not assume the calculated time is corrected following the procedure. It does not happen. (The auxiliary odometer also remains unchanged.)

Second, when you execute an automatic factor calculation, *all four odometer factors may undergo a correction*. That is, the factors associated with the inactive odometer input may also change. However, to automatically correct those factors, you must have a functioning transducer attached to the inactive input during the odometer check. (You can use the signal duplicator jumper plug to simulate a transducer, if you want.) If a transducer is not attached to the inactive input, the 798A senses this and does not change the associated factors.

Lastly, correct base values for the unused factors (the second factor for the active input, as well as both factors for the inactive input) must have been set into the 798A. This is because the 798A computes a correction percentage for the active factor, and then applies that same percentage adjustment to each of the other factors (unless, as mentioned above, the inactive input is not receiving a signal, in which case the factors for that input are not changed).

Other items to note:

- ❑ You must not change the factor or the odometer input during the odometer check.
- ❑ The automatic calculation uses the overall distance measured by the 798A when figuring the new factor. Do not split the 798A at the end of the odometer check and drive beyond the reference marker before executing **Compute Factor**. If you do so, the 798A will compute incorrect factors. The 798A uses the actual distance driven, not the split value.

- ❑ Do not execute **Compute Factor** at intermediate mileaged references along the odometer check route. The calculation algorithm assumes measurement differences occur linearly throughout the odometer check, not just between a couple of references. *Repeatedly executing* **Compute Factor** *is not a valid way to "zero in" on your factors!*
- ❑ After executing an automatic factor calculation, you must change the **Odo Check** distance before the function can be executed again. As such, it is recommended that you do not alter the **Odo Check** value after executing the function. This will prevent an unintentional activation of the procedure a second time.
- ❑ *Always record the new factors computed by the 798A!* If you manually alter the factors, you might subsequently need the original numbers to put back into the factor memories.

Sample Factor Calculation

The 798A can also execute a "sample" factor computation.

To compute a sample factor without changing any of the original factors, follow the **Compute Factor** procedure as outlined above, except actuate the **RESET** switch at the end of the odometer check (instead of the **SHIFT** switch and a "**+ / –**" toggle switch).

(The **RESET** switch action will not reset the odometer check distance.)

The computed sample factor will be shown in the **CALCULATED TIME** display. Neither the main odometer nor any of the factors (active or inactive) will be modified.

The sample factor will be displayed until you turn the rotary switch away from the **Odo Check** position. Record the sample factor as necessary before moving the rotary switch!

You can repeat the sample factor calculation without changing the odometer check distance. A new calculation is performed each time. But note this important item:

After a sample factor calculation is executed, the normal **Compute Factor** function can be executed *only before the 798A counts another transducer pulse*. As soon as a pulse is used to count forward motion (i.e., when the 798A is in **FORWARD**), the **Compute Factor** function is disabled until the odometer check distance is modified. This prevents inadvertent changes to the factors should you accidentally attempt to execute the function later.

Details on the Odometer Factor

Note that the least significant digit of the factor represents one hundred millionth of a mile (0.00000001 mile). Adjusting a factor by one count means that the 798A will gain (or lose) 0.00000001 mile with each pulse from the transducer. You would have to receive 100,000 pulses before a one count adjustment would make a correction of 0.001 mile.

To illustrate further: On installations where the transducer senses two magnets mounted to a wheel rim, the wheel must complete 50,000 revolutions before a factor adjustment of one count would make a noticeable correction in the odometers. Since a wheel turns approximately 1000 times per mile, you would have to drive 50 miles before a one count adjustment in the factor would make a 0.001 mile difference in the odometers. Consequently, corrections to the odometer factor usually mean adjusting it more than just a few counts.

Fine Tuning the Odometer Factor

Whenever the rallymaster gives an official mileage at a reference, you can use that information to confirm the measuring accuracy of the 798A. When doing so, you will often notice slight deviations from official mileages. Such inconsistencies occur when the rallymaster's driving style differs from yours. Also, the course may have been measured under different road and weather conditions.

Although you can align your odometer at each official mileage, you may decide to re-figure your odometer factor in the midst of the rally. Changing your factor to adjust for such minor course variations is called "fine tuning" the factor.

To fine tune your factor in the midst of a rally, use the **New Factor** formula as before. You will need two official mileage references and your odometer reading at both locations. Then use the distances between the references (both official and measured) in the formula.

Rather than using the **New Factor** formula to re-calculate the factor, it is sometimes easier to do a quick fix "in your head". Let's look at the relationship between a mileage measurement error and the correction required in the odometer factor to eliminate the error.

Assume your factor is 065000. Then suppose your odometer has increased 1.00 mile after traveling 0.99 official course miles. Your measurement of 1.00 was in error by 0.01 mile. That is, your measurement error is 0.01 mile per 1.00 mile, or 1% (0.01 ÷ 1.00). This 1% error figure is also the error in the factor.

A decrease of the factor by this same percentage is necessary to correct the factor. (Remember — decreasing the factor makes the 798A measure fewer miles.) Thus, reduce the factor 1% of 065000, or 650 counts. The correct factor is 064350. You must also correct the inactive factors, as well as adjust your odometer and calculated time to match the rallymaster.

Had you traveled 10.00 miles before accumulating the 0.01 mile error, you would have a 0.1% error (0.01 ÷ 10.00). Your factor would then be reduced 0.1% of 065000, or 65 counts, to a new value of 064935.

Unfortunately, when an opportunity to fine tune the factor does occur, you will likely not have such easy to use numbers for the mileage or factor. Still, the principle is the same…figure the percentage error of the mileage, and correct the factor by that percentage.

Here's a more realistic example: Assume your factor is 072563 and that you reset the odometer at the start of the leg. You are currently working on an instruction that reads,

"Turn on Rinkel Road at 4.32 miles"

When you turn on Rinkel Road, you note that your odometer displays 4.30 miles, giving you an error of 0.02 miles. This is a 0.02 mile error in 4.30 miles, or approximately 0.5%. To correct the factor, increase it by 0.5%, or approximately 360 counts. Set your new factor to 072920, rounding off to ease future recalculations. Don't forget to adjust the inactive factors by the same percentage. Also, remember to correct both the odometer and calculated time!

CAUTION! As all experienced rallyists know, mileage references at anything other than clearly labeled signs should be suspect as to their accuracy. Do not change your factor every time a reference mileage is given! Rather, align your odometer, if you must, and watch for a repeating trend. If your odometer continues to drift, you may then wish to change the factor.

It is unwise to change the factor when noting a one time 0.01 mile difference between your odometer and the official mileage. One pulse from the transducer can cause the difference.

Of course, the way to win a rally is to exactly match the rallymaster's official distance at all points along the course. To do so, many rallyists keep a constant watch on their odometer, looking for a pattern of measurement differences. That is really the most effective method for knowing when to adjust the factor or just align the odometer.

By using the thousandths of miles capabilities of the 798A, you can see how close you match every mileage reference given by the rallymaster. You can precisely align your odometer to the rallymaster's official measurements at each such reference.

IMPORTANT! Do not use **TRUNCATE** to synchronize your odometer to the rallymaster's mileages in the middle of a leg! See **Truncating the Calculated Time** to understand why.

THE CALCULATED TIME

A primary function of the 798A is to compute perfect rally time. Perfect rally time, termed the "calculated time," is the exact time of day that you should arrive at each point along the course. The **CALCULATED TIME** display shows this figure.

Like the time of day clock, the calculated time ranges from 12:00.000 to 11:59.999 (:59.9). The counting mode (i.e., "hundredths of minutes", "thousandths of minutes", "seconds", or "tenths of seconds") of the clock also dictates the counting mode of the calculated time.

The calculated time is computed from the distance you drive and the average speeds given by the rallymaster. Since the calculated time is a computed value, rather than a stopwatch or a clock, the value displayed will not necessarily advance at a steady pace. Instead, the calculated time will count at a rate that depends on your progress along the rally route.

By comparing the value of the calculated time to the time of day clock, you can determine whether you are "early" or "late" as you proceed along the course. *If the calculated time is greater than the clock, you are early. If the calculated time is less, you are late.* As explained later, the **ERROR** display on the driver's module makes this comparison for you.

Like the odometers, the counting direction of the calculated time is determined by the **FORWARD–PARK–REVERSE** switch. **FORWARD** makes the calculated time increase as you drive; **REVERSE** makes the calculated time decrease as you drive; and **PARK** stops the calculated time from changing. When you select **REVERSE** while retracing an off-course excursion, the calculated time decreases so that upon returning to the correct route, the value will be correct for that location, irrespective of your indirect way of getting there.

The 798A can also display an "**Auxiliary Calculated Time**". The auxiliary calculated time is the computed driving time from a previously selected point to your current location. The **AUXILIARY** display shows the auxiliary calculated time when you select **TIME** on the **TIME–Δ–ODO** toggle switch. See **THE AUXILIARY DISPLAY** for more information.

Adjusting the Calculated Time

When **Calc Time** is selected on the rotary switch, the "**+ / –**" toggle switches can be used to adjust the calculated time. Use this feature to align the calculated time to your assigned out-time at the beginning of the rally and at each checkpoint outmarker.

Pauses and Gains

When a rally instruction directs you to execute a "pause" or a "gain", use **Calc Time** to enter the amount. A pause is entered as a positive change to the calculated time; a gain is entered as a negative change. That is, **add time to the calculated time to enter a pause**; and conversely, **subtract time from the calculated time to enter a gain**.

As you make such adjustments to the calculated time, the amount of change may be viewed in the **AUXILIARY** display. See **THE AUXILIARY DISPLAY** for more information.

Truncating the Calculated Time

The 798A computes the calculated time to a resolution of 0.00**01** minute (or 0.**01** second). The two least significant digits (in bold) are generally not of concern since official times are given only to a resolution of 0.01 minute (or whole seconds). Nevertheless, it is advisable to zero those two low order digits when setting your out-time at the start of each leg, insuring that the 798A counts from the exact value used by the rallymaster. If not cleared, non-zero values in those two digits would cause the calculated time to increment too soon. The result would be a slightly incorrect calculated time throughout the entire leg.

To clear the calculated time's two least significant digits, momentarily select **TRUNCATE** on the **CAST–TRUNCATE** switch.† In this manner you truncate the calculated time to an exact hundredth of a minute (or exact whole second).

IMPORTANT! Truncating the calculated time also truncates the main odometer to hundredths of a mile.

IMPORTANT! Resetting the main odometer (by activating **RESET** and **TRUNCATE**) also truncates the calculated time to whole hundredths of a minute (or whole seconds).

IMPORTANT! As long as **TRUNCATE** is selected, the 798A will not accumulate any calculated time, nor will distance accumulate in the *main odometer*.‡

Truncating the Calculated Time Minutes

As of version 5.010 firmware, you can optionally truncate the calculated time to exact whole minutes, whereby all digits to the right of the calculated time minutes are cleared to zero. To do so, first turn the rotary switch to **Calc Time**, then concurrently actuate **TRUNCATE** and the "**+ / –**" **.001** switch (either "**+**" or "**–**"). This feature is known as Option 17.

THE AVERAGE RALLY SPEED (The CAST)

Depending on local custom, the average speed at which you are to travel has been called "BAS", "CAS", or "CAST". These are acronyms for "Begin Average Speed", "Continue at Average Speed", "Commence Average Speed", and "Change Average Speed To". Throughout the remainder of these instructions the acronym "CAST" will be used when referring to the average speeds given by the rallymaster. Similarly, the phrase "change CAST" means "change to a new average speed."

CASTs can be anywhere in the range 0.1 to 99.9, or 1 to 399. The 1 to 399 range is most often used when the rally is run in kilometers, rather than miles. (Optional firmware allows CASTs to be set from 0.01 to 99.99 (0.01 resolution). See the Option 6 supplement at the front of this manual for more information.)

To change from one speed range to the other, turn the rotary switch to its special function (5 o'clock) position. Then depress and hold **SHIFT**. Finally, use the "**+ / –**" **.001** switch to

† See the footnotes on pages 30 and 31 regarding implementation of a one second delay for the truncate function.

‡ The implementation of the one second delay for the truncate function (see the footnotes on pages 30 and 31) disables the continuous truncation of the main odometer and the calculated time while the **TRUNCATE** switch is being depressed (both before and after the truncation).

activate the **Speed Format** function. Each time you activate **Speed Format**, the 798A will change from one speed range to the other.

Note: If you have a non-zero value in the "tenths" digit while in the 0.1 to 99.9 range and subsequently select the 1 to 399 range, that digit will be forced to a zero. If you switch back to the low range, that digit will remain at zero. Similarly, a non-zero digit in the "hundreds" position while in the high range will be forced to a zero when switching to the low range.

The Active CAST

The **SPEED** display shows the CAST currently in use by the 798A as it computes the calculated time. The CAST shown is the average speed the 798A expects you to maintain, *not the speed at which you are actually traveling*.

You will change the active CAST throughout the rally as directed by the rally instructions.

The Next CAST

The **NEXT SPEED** display shows the next CAST you expect to use. This value is derived from information given in the rally instructions.

By selecting **Next Speed** on the rotary switch, the value shown in the **NEXT SPEED** display can be adjusted with the "**+ / –**" toggle switches *, thereby setting it to the next expected CAST.

Changing to a New Active CAST

To begin using a new active CAST, momentarily select **CAST** on the **CAST–TRUNCATE** toggle switch. This will instantly change the currently active CAST, as had been showing in the **SPEED** display, to the next CAST, as had been showing in the **NEXT SPEED** display. The 798A will immediately begin using the new CAST value as it computes the calculated time.

After activating **CAST**, the value in the **NEXT SPEED** display is automatically set to the previous CAST. You will essentially see the two CAST values change places. In this manner, the 798A allows you to easily switch back and forth between the two speeds.

You may actuate **CAST** at any time. Each time you actuate **CAST**, a beeper will briefly sound.

When you execute a CAST, the 798A inserts a 0.56 second delay before allowing another CAST to be executed. Call Timewise if you want a different delay (0 to 20 seconds).

While the **CAST–TRUNCATE** toggle switch is held in the **CAST** position, the 798A will split the odometers, the calculated time, and the time of day clock. This is a convenience for rallyists wishing to keep a log of distance and times at each CAST change. (You cannot adjust any value in the 798A while split in this manner, but you can select **SPLIT** on the **SPLIT–LAST CAST** switch and make adjustments after releasing the **CAST** switch.)

Note: You must CAST at least once every 27.77 hours of calculated time. This is because the 798A subtotals calculated time for each speed section in a register that overflows after 27.77 hours (100,000 seconds). You do not actually have to change to a new CAST value — it is only necessary to activate the **CAST** switch. You can "change" to the same CAST value.

* You can reverse the selection of whether the **Next Speed** or **Speed** adjustment is enabled when the **SHIFT** switch is actuated. To do so, turn on the 798A with both **SHIFT** and the "**– .001**" position of the "**+ / –**" **.001** switch selected. Repeat this procedure to revert to the factory setup.

Adjusting the Active CAST (Executing a Retro-CAST™)

When **Speed** is selected on the rotary switch (choose **Next Speed** on the rotary switch and actuate **SHIFT**)†, the "**+ / –**" toggle switches can be used to adjust the active CAST (the value in the **SPEED** display). When you adjust the active CAST, the calculated time for the distance you have traveled *since the last activation of the* **CAST** *switch* is re-computed.

Adjusting the active CAST is called a "retroactive CAST change" or **Retro-CAST™**. Unique to Timewise rally computers, this important feature deserves further explanation:

As you drive, the 798A not only keeps track of distance in the main and auxiliary odometers, it also has another internal odometer that records the distance driven within the "active speed section". (The active speed section is the distance driven since the **CAST** switch was last activated). The 798A uses this active speed section distance, along with the active CAST value, to compute the calculated time. This computation is repeated 12.5 times per second.

Imagine, if you will, that you used a handheld calculator to compute your perfect passage time as you progressed along the course. In that scenario, you'd insert a new distance into the calculator each time you made the computation. Note that with each iteration you could also use a different speed, as well as a new distance. In fact, even if you didn't update the distance, using a different speed would alter the result of your time calculation.

The 798A essentially does just that when you adjust the active CAST to a new value.

The concept of adjusting the active CAST is often best understood by example. Here's an intriguing application that utilizes the Retro-CAST feature:

Suppose you're driving at an assigned CAST of 40 and the current instruction reads:

> "CAST 30 at last sideroad prior to Reynolds Drive."

How can you possibly know where to begin execution of this instruction if the sideroad and Reynolds Drive are not within sight of each other? You would never know which sideroad to use as the initiation point of the instruction until you find Reynolds. Unfortunately, when Reynolds is reached, it would be too late to make the CAST change. You would have to drive back to the sideroad, execute the CAST change, and return to Reynolds.

Fortunately, you can use the Retro-CAST function so you don't have to retrace the distance to the sideroad. ‡

Here's what you can do: Enter a speed of 40.0 into the **NEXT SPEED** display. This would be the same value as you would have in the **SPEED** display. At each sideroad you pass, actuate **CAST**. Although, it will appear that you aren't changing CAST, you will start a new active speed section with each CAST execution. When you finally do reach Reynolds Drive, *do not* actuate **CAST**. Instead, use the **Speed** function to adjust the **SPEED** display to a value of 30.0 mph. The 798A will automatically re-compute the calculated time for the distance traveled since the last sideroad (the starting point for the active speed section) using the corrected CAST.

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† You can reverse the selection of whether the **Next Speed** or **Speed** adjustment is enabled when the **SHIFT** switch is actuated. To do so, turn on the 798A with both **SHIFT** and the "**– .001**" position of the "**+ / –**" **.001** switch selected. Repeat this procedure to revert to the factory setup.

‡ See the discussion on **Changing the Distance Measurement and Calculated Time at the Last CAST** on page 47 for another idea on how to handle this problem.

When you become comfortable adjusting the active CAST "after the fact," you will discover other ways to use this feature. For example, you might be on a rally that has a default CAST of 20 whenever you enter a gravel road. Normal CAST changes would be executed using values entered into the **NEXT SPEED** display. However, if you suddenly enter a gravel road, actuate **CAST** immediately. Then select **Speed** and adjust the **SPEED** display to 20.0 as you drive. The ability to correct the active CAST eliminates the need to stop the vehicle and fiddle with a series of switches before proceeding along the course.

You'll soon realize that it doesn't matter what value is set in the **NEXT SPEED** display...you can always correct the active speed after executing **CAST**. In fact, the next speed feature is provided primarily as a convenience for presetting the next expected CAST when enough time and information is given about the course. When a surprise CAST does occur, all you have to do is actuate **CAST** and adjust the **SPEED** display to the correct value using the **Speed** function. † There is no loss of accuracy when using the 798A in this manner.

Note: Once you execute a **Transit**, **TRUNCATE**, **Reset**, or **Compute Factor** function, you can no longer alter the CAST for the distance traveled prior to the execution point of those functions. Executing any of those functions always establishes a new active speed section.

Details, Details...

As mentioned earlier, when changes to the main odometer are made using the **Adjust ORM** function, the 798A accumulates those changes, along with the actual distance you drive, in the "active speed section".

It follows, therefore, that any use of the Retro-CAST function will result in a recomputed calculated time due, in part, to **Adjust ORM** adjustments made in the active speed section.

If you wish to prevent course adjustments from becoming part of a Retro-CAST correction, use the **Odo & Time** function instead of the **Adjust ORM** function. The **Odo & Time** function is explained in **AUTOMATIC CALCULATED TIME ADJUSTMENTS**.

When You Change CAST

When computing the calculated time, the 798A uses some of the internal, non-visible digits of the odometer. By using these lower order digits, the calculated time can update before the odometer visibly increments a hundredth of a mile. If the 798A updated the calculated time only when the odometer visibly incremented the hundredths digit, the calculated time would appear to skip numbers.

For example: After traveling exactly 1.000 mile at a CAST of 30 mph, the 798A will increase the calculated time exactly 2.00 minutes. When you travel 1.005 miles, the calculated time will increase to 2.01 minutes. Note, however, that because the rallymaster typically resolves distances to only hundredths of a mile, she will still consider the distance to be 1.00 mile. The rallymaster's calculated time will, therefore, remain at 2.00 minutes. When the distance increases to 1.010 mile, both the 798A and the rallymaster will compute the same calculated time of 2.02 minutes. Thus, the rallymaster effectively skips from 2.00 minutes to 2.02 minutes, whereas the 798A does not.

Since the 798A does not skip numbers, the calculated time it displays may differ from the figure computed by the rallymaster whenever you are "in between" hundredths of a mile. The 798A can, at those times, compute a calculated time more precise than the official value. In effect, the 798A is too accurate!

† If desired, you can reverse the selection of whether the **Next Speed** or **Speed** adjustment is enabled when the **SHIFT** switch is actuated. To do so, turn on the 798A with both **SHIFT** and the "**– .001**" position of the "**+ / –**" **.001** switch selected. Repeat this procedure to revert to the factory setup.

Note, however, that any discrepancy between the 798A and the official calculated time disappears whenever your mileage equals an exact hundredth of a mile. At each such point, both the 798A and the rallymaster compute the same value for the calculated time. Thus, the discrepancy will come and go with each hundredth of a mile change in the odometer.

If you CAST while "between" hundredths of a mile, however, an apparent problem occurs. At that moment, the calculated time for the just completed CAST section will be saved in an internal "spreadsheet". Any discrepancy between the 798A's calculations and those of the rallymaster will, therefore, be permanently recorded. At this point, it would appear that the measuring accuracy of the 798A would cause an unrecoverable calculation error.

As it turns out, however, such errors are rarely observed. This is because the 798A ends up measuring a fractionally shorter distance in the new CAST section. Unless the new CAST is substantially different in value from the previous one, the slightly reduced calculated time for the new section will balance the slightly excess calculated time of the previous section.

If you are concerned about timing discrepancies resulting from the high measuring resolution of the 798A, it is suggested that you change CAST at locations that are exact hundredth of a mile increments. That is, instead of executing a CAST *exactly* at a reference, you may wish to execute the CAST just before or immediately after the reference.

You can often judge where the odometer will increment by watching its counting rhythm. If you think the odometer will increment a foot or two after the reference, try waiting those extra few feet before actuating the **CAST** switch. If you see the odometer increment a few feet before the reference, and you believe the rallymaster would have used that exact value, actuate the **CAST** switch immediately. Note that many rallymasters effectively do this when they record an official course mileage in "xxx.xx" resolution at a landmark.

Using Slow Speeds

The 798A allows you to use a CAST as low as 0.1 mph. Even while traversing such slow speed sections the calculated time will increment appropriately, making it possible to easily judge your driving time error.

As mentioned, the measuring resolution of the 798A can cause an apparent discrepancy when changing CAST while "between" hundredths of a mile. This is especially true when entering and exiting very slow speed sections. Unless you execute slow speed CAST changes at the *exact* mileages intended by the rallymaster, the 798A *will* compute a comparatively erroneous figure for the calculated time.

As an example, let's assume that you are at a CAST of 60 and that the rallymaster instructs you to CAST 10 at an "RXR" sign and then CAST 60, again, at a "Pass With Care" sign. As is usual for such slow speed sections, the rallymaster has also given the official mileages at the two signs. Let's assume the official distance between the two signs is 0.14 mile.

If you actuate **CAST** exactly at the referenced signs, the 798A may, in fact, measure a distance of 0.145 mile. At a CAST of 10, the travel time for 0.145 mile is 0.87 minutes. For the 0.14 mile measurement used by the rallymaster, the travel time is 0.84 minutes. The greater accuracy of the 798A will actually give you a 0.03 minute error.

As a result, it is highly recommended that you enter and exit slow speed sections (<25 mph) at the exact official mileages given by the rallymaster. If official mileages are not given, actuate **CAST** when the hundredths digit of the odometer visibly increments slightly before, or immediately after, a reference. By doing so, you will more than likely execute the speed changes at the exact mileages used by the rallymaster.

Intelligent CASTs

The 798A can be set up so that the distance (and, therefore, the calculated time) for each CAST section will exactly match the rallymaster's 0.01 mile resolution *regardless of where [within the intended hundredth of a mile] you change CAST.*

This Intelligent CAST, or **Intelli-CAST™**, feature automatically re-computes the calculated time upon each **CAST**, temporarily ignoring any partial hundredths of a mile in the main odometer. Essentially, the 798A measures distance in "normal" high resolution (0.00000001) while traversing a speed section, yet reverts to the rallymaster's resolution (0.01) upon a CAST. After the CAST, the ignored partial hundredths of a mile is applied to the new speed section. In this manner, each speed section always ends at hundredths of a mile increments.

To enable the intelligent CAST feature, turn the rotary switch to its special function position, and actuate the "**+ / –**" **1.00** toggle switch. Note the **Intelli-CAST** label below the switch.

Each time you actuate the "**+ / –**" **1.00** switch the 798A will alternately enable and disable the Intelli-CAST mode. To indicate whether or not the Intelli-CAST mode is enabled, an LED illuminates in the upper right of the **ODOMETER** display. A label identifies the LED's meaning. You can use intelligent CASTs for an entire rally, or just for selected sections.

As an example of how Intelli-CAST operates, consider the scenario described in **Using Slow Speeds**. With Intelli-CAST enabled, exiting the 10 mph section will cause the 798A to re-compute the calculated time using an exact 0.14 mile distance, temporarily ignoring the extra 0.005 mile. The calculated time for the 10 mph section will be 0.84 minutes—exactly the same figure computed by the rallymaster. The unused 0.005 mile is then applied to the following CAST 60 section. Thus, you may enter and exit slow speed sections without concern about where within the intended hundredth of a mile you make the CAST changes.

However, it must be pointed out that a disadvantage of using this feature is that you ***must*** execute all CAST changes ***within*** the intended hundredth of a mile. If you execute a CAST change just inches before the intended hundredth, the 798A will have measured the just completed CAST section incorrectly by a full 0.01 mile. The calculated time will then likely be incorrect — unless the two speed sections have substantially the same CAST.

Note: If you use the Intelli-CAST feature, *you may see a correction to the calculated time at the moment you change CAST.* This is because while re-computing the calculated time, the 798A may temporarily ignore some distance (<0.01) it had measured up to that point. The calculated time may change as a result of using this "truncated" odometer distance. Note that you won't often observe the correction because the re-computed calculated time will also automatically include the travel time for that same distance (<0.01) at the new CAST. If the new CAST is close in value to the old one, the correction may not be evident. However, if you switch to a significantly different CAST, it is possible to see the calculated time correct itself by a count or more. Remember, too, that the 798A is split while **CAST** is actuated, so if you are moving, you'll have to release the **CAST** switch quickly to observe the correction.

Semi-Intelligent CASTs (Option 18)

As of version 6.000 firmware, a **Semi-Intelli-CAST™** mode is optionally available. Called "Option 18", the Semi-Intelli-CAST mode operates similar to Intelli-CAST, but the odometer momentarily revert to 0.001 resolution upon each CAST (rather than the 0.01 resolution used by Intelli-CAST). The unused <0.001 mile then becomes part of the new speed section. When option 18 is installed, activating the "**+ / –**" **1.00** switch (with the rotary switch in its special function position) will cycle through three modes: "normal", Semi-Intelli-CAST, and Intelli-CAST. When the Semi-Intelli-CAST mode is active, the LED in the upper right of the **ODOMETER** display will blink on and off each second.

Recalling the Course Parameters from the Last CAST

Each time you execute a CAST, the 798A saves in memory the following parameters: the odometer, the clock, the calculated time, the CAST used during the just completed speed section, and the actual distance measured during the just completed section.

To review this "last CAST" data, select **LAST CAST** on the **SPLIT–LAST CAST** toggle switch. While the **LAST CAST** function is selected, the distance in the **ODOMETER** display is temporarily replaced by the value that was in the 798A when you last actuated the **CAST** switch. Likewise, the **CLOCK**, **CALCULATED TIME**, and **SPEED** displays will show the values they were displaying when you last executed a CAST. Lastly, the **AUXILIARY** display shows the actual distance traveled during the just completed CAST section.†

Last CAST data is also saved upon a **Transit**, a **TRUNCATE**, a main odometer **Reset**, after executing the **Compute Factor** function, or after loading **Preset** data (explained later).

Note: Even when Intelli-CAST is active, the saved last CAST execution point will include the "thousandths of miles" that had been present when the CAST was executed. On the other hand, the stored calculated time will include the correction resulting from use of the Intelli-CAST's "odometer truncation" feature. (Recall that when Intelli-CAST is active, each CAST action recomputes the calculated time by temporarily disregarding the odometer's thousandths of miles.) By displaying the "thousandths" in the last CAST odometer readback you can determine how close you were to the distance measurement used by the rallymaster.

Changing the Distance Measurement and Calculated Time at the Last CAST (Post-Alignment™)

A very remarkable feature of the 798A is that you can retroactively correct the execution point (ORM distance) for the last CAST. This capability is called **Post-Alignment™**.

To correct the last CAST execution point, hold down the **LAST CAST** switch. Now, regardless of the rotary switch position, the "**+ / –**" toggle switches will adjust the last CAST execution point (in the **ODOMETER** display). When you change the last CAST execution point, the overall calculated time is mathematically corrected (using the previous and current CASTs) to a value appropriate to the new last CAST execution point.

(Note: **Post-Alignment™** corrections can be executed at anytime, regardless of the position of the rotary switch. *The* **LAST CAST** *function overrides all rotary switch functions*.)

For example, suppose you are driving at a CAST of 30 and are working on this instruction:

> CAST 20 at "RXR" at 26.75 miles.

Here's how this might be played out…

As you pass the "RXR" sign, you actuate **CAST**. Then, to double check the mileage at which you executed the CAST change, you depress the **LAST CAST** toggle. In doing so, you see that the last CAST odometer measurement was actually recorded as 26.74 miles, not the 26.75 official mileage. While continuing to depress the **LAST CAST** switch, you correct the 0.01 mile error using the "**+ / –**" toggle switches.

As you change the last CAST execution point to 26.75, the 798A will add 0.02 minute to the *previous* section's calculated time. This is due to the additional .01 mile traveled at 30 mph. (You'll see this as a correction to the value in the **CALCULATED TIME** display.)

† As of version 5.001 firmware: If your 798A is outfitted with option 10 (**Intelli-Fix™**, explained in a moment), the **AUXILIARY** display will show an **Intelli-Fix™** adjustment amount whenever the rotary switch is turned to the **Adjust ORM** position.

Simultaneously, [internally] the 798A will subtract 0.03 minute from the *active* section's calculated time (for the .01 mile not traveled at 20 mph). The result is that the *overall* calculated time will be reduced by 0.01 minute. Upon releasing the **LAST CAST** switch, the corrected overall calculated time will be displayed.

As mentioned, when viewing last CAST data the distance traveled during the previous speed section is in the **AUXILIARY** display (exception…see footnote). The **Post-Alignment™** will also correct the previous section distance in the **AUXILIARY** display.

Note: Attempts to adjust the last CAST odometer measurement's "thousandths" place will be disregarded if the Intelli-CAST™ feature was enabled at the time of the last CAST.

As of version 4.008 firmware, last CAST data can be returned to original values by actuating the **RESET** switch while the **LAST CAST** switch is depressed.

When you release the **LAST CAST** switch after entering a last CAST odometer correction, the 798A temporarily disables use of the "**+ / –**" toggle switches for about one second. This forestalls a change to any other parameter should you accidentally release the **LAST CAST** switch while making the **Post-Alignment™** adjustment.

But be careful, there's one more step!

Continuing with the example above: If you are confident that you executed the CAST at the proper physical point on the course, it must be that your overall measured course distance (ORM) had been short by the 0.01 mile. As such, you'll also need to use the **Adjust ORM** function to add 0.01 mile to the overall mileage so it matches the rallymaster's. You can make this adjustment at any time. If, however, you executed the CAST at the wrong location, your course mileage may or may not be correct…you'd need to ascertain that later.

Automatic ORM Correction when making a LAST CAST Adjustment (Option 10)

As of version 6.000 firmware, a standard feature of the 798A can be used to automatically adjust the overall rally mileage (ORM) as you make **LAST CAST** adjustments. This feature, called **Intelli-Fix™**, will correct the ORM by the same amount applied to the **LAST CAST** odometer reading if the rotary switch is in the **Adjust ORM** position. Thus, **Intelli-Fix™** can eliminate the need to separately correct the ORM after a **LAST CAST** adjustment.

To illustrate **Intelli-Fix™** functionality, let's use the example from above. As had been explained, the **LAST CAST** function aligned the last CAST odometer measurement to 26.75, and, it corrected the overall calculated time by 0.01 minute. With **Intelli-Fix™**, the 798A will also automatically add 0.01 mile to the overall course distance (the ORM). You do not need to separately use the **Adjust ORM** function to align your overall mileage to the rallymaster's overall mileage.

Of course, there are times when **LAST CAST** adjustments do not require a correction to the overall course mileage. For example, if you execute a CAST at the wrong location, you need only align the CAST execution point to where the rallymaster intended (even if you can only guess at that mileage). In this case, the overall course mileage need not be changed. Therefore, to allow for situations when an ORM correction is not required following a **LAST CAST** adjustment, the use of **Intelli-Fix™** is discretionary. As mentioned, the **Intelli-Fix™** correction is applied only when the rotary switch is in the **Adjust ORM** position. † In all other rotary switch positions, the **Intelli-Fix™** correction is skipped.

† As of version 5.001 firmware, selecting **Adjust ORM** while viewing last CAST data causes the **AUXILIARY** to display an **Intelli-Fix™** adjustment counter. This counter shows ORM adjustments entered via the **Intelli-Fix™** feature. The counter is reset upon each CAST.

AUTOMATIC CALCULATED TIME ADJUSTMENTS

At the start of each leg of a rally, you will set the calculated time to your assigned out-time and the main odometer to the official mileage. (See **Checkpoint Procedure** in **Section 3** for details.) If you follow all the rally instructions perfectly, the odometer and calculated time will exactly match the rallymaster's official figures throughout the leg. At least that is what is supposed to happen.

Unfortunately, there is always some error in distance measurement due to wheel slippage, lane changes, driving techniques, etc. Since distance measurement errors result in calculated time errors, it will become necessary to correct both the odometer and calculated time.

Normally, correcting both the odometer and calculated time would be a three step affair. You would have to correct the odometer, manually compute the required adjustment to the calculated time, and then make the adjustment to the calculated time.

Fortunately, there is a faster, easier, and more precise method to automatically adjust the calculated time while correcting the odometer. In fact, there are two methods. The first method is to use the **Adjust ORM** function as discussed in **Adjusting the Odometer and Calculated Time Together**. The second method is to use the **Odo & Time** function.

The two functions act very similar, with one exception. Distance adjustments entered using the **Odo & Time** function are not considered an integral part of the current speed section. As a result, if the Retro-CAST™ function is used after entering an **Odo & Time** adjustment, the distance added or subtracted is not used during the Retro-CAST™ recalculation. To explain further, here's a complete description of the **Odo & Time** function, with additional clarification on how it differs from the **Adjust ORM** function.

Odo & Time Adjustments

With **Odo & Time** selected on the rotary switch, the "**+ / –**" toggle switches can be used to adjust the main odometer. As the main odometer is changed, the calculated time is automatically corrected to account for distance added to, or subtracted from, the main odometer. The standard TSD formula is used to compute the calculated time correction:

$$\textbf{CALCULATED TIME CORRECTION} = \frac{\textbf{DISTANCE ADJUSTMENT}}{\textbf{CALCULATION SPEED}}$$

While making an **Odo & Time** adjustment, both the **ODOMETER** and **CALCULATED TIME** displays update instantly to show the results of your adjustment. (Note: the "**+ / –**" **.001** toggle switch is inactive if you are not viewing distance with "thousandths" resolution. If you display thousandths only when split, you may adjust thousandths only when split.)

The adjustment made to the main odometer will be shown in the **AUXILIARY** display. This "amount of adjustment" figure is shown regardless of the **TIME–Δ–ODO** switch position. By watching the **AUXILIARY** display, you can confirm the correction you enter. Upon de-selecting **Odo & Time**, the **AUXILIARY** display returns to its normal usage <u>and the "amount of adjustment" reminder figure is reset</u>. When you select **Odo & Time** again, the **AUXILIARY** display will always show 0.00 (or 0.000 if viewing thousandths of miles).

The **Odo & Time** function will work even when the 798A is split. As when adjusting any split parameter, corrections to the split calculated time will be apparent as you enter the distance adjustment, and will be included in the "live" values when you unsplit.

Odo & Time adjustments are computed to a resolution of 0.0001 minute (0.01 second). Thus, the adjustments are just as precise as if you had driven the distance.

The Odo & Time Calculation Speed

The **CALCULATION SPEED** term in the above formula is shown in the **SPEED** display whenever you select **Odo & Time** on the rotary switch. The calculation speed always defaults to the active CAST value when you select the **Odo & Time** function. As a result, the **SPEED** display won't visibly change. Nevertheless, the calculation speed is a separate parameter from the active CAST.

Odo & Time adjustments can be used to correct measurement errors resulting from wheel slippage, lane changes, improper turns, etc. To correct such errors, select **Odo & Time** and adjust the main odometer. The calculated time will be updated using the calculation speed in the **SPEED** display. And since the calculation speed defaults to the active CAST, it's easy to make corrections the moment you experience a measurement error.

You may notice that the **Odo & Time** function appears to do the same thing as the **Adjust ORM** function (described earlier). This is true to a major extent. With either function, you can make concurrent distance and time adjustments the moment you experience a distance measurement error. However, there are occasions when you need to make the adjustment using a calculation speed different from the active CAST. This is when the **Odo & Time** function needs to be used instead of **Adjust ORM**. Here's an example:

Suppose, in retrospect, you decide that you had experienced wheel slippage while driving on a gravel road earlier in the course. Suppose, too, that the CAST used on the gravel road was different from the active CAST. If you use the **Adjust ORM** function to adjust the odometer, the calculated time will be corrected using the active CAST. Similarly, if you use the **Odo & Time** function, you will correct the calculated time using the calculation speed showing in the **SPEED** display. And since the calculation speed for the **Odo & Time** function defaults to the same value as the active CAST, the end result would be the same.

In this situation, however, you need to correct the calculated time using the CAST employed while on the gravel road. You need to change the calculation speed.

Changing the Calculation Speed

Here's how you can do that: With **Odo & Time** selected on the rotary switch, depress and hold the **SHIFT** switch. The **Calc Speed** function is now active, and the "**+ / –**" switches will alter the calculation speed showing in the **SPEED** display. (Remember, the calculation speed takes the place of the active CAST when **Odo & Time** is selected.)

You may alter the calculation speed before or after you enter an **Odo & Time** odometer adjustment — providing you don't rotate the rotary switch away from the **Odo & Time** position. (If you change the calculation speed *after* entering the distance adjustment, the 798A appropriately re-computes the correction to the calculated time.)

Distance adjustments you make, as well as the associated correction to the calculate time, are permanently recorded when you de-select **Odo & Time**. At that time, the calculation speed will automatically revert to the active CAST value. The next time you select **Odo & Time**, the calculation speed will once again be the same as the active CAST.

Note: If you execute a **CAST**, a **Transit**, a **TRUNCATE**, or **Reset** the main odometer while **Odo & Time** is selected, the 798A will electronically de-select **Odo & Time** for a moment. Any adjustments you are in the process of making will be permanently recorded, the calculation speed will change to the new active CAST, and the "amount of adjustment" figure in the **AUXILIARY** display will be reset to 0.000 mile.

The **Odo & Time** function can make a calculated time adjustment up to 27.77 hours. Don't be concerned if you temporarily enter a calculation speed and distance combination (e.g., 0.5 mph for 15.00 miles) that computes a time greater than 27.77 hours—the calculated time will be "fixed" when a more reasonable combination is chosen.

Remember: To adjust the odometer without changing the calculated time, use the **Odometer** position on the rotary switch. Also, use **Calc Time** to adjust only the calculated time.

Details... one more time

Here is the important point to remember when determining whether to use the **Odo & Time** function or the **Adjust ORM** function:

Distance adjustments entered using the **Odo & Time** function are <u>not</u> linked to the active speed section, and, therefore, will <u>not</u> influence the calculated time should the Retro-CAST™ function be employed. That is, odometer adjustments made via the **Odo & Time** function will not contribute to the revised calculated time should you execute a Retro-CAST™. *This applies even when an* **Odo & Time** *adjustment is made using a calculation speed that is the same as the active CAST.*

On the other hand, changes to the odometer made via the **Adjust ORM** function are tallied in a manner identical to distance accumulated while driving. Both the actual measured distance and the manually entered **Adjust ORM** distance are part of the active speed section. Since **Adjust ORM** adjustments are part of the active speed section, those adjustments will influence the revised calculated time if you subsequently use the Retro-CAST™ function.

Therefore, if you anticipate employing the Retro-CAST™ function, and you want an automatic calculated time adjustment to remain unchanged (after the Retro-CAST), use the **Odo & Time** function when making the combined odometer and calculated time adjustment.

TRANSIT ZONES

Sometimes you are instructed to drive a section of the course without maintaining a specific speed. In such cases, you're usually given an exact time to travel the route instead of an average speed. Such course sections are often referred to as "transit zones."

There are two ways to begin a transit zone. Both methods give the same results — one is just a bit quicker to execute.

One way to start a transit is to CAST 0.0 mph. That is, prior to arriving at the transit zone, set a CAST of 0.0 mph into the **NEXT SPEED** display. Then actuate **CAST** at the start of the transit. The **SPEED** display will show 0.0 mph, and the 798A will be in the transit mode.

A faster method for entering the transit mode is to use the **Transit** function. To do so, depress (and hold) **SHIFT** while executing a CAST. The **Transit** function automatically executes a CAST of 0.0 mph, disregarding the next speed setting.

During passage of the transit zone, select **Calc Time** and add the official travel time for the transit zone into the calculated time. Also, set the next CAST into the **NEXT SPEED** display. At the end of the transit zone, actuate **CAST**.

The 798A treats transit zones just like any other speed section. As a result, you can use the Retro-CAST™ function. If you execute a **Transit** in error, use the **Speed** function to change to the earlier CAST. The 798A corrects the calculated time appropriately. (Don't forget to remove any transit time you added for the "erroneous" **Transit**.) You can also use the **LAST CAST** function after entry into (or exit from) a transit zone.

Rather than using the transit zone capabilities of the 798A, some rallyists calculate an ideal average speed for the transit zone. (This can often be done using information given by the rallymaster.) This speed is then used as a transit CAST. The advantage of this method is that while traversing the transit zone, the calculated time will operate normally, making it easier to judge your transit timing. As before, **CAST** to the next speed at the end of the transit.

The transit mode is also used with "warp speed" CASTs. A warp speed CAST means that you must effectively drive at the speed of light, making your travel time for any rally distance essentially zero. By using the transit zone function, you can drive the distance to the next CAST without increasing the calculated time. A warp speed zone is, therefore, treated like a transit zone except that there is no passage time added to the calculated time.

Note: If you enable the Intelli-CAST™ feature, transit zones will begin and end at exact hundredth of a mile increments. That is, upon entering the transit zone, any partial hundredth of a mile in the odometer is considered part of the transit zone, rather than the previous CAST section. Likewise, upon exiting the transit zone, partial hundredths are applied to the following CAST section, not the transit zone. See **Intelligent CASTs** for more information.

PRESET DATA

During a rally there are a number of reference points at which the three important official values — time, speed, and distance — are provided by the rallymaster. Such is the case at the start of the rally and (usually) at the start of each leg.

At each of these "alignment" locations you are given an official odometer measurement (e.g., 0.00 miles), a calculated time (your out-time), and a CAST. Using this information you can precisely align the 798A to the rallymaster's values. To do so, drive to the identified landmark and enter the three official values into the appropriate displays.

Acknowledging the need for expediency in such situations, the 798A allows you to load the three official values into a stand-by "preset" memory. Then, upon reaching the referenced landmark, you can insert the stored values simultaneously into the **ODOMETER**, **CALCULATED TIME**, and **SPEED** displays. The **Preset** function is used for this purpose.

Entering Preset Data

When **Preset** is selected on the rotary switch, future values for the odometer, the calculated time, and a CAST can be viewed and edited. The three values will be shown in the **AUXILIARY** display, with the **TIME–Δ–ODO** switch selecting which parameter is visible. Select **TIME** to preset a future calculated time, select **ODO** to preset a future odometer value, and select the "Δ" symbol to preset a future CAST. The "**+ / –**" toggle switches adjust whichever parameter is being displayed. The three values are retained in memory when the **Preset** function is de-selected, so the information can be entered at anytime.

Loading Preset Data

To simultaneously load the three preset values into the **CALCULATED TIME**, **SPEED**, and **ODOMETER** displays, start by selecting **Preset** on the rotary switch. Then depress and hold **SHIFT**, and finally actuate the **CAST** switch. Note the asterisked "**SHIFT – CAST to Load**" notation for the **Preset** function identifying the load procedure. (***Important!*** When **Preset** is selected on the rotary switch, the **SHIFT/CAST** combination does not execute a **Transit**.)

As of firmware version 5.010, upon executing a **Preset** load, the clock, odometers, and calculated time will be split as long as the **CAST** toggle switch is held in place.

If you want to load only one or two preset values, you can individually select which ones you <u>don't</u> want to load by activating **RESET** while viewing that value. That parameter's value will then be hidden from view and replaced by dashes ("– – – – – –"). Activating

RESET, again, causes the parameter to be visible again. A “hidden” preset value will not be inserted into the relevant display when you execute the load procedure.

The resolution of the preset value for the calculated time is limited to whole units (seconds or hundredths). That is, the “tenths of units” is always “0” (**xx.xx.xx.0**). When a preset calculated time is loaded, all other internal fractional parts of seconds/hundredths are also cleared. The calculated time is, as a result, truncated. **Note:** If you do not load a preset calculated time (because its preset value is hidden) the calculate time is not truncated.

The resolution of the preset value for the odometer includes thousandths of miles. When an odometer preset is loaded, the odometer’s thousandths of miles will be set to your preset number. All other internal digits of the odometer (**- - - . - - - xxxxx**) are automatically cleared. The odometer is, in effect, truncated to thousandths of miles.

Once a load procedure is executed, you must change at least one preset value before the function will operate again.

WARNING! *The load procedure cannot be undone.*

THE DATALOG (option 1)

As of version 6.000 firmware, the 798A is always outfitted with a battery-backed memory datalog. The datalog will store significant course information upon execution of each split or CAST (and CAST related functions, such as a transit, truncate, reset, etc.).

Fifty-six sets of data are retained. Each data set consists of your new speed† (the current CAST, if **SPLIT** was actuated), as well as the values of the **ODOMETER**, **CLOCK**, and **CALCULATED TIME** that were present at the moment the function was executed. Internal “live” values are stored if a CAST is executed while the 798A is split.

As each data set is collected, it is stored in a cyclical memory stack. This means that after all 56 storage locations are filled, subsequent splits (or CASTs, etc.) will overwrite the oldest information. Thus, only the most recent 56 data sets are retained in memory.

Reviewing the Datalog

When the **Log** position is selected on the rotary switch, the **CLOCK**, **CALCULATED TIME**, **ODOMETER**, and **SPEED** displays will show one set of data from the log. The **AUXILIARY** display indicates whether the data is from the execution of a split (**SPLit**), a CAST (**CASt**), a transit (**trAnSt**), a truncate (**trunct**), a main odometer reset (**rESEt**), an automatic factor calculation (**C. Fctr.**), or when you loaded preset data (**LoAd**). The **NEXT SPEED** display indicates the sequence number of the data set being viewed

To cycle through the 56 datalog locations, actuate any “**+ / –**” toggle switch. A “**+**” actuation displays more recent logged information, a “**–**” actuation displays older information.

As mentioned, the **NEXT SPEED** display shows the sequence number of the data set being viewed. The first data set is assigned memory sequence number 1. With each logged data set, the memory sequence number increments. When you split (or CAST, truncate, load, etc.) more than 56 times, the sequence number continues to increment. The number will increment to 255 before starting over at 1. Use the sequence number when transferring log data to a worksheet of all your splits, CASTs, resets, etc.

† You can modify the 798A so that it stores the speed you changed “from”, rather than the speed you changed “to”, whenever a data set is saved. To do so (with version 2.001 firmware, or newer), turn on the 798A while concurrently activating the **SHIFT** and **CAST** switch functions. From then on, the speed stored in each data set will be the previous CAST, rather than the new CAST. Repeat this procedure to revert to the factory setup.

Memory sequence numbering can be manually restarted by concurrently selecting both the "–" **10.00** toggle switch and the "–" **.001** toggle switch (only when **Log** is selected on the rotary switch). When you do this, *the entire datalog is cleared*, and memory location 1 will be assigned to the next data set saved.

You cannot change any data in the datalog. And please note: If you adjust the "last CAST odometer measurement" by using the **LAST CAST** function, the original values stored in the datalog for that CAST are retained. There will be a discrepancy between the data in the log and the corrected distance you inserted to re-compute the calculated time. This is intended. The same is true if you adjust a parameter while split and review the original split data later.

Datalog Presentation Modes

You have a choice as to the way the 798A proffers data following each logging action. The data may be presented in two ways: one way allows you to quickly locate recently logged information; the other way makes it easier to review older data. The data is the same regardless of the presentation mode.

To determine the current data presentation mode, actuate the **RESET** switch while **Log** is selected. The **AUXILIARY** display will show either "**nu. LoG**" or "**old.LoG**". Actuate any "**+ / –**" switch to toggle between the two modes.

If you choose the **nu. LoG** mode, the log data in the displays automatically updates to a newer data set with every data collection. It is generally easier to confirm recently logged data in this "update to recent" presentation mode. For example, if you are viewing logged data from the most recent split and execute another split, the information in the displays will change to the new split data. As a second example, if you are looking at the **second** most recent datalog set, and execute a split, the displays will update to show data from the *previously* most recent split (which has, in fact, become the second most recent datalog set).

The **nu. LoG** mode makes it easier to review logged data in a "newer to older" order. Even after executing many splits (or CASTs, resets, etc.), you will always be presented with newer data whenever the **Log** position of the rotary switch is selected.

The **nu. LoG** mode is the commonly expected presentation mode of a standard datalogger.

An alternate data presentation method is the **old.LoG** mode. While operating in the **old.LoG** mode, the displays do not automatically update to newer data following each logging action. Instead, the displays continue showing the previously selected logged data.

The **old.LoG** mode makes it easier to review data in an "older to newer" order. Even after executing a series of splits (or CASTs, etc.) the log displays continue showing the same data set. This means that whenever you select **Log** on the rotary switch, you will always return to the data set you were viewing earlier. As a result, you do not have to re-locate the original data of interest each time you split.

In the **old.LoG** mode, each new set data is appended to the datalog memory. Consequently, you must shift through the data to locate newly saved information. This is the presentation mode generally designed into multi-split checkpoint clocks.

Note: When operating in the **old.LoG** mode, if you are looking at the oldest data in the log and actuate a split (or CAST, etc.), the displays do, in fact, update to the next newer data set (as would happen in the **nu. LoG** mode). This is necessary because the data set you were reviewing will be discarded and overwritten by the most recent split data.

Printing the Datalog

No Longer Offered.

When the RS232 interface is installed, depressing **SHIFT** while **Log** is selected on the rotary switch, will execute the **Print** function. Each time you do this, the currently visible datalog information is sent out the RS-232C port. The data sent consists of the memory sequence number of the data being printed, followed by the odometer, calculated time, clock, and CAST values, and the reason the data was stored (split, CAST, truncate, load, etc.).

The data is tab delimited, and is followed by a carriage return (CR) and a line feed (LF). The communication protocol is: 9600 baud, 1 start bit, 8 data bits, 1 stop bit, no parity.

The RS-232C interface connection is via the modular jack of **ODOMETER INPUT 1**. (See **Appendix C** for the pin assignments in the modular jack.) Timewise can provide an adapter cable between the modular jack and a 9 pin D-subminiature connector typically used by printers or computers. Contact Timewise for more information.

THE ODOMETER ALARM

When **Alarm** is selected on the rotary switch, <u>and **ODO** is selected on the **TIME–∆–ODO** toggle switch</u>, the **AUXILIARY** display will show an odometer alarm distance.

Use the "**+ / –**" toggle switches to adjust the value. The alarm distance is adjustable within the range 0.00 to 999.99 miles. (The alarm does not use thousandths of miles.)

If you select "∆" on the **TIME–∆–ODO** switch, the **AUXILIARY** display will show a countdown distance to the alarm mileage. If you adjust the countdown distance, the alarm distance will be appropriately altered. You can even split the 798A and set the countdown distance while you drive. As is the case for adjusting other split parameters, the 798A compensates for the distance you drive and sets the actual alarm distance accordingly.

An odometer alarm beeper will sound for 2 seconds when the specified distance is reached. At that time, the **CLOCK** display will sequentially flash the words "**odo**" and "**ALErt**".† Turn the rotary switch or actuate **SHIFT** to dismiss the visual warning.

Use the odometer alarm to notify yourself that a predetermined mileage has been reached. For example, if the rallymaster instructs you to change speed at a specific distance, preset the odometer alarm to that value and let the 798A notify you when you reach the location. You won't forget to make the speed change when the alarm sounds and "**odo ALErt**" flashes.

Once the beeper sounds, you must change the odometer alarm mileage in order to re-arm the system. This prevents unnecessary alarms when official mileage resets to zero at the start of each leg. It also prevents the alarm from sounding every 1000 miles on long rallies.

The Alarm "To Go" Distance

If you depress **SHIFT** while **Alarm** is selected, the **AUXILIARY** display will show a "**To Go**" distance. The **To Go** distance is used to provide an "alarm mileage approaching" warning. This parameter is adjustable from 0.00 to 9.99 miles. Setting the **To Go** distance to a value other than 0.00 mile causes the beeper to sound (and a display of the "**odo ALErt**" message) at the selected distance prior to arriving at the actual alarm mileage.

The **To Go** feature is useful during Monte Carlo legs when a warning is desired at the "stand-off" mileage

† As of version 4.008 firmware, the lower display in the driver's module will also flash the "**odo ALErt**" warning. And as of version 4.011, the driver's warning shows only when the "**To Go**" distance is zero.

THE AUXILIARY DISPLAY

The **AUXILIARY** display on the main computer is used to show a variety of parameters. The **TIME–Δ–ODO** switch generally selects which value is displayed. However, some functions override the **TIME–Δ–ODO** switch and force the display of a different parameter:

- When the **LAST CAST** function is actuated, the **AUXILIARY** display shows the previous speed section distance. If option 10 is present (**Intelli-Fix™**), and the rotary switch in turned to **Adj ORM**, the display shows the **Intelli-Fix™** adjustment amount.
- When using the rotary switch **Odo Check** function, the official odometer check mileage is shown in the **AUXILIARY** display.
- When using the rotary switch **Odo & Time** function, the **AUXILIARY** display shows the odometer adjustment entered. The adjustment amount is automatically reset to 0.00 when the rotary switch is turned away from the **Odo & Time** function.
- When **Alarm** is selected, the **AUXILIARY** display shows the odometer alarm mileage while **ODO** is chosen on the **TIME–Δ–ODO** switch. Selecting "Δ" displays the distance remaining before the alarm. Actuating **SHIFT** displays the **To Go** distance.
- When using the **Preset** function, the **AUXILIARY** display shows the preset values for the **CALCULATED TIME**, **SPEED**, and **ODOMETER**. The **TIME–Δ–ODO** switch selects which parameter is shown (the "Δ" symbol is used to denote speed).
- W hen **Log** is selected, the **AUXILIARY** display shows whether the data being viewed was saved as a result of a split, CAST, reset, etc. (The memory datalog is an option.).
- When **Next Speed** is selected and "Δ" is selected on the **TIME–Δ–ODO** switch, the **AUXILIARY** display shows the **ERROR** (see page 58). Note: Prior to version 5.010 firmware, the display showed dashes ("––––––") unless the 798A was split.

The Auxiliary Odometer

Selecting **ODO** on the **TIME–Δ–ODO** switch lets you view an **Auxiliary Odometer**. This odometer is completely independent of the main odometer. When visible in the **AUXILIARY** display, the auxiliary odometer can be reset to 0.00[000000] mile by actuating **RESET**.

The Auxiliary Calculated Time

Selecting **TIME** on the **TIME–Δ–ODO** switch will show an **Auxiliary Calculated Time**. This parameter is not a timer; rather, it is the computed driving time from a previously selected point to your current location. You initiate the beginning point for the computation by actuating **RESET** while the auxiliary calculated time is being displayed.

CASTs used to determine the overall calculated time are also used to compute the auxiliary calculated time. Likewise, corrections to the calculated time via the **Calc Time**, **Adjust ORM**, **Odo & Time**, and **LAST CAST** functions also affect the auxiliary calculated time.

The auxiliary calculated time can range from –59.99.9 to 5:59.99.9. The auxiliary calculated time can be negative when you drive a sufficient distance while in **REVERSE**, or due to negative calculated time adjustments. If a negative auxiliary calculated time exceeds –59.99.9, the displayed digits will still be correct. (Also note that auxiliary calculated time values greater than 5:59.99.9 roll over to –[6:]00.00.0)

When setting up a rally, the auxiliary calculated time is useful in determining official leg times. To do so, reset the auxiliary calculated time at the start of a leg and drive the route, executing CAST changes at the correct locations. When you reach the planned in-line for the next checkpoint, the **AUXILIARY** display will show the official travel time for the leg.

Note: When not viewing the thousandths of minutes (or tenths of seconds), the auxiliary calculated time is, as would be expected, visually truncated to the hundredth (or second).

Nevertheless, as is the case for the normal calculated time, the non-truncated individual times for each CAST section are added together to make up the total auxiliary calculated time. This is the method used by most rallymasters when computing official leg times.

The “Delta” Counters

When the “Δ” (the Greek letter “delta”) position of the **TIME–Δ–ODO** switch is selected, you can see the **Amount of Change**, or delta adjustment, applied to the main odometer or the calculated time. There are two delta counters, one for the main odometer and one for the calculated time. The position of the rotary switch dictates which delta counter is displayed.

When **Odometer** or **Adjust ORM** is selected on the rotary switch, the odometer delta counter can be displayed, showing the sum total of adjustments made to the odometer. The total includes all adjustments made using the **Adjust ORM**, **Odometer,** and **Odo & Time** functions. ***Note****: The odometer delta counter does not include* **LAST CAST** *adjustments, except when using the discretionary* **Intelli-Fix™** *feature (option 10).*

When **Calc Time** is selected on the rotary switch, the calculated time delta counter can be displayed, showing the sum total of adjustments you’ve made to the calculated time using the **Calc Time** function. ***IMPORTANT****: Changes to the calculated time that result from use of the* **Adjust ORM**, **Odo & Time***, or the* **LAST CAST** *functions are not included.*

The delta counters can show a value from –99.999 to 999.999 when displaying distance, or –59.99.9 to 5:59.99.9 when displaying time. When a parameter exceeds this range, the displayed digits will still be correct and the value will retain the correct sign. (Note that time values greater than 5:59.99.9 roll over to –[6:]00.00.0).

The delta counters can be independently reset to zero. The odometer delta counter is reset by selecting **RESET** on the **RESET–SHIFT** switch when **Odometer** or **Adjust ORM** is selected on the rotary switch. The calculated time delta counter is reset by selecting **RESET** when **Calc Time** is selected on the rotary switch.

CHANGING THE DISPLAY BRIGHTNESS

When the 798A is powered up, the displays illuminate at their brightest setting.

The display brightness can be adjusted to fit ambient lighting conditions. When the special function position is chosen on the rotary switch, activating the “**+ / –**” **.10** toggle switch changes the intensity of the displays on the main computer. If you depress **SHIFT** while making the change, the driver’s display brightness is adjusted. Beneath the “**+ / –**” **.10** toggle switch are the designations “**Brightness**” and “**Remote Brightness**”. The displays become dimmer when you select the “**–**” position; they get brighter when you select the “**+**” position

The **AUXILIARY** display indicates the brightness level selected for the main and remote displays. There are 32 levels for each display group. The two rightmost digits show the main display setting, whereas the two leftmost digits show the driver’s display setting.

All displays (including those in the driver’s module) turn off when the main computer is dimmed below level 1. All measurements continue while the displays are off. The displays will re-illuminate with the activation of any switch. Using a “**+ / –**” toggle to re-illuminate the displays will not alter a parameter regardless of the rotary switch position.

Note: After 16 minutes of inactivity, the displays automatically turn off. Use any switch, or drive the vehicle, to re-illuminate the displays. The “**+ / –**” toggle switches will not alter a value when exiting this automatic power saving mode. To prevent the displays from turning off when the 798A is idle, place the rotary switch in its **Next Speed** position.

THE REMOTE DRIVER'S MODULE

The remote display module shows parameters that are of particular importance to the driver. The driver's module is always "live"—the split mode does not freeze either of the displays.

Parameters in the driver's module update 12.5 times per second, except for the speedometer, which updates about once per second (or less often when you travel very slowly).

The Driver's ERROR Display

The **ERROR** display shows the actual driving time error. This figure is the difference between the clock and the calculated time. The value displayed ranges from – 9.99 to 59.99 minutes (– 9:59 to 59:59 in the "seconds" counting mode). Negative values mean that you are late. Positive values—the plus sign is assumed—mean that you are early.

Note: The error also visible in the main computer's **AUXILIARY** display. See page 56.

When you are outside the displayable range for the error, the 798A will show "**EEEE**" up to six hours early, or "**LLLL**" up to six hours late. If you are more than one hour early or ten minutes late, use the clock and the calculated time displays on the main computer to determine your error. In such cases, you'll be more concerned with course following than with your exact driving time error.

The counting format and resolution (seconds, tenths of seconds, hundredths of minutes, or thousandths of minutes) of the **ERROR** display may be changed at any time. To change the format of the error, turn the rotary switch to its special function position. Then depress (and hold) **SHIFT**, and actuate the "**+ / –**" **.01** switch. Notice that beneath the "**+ / –**" **.01** switch there is the shifted designation **Error Format**. Each time you activate **Error Format** the error will change from one format to another. The counting format and resolution selected for the **ERROR** display can be different from that selected for the main computer.

The selection of counting mode for the driver's **ERROR** display allows you to use a format with which you are most comfortable. Any combination of the following choices can be made: counting in seconds or in hundredths of minutes; showing lateness with negative numbers or counting down from 100; and, lastly, displaying tenths of units when less than 4 counts from a perfect zero, or never showing tenths.

While you're selecting the format for the error, the computed value in the **ERROR** display is temporarily replaced by a sample value exemplifying the selected format. The following descriptions will help you identify the meaning of the samples:

1) When displaying seconds, the 798A shows a colon to the right of the minutes digit, e.g., "**10:30**". When displaying hundredths of minutes, a decimal point is illuminated, e.g., "**10.50**".

2) The standard lateness style for modern rally computers is usually a negative sign preceding the error (– 0:01, – 0:02, – 0:03, etc.). To make the negative sign more visible, the 798A actually displays a triple minus sign "≡", in place of a standard minus sign "– ".

Instead of showing negative numbers, you may select a lateness style originally introduced by vintage rally computers. These computers displayed lateness by counting backwards from 100.00 (99.99, 99.98. 99.97, etc.). Some rallyists prefer this method of displaying lateness because of the significant change in appearance of the display when the error becomes negative.

When making your error lateness style selection, the 798A shows the sample value such as "**≡ :01.1**" or "**99:99.9**" to identify the lateness style.

3) You can also select whether the error is displayed to "tenths of units" resolution (tenths of seconds or thousandths of minutes) or only to "units" resolution (seconds or hundredths). When "tenths of units" is selected, the 798A will display the tenths only when the error is less than 4 full "unit" counts from zero. The automatic switchover from "units" to "tenths" is implemented by illuminating the rightmost digit (the **– –.– – x**). When the units mode is selected, tenths are never displayed.

As you cycle through the error format selections, the 798A will show the sample value as "≡ **:01.1**" (or "**99:99.9**") when selecting tenths resolution, or "≡ **:01** ≡" (or "**99:99** ") when selecting units resolution.

Note that when operating in the "negative numbers/units" format, a triple minus sign is displayed on both sides of a negative error value, i.e., "≡ **:01** ≡". This is to make negative numbers more obvious. †

Details on the ERROR

Because the 798A counts time (both for the clock and the calculated time) in higher resolution than that which can be displayed, several counting peculiarities in the **ERROR** display can be noted. The peculiarities are the result of subtracting the high resolution clock from the high resolution calculated time. In all cases, the values displayed are correct.

The first peculiarity can be seen when showing tenths in the **ERROR** display while not showing tenths in the main displays. An example will demonstrate what happens. For simplicity, only the counting mode of "seconds" is used in the following discussion – the same scenario applies when operating in the "hundredths of minutes" mode.

Suppose that the time of day is **12:00:06.1**, and the calculated time is **12:00:10.0**. Since we're assuming that you are looking at a resolution of units in the main displays, the **CLOCK** and **CALCULATED TIME** will show "**12:00:06**" and "**12:00:10**", respectively. Using the information shown in these displays, you would calculate an apparent error of 4 seconds. However, the real error is actually 3.9 seconds, and is displayed as such on the driver's module. In fact, the **ERROR** display will show the sequence from " **:03.9**" to " **:03.1**" while the main unit continues to indicate an apparent full 4 second error. This is unavoidable.

This "out of sync" counting is evident even when tenths are not showing in the **ERROR** display (i.e., when the error is greater than 4 seconds, or when you've chosen not to view the tenths at all). During those times, the remote display will still appear to count toward zero nearly one step ahead of a manually calculated error using information from the main unit.

For example, the **ERROR** display will show "**:06** " for the real errors values 6.9 through 6.0 seconds. You, however, will observe a 7 second difference between the clock and calculated time displays during that entire period. (Actually, the two values — the 798A computed error and your manually computed error — will be aligned when the difference between the clock and calculated time is exactly 6.0 seconds. However, because the clock keeps time internally to .01 second resolution, and the remote display is updated 12.5 times per second, you may miss the momentary synchronization.)

Another oddity arises as the error switches from "units" to "tenths" resolution at the 4 second mark. When the count reaches " **:04** ", that value will be displayed for nearly one second before the error visibly decrements to " **03.9**". This is the result of not showing the

† If you wish, you can remove the triple minus sign on the right side of the **ERROR** display. To do so, turn on the 798A with both **SHIFT** and the "**– .01**" position of the "**+ / –**" **.01** switch selected. Repeat this procedure to show the right-hand triple minus sign again.

individual error values 4.9 through 4.0 seconds. Each of these values is displayed as " **:04** ". This counting rhythm is surprising at first, but it is correct. (When counting up from " **03.9**" to " **:04** " there won't be any hesitation — the error will increment from one number to the next in exactly one tenth second.)

Note that when operating in the "negative numbers/units" format, the 798A appears to be at zero for nearly 2 seconds. This is because the values " :00.9" early through "– :00.9" late are all shown as a "zero". A positive zero (" **:00** ") will be displayed for one full second, and a negative zero ("≡ **:00** ≡") will be displayed for .9 seconds more.

As an option, the 798A can be modified to show an error of zero for exactly 1 second when in the "negative numbers/units" format. The 798A accomplishes this by shifting all values of the error one half count toward zero. When operating in this modified "negative numbers/units" format, all values of earliness or lateness are, as a result, shown to the nearest whole count. You must return the 798A to Timewise for this modification.

Adding an Offset Bias to the ERROR Display

You may, if you wish, insert a fixed offset into the driver's module **ERROR** display. This offset makes the error read approximately a half-count "high". **†** See footnote You can use the offset so that at a checkpoint your in-time will be recorded "within the count" intended by the rallymaster. Here's an explanation why offsetting the error should be considered.

If you initially synchronize the time of day clock in the 798A to the official time, you will execute each timed maneuver at the exact moment expected by the rallymaster. Each tick of the 798A's clock coincides with a tick on the official clock. This is great for starting each leg of the rally.

When you drive with the **ERROR** showing an exact **0.00**, your timing and location on the course will be correct upon each clock tick. Unfortunately, however, all time and location combinations have limited resolution. The odds are equal that you will be very slightly fast (early) or very slightly slow (late) at any moment.

Additionally, the correlation between the clock in the 798A and a checkpoint clock is never perfect. Even when you arrive at a checkpoint at the perfect arrival time, there is a chance the checkpoint workers will record your arrival as "on-time", or "one count early". (We must also assume the rallymaster positioned the checkpoint in-line exactly where it should be.)

Because a checkpoint worker can potentially record a perfect time of arrival as "one count early", some rallyist intentionally run "a little late". This is often accomplished by retarding the time of day clock, or by manually inserting a small offset into the calculated time. Sometimes the driver runs with the **ERROR** display showing a slightly negative value. All these methods work fine, but each comes with its own potential for error. Shifting the clock or manually changing the calculated time always present the possibility of making a mistake. Simply asking the driver to **not** aim for a "zero" error is counter-intuitive.

A safer method is to utilize the error offset function of the 798A. When the offset function is enabled, the **ERROR** display is shifted a fixed positive 0.0045 minutes (or 0.45 seconds).

As a result, if you cross the checkpoint in-line showing **0.00** in the **ERROR** display, you will actually be 0.0045 minutes late. This makes it more likely you'll arrive "within the count" intended by the rallymaster, thereby increasing your chances of receiving a score of zero.

† When the 798A is outfitted with the **Adjustable Driver's ERROR Offset Bias** option (a standard feature in version 6.000 firmware), the error offset is adjustable between +0.9 and –0.9 units. See the option 9 supplement for more information.

If you're convinced that using the offset error is appropriate, here's how you can activate the function: First, select **Calculated Time** on the rotary switch. Then depress and hold the **SHIFT** switch. Finally, actuate the "**+ / –** " **.001** switch, either up or down. Each time you do so, the offset function will turn on or off.

Whenever the offset function is active, a radix point in the extreme lower right of the **CALCULATED TIME** display illuminates.

Note that the error offset function visually shifts the driver's **ERROR** display. It does not alter either the calculated time, the time of day clock, or the split error (that can be seen in the main unit **AUXILIARY** display). Data recalled from the optional datalog, or displayed upon activation of **Last Split** or **LAST CAST**, is also not affected.

The Driver's AUXILIARY Display

The driver's **AUXILIARY** display can show one of several parameters. To cycle through the choices, select the special function position of the rotary switch and activate the "**Remote Aux**" function (the "**+ / –**" **10.00** toggle switch). As you cycle through the possibilities, the driver's display will show an abbreviation for each choice. †

- **Odometer ("odo"):** A duplicate of the **ODOMETER** display on the main computer. The "thousandths" digit is not shown.
- **Auxiliary odometer ("A. odo"):** A copy of the auxiliary odometer that can be shown in the main computer's **AUXILIARY** display. The "thousandths" digit is not displayed.
- **Active CAST ("CASt"):** A duplicate of the **SPEED** display on the main computer. (The active CAST will be shown in the driver's display even if the rotary switch on the main computer is turned to the **Odo & Time** function and the **Calc Speed** is adjusted.)
- **Manual select ("t–d–o"):** The **TIME–Δ–ODO** switch next to the main computer's **AUXILIARY** display selects which parameter will be shown on the driver's **AUXILIARY** display. As of version 5.008 firmware, select **TIME** to show the distance remaining to the odometer alarm mileage (disregarding the "**To Go**" mileage), select "Δ" to show the main odometer, or select **ODO** to show the auxiliary odometer.
- **Speedometer ("SPEEd"):** Your true speed. The displayable range is 0.0 to 999.9 mph. The upper limit of the speedometer is dependent on the transducer used. Two-piece magnetic transducer installations usually limit the displayable speed to about 150 mph. You can, however, use the built-in frequency divider circuitry in odometer input 2 and extend the displayable upper limit to 999.9 mph. The lower limit is generally about 3 mph when sensing two magnets mounted on a wheel or half shaft. Below this limit, the computer will automatically display 0.0 mph.
- **Speed difference ("diFF"):** The difference between your true speed and the active CAST. The value is rounded to the nearest mile per hour. Use this figure to confirm that you are at the correct rally speed. Ideally, the value should always be 0 (mph difference). The displayable range is from –399 to 399. A minus sign is displayed when you are going less than the active CAST. A plus sign is assumed when traveling faster then the CAST.

† If your 798A is outfitted with option 7 (**Remote AUXILIARY Display Select**), you can remotely switch between two of these choices. When option 7 is installed, an additional stereo input jack is present on the rear of the 798A. Use the "**Remote Aux**" function to select one parameter when the "ring" and "sleeve" contacts of the jack are shorted together; the other when the contacts are not connected.

Used in conjunction with the **ERROR** display, the speed difference lets you judge how to adjust vehicle speed as a checkpoint is approached. By maintaining a zero speed differential, you'll find it easier to hold an error of zero.

- **Countdown (**"**Cnt.dn**"**):** The distance remaining before the odometer alarm mileage is reached. The "**To Go**" mileage is not considered when figuring this countdown distance.
- **Blank (**" **oFF** "**):** The lower display in the driver's module can be turned off.

OPERATING MODE INDICATORS

Some operating modes of the 798A allow entry of non-recoverable changes to course parameters. Although there is nothing wrong with operating in these modes, you must be mindful of the consequences of doing so. For example, if you select **PARK** during a rest stop, it is imperative that you select **FORWARD** when you start on the course again. If you remain in **PARK**, the 798A will become useless. The only way to recover from such a mistake would be to return to the rest stop and restart that section of the course.

For the same reason, the "**+ / –**" toggle switches should be used only when you are certain of the rotary switch position. For example, an adjustment to the odometer while **Odo & Time** is selected on the rotary switch will also change the calculated time. If you had wanted to change *only* the odometer, the **Odometer** position should be used. Although you can recover from this mistake, you can do so only if you take notice of it. It's better to make the correct adjustment the first time.

Because of this potential for error, the 798A is programmed to alert you while it is operating in a non-standard mode or when you select certain rotary switch positions. To alert you, the 798A will either flash the entire display or just the decimal point (and colon, if appropriate) in the relevant rally parameter. The list below shows which displays are affected.

Operating Mode	Flashing Display
PARK	**ODOMETER**
REVERSE	**ODOMETER**
SPLIT	**CLOCK**

Rotary Switch Position	Flashing Decimal Point(s) in
Next Speed / When Shifted	**NEXT SPEED** / **SPEED**
Calc Time	**CALCULATED TIME**
Odometer	**ODOMETER**
Adjust ORM	**ODOMETER**
Odo & Time / When Shifted	**ODOMETER** / **SPEED**

When you activate the **Intelli-CAST™** feature, an LED indicator near the upper right of the **ODOMETER** display will be illuminated. A front panel label above the indicator identifies the meaning of the LED. When **Semi-Intelli-CAST** is active, the indicator blinks.

Similarly, when you enable the "error offset" function (to offset the driver's **ERROR** display a half count), the "radix point" LED in the lower right corner of the **CALCULATED TIME** display illuminates. There is no label identifying the meaning of this indicator.

In addition to flashing the odometer display while in **PARK** or **REVERSE**, a beeper will sound briefly every ten seconds. If the beeper becomes bothersome during long periods of being in **PARK** or **REVERSE**, you can stop it from sounding by momentarily selecting

LAST CAST. Repeat the action to re-enable the beeper. The beeper is automatically re-enabled when you return to **FORWARD**, so the next time you chose **PARK** or **REVERSE**, the alarm will again sound every ten seconds even if you had previously disabled it. †

The beeper will also sound briefly each time **CAST** is actuated, and every ten seconds while the 798A is split. †

Generally, it's best to leave the rotary switch in the **Next Speed** position. In this position, accidental activation of a "**+ / –**" toggle switch will not change any crucial rally parameter.

Transducer Failure Warning

The 798A's **Intelli-Sense™** monitoring system warns you when the correlated distance measured by the two odometer inputs significantly changes. In such a case, the 798A will display "**InPut 1 SUSPECt**", or "**InPut 2 SUSPECt**" in the **CLOCK** and **CALCULATED TIME** displays. When the 798A warns you of such a transducer failure, remove the warning from the displays by activating **SHIFT**, adjusting the factor, changing the odometer input, or (as of firmware version 5.009) turning the rotary switch. The monitoring system is re-armed when you change odometer inputs.

If transducer pulses arrive too rapidly for the 798A to assimilate (> 1000 pulses per second on the active input), the 798A will display the warning "**PULSES ArE too FASt**". The warning is displayed until the pulse rate is lowered. Use the odometer input pulse divider on Odometer Input 2 if necessary.

Power Failure Warning

If the 798A detects a momentary power failure, a warning of "**P.GLitch**" (Power Glitch) will be shown in the **CLOCK** display. The power quality sensing circuit essentially gives you warning that your vehicle is not delivering good, continuous power to the 798A.

When warned of a power problem, turn the rotary switch or activate **SHIFT** to dismiss the warning. The warning will be displayed, again, if another partial power failure occurs.

System Information

If you're interested, you may view the number of power glitches the 798A has experienced by turning on the instrument while **SPLIT** is selected. The **NEXT SPEED** display will show the accumulated number of power glitches sensed by the 798A.

The number in the **SPEED** display is the count of internal system errors that occurred causing a firmware restart. This number should always be zero. If not, contact Timewise.

The **CLOCK**, **CALCULATED TIME**, and **AUXILIARY** displays will show the date of manufacture, the serial number, and the operating firmware version, respectively. The **ODOMETER** display will show "**LoG**" if the datalog memory is installed. Also, as of firmware version 4.011, the leftmost digit in the **ODOMETER** display is used to identify which options are installed in the 798A. Each installed option illuminates a specific segment or decimal point in the digit. Contact Timewise for detailed information.

Actuate **SHIFT**, or de-select **SPLIT**, to make the 798A operate normally.

† You can adjust the length of time each beep sounds when the 798A is in park or reverse, or when the 798A is split. To do so, select **ALARM** on the rotary switch and momentarily actuate **RESET**. The number at the right of the **AUXILIARY** display is the length of time (in tenths of seconds) the "park/reverse beep" sounds every ten seconds. The number at the left of the **AUXILIARY** display is the length of time (in tenths of seconds) the "split beep" sounds every ten seconds. Use the "**+ / –**" **.001** toggle switch to adjust the park/reverse beep time from 0 to 15 tenths of seconds. Use the "**+ / –**" **10.00** toggle switch to adjust the split beep time from 0 to 15 tenths of seconds. Select **SHIFT** to hear a sample beep indicating the newly selected beep time(s).

Internal Battery Backup

If you turn on the 798A and the **CLOCK**, **CALCULATED TIME**, and **AUXILIARY** displays are showing the warning "**dAtALoG StorAGE Error**" alternating with "**bAttErY inSidE FAiLEd**", a lithium battery inside has become too weak to maintain battery backed data.

When the lithium battery fails, the 798A will not save your setup selections, factors, and logged data while powered down. The clock will also have to be set each time you turn the instrument on. The lithium battery will last at least 25 years, so it's unlikely you will ever see this warning. (The battery is soldered in place, and is replaceable only by Timewise.)

Actuate the **SHIFT** switch to remove the warning. The 798A will then function normally.

Display Re-Initialization

The LED display circuits in both the main computer and the driver's module are re-initialized whenever the **Last Split** function (a shifted **LAST CAST**) is activated for two seconds. Should the displays not function properly, activate **Last Split** for a couple seconds to re-initialize the displays. As of version 5.010 firmware, activating the **SHIFT** switch alone will immediately re-initialize the displays.

Re-initializing the LED circuitry does not affect the numerical values of the data.

Overall System Reset

You can reset the 798A to factory default conditions if you wish. To do so, turn the instrument on while holding the **RESET** switch up. All parameters and set up selections will be re-initialized, and the time of day clock will restart at 12:00:00

The only items that are not re-initialized in a reset to factory default conditions are the counters that track the number of power glitches and the number of firmware errors.

PLEASE READ ON...

By now you should be familiar with the operating modes and switch settings of the 798A. You are encouraged to study the next section on **APPLICATIONS** where you will find a sample rally and suggested methods for using the 798A in common rally situations.

You should also read the **APPENDICES**. There you will find information about rear panel connections, technical requirements for the odometer transducer, suggestions for trouble-shooting, and care of the 798A. A thorough understanding of the information presented in **Appendix B** is important. The information presented there concerning overheating and electrical connections can help prevent temporary or permanent failure of the 798A.

Lastly, you'll find a **QUICK REFERENCE GUIDE** that briefly describes how to operate most features on the 798A.

USING THE 798A

To help you toward successful application of the 798A, this section of the manual details the operational procedures used during common rally situations. Additionally, a sample rally demonstrates how to exercise the 798A.

These examples are not intended to answer all rally problems, but rather to stimulate your imagination in the ways the 798A can be used. As always, there are exceptions to any rule, so make an effort to understand the reason for each procedure. Most successful rallyists make up their own rally scenarios to prepare for "what if…" situations. That is the best method to prepare for unusual combinations of general, route, and special instructions.

At the Start of a Rally

When you arrive at the starting point for the rally, always check with the rallymaster for the official time standard. You must align your clock to the rallymaster's clock. It doesn't matter whether or not the official clock agrees with a broadcasted time standard such as WWV or CHU. Never assume that you can use WWV or CHU as the official time!

Then follow these steps to start the rally:

1. Place the 798A in **PARK**.
2. Reset the main odometer to 0.000[00000] miles. Actuate **SHIFT** and then concurrently actuate **TRUNCATE** to do this.
3. Enter your out-time for the first leg (not the odometer check) into the **CALCULATED TIME** display. †
4. Reset the auxiliary odometer, auxiliary calculated time, and the delta counters (for both **Odometer** and **Calc Time** adjustments).
5. Enter the transit mode by depressing **SHIFT** and **CAST** (or adjust the active CAST to a speed of 0.0, thereby entering the transit mode). (Even if the rallymaster gives a CAST to use during the odometer check, rather than a transit time, you can often consider the odometer check a transit zone. In such a case, compute the required transit time for the odometer check and set your out-time for the first leg accordingly.) †
6. Drive to the start of the odometer check.
7. Place the 798A in **FORWARD** and wait for your out-time for the odometer check. (Often, the rallymaster will allow you to leave early.)
8. Drive the odometer check route. During the drive, set the **NEXT SPEED** display to the CAST you are to use after finishing the odometer check.
9. At the end of the odometer check, actuate **CAST**, compute and enter your new factor (or use the **Compute Factor** function), and proceed as usual for starting a leg of a rally.

   Alternatively, you can use the **Preset** function to pre-enter the mileage, out-time, and CAST values to be used for start of the first leg. Then use the preset **Load** function to insert all three numbers simultaneously into the 798A at the "end odo check" marker. If you intend to use the **Compute Factor** function, do so **before** executing the preset **Load** function.

† Some rallyists compute the required average speed for the odometer check (or, perhaps a CAST is given in the instructions) and drive the odometer check *without* using the transit mode. Although the calculated time will not be exact (because you're not yet correctly measuring distance), this method does give a good indication of progress along the course. If you decide to do this, set your out-time for the start of the odometer check into the **CALCULATED TIME** display (step **3**) and your computed CAST for the odometer check into the **SPEED** display (step **5**).

Checkpoint Procedures

Upon arriving at a checkpoint, split the 798A at the timing line to freeze the **CLOCK**, **ODOMETER**, and **CALCULATED TIME** displays. When the checkpoint workers give you your arrival time, verify that time with the split **CLOCK** display. Your error at the in-line will be the difference between the **CLOCK** and the **CALCULATED TIME**.

After receiving all pertinent information from the checkpoint workers, and confirming mileage and times, you're ready to start the next leg. The steps you must take before starting the next leg vary according to the mileage counting method used by the rallymaster.

When Official Mileage Resets to 0.00 at Leg Outmarkers..

Normally, the rallymaster provides a leg outmarker that is a short distance past the in-line for each checkpoint. Official mileage usually reverts to 0.00 miles at this point, and your out-time will be from the outmarker. The distance within the checkpoint area is not added to the official mileage for the next leg, nor is the time to drive to the outmarker added to the calculated time for the next leg.

The checkpoint area, therefore, is considered "dead" mileage and is not used in measurements for the next leg. (Note that rallymasters still expects you to measure distance within the checkpoint, at least to find the outmarker; sometimes an instruction initiated before the timing line will also require that you measure the distance within the checkpoint.)

The recommended checkpoint procedure for a rally that resets official mileage to 0.00 miles at each leg outmarker is as follows:

1. At the in-line to the checkpoint, actuate **SPLIT**.
2. After receiving your checkpoint critique slip, confirm mileage and times for the just completed leg. Then exit the split mode.
3. Drive to the outmarker.
4. **Reset** the main odometer to 0.000[00000] miles. Actuate **SHIFT** and then concurrently actuate **TRUNCATE** to do this. †
5. Enter your out-time from the outmarker into the **CALCULATED TIME** display.
6. If the CAST changes at the start of the next leg, enter the new CAST into the **SPEED** display. ‡
7. Pull beyond the outmarker a safe distance and wait for your out-time. When the **ERROR** display on the driver's module nears 0.00, proceed along the course.

If official mileage resets to 0.00 miles at the end of the odometer check, follow the above procedure there, too. When the odometer check is considered part of the first leg, *don't* **Reset** the odometer to 0.00 at the end of the odometer check. Instead, execute a **TRUNCATE**, and then adjust the **ODOMETER** to the official mileage to that point. If you execute the **Compute Factor** function at the end of the odometer check, the 798A assumes you are at the start of the first leg and automatically enters the official mileage and actuates **TRUNCATE** for you.

† **IMPORTANT!** To reset the **ODOMETER** to 0.000, you should use the **Reset** function at the outmarker, rather than adjusting the **ODOMETER** to 0.000. Remember that **Reset** also truncates the calculated time. You need to truncate the calculated time to start the next leg with the exact value intended by the rallymaster.

‡ In step **6** there are actually two ways to enter the CAST. You can preset the CAST into the **NEXT SPEED** display and actuate **CAST**, or you can select **Speed** and adjust the CAST in the **SPEED** display. You can use the second method because executing a **Reset** (step **4)** also executes a **CAST**, except that the "next speed" doesn't exchange places with the current speed. Executing the CAST insures that mileage driven before the starting point of the new leg won't be used if you subsequently execute the **Retro-CAST™** function.

When Official Mileage Resets to 0.00 at Checkpoint In-lines...

Some rallymasters do not reset official mileage to 0.00 at an outmarker for each leg. Rather, mileage resets to 0.00 at the in-line to each checkpoint, and your out-time is given from that point. There is no “dead” mileage within the checkpoint area. Since you won’t be allowed to wait at the in-line as you prepare for the next leg, you will have to use a different checkpoint procedure than that outlined above. There are two possibilities:

A. Mileaged outmarker are provided after the checkpoint area
B. Mileaged outmarker are not provided after the checkpoint area

...and Mileaged Outmarkers Are Provided

When mileage resets to 0.00 at a checkpoint in-line and the rallymaster provides a mileaged outmarker, use the outmarker as an ordinary mileage reference where you can align the **ODOMETER** and **CALCULATED TIME**. Use this checkpoint procedure:

1. At the in-line to the checkpoint, actuate **SPLIT**.
2. After receiving your checkpoint critique slip, confirm mileage and times for the just completed leg. Then exit the split mode.
3. Drive to the outmarker.
4. **Reset** the main odometer to 0.000[00000] miles.
5. Enter your out-time from the *in-line* into the **CALCULATED TIME** display.
6. If necessary, adjust the **SPEED** display to the correct CAST.
7. Using the **Adjust ORM** function, adjust the odometer to the official mileage at the outmarker. The calculated time will be updated to include the travel time from the in-line to the outmarker. †
8. When the **ERROR** display nears 0.00, proceed along the course.

...and Mileaged Outmarkers Are Not Provided

When mileage resets to 0.00 at a checkpoint in-line and the rallymaster *does not* provide a mileaged outmarker, use the following procedure:

1. At the in-line to the checkpoint, actuate both **SPLIT** and **TRUNCATE** simultaneously. **Do not exit the split mode until step 4**, but release the **TRUNCATE** switch *immediately*. (Some rallyist execute a **CAST** instead of a **TRUNCATE**.)
2. After receiving your checkpoint critique slip, confirm mileage and times for the just completed leg, **and stay in the split mode.**
3. Change the **ODOMETER** to read 0.00 miles. That is, change the displayed value via the **Odometer** function to read 0.00 *(Do not use the* **Adjust ORM** *or* **Odo & Time** *positions.)* **Do not exit the split mode yet**.
4. Enter your out-time from the *in-line* into the **CALCULATED TIME** display.
5. Exit the split mode.
6. If necessary, use the **Speed** function to correct the active CAST.
7. When the **ERROR** display nears 0.00, proceed along the course.

By splitting at the in-line, you can change values within the 798A to what they should be at the in-line even though you will be past that point. Truncating (or casting) allows you to make a “retroactive CAST change” back to the in-line if the critique slip instructs you to change CAST at the in-line.

† You can execute steps **6** and **7** in either order if you use the **Adjust ORM** function. This is because the **Reset** executed in step **4** allows a Retro-CAST. You can alternatively use the **Odo & Time** function. In this case. you should execute steps **6** and **7** in the prescribed order. Otherwise (if you execute steps **6** and **7** in reverse order), you’ll also have to changed the **Odo & Time** calculation speed to the active CAST.

When Official Mileage Accumulates Throughout a Rally…

When mileage accumulates throughout a rally without resetting to 0.00 at checkpoints, there are, again, two possibilities: mileaged outmarkers or no mileaged outmarkers.

If mileaged outmarkers are provided and your out-time is from that point, use the steps outlined in "**When Official Mileage Resets to 0.00 at Leg Outmarkers…**" except that in step **4**, actuate **TRUNCATE only**. Then adjust the **ODOMETER** (using the **Odometer** position on the rotary switch) to the official outmarker mileage. (If you do actually reset the odometer to 0.00, that's OK, it just takes longer to set the official mileage.)

When outmarkers are not present and your out-time is given from the in-line of a checkpoint, use the steps outlined in "**…and Mileaged Outmarkers Are Not Provided**" except that in step **3** adjust the **ODOMETER** to the official mileage for the in-line (on the checkpoint critique slip), rather than 0.00 miles. If desired, in step **1**, you could actuate **SPLIT** and **CAST** simultaneously if you don't want to truncate the **ODOMETER** and **CALCULATED TIME**. This will still allow a Retro-CAST™ back to the in-line should the critique slip change the starting CAST for the new leg.

Do It Yourself Checkpoints

When designing a rally course, rallymasters often use "Do It Yourself Checkpoints" (DIYCs). DIYCs allow the rallymaster to score a leg of the rally without having checkpoint workers monitor the passage of each rally car. Instead, you record your own "official time of arrival" at an indicated reference on the course. Obviously, you can record a calculated time, rather than your actual time of arrival.

As for all legs of a rally, the 798A calculates the DIYC travel time using the distance you drive and the CASTs you enter. Since the calculated time is not dependent on actual driving time or speed, you can usually proceed along the course at your own pace. Of course, you must arrive at the end of the DIYC early enough to begin the next leg of the rally on time.

The general procedure for executing a DIYC is as follows:

1. Follow the course, executing all the CAST changes at the correct locations.
2. At the end of the DIYC, record the value in the **CALCULATED TIME** display. This is your "calculated in-time" for the DIYC. The difference between this value and your out-time from the previous leg is your "official leg time" for the DIYC. Record these values as directed by the rallymaster.
3. Actuate the **TRUNCATE** switch.
4. Enter the next CAST into the **SPEED** display. If the CAST doesn't change at the start of the new leg, skip this step.
5. Add to your calculated in-time the amount of time (if any) you are to pause at the DIYC before starting the next leg. Use the **Calc Time** function to add this pause. The new value in the **CALCULATED TIME** display is your "calculated out-time" for the next leg. Record this value, too.
6. Pull beyond the end of the DIYC a safe distance. As the **ERROR** display on the driver's module nears 0.00, proceed into the next leg of the rally.

Correctly executing a DIYC is probably one of the easiest ways to score a zero on a leg of a rally. Unfortunately, rallyists are so often concerned about DIYC procedures that they make course errors. Keep in mind that the purpose of a DIYC is often just to reduce the number of rally workers. The determining factor in DIYC scores is usually proper course following.

Rebuilding a Leg of the Rally

The 798A can be used by a rallymaster to confirm the travel time for each leg of a rally. Rather than employing a separate computer to calculate the ideal leg time, or even driving the course to "measure" the leg time, the following steps that use the **Odo & Time** function can be executed. In the midst of a rally, the rallyist can use these same steps to rebuild a leg while recovering from an extensive off-course excursion.

Rebuilding a leg is actually very simple. Follow this procedure:

1. Actuate **TRUNCATE**.
2. Enter the outmarker mileage of the last checkpoint into the **ODOMETER** display. This mileage is more often than not 0.000 miles.
3. Enter your out-time from the checkpoint into the **CALCULATED TIME** display.
4. Select **Odo & Time** and add to the odometer the first speed section mileage.
5. Depress **SHIFT** to select **Calc Speed** and change the calculation speed (shown in the **SPEED** display) to the CAST used during the first speed section.
6. De-select **Odo & Time**. This will permanently add the mileage and computed travel time to the appropriate displays.
7. Repeat from step **4** using the figures for the next speed section. Do this as often as necessary to complete the leg.

The resulting values of the main odometer and calculated time will be the same as if you had driven the leg.

Note that you could also use the **Adjust ORM** function to rebuild the rally. The procedure would be to zero the odometer, and enter the first CAST for the leg into the **NEXT SPEED** display. Then **CAST** and add the speed section mileage to the odometer using the **Adjust ORM** function. Then set the next speed into the **NEXT SPEED** display, execute **CAST**, and add in the new speed section mileage. Repeat as necessary.

Fortunately, rebuilding a leg is rarely necessary in the midst of a rally. Although the procedure is simple, the pressure of staying on time while executing the procedure causes panic in the soul of every rallyist.

Recovering from a Missed CAST

A more common experience for a rallyist is forgetting to execute a CAST change at the correct point. Here's a procedure to follow if you need to recover from such a mistake:

1. Actuate **CAST** to change to the new CAST as soon as you realize your error.
2. Estimate the distance back to the correct CAST execution point. Sometimes looking over your shoulder will suffice here; at other times you'll have course information that can be of help.
3. Select **LAST CAST** and subtract the estimated distance from the last CAST odometer measurement value in the **ODOMETER** display.

The 798A will now display the correct calculated time — assuming, of course, that you correctly guessed the distance back to the proper CAST execution point.

Correcting the Odometer at a Mileaged Reference...

When official mileages are given at a turn or landmark, use the **Adjust ORM** function to correct both the odometer and calculated time simultaneously. To do so, activate **Split** as you pass the reference, turn the rotary switch to **Adjust ORM**, and correct the odometer to the official mileage. The calculated time will be appropriately corrected.

If you do not split, but just mentally note the mileage error at the reference, you can simply make the odometer correction "on the fly" with the **Adjust ORM** function.

If you can foresee that the official mileage will appear on the 798A *before* the reference is reached, there is another method for aligning the odometer and calculated time at the reference. When the odometer on the 798A reads the official mileage, put the 798A in **PARK**. When you reach the reference, select **FORWARD** again.

...when the mileage error occurred earlier

When you're certain the mileage error accumulated in a speed section with a CAST different from the current CAST, use the **Odo & Time** function, rather than the **Adjust ORM** function. To do so, activate **Split** as you pass the reference, turn the rotary switch to **Odo & Time**, and correct the odometer to the official mileage. Then, before de-selecting **Odo & Time**, depress **SHIFT** to select **Calc Speed** so you can change the calculation speed to the CAST in effect during the earlier section. Finally, de-select **Odo & Time**.

...when a CAST is executed at the reference

If a speed change occurs at a mileaged turn or landmark, use both the **LAST CAST** and the **Adjust ORM** functions to align the 798A to the rallymaster's numbers. Here's what to do:

1. At the mileaged reference, execute the CAST
2. After you pass the reference, use the **LAST CAST** function to review the mileage recorded at the reference. If necessary, correct the last CAST odometer measurement, *making note of the adjustment amount*.
3. Release the **LAST CAST** toggle switch.
4. Select **Adjust ORM** and adjust the odometer by the amount noted in step **2**. If you made a positive adjustment to the last cast odometer measurement, add that amount to the odometer. If you made a negative adjustment, subtract the amount.

(Note: If your 798A is outfitted with Option 10, step **4** *is automatically executed providing* **Adjust ORM** *was already selected as you executed step* **2**.*)*

In rallies where the rallymaster provides official mileage at every instruction, this technique quickly and precisely corrects for distance measurement errors throughout the entire rally.

Another method exists for correcting the 798A at mileaged CAST changes.

1. When you pass the reference, actuate **SPLIT**. Actuate **CAST** when convenient. Unsplit when convenient. (The **CAST** and **SPLIT** can occur in either order. Note that the 798A will correctly execute a CAST even when the unit is split.)
2. Select **LAST CAST** and change the last CAST mileage to the official distance.
3. Select **Last Split** and compute the difference between the official mileage at the reference and your mileage measurement.
4. Select **Adjust ORM** (or **Odo & Time** †) and do one of the following.
   a. If your split mileage at the reference was greater than the official mileage, *subtract* the mileage difference compute in step **3**.
   b. If your split mileage at the reference was less than the official mileage, *add* the mileage difference compute in step **3**.

† Since you used the **LAST CAST** function to correct the previous speed section mileage, any overall mileage error will always be in the new speed section. The active CAST can always be used as the calculation speed for the **Odo & Time** function. You do not need to use the **Calc Speed** function.

SAMPLE RALLY

The first step toward becoming familiar with the 798A is often just a matter of activating its switches while working out rally problems. To that end, the following sample rally will exercise most features of the 798A. Although rather brief, the instructions are typical of many TSD rallies.

You can actually use the 798A while reading this sample rally. As you proceed, enter the numbers via the **Odometer**, **Calc Time**, **Adjust ORM**, and **Odo & Time** functions.

Let’s assume your base odometer factor is 064050 and that you are assigned car number 12.

General Instructions

- Leave the start at 10:00 AM plus your car number in minutes.
- Official rally mileage reverts to 0.00 at the start of each leg.
- CAST 25 while on gravel, then revert to previous CAST when gravel ends.
- CAST 45 at 15.75 official rally miles.
- Execute route instructions at the first opportunity. However, if the route instruction is accompanied by an official mileage, execute the route instruction only at that mileage.
- Main Road Rules:
  Left at tee
  Onto rule (re-enter a road prior to the next route instruction…etc., etc., etc.)
  Straight as possible

Route Instructions

0.00	1.	Start odometer check at “SPEED LIMIT 25”. Complete route instruction 4 at 10:40 AM plus your car number in minutes.
0.23	2.	Left on Algonquin.
12.76	3.	Right on Frank.
13.19/0.00	4.	End odometer check at “STOP AHEAD”. CAST 39.
	5.	Leave the main road. CAST 30.
5.69	6.	CAST 36 at tee.
	7.	Turn at first sideroad.
2.46	8.	CAST 1 at “DAIRY QUEEN”. Begin free zone. (Food and gas are available in town.)
3.14	9.	CAST 40 at “ARBY’S”. End free zone.
	10.	Right onto Cuba Rd.
16.11	11.	DIYC at “4-WAY”. CAST 32.
	12.	Right at sideroad. Pause 1.00 minute during next 1.4 miles.
	13.	Right at crossroad.
4.57	14.	Right at Smith. CAST 24 a third of the distance to the next checkpoint, CAST 30 another third of the distance, and CAST 48 the other third of the distance.
1.88	15.	Begin transit zone at “RXR”. Take 7.42 minutes to reach route instruction 16.
4.44	16.	End transit zone at “STOP AHEAD”. CAST 33.
	17.	Turn left exactly 1.85 minutes after “YIELD”.
	18.	CAST 40 exactly 3.00 minutes prior to Swanson.
	19.	End rally at checkpoint.

Step by Step Critique

When you arrive at the start of the rally, set the 798A clock to the official time and follow the procedures detailed earlier in **At the Start of a Rally**.

Assuming that you're going to use the **Compute Factor** feature, enter 13.19 as the **Odo Check** mileage. Make sure you reset the main odometer to 0.00 and that you use a CAST of 0.0 during the odometer check (so you drive the odometer check as a transit zone).

0.00 1. Start odometer check at "SPEED LIMIT 25". Complete route instruction 4 at 10:40 AM plus your car number in minutes.

Leave the start at 10:12 AM (or earlier, if permitted), placing the 798A in **FORWARD** at the "SPEED LIMIT 25" sign. Proceed along the course, comparing the odometer to the reference mileages given in route instructions 2 and 3. *Do not* correct the main odometer at these references! During the transit, set the next CAST (39) into the **NEXT SPEED** display.

13.19/0.00 4. End odometer check at "STOP AHEAD". CAST 39.

At "STOP AHEAD" the odometer reads 13.56 miles. When you execute **Compute Factor**, your new factor is 062302. Write this number down!

Your out-time from this point is 10:52 AM. Enter this time into the **CALCULATED TIME** display. Then actuate **CAST** to change to the speed used for the first speed section (39).

Preset the next CAST (30) into the **NEXT SPEED** display.

5. Leave the main road. CAST 30.

After a short distance, you come to a sideroad. Since the main road goes straight here, you turn down the sideroad and simultaneously actuate **CAST** to change the CAST to 30.

Preset the next CAST (36) into the **NEXT SPEED** display.

Suddenly, the road surface turns to gravel. Actuate **CAST** immediately and adjust the active CAST to 25 (from the value 36 now showing in the **SPEED** display) by using the **Speed** function. By adjusting the active CAST, the calculated time from where the road changed to gravel (where you executed the CAST) will be corrected. This is a retroactive CAST change. When the road surface changes back to paved, actuate **CAST** again and confirm that the active CAST is 30 (the CAST prior to entering the gravel road).

5.69 6. CAST 36 at tee.

At the tee, CAST. Then select **LAST CAST**. Let's assume your actual odometer measurement at the tee was 5.72 miles.

To align the odometer and calculated time to official course values, select **LAST CAST** and change the last CAST odometer measurement to 5.69 by subtracting .03 miles. The corrected distance for the last speed section will be shown in the **AUXILIARY** display. Then select **Adjust ORM** and subtract 0.03 miles from the odometer. This corrects the overall distance.

Note, however, that the 0.03 mile error may have occurred because of wheel slippage while on the gravel road. For better accuracy, you can use the **Odo & Time** function, instead of the **Adjust ORM** function, setting the calculation speed to the CAST used on gravel (25 mph). To do so, select **Odo & Time**, subtract the .03 miles from the odometer, select **Calc Speed** (depress **SHIFT**) and set the calculation speed (showing in the **SPEED** display) to 25. Then turn the rotary switch away from the **Odo & Time** position. (You can adjust the calculation speed before or after you enter the **Odo & Time** mileage correction.)

Preset the next CAST (30) into the **NEXT SPEED** display.

7. Turn at first sideroad.

   You make the turn and approach a checkpoint. As you cross the in-line, actuate **SPLIT**.

   Follow the procedures outlined in **Checkpoint Procedure** to prepare for the next leg. Remember that the official mileage reverts to 0.00 at the outmarker.

   After starting the next leg you suddenly realize that the timing slip issued at the checkpoint contained a special instruction changing your CAST to 43. Don't panic! Simply adjust the active CAST to 43 using the **Speed** function. The retroactive CAST change feature corrects the calculated time from the outmarker to your present location.

2.46 8. CAST 1 at "DAIRY QUEEN". Begin free zone. (Food and gas are available in town.)

3.14 9. CAST 40 at "ARBY'S". End free zone.

   There are several methods that can be used to execute these two instructions:

   You can CAST 1 at "DAIRY QUEEN", drive to the end of the free zone, and CAST 40 at "ARBY'S". Note that the rallymaster has given an exact distance of 0.68 mile between the two signs. Let's assume the 798A actually measured 0.683 mile. At a CAST of 1 mph, the travel time for 0.68 mile is 40.80 minutes; whereas for 0.683 mile, the travel time is 40.98 minutes. Because you haven't executed the CAST changes at the *exact* official mileages, the greater measuring accuracy of the 798A will give you a 0.18 minute error.

   Had you had enabled the Intelli-CAST option, the 798A will assume the CASTs occur at exact hundredth of a mile increments. Upon changing to the next CAST (40), the 798A will temporarily ignore the extra 0.003 mile, re-computing the calculated time as necessary. The unused 0.003 mile is then included in the CAST 40 section.

   Alternatively, you can treat the free zone as a transit zone. This avoids the necessity of executing the CASTs at the *exact* mileages intended by the rallymaster. To do so, execute **Transit** at "DAIRY QUEEN" (or preset 0.0 into the **NEXT SPEED** display and execute **CAST**) and add 40.80 minutes [0.68 miles at 1 mph = 40.80 minutes] to the calculated time.

   Another choice is to select **PARK** at "DAIRY QUEEN" and manually compute your "out-time" from the end of the free zone. This makes it easier to drive while you search for food and gas. At "ARBY'S", set the official mileage and your computed out-time from this point. You will essentially start a new leg. Don't forget to select **FORWARD** at the ARBY'S sign!

10. Right onto Cuba Rd.

   At Cuba road, turn right. You are now *onto* Cuba.

   Before long you come to a tee and turn left as per the main road rules. Then, as you pass a sideroad, you notice that it was named Cuba. According to the main road rules, you must re-enter Cuba because you are *onto* the road. By now, however, you've driven past the sideroad and must turn around. As you do this, switch into **REVERSE** to recover from your short off-course excursion. Switch to **FORWARD** when you turn onto Cuba.

16.11 11. DIYC at "4-WAY". CAST 32.

   Before you reach the "4-WAY" sign, the odometer alarm sounds because you are at 15.5 miles. (You did set the odometer alarm at the beginning of the rally to warn you of the general instruction CAST change, didn't you?) Change to a CAST of 45 at 15.75 miles.

   When you reach the "4-WAY" sign, follow the DIYC procedures outlined earlier.

12. Right at sideroad. Pause 1.00 minute during next 1.4 miles.

Turn right at the first sideroad, enter a pause of 1.00 minute, and reset the auxiliary odometer. When the auxiliary odometer reads 1.4 miles, you can proceed to route instruction 13. (While traversing the 1.4 miles, you may pass many crossroads.)

13. Right at crossroad.

Turn right at the correct crossroad.

4.57 14. Right at Smith. CAST 24 a third of the distance to the next checkpoint, CAST 30 another third of the distance, and CAST 48 the other third of the distance.

Here's one for the navigator. Don't expect the 798A to do *all* the work for you!

(Just in case you're interested: Add together the minutes/mile equivalents for the three CASTs (see **Appendix H**) and divide the sum by three. The resulting average minutes/mile figure equates to a speed of 31.3 mph. You must CAST 31.3 immediately after turning right at Smith and maintain that CAST until the next checkpoint.)

The Retro-CAST™ feature of the 798A is very helpful here. Even if you haven't figured out the speed you're supposed to drive before turning at Smith, actuate **CAST** at the turn and proceed along the course. When you finally figure that you should travel 31.3 mph, change the active CAST to that value by using the **Speed** function.

At 11.30 miles you come to a checkpoint. (You should arrive at the checkpoint exactly 12.90 minutes after turning right at Smith.)

1.88 15. Begin transit zone at "RXR". Take 7.42 minutes to reach route instruction 16.

4.44 16. End transit zone at "STOP AHEAD". CAST 33.

This is a standard transit zone: Execute **Transit** (or CAST 0.0) at "RXR", enter the 7.42 minutes as a pause, and then CAST 33 at "STOP AHEAD".

On the other hand, you could drive the 2.56 miles between the two instructions at a CAST of 20.7 mph. The advantage with this method is that you would be able to see your timing error as you drive.

17. Turn left exactly 1.85 minutes after "YIELD".

When you reach a "YIELD" sign, reset the auxiliary calculated time. When 1.85 minutes has accumulated in the auxiliary calculated time, turn left.

Note, however, that the rallymaster may not have used the first "YIELD" sign on the course as the beginning point for the 1.85 minute measurement. Unfortunately, you have no way of knowing this fact before driving 1.85 minutes past the sign and discovering that there is no road on which to turn left. It is, therefore, mandatory that you record the value of the calculated time (or auxiliary calculated time) at all other "YIELD" signs you pass, and then add 1.85 minutes to each of those values. The intended left turn may be 1.85 minutes after a sign other than the first one.

18. CAST 40 exactly 3.00 minutes prior to Swanson.

Here's an example where the **Odo & Time** function must be used rather than the **Adjust ORM** function. (Hint: At a CAST of 40, you will travel 2.00 miles in 3.00 minutes.) Or you can use the **LAST CAST** function: CAST 40 at Swanson, then subtract 2.00 miles from the last CAST odometer measurement.

19. End rally at checkpoint.

The Next Step...

That’s it, folks! Hopefully, this exercise will stimulate your imagination on how to use the 798A. Note that there are often several ways to handle problems given to you by the rallymaster. Use the method with which you are most comfortable.

Your next step is to run an actual rally. But don’t expect to remember all the features of the 798A the first time you use it. There is always a learning curve associated with the operation of any sophisticated instrument such as the 798A. It is likely that you will make a few operational errors early on. Don’t be discouraged. As you become more familiar with the instrument, you will do better and better.

Drive Safely!

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REAR PANEL DESCRIPTION

The rear panel of the 798A lists the electrical and environmental limitations of the 798A. Please read that information. *Failure of the instrument and/or damage to the vehicle may result if the guidelines are not followed*.

The rear panel input and output connections for the 798A are described below. These connections are used to remotely activate functions in the 798A, or to transfer the time from a Timewise checkpoint clock into the 798A.

Remote Control Inputs

The **PARK**, **SYNC**, **SPLIT**, and **CAST** rear panel inputs provide features that some rallyists find useful when adapting the 798A to their style of rallying. The use of these features is purely optional and is not required for normal operation of the instrument.

To activate the remote **PARK**, **SPLIT**, or **CAST** functions, all you need to do is make an electrical connection between two contacts of the appropriate input jack. The **SYNC** function works in conjunction with other Timewise products when using an appropriate interconnection cable.

WARNING!

Do not apply vehicle voltage to any contact in the remote control inputs!

Note: The “tip” and "ring" contacts in the **PARK/CAST** and **SPLIT/SYNC** input jacks are pulled high (to 5 volts) with a 1,000 ohm resistor (10,000 ohm for the **SYNC** input) inside the 798A. The “sleeve” contact is connected directly to the chassis of the 798A and then to vehicle ground via the black (negative) power wire.

Please Note!

To properly use the remote inputs, the 798A must also be grounded to the vehicle via the brass grounding lug on the rear panel. If you don’t ground the 798A via the grounding lug, the remote control inputs may not work.

To use the rear panel inputs you must build a cable/switch assembly for each input. Here’s what you need:

1. Miniature stereo phone plugs (three contact; 1/8TH inch diameter)
2. Two or three conductor cable (shielded cable is recommended but not required)
3. Single pole, normally open switches (e.g., a non-lighted door bell switch)
4. The correct tools and materials for cutting, stripping, and soldering wires to the switch and plug.

Radio Shack is a good source for all these items. The plugs are available with a black plastic handle (part number 274-284) or chrome plated metal handle (part number 274-1547.) Ask for assistance from the store personnel on the other items.

The switch assemblies are easy to make: At one end of a cable, solder one conductor to the appropriate “tip” or “ring” contact of the phone plug. Solder another conductor to the “sleeve” contact. At the other end of the cable, solder a conductor to each switch contact. (With shielded cable, also solder the shield drain wire to the “sleeve” contact on the plug.)

Once assembled, plug the cable/switch assembly into the remote control input jacks on the back of the 798A.

Remote PARK

The remote **PARK** function allows you to remotely stop counting transducer pulses. Activating this input is the same as selecting **PARK** on the front panel. As with a front panel activated park, (or reverse) the **ODOMETER** display will flash every other second when a remote **PARK** is actuated. However, the beeper will not sound every ten seconds.

The remote **PARK** function is often used when running off-road rallies. During such rallies, the navigator may use a factor that is a little on the "high" side. The 798A will then accumulate mileage too fast. The navigator uses this "advance information" to warn the driver about impending turns or obstacles. The navigator then activates the remote **PARK** input to freeze the odometers until the actual execution point is reached. Releasing remote **PARK** at that point re-aligns the 798A to official course values.

Remote SPLIT

The remote **SPLIT** input splits the clock, main odometer, and calculated time just as does the front panel **SPLIT** function. The auxiliary odometer and auxiliary calculated time are also split, and simultaneously reset to zero internally. When remote **SPLIT** is deactivated, all displays update to current course values, with the auxiliary odometer and auxiliary calculated time displaying the distance and driving time since the initial activation of remote **SPLIT**.

The remote **SPLIT** input is most often used during rallies that give incremental mileages between instructions rather than accumulated overall course mileage. Activating the remote **SPLIT** allows you to confirm time and mileage at the execution point of an instruction, while simultaneously resetting the auxiliary odometer.

Note: The remote **SPLIT** cannot be activated while a front panel **SPLIT** or **CAST** is actuated.

Remote CAST

The remote **CAST** input functions the same as the **CAST** function on the front panel.

Note: The remote **CAST** is inactive while the front panel **CAST** switch is actuated.

The Clock SYNC input

The **SYNC** input connection allows you to transfer the time of day from a Timewise checkpoint clock directly into the 798A.

The procedure to synchronize the clock in the 798A is discussed in the **OPERATION** section of this manual. See **Automatically Setting the Clock** for details.

Other Rear Panel Connectors

The **ODOMETER INPUT 1**, **ODOMETER INPUT 2**, and **REMOTE DISPLAY** modular jacks are the connectors for the odometer transducers and driver's module, respectively.

Note: You will not electrically damage either an odometer transducer or the driver's module if you accidentally connect them to the wrong modular jack. The 798A is designed to allow for this mistake.

The **Freq Adj** opening is used when adjusting the 798A clock oscillator. Do not put anything into this opening. **Appendix D** describes the technical procedure that must be followed to recalibrate the oscillator in the 798A.

If your 798A is outfitted with option 7 (**Remote AUXILIARY Display Select**), an additional <u>stereo</u> input jack will be present on the rear panel. This option allows you to remotely select between two parameters in the driver's auxiliary display. To alternate between parameters, all you need to do is open or close an electrical connection between the "ring" and "sleeve" contacts of the input jack.

PREVENTING PROBLEMS

Do not open the 798A. Some components within the instrument are very sensitive to a discharge of static electricity. Just touching a component or a solder trace on the printed circuit board can damage the instrument. Don't fool yourself about your immunity to static charges. Static electricity can be generated by sliding around in a chair. You can destroy the 798A with a static charge that is considerable weaker than the voltage required to produce a spark when you touch a doorknob.

While riding in your vehicle, a static charge is generated within the entire vehicle as the tires flex against the road. Such static charges are generally dissipated evenly throughout the vehicle and therefore do not cause a problem with the operation of the 798A. However, sometimes the fabric used to cover the seats produces a localized charge on your body. In such a case, just touching the outside of the 798A can cause a problem. If you get a shock when you touch the door frame as you exit your vehicle, you can be sure that you're generating a very substantial static charge. (For your information, carbon is often added to the rubber formulation in tires to help dissipate this static charge.)

IMPORTANT!

If static is a problem in your vehicle, Timewise suggests you treat the inside of your vehicle with a static dissipating chemical. Anti-static chemicals, often in an aerosol or pump spray bottle, are available from stationary and computer stores. Radio Shack sells an anti-static aerosol spray as part number 64-2330.

As a general rule with all electronic instrumentation, never plug or unplug accessories while the unit is turned on. The 798A carries the same warning. Damage to the 798A or the accessory may occur as voltages are randomly applied to internal components. The 798A and its accessories are engineered with protection against such random power surges, but following the above guideline reduces the possibility of damage.

WARNING!

The driver's module display must be plugged into the 798A before turning on the instrument. The LED displays can be damaged if the driver's module is plugged in after the 798A is already powered up!

TRANSDUCER TROUBLE-SHOOTING

When magnets for a two-piece odometer transducer are mounted on the rim of a wheel, use caution when parking in slush or snow. A bridge of ice might form between a magnet and transducer if the two components are next to each other when you park. It is possible that the transducer could be pulled out of alignment when the vehicle is subsequently moved. Park with the magnet and transducer offset to avoid this potential problem. (You can mark the outer rim of the wheel to identify the location of the magnet.

Do not use a reduction gear assembly in the installation of an in-line transducer. Although you can select an odometer factor that will count mileage correctly, the pulses from the transducer may arrive so infrequently that the 798A assumes you stop between pulses. The result is that the speedometer on the driver's module may not function at lower speeds.

The 798A will display an erratic speedometer reading when operating from a malfunctioning or poorly installed odometer transducer. If the speedometer momentarily flashes an unusual value (especially when on rough terrain), it is likely that you've missed a pulse or received multiple pulses from a vibrating odometer transducer. In either case, double check your placement of the transducer and/or strengthen the mounting arrangement. Also check for a loose wheel, worn bushings, or even worn wheel bearings.

ELECTRICAL TROUBLE-SHOOTING

If you experience problems with electrical operation of the 798A, the following discussion suggests several areas to investigate before concluding that the instrument is broken. Most problems are caused by incorrect wiring techniques used during installation of the 798A.

Improper operation of rally equipment is often traced to faulty wiring or a defective charging system within the vehicle itself. You must be certain that power is never interrupted to the 798A. Since it is often impractical to run power wires directly to the battery, your best protection against a power failure is clean, secure wiring. A loose connection to the battery or a power distribution point in the wiring harness is a common problem. If a connection is loose, road and engine vibrations can cause an intermittent loss of power to part of the vehicle. All connections must be as clean, secure, and direct as possible

IMPORTANT!

A proper connection to the ground lug on the rear of the 798A is extremely important. The wire used must be heavy gauge and as short as is practical. Make certain the chassis location you choose for this connection provides an easy path for draining static discharges and high frequency noise. Faulty ground connections throughout a vehicle chassis are common.

Make certain that the in-line fuse holder on the power cord supplied with the 798A has some freedom of movement. Power to the 798A can be interrupted if the wires are pulled on both side of the fuse holder. (A spring in the fuse holder compresses, thereby causing loss of electrical contact.) Also, be careful when routing the wires around the glovebox or among control levers. The wires may be pulled when the glovebox is opened or control levers are moved. Wires placed below floor mats or carpeting can be accidentally pulled.

Some rallyist experience trouble only when starting their vehicle. This is often caused by an ignition switch that momentarily breaks contact with a circuit as you turn the key from “RUN” to “START”. During this period the 798A may see a momentary power loss. Sometimes the circuit is not disconnected, but a voltage “brown out” is produced because of poor vehicle wiring or a weak battery.

Make certain that your battery charging system is operating properly and that cables between the battery, alternator, and voltage regulator are securely attached. If any of these cables have loose connections, the alternator can create what is termed a “load dump”. When that happens, voltage spikes beyond 400 volts can be generated. The 798A has circuitry to guard against some of this destructive energy, but continual exposure to that high voltage will rapidly deteriorate the protection circuitry and the 798A can be permanently damaged.

When the 798A is disconnected from your vehicle, keep the electrical power connector free of dirt, oil, and moisture. Contamination might cause a future intermittent power failure. This warning applies to odometer transducer and driver’s module connectors as well.

Electrical Noise

A problem that plagues all instrumentation is electrical noise. The 798A is no exception.

Electrical noise (often referred to as Electromagnetic Interference or EMI) comes in two basic varieties: “radiated” and “conducted” noise. Radiated noise is caused by anything that produces a spark. The resulting electromagnetic noise is often referred to as “Radio Frequency Interference” (RFI). Any device that broadcasts a signal also produces RFI. Such interference can enter into an instrument directly through its case or by inducing extraneous voltages into power supply and accessory cables.

Conducted noise is an undesirable voltage transient that “pollutes” the power and/or ground lines of the instrument. Conducted noise is produced when switching another electrical device on or off. A static discharge to the front panel of an instrument is conducted noise that simultaneously produces RFI.

Although each of these types of EMI has particular modes of entering the 798A, the end result is the same: the instrument will fail to function—either temporarily or permanently.

Electrical noise originates from ignition systems (yours as well as those of other vehicles), CB and business band radio transmissions, cellular telephones, lightening, high tension wires, nuclear explosions, static discharges, microwave receivers (radar detectors), microwave transmitters (police radar and communication links), OEM trip computers, computerized dashboards, microwave ovens, AC and DC motors (blower motors and wiper motors are particularly nasty), etc.

Electrical noise can cause the 798A to fail in a variety of ways. Some modes of failure are: meaningless information in the displays, erratic odometer measurements (usually too high), locked-up displays, reset of the computer to start-up status (although this is often caused by intermittent power), or a change in the counting rhythm of the clock. Unfortunately, electrical noise problems often show up after long periods of correct operation.

Obviously some sources of electrical noise are of less concern than others. Few rallyists have an onboard microwave oven; and, if there is a nearby nuclear explosion—well, you've got other things to worry about.

On the other hand, electrical noise from some sources occurs regularly in a vehicle. Spark plug wires, CB radios, business band radios, cellular telephones, and static discharges are common sources of radiated noise. Alternators, voltage regulators, blower motors, power seats, air conditioners, electronic fuel injection systems, and microprocessor controlled instrumentation generate electrical noise that pollutes the 12 volt power system of a vehicle.

Reducing Electrical Noise

The 798A has been designed, both electrically and physically, with protection against high levels of electrical noise. Still, proper attention must be given to protecting the 798A from excessive electrical noise. Correct installation of the 798A and proper maintenance of the vehicle play a significant role in eliminating electrical noise problems.

One sign that you have a problem with excessive electrical noise is a "ticking" sound you hear when listening to the vehicle's AM radio. This ticking sound is often caused by a faulty ignition system. It can enter the radio through the power connection (conducted noise), or via the antenna (radiated noise). (Note: You can have an electrical noise problem even when your AM radio reception is fine. Some radios handle electrical noise better than others.)

To determine whether the ticking is caused by conducted or radiated noise, you can perform a simple test. Disconnect the radio antenna and listen for the ticking sound again. If you continue to hear the ticking sound over the background static on the radio, the interference is probably coming over the power line as conducted noise. If the ticking is eliminated after the antenna is disconnected, the noise is more than likely being received by the antenna as radiated noise (RFI).

If conducted noise is polluting the 12 volt power system, appropriate electrical components can be used to "clean-up" the power lines. The 798A is designed with an electrical filter to remove most of this interference. However, with excessive interference you will need to add another noise filter to the power lines. Radio Shack's part number 270–051 should solve the problem. Follow the installation directions supplied with the product.

If the noise is being picked-up by your radio's antenna, the problem is more difficult to solve. Since such interference is received by the antenna, it means that an RFI field literally surrounds the entire vehicle. Any instrument placed in the vehicle is subjected to the same stray RFI field. In the radio, excessive interference causes an aggravating noise. In the 798A, the interference can cause complete disruption of the instrument.

There are two ways to stop the effects of RFI on the 798A. One is to protect the instrument from high levels of such interference. The other is to prevent the interference from being generated in the first place, or at least reduce its level.

Several design features of the 798A are very significant in preventing RFI from affecting its operation. The metal case of the 798A shields its circuitry from much RFI. Internally, the printed circuit board layout and component selection absorb most of the remaining RFI. The cable that connects the driver's module to the main unit is shielded to reduce pick-up of RFI. Timewise odometer transducer cables are also shielded. For protection beyond what these features provide, the 798A would need more costly connectors, cables, and housings.

There are several courses of action you can follow to prevent radiated noise from affecting the 798A. *Unless you follow these procedures, you will have electrical noise problems!*

❏ Solid spark plug wires radiate incredible amounts of RFI. If your vehicle has solid spark plug wires, you <u>must</u> replace them with resistance wires. Spark plugs and spark plug caps with suppressor resistors also reduce ignition noise. Don't be misled by an apparent lack of trouble when using solid wires. Ignition noise can be very elusive, occurring only on humid days, during hard acceleration, or when your engine is cold, hot or out of tune. **The 798A will fail if you have solid ignition wires!**

❏ The vehicle's battery charging system is also a source of RFI. Most vehicles have, as standard equipment, noise suppressing capacitors and/or chokes on the alternator and voltage regulator that reduce RFI. If your vehicle is lacking these components, contact your automobile dealer or a local installer of quality vehicle sound systems for such components, and advice on how to install them.

❏ Do not attach the 798A's black power lead directly behind the computer and run the red wire a long distance to the fuse box or battery. By doing so, you create a loop antenna that receives RFI. Connect the power leads to points near each other.

❏ Even properly connected power leads pick up some RFI. One of the best ways to remove interference is to twist the two leads together—about one or two turns for every inch of wire. By doing so, the interference on each wire is canceled out. You must do this! Replacement power cables are available at Radio Shack. Ask for part number 270–025.

❏ The 798A must be properly grounded to the vehicle via the grounding lug on the rear panel. A poor ground connection will increase the likelihood that the 798A will be affected by static discharges or RFI.

❏ Make certain the negative terminal of the battery is firmly connected to both the chassis and engine block. Do not overlook this important point. A poor chassis ground not only reduces the voltage supplied to the 798A, but also lets the ground wire act as an antenna.

- ❏ If you connect the 798A power wires directly to the battery, consider replacing the power cable supplied with the 798A with a shielded, twisted pair cable. Such a shielded cable will give you added protection against RFI. You can purchase shielded, twisted pair cable from electronic and electrical suppliers. When installing shielded cable, connect the shield drain wire only to the vehicle chassis or battery, not the 798A.

The preceding discussion is not meant to cause undo concern about the ability to use the 798A in a typical rally vehicle. Rather, the information is to help allay EMI/RFI problems. Electrical noise problems can be solved. Please check, and double check, your installation before calling Timewise.

OVERHEATING

The 798A uses industrial grade components throughout its construction and is designed to operate within the broad environmental conditions that occur within the passenger compartment of an automobile. However, the extremely high temperatures that occur in a closed vehicle standing in summer sunlight can have a detrimental effect on the instrument.

On a hot summer day with little wind blowing, temperatures within a closed vehicle can exceed 160˚ F. If the 798A is exposed to such conditions when it is turned on, and the LED displays are at their brightest setting, the instrument will exceed its maximum operating temperature. Should the 798A overheat, the life of internal components will be shortened considerably. A thermal shut-off feature built into the 798A should stop operation before the instrument is damaged.

If the 798A is exposed to temperatures over 250˚ F, even momentarily, the operating firmware will be permanently altered.

To prevent overheating on hot days, dim the displays and park your vehicle in the shade whenever you leave your vehicle for substantial lengths of time.

The 798A will get warm. However, it should never get too hot to touch. If the 798A is so hot that you cannot keep your fingers on the metal, you are overheating the unit.

Fresh air must be allowed to cool the 798A and to circulate through the instrument. Normally, there is enough air movement while driving. But be careful if the instrument is placed in the glovebox or recessed into the dashboard, as air circulation will be restricted. Do not block the ventilation grill across the top and bottom of the instrument.

NOTE: If you use an odometer transducer other than one supplied by Timewise, be forewarned that the higher power required by some designs (particularly photoelectric types) will cause an internal resettable fuse to heat up. The fuse will disconnect power to the odometer inputs if the transducers draw more than 170 milliamps. After about 2 - 5 minutes, the fuse will reset, allowing the odometer transducers to operate once again. If the transducers continue to draw too much current, the fuse will cycle on and off continuously. This safety feature also protects the 798A if you cause a short circuit when installing a homemade transducer

WARNING!

Do not have the 798A turned on if you jump start your vehicle with a 24 volt starting system, or whenever you recharge your battery!

The higher voltage of such charging systems will cause overheating of the 798A within seconds.

And, Yes, The 798A Can Get Too Cold!

The 798A uses a lithium battery to maintain the time of day clock, personal setup selections and datalog memory when primary power is removed from the instrument. Laser sealing of the battery allows long term exposure to the high temperatures encountered in a vehicle; low temperature operation is limited by the lithium battery's chemistry.

Lithium battery chemistry can withstand short term exposure to – 40°C (–40° F) and a continuous low temperature of – 35°C (–22° F).

Be forewarned that if you use the 798A on a rally where the weather gets very cold, keeping the instrument in an unheated vehicle overnight may result in loss of data. During overnight rest stops when the outside temperature can drop to less than – 35°C, it is imperative that the 798A be brought inside to warmer conditions.

ODOMETER INPUT SPECIFICATIONS

The following information is for rallyists designing their own odometer transducer or adapting another manufacturer's transducer to the 798A.

Cable Requirements

The odometer transducer inputs on the back of the 798A are "eight-contact unkeyed modular jacks". The connector on the transducer cable must be an "eight-contact unkeyed modular plug". Do not use a four or six contact modular plug. The smaller plug will fit into the eight contact jacks, but some of the contacts in the jacks will be damaged.

Timewise can supply shielded cables with an eight-contact modular plug attached. Cables are available in any length. Adapter cables for other transducers brands are also available.

Shielded cables with modular plugs are also available from some specialty electronic distributors. You must describe in exact detail the cable you require. For example:

"Seven conductor (28 gauge stranded), with overall shield (metalized polyester foil) with 24 gauge stranded drain wire, rubberized black neoprene jacket cable, fifteen feet long; one end with an eight-contact unkeyed modular plug—shield must be on pin 1; other end blunt cut"

If you wish to make your own cable, a special tool for installing modular plugs will be needed. The tool (and modular plugs) can be ordered from specialty tool suppliers. The tool is expensive. Shielded multi-wire cable (with a shield drain wire) is available from electronic distributors. The individual insulated wires must be small enough to allow insertion into the modular plug. Thin insulation (.009 thick) covering 26 or 28 gauge wire is required.

Contact Assignments

Pin assignments for the odometer transducer input modular jacks are listed below. Pin 1 is on the left when looking at the jacks on the rear of the 798A. The plug on the transducer cable will enter a jack with its flexible locking lever downward.

Pin 1— Shield; connected to chassis ground. Do not use this pin as the signal ground.

Pin 2— Five volts output. Current limited with a 170 milliamp resettable PTC fuse (or, alternatively, a 4.3 ohm 1/2 watt resistor, if requested).

Pin 3— (**ODOMETER INPUT 1** only) Optional RS-232C output.

Pin 4— Odometer signal input. Inside the 798A, the input is "pulled" to 5 volts using a 3000 ohm "pull-up" resistor. The odometer signal is connected to a 74HC14 Schmitt trigger inverter after passing through a 2000 ohm "series" resistor,.† Clamping diodes protect the 798A (on the Schmitt trigger side of the series resistor) from an over- or under-voltage signal. The input is negative edge triggered and must be lowered to 1 volt or less for a pulse to be counted. The signal must be allowed to return to 4.5 volts to re-arm the sensing circuitry.

Pin 5— (**ODOMETER INPUT 1** only) Optional RS-232C input.

Pin 6 — Not used.

Pin 7— Signal ground. Internally connected to the " – " (black) power wire.

Pin 8— A buffered duplicate of the odometer signal applied to the other odometer input (pin 4 of the other odometer input). The buffered signal on pin 8 of odometer input 1 is the internally created "divided by" signal from odometer input 2.

† To allow an OEM vehicle speed sensor (Vss) to be used as the odometer input signal, the resistor values associated with **ODOMETER INPUT 2** are often changed. Typical values for the "pull-up" and "series" resistors will then be 10k ohms and 3k ohms, respectively.

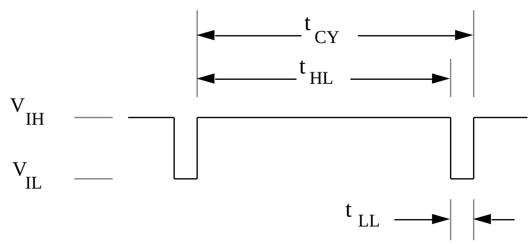
Using One Transducer with Two Computers

If you plan on using two Timewise rally computers in one vehicle, you may want to obtain a special cable that allows you to connect one odometer transducer to both units. This custom cable is constructed so as to connect pin 8 on one end of the cable to pin 4 on the other end. The cable is installed between an unused odometer input on the 798A, and an odometer input on a second computer. The odometer transducer signal received by the 798A is thusly forwarded to the second computer, allowing both units to share the same signal. If you decide to construct such a cable yourself, ***you must not interconnect any other pins within the cable.***

Signal Specifications

If you design your own odometer transducer system or are planning to use a signal from the OEM electronic speedometer in your vehicle, the following odometer signal input specifications for the 798A will be of interest:

Symbol	Parameter	Min.	Typ.	Max.	Unit	Comment
t_{CY}	Cycle Time	1.00		∞	millisec.	without pulse divider
t_{HL}	High Level Valid	0.99		∞	millisec.	
t_{LL}	Low Level Valid	10 *		∞	microsec.	
V_{IH}	Input High Level	4.5	5	14	volts	5 volts typ.
V_{IL}	Input Low Level	–0.5	0	1	volt	



IMPORTANT!

* The 798A counts pulses from the transducer when the signal goes low. As shown in the table, this low level pulse needs to be valid for only 10 microseconds to be sensed by the computer.

Be forewarned that odometer counting inaccuracies can occur when using a reed switch or other mechanical switching device in an odometer transducer. Multiple counts from switch contact bounce can be significant in such systems. Also note that transducers utilizing mechanical switches often have a life expectancy of only 2 to 4 million operations. This is actually not very many operations when you consider that the switch will be operating 1000 to 2000 times per mile. Since these switches operate at all times (whether or not power is applied), their useful life can be less than 4000 miles. Such transducers are not recommended.

Please read the information in **Appendix B** in regard to the power available for use by odometer transducers. The more power your transducer uses, the hotter the 798A will become. An internal fuse will limit the current available for transducers to 170 milliamps.

Transducer Input Limitations

At a vehicle speed of 120 mph the 798A can sense up to 30,000 pulses per mile (a factor of 003333) and keep up with incoming pulses. At this speed you will be receiving one pulse every millisecond. This is a rate of 60,000 pulses per minute, or 1000 Hertz (cycles per second). If you limit your maximum speed to 100 mph, the pulses per mile figure can increase to 36,000 (a factor of 002777) before you exceed the 1000 pulses per second limit.†

Note that these figures are valid only if the odometer input signal meets all restrictive aspects of the signal timing specifications. This is generally not possible; nor is it necessary.

For instance: In an installation using an open two-piece transducer, with magnets attached to a wheel, a typical factor of 060000 is used. In such an installation, the vehicle would have to be driven over 500 mph before a timing limitation is reached. In this case, the limitation is not an overly high pulse rate, rather it is the short time (< 10 microseconds – see the "Low Level Valid" time in the signal specifications table on the previous page) that the magnet passes in front of the transducer. When a speed of 500 mph is reached, the cycle time is still about 8 milliseconds (125 Hertz)…a value well within the limits of the timing specifications.

If odometer transducer pulses do arrive too rapidly for the 798A to assimilate (> 1000 pulses per second on the active input †), the 798A will display the warning "**PULSES ArE too FASt**" in the **CLOCK**, **CALCULATED TIME**, and **AUXILIARY** displays. The warning is displayed until the pulse rate is lowered.

Odometer Input Pulse Divider

If you plan to connect the 798A to a vehicle's OEM (Original Equipment Manufacturer) electronic speedometer signal, be aware that some vehicle systems output pulses at rates faster than 1000 Hertz—even at 30 mph. Others may have slower pulse rates but will fail to work correctly because the signal does not meet one of the other input signal specifications.

The 798A is supplied with circuitry that allows you to connect **ODOMETER INPUT 2** to signal sources that output pulses more rapidly than normally permitted by the 798A. This input incorporates a programmable frequency divider that allows you to utilize high pulse rate signals from an OEM electronic speedometer.

Using the programmable frequency divider, odometer pulses may be divided by 1, 2, 4, 8, 16, 32, 64, or 128. See **Using the Built-in Odometer Pulse Divider** in the **OPERATION** section of this manual on how to set the "divide-by" ratio setting.

You will have to experimentally determine the correct setting for your installation. Select the "divide by 2" position first. Drive slowly (10 - 20 mph) for a short distance and compute a new odometer factor. If the factor is below 010000, select the next higher division ratio and re-try. For electronic speedometer systems, the 4:1 or 8:1 ratio is usually appropriate.

IMPORTANT: While the frequency divider circuitry does electronically reshape low amplitude signals from OEM electronic speedometer systems, many such systems do not reliably provide signals at low speeds. As of this writing, many electronic systems on US manufactured vehicles are essentially small generators that cease to function at low speeds. Bosch electronic systems (on most European vehicles) typically use a Hall-Effect circuit that outputs logic level signals at any speed. Signals from such systems should work fine. The signal conditioning provided will not normally interfere with operation of any OEM electronic speedometer, although this is not guaranteed.

† As of version 3.001 firmware, the allowable pulse rate was increased to 1500 pulses per second.

Usually a single electrical connection to your vehicle's electronic speedometer is all that is required when connecting to the 798A. First locate the appropriate signal from the speedometer drive circuitry and then carefully connect that signal to pin 4 of **ODOMETER INPUT 2**. (Timewise can supply a shielded cable with a modular plug on only one end. The shield drain wire (from pin 1 on the plug) can be connected to the vehicle chassis.)

Typically, neither the 5 volt power or signal ground connection is required when operating the 798A from an electronic speedometer signal source. Timewise suggests that you **do not** make a signal ground connection (pin 7) to the chassis unless the attachment point is identical to the main power negative lead attachment location for the computer. Otherwise, you may create a "loop antenna" and the odometer input circuitry may work erratically. (Shielded wire is recommended for the signal connection. Connect the shield to pin 1 of the modular plug, or the chassis near the signal source, but not both.)

NOTICE! You must determine where you connect to the OEM electronic speedometer circuitry. Timewise assumes no liability associated with the use of this option. Timewise will not assist in locating either a wiring diagram of your vehicle or a specific connector under the dash. Timewise has no information in this regard for any vehicle.

Note: When using an OEM electronic speedometer system as a transducer input signal, the *speedometer* in the driver's module may not work correctly, even though the 798A functions properly in all other aspects. This is because the time between pulses from the OEM system may vary even while vehicle speed is held constant. If the speedometer shows varying values even while you carefully maintain vehicle speed, it could be that the pulses from the OEM system are not evenly spaced. (The 798A uses the time between several pulses to calculate your speed.) Contact Timewise for suggested circuits to correct this problem.

Regarding the use of the odometer input jumper plug: A signal supplied to **ODOMETER INPUT 2** is not fed directly to pin 8 of **ODOMETER INPUT 1**. The signal goes through the frequency divider circuitry first. Therefore, the jumper plug that connects pin 8 to pin 4 of **ODOMETER INPUT 1** will connect the divided signal from input 2 back into input 1.

Odometer Input 2 Pulse Divider Specifications

- Permissible input signal voltage: – 1 to 15 volts
- Input signal level for "low": 0 to 1.5 volts
- Input signal level for "high": 4 to 15 volts
- Input current, high signal level: Typically +13 microamps (Assumes an 8 volt signal)
- Input current, low signal level: Typically – 1.7 milliamps
  (The input terminal is pulled to 5 volts within the 798A via a 3000 (typically) ohm resistor. The electronic speedometer drive circuitry must be able to sink this 1.7 milliamps when it outputs a low level signal.)
- Input frequency range: 0 to 640,000 Hz (up to 19,200,000 pulses per mile @ 120 mph)
- Signal frequency division selection: ÷1, ÷2, ÷4, ÷8, ÷16, ÷32, ÷64, or ÷128

OSCILLATOR ADJUSTMENT

The Timewise 798A uses an 11.0592 MHz quartz crystal oscillator to accurately maintain the time of day clock. The frequency of this oscillator has been adjusted to provide a specified clock accuracy of ± 0.01 minute after twelve hours. (Actually, the clock is typically accurate to ± 0.01 minute after twenty-four hours.)

After a period of time, the crystal and other parts of the circuit age and the frequency of the oscillator drifts slightly. (This is true for all oscillator circuits.) The clock will then begin to gain or lose time to a greater amount than the specified accuracy. The oscillator frequency should then be re-adjusted. Although the procedure is rather simple, the equipment required to make the frequency adjustment is quite specialized. Timewise will calibrate your 798A for a minimal charge.

Do not attempt to adjust the oscillator unless you have the appropriate test equipment and are experienced at calibrating electronic instrumentation.

For those of you that qualify, here’s the procedure to follow:

1. Turn the 798A off and connect the input of an eight-digit *reciprocal* frequency counter to the remote **PARK** input on the rear of the 798A. Use a cable you have fabricated. You must ground the 798A to the negative side of the power supply for this procedure to work correctly.

2. Hold the **SPLIT–LAST CAST** toggle switch on the front of the 798A in the **LAST CAST** position. Then turn the instrument on and release the toggle switch. The 798A will output a high-speed clock to the remote **PARK** port. All the LED segments will turn on to their brightest setting.

3. Let the 798A warm up for at least 30 minutes.

4. Carefully insert a small *non-conductive* flat-blade adjustment tool into the **Freq Adj** opening on the back of the 798A and locate a small adjustable capacitor recessed approximately 1/4" inside the instrument. As you attempt to locate the adjustment screw on the capacitor, be very careful. The slotted head may be hard to find, as it is not necessarily perfectly aligned with the center of the access hole. If you’re not careful, you can break the capacitor.

   DO NOT USE A SMALL METAL SCREWDRIVER FOR THIS ADJUSTMENT! You can permanently damage the 798A if you make electrical contact to circuitry near the capacitor! In addition, the metal will allow your body capacitance to unpredictably change the frequency of the oscillator as you make the adjustment.

5. Using a gate time on the frequency counter of at least five seconds, adjust the 798A clock output to a frequency of 230,400 Hz ± 1 Hz. The adjustment screw will need to be turned *very* little. Note that the screw will turn endlessly, cycling through its adjustment range with each revolution. If the oscillator cannot be adjusted to the correct value within one revolution of the adjustment screw, the 798A must be returned to Timewise for repair.

   (As a matter of interest, the clock in the 798A will be accurate to ± 0.01 minute after twelve hours if the oscillator is set to 230,400 Hz ± 3.2 Hz. When adjusted by Timewise, the oscillator frequency is initially set to 230,400 Hz ± 0.8 Hz, providing an accuracy of ± 0.01 minute after 48 hours.)

6. After making the adjustment, select **SHIFT**, or turn the 798A off and on again to resume normal operation.

CLEANING THE 798A

Keep the 798A free of as much dirt and grime as possible. Although it is obviously impossible to prevent accumulation of dust and fingerprints on the instrument during normal use, ordinary precautions can protect the 798A from excessive dirt. One of the easiest ways to do this is to remove the 798A from your vehicle when you are not on a rally. In doing so, you will also remove a temptation from the prying eyes of thieves.

Clean the 798A as necessary. Front panel switches and rear panel connectors can eventually be damaged by accumulations of dirt and grime.

Be careful when cleaning the polycarbonate front panels of the main computer and remote driver's module. Although they are protected from fingerprints, minor scratches, and chemical damage by a special protective coating, abrasive grit and certain cleaning chemicals will mar the surface. To remove fingerprints, use a mild **plastic** cleaning solution. Do not use chemical solvents, bathroom and kitchen cleansers, or any aromatic hydrocarbon based cleaner. Use a soft cloth and wipe accumulated dirt off carefully to prevent scratches.

CAREFUL!

> Never spray a cleaner directly on the 798A; rather, spray a cloth and then clean the panels with the damp cloth. If you spray a cleaner directly on the front panel of the 798A, some of the liquid will enter the switches and cause internal corrosion and eventual failure of the switch mechanism.

Do not open the 798A to clean inside. You will void the warranty. If your 798A needs to be cleaned internally, return it to Timewise for a thorough checkup. Timewise will clean and calibrate any 798A for a minimal charge.

If you feel that the contacts in the rear panel odometer inputs and remote display modular jacks need to be cleaned, you can use foam tip cleaning swabs for VCRs that have been saturated with denatured ethyl alcohol or isopropyl alcohol. Some Freon® substitutes are OK, but be very careful — there <u>absolutely must not</u> be any methanol, methylene chloride, acetone, 1,1,1-trichloroethane, or nitromethane in the cleaner. Take special precautions here, as many formulations used for cleaning electrical contacts (e.g. television tuner cleaner sprays) contain unspecified additives that lubricate metal surfaces or dissolve waxes and heavy deposits of grease. You *will* dissolve and/or soften some of the plastics (especially the polycarbonate front panel, polycarbonate modular plugs, and polystyrene LEDs) in the 798A with those chemicals. Also, do not touch the contacts in the modular jacks with a cotton swab as you may bend the wires or leave behind some cotton fibers.

WARNING! DO NOT USE AN AUTOMOTIVE ENGINE CLEANER ON THE 798A! Such formulations contain unspecified chemicals and lubricating oils that will damage some of the plastics in the 798A. In addition, electrical contacts in the instrument will be coated with the oils.

One final note: Some chemicals used in insect repellents can damage the front panel and/or paint on the 798A. Do not let these chemicals contact the 798A, as you can ruin the appearance of the instrument.

MATERIALS LIST

Throughout this manual, there are references to components and materials used during installation of the 798A, as well as suggested spare parts and cleaning supplies required for maintenance of the instrument. Here is a list of those items and suggested suppliers for them.

Personal preference must guide you in the selection of some items, such as a switch needed for operating remote functions. Visit a local hardware store or Radio Shack to make your selection.

The abundance of Radio Shack stores in North America is the reason that source is listed so often. Similar items are usually available from hardware, home center, and auto parts stores.

ITEM	SUPPLIER	PART NUMBER
Magnetic odometer transducers:		
Open "two-piece", super sensitive	Timewise	217-15; 8 Contact Modular Plug, 15 ft cable.
Closed (for Speedometer Cable)	Timewise	215.0-7; 5/8" x 18 tpi, 8 contact modular plug, 7 ft cable. Other fittings available.
Power cable w/ fuse holder	Radio Shack	270–025 (w/ quick-disconnect, w/ fuse holder, 4 ft);stocked by Timewise
Power cable extension	Radio Shack	270–026 (w/ quick-disconnect on both ends, 1 ft long)
Multi-conductor signal cable	Timewise	100-xx (3 conductor, 26 gauge, shielded; substitute length in feet for -xx). Available with or without modular plug.
		110-8-xx (7 conductor plus shield, 28 gauge, w/ 8 contact unkeyed modular plug on one end, shield drain wire on pin 1; substitute length in feet for -xx). Also available without modular plug.
Modular jack coupler (for connecting two male 8 contact modular plugs)	Timewise	Hubble #BRIA4P, or Radio Shack #xxx-xxx; 8 contact <u>straight through</u> double female coupler jack. Do not use a crossover connector.
Modular plugs (8 contact, unkeyed)	Timewise	AMP # 5-554739-3 Use only with AMP crimping tool.
	Digi-Key (800) 344-4539	AMP # 5-554739-3 (Digi-Key # A9094) Use only with AMP crimping tool.
Modular plug crimping tool (for 8 contact plugs)	Digi-Key (800) 344-4539	AMP crimping tool # 231652-1 (Digi-Key # A9900-ND) Important! Only use AMP modular plugs with this tool.
Fuse (3AG, 2 Amp)	Radio Shack	270–1007
Mounting bracket washer	Hardware stores	Hard rubber " 3/8 L" flat faucet washer (with hole drilled to 17/64")
Electrical noise suppression filter	Radio Shack	270–051
Stereo phone plug (3 contact, 1/8")	Radio Shack	274–1547 (shielded, w/ spring strain relief)
		274–284 (black)
		42-2387 (3 conductor cable with plug at both ends, 6 ft long)
Magnets	Radio Shack	64–1883 (0.5" dia x 0.2"; package of 5)
		64-1895 (1/8" dia x 1/16"; strong, rare earth magnet; pkg. of 2)
		64–1877 (1.9" x 0.9" x 0.375")
Cable ties	Radio Shack	278–1631 (4"), 278–1632 (5"), or 278–1642 (8")
Double-sided foam tape	Hardware stores	Use the 3M brand only; other brands are too difficult to remove
Anti-static spray	Computer stores	Ask for a spray-on chemical that reduces static electricity
Velcro®	Hardware stores	Ask for self-adhering Velcro® strips

TECHNICAL SPECIFICATIONS

Design

CPU type: 8 bit, DS87C530 operating @ 11.0592 MHz
Memory: Operating System OTP ROM: 16K bytes
Data manipulation RAM: 256 bytes
Battery-backed data storage SRAM: 1024 bytes
Displays: 0.4" tall, super bright, high efficiency red LEDs

Accuracy

Odometers: ± 0.001 mile (km) after 50 miles (km)
Clock: ± 0.01 minute after 12 hours (24 hours typical)
Battery backed Clock: ± 2 minutes per month (12 volt power disabled the entire time)
Calculated Time: ± 0.01 minute after 100 CAST changes
Error: ± 0.01 minute after 50 CAST changes and 6 hours
Speedometer: ± 0.1 mph (kph) up to 175 mph (280 kph)

Displayed Information

Main Odometer: 0.000 to 999.999 miles (km)
Auxiliary Odometer: 0.000 to 999.999 miles (km)
Clock: 12:00.000 to 11:59.999 (:59.9)
Calculated Time: 12:00.000 to 11:59.999 (:59.9)
Auxiliary Calc Time: –59.999 (:59.9) to 5:59.999 (:59.9)
Speed (CAST): 0.1 to 99.9, and 1 to 399 mph (kph); (opt: 0.01 to 99.99 mph (kph))
Factor: [0.00]000001 to [0.00]999999 mile (km) per pulse
Odo Check Range: 0.001 to 99.999 miles (km)
Alarm Mileage: 0.00 to 999.99 miles (km)
Alarm “To Go” Range: 0.00 to 9.99 miles (km)
Delta Counters (“Amount of Change”)
Mileage: –99.999 to 999.999 miles (km)
Time: –59.999 (:59.9) to 5:59.999 (:59.9)
Error (on driver’s module): –9.999 (:59.9) to 59.999 (:59.9); or,
40.001 (:00.1) to 99.999 (:59.9), then .000 to 59.999 (:59.9)
Outside the above ranges: “**EEEE**” up to 6 hours early, or “**LLLL**” up to 6 hours late
Odometer (on driver’s module): 0.00 to 999.99 miles (km)
Speedometer (on driver’s module): 0.0 to >300.0 mph (>480.0 kph)
Speed difference (on driver’s module): –399 to 399 mph (kph)

Electrical

Power requirements: 8 – 15 VDC; 1.2 amps max.; 0.8 amps typ. @ 12 volts
Fuse: 2 amp fast blow; type 3AG or equivalent
Internal, auto-resetting PTC fuse (non-serviceable), for odometer transducer inputs: 0.17 amp
Optional RS-232C Interface: 9600 baud, 1 start bit, 8 data bits, 1 stop bit, no parity

Environmental

Storage temperature: –35°C to 125°C
Operating temperature: –30°C to 65°C
Humidity: 90%, non-condensing

Physical

Enclosures: Aluminum and/or ABS
Front panels: Hard coat protected polycarbonate on aluminum subpanel
Rear panel: Photo-etched anodized aluminum
Main computer size: 11.35" W x 3.35" H x 3" D
12.15" W x 3.75" H x 3" D with mounting bracket and knobs
Main computer weight: Approximately 2 lb. 3 oz.
Driver’s module size: 3.1" W x 2.1" H x 2.50" D
Driver’s module weight: Approximately 5 oz.
Driver’s module interconnect cable length: Approximately 3.5 ft.

MPH	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	MPH
10	6.00000	5.94059	5.88235	5.82524	5.76923	5.71429	5.66038	5.60748	5.55556	5.50459	**10**
11	5.45455	5.40541	5.35714	5.30973	5.26316	5.21739	5.17241	5.12821	5.08475	5.04202	**11**
12	5.00000	4.95868	4.91803	4.87805	4.83871	4.80000	4.76190	4.72441	4.68750	4.65116	**12**
13	4.61538	4.58015	4.54545	4.51128	4.47761	4.44444	4.41176	4.37956	4.34783	4.31655	**13**
14	4.28571	4.25532	4.22535	4.19580	4.16667	4.13793	4.10959	4.08163	4.05405	4.02685	**14**
15	4.00000	3.97351	3.94737	3.92157	3.89610	3.87097	3.84615	3.82166	3.79747	3.77358	**15**
16	3.75000	3.72671	3.70370	3.68098	3.65854	3.63636	3.61446	3.59281	3.57143	3.55030	**16**
17	3.52941	3.50877	3.48837	3.46821	3.44828	3.42857	3.40909	3.38983	3.37079	3.35196	**17**
18	3.33333	3.31492	3.29670	3.27869	3.26087	3.24324	3.22581	3.20856	3.19149	3.17460	**18**
19	3.15789	3.14136	3.12500	3.10881	3.09278	3.07692	3.06122	3.04569	3.03030	3.01508	**19**
20	3.00000	2.98507	2.97030	2.95567	2.94118	2.92683	2.91262	2.89855	2.88462	2.87081	**20**
21	2.85714	2.84360	2.83019	2.81690	2.80374	2.79070	2.77778	2.76498	2.75229	2.73973	**21**
22	2.72727	2.71493	2.70270	2.69058	2.67857	2.66667	2.65487	2.64317	2.63158	2.62009	**22**
23	2.60870	2.59740	2.58621	2.57511	2.56410	2.55319	2.54237	2.53165	2.52101	2.51046	**23**
24	2.50000	2.48963	2.47934	2.46914	2.45902	2.44898	2.43902	2.42915	2.41935	2.40964	**24**
25	2.40000	2.39044	2.38095	2.37154	2.36220	2.35294	2.34375	2.33463	2.32558	2.31660	**25**
26	2.30769	2.29885	2.29008	2.28137	2.27273	2.26415	2.25564	2.24719	2.23881	2.23048	**26**
27	2.22222	2.21402	2.20588	2.19780	2.18978	2.18182	2.17391	2.16606	2.15827	2.15054	**27**
28	2.14286	2.13523	2.12766	2.12014	2.11268	2.10526	2.09790	2.09059	2.08333	2.07612	**28**
29	2.06897	2.06186	2.05479	2.04778	2.04082	2.03390	2.02703	2.02020	2.01342	2.00669	**29**
30	2.00000	1.99336	1.98675	1.98020	1.97368	1.96721	1.96078	1.95440	1.94805	1.94175	**30**
31	1.93548	1.92926	1.92308	1.91693	1.91083	1.90476	1.89873	1.89274	1.88679	1.88088	**31**
32	1.87500	1.86916	1.86335	1.85759	1.85185	1.84615	1.84049	1.83486	1.82927	1.82371	**32**
33	1.81818	1.81269	1.80723	1.80180	1.79641	1.79104	1.78571	1.78042	1.77515	1.76991	**33**
34	1.76471	1.75953	1.75439	1.74927	1.74419	1.73913	1.73410	1.72911	1.72414	1.71920	**34**
35	1.71429	1.70940	1.70455	1.69972	1.69492	1.69014	1.68539	1.68067	1.67598	1.67131	**35**
36	1.66667	1.66205	1.65746	1.65289	1.64835	1.64384	1.63934	1.63488	1.63043	1.62602	**36**
37	1.62162	1.61725	1.61290	1.60858	1.60428	1.60000	1.59574	1.59151	1.58730	1.58311	**37**
38	1.57895	1.57480	1.57068	1.56658	1.56250	1.55844	1.55440	1.55039	1.54639	1.54242	**38**
39	1.53846	1.53453	1.53061	1.52672	1.52284	1.51899	1.51515	1.51134	1.50754	1.50376	**39**
40	1.50000	1.49626	1.49254	1.48883	1.48515	1.48148	1.47783	1.47420	1.47059	1.46699	**40**
41	1.46341	1.45985	1.45631	1.45278	1.44928	1.44578	1.44231	1.43885	1.43541	1.43198	**41**
42	1.42857	1.42518	1.42180	1.41844	1.41509	1.41176	1.40845	1.40515	1.40187	1.39860	**42**
43	1.39535	1.39211	1.38889	1.38568	1.38249	1.37931	1.37615	1.37300	1.36986	1.36674	**43**
44	1.36364	1.36054	1.35747	1.35440	1.35135	1.34831	1.34529	1.34228	1.33929	1.33630	**44**
45	1.33333	1.33038	1.32743	1.32450	1.32159	1.31868	1.31579	1.31291	1.31004	1.30719	**45**
46	1.30435	1.30152	1.29870	1.29590	1.29310	1.29032	1.28755	1.28480	1.28205	1.27932	**46**
47	1.27660	1.27389	1.27119	1.26850	1.26582	1.26316	1.26050	1.25786	1.25523	1.25261	**47**
48	1.25000	1.24740	1.24481	1.24224	1.23967	1.23711	1.23457	1.23203	1.22951	1.22699	**48**
49	1.22449	1.22200	1.21951	1.21704	1.21457	1.21212	1.20968	1.20724	1.20482	1.20240	**49**
50	1.20000	1.19760	1.19522	1.19284	1.19048	1.18812	1.18577	1.18343	1.18110	1.17878	**50**
51	1.17647	1.17417	1.17188	1.16959	1.16732	1.16505	1.16279	1.16054	1.15830	1.15607	**51**
52	1.15385	1.15163	1.14943	1.14723	1.14504	1.14286	1.14068	1.13852	1.13636	1.13422	**52**
53	1.13208	1.12994	1.12782	1.12570	1.12360	1.12150	1.11940	1.11732	1.11524	1.11317	**53**
54	1.11111	1.10906	1.10701	1.10497	1.10294	1.10092	1.09890	1.09689	1.09489	1.09290	**54**
MPH	**.0**	**.1**	**.2**	**.3**	**.4**	**.5**	**.6**	**.7**	**.8**	**.9**	**MPH**

MPH	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	MPH
55	1.09091	1.08893	1.08696	1.08499	1.08303	1.08108	1.07914	1.07720	1.07527	1.07335	**55**
56	1.07143	1.06952	1.06762	1.06572	1.06383	1.06195	1.06007	1.05820	1.05634	1.05448	**56**
57	1.05263	1.05079	1.04895	1.04712	1.04530	1.04348	1.04167	1.03986	1.03806	1.03627	**57**
58	1.03448	1.03270	1.03093	1.02916	1.02740	1.02564	1.02389	1.02215	1.02041	1.01868	**58**
59	1.01695	1.01523	1.01351	1.01180	1.01010	1.00840	1.00671	1.00503	1.00334	1.00167	**59**
60	1.00000	0.99834	0.99668	0.99502	0.99338	0.99174	0.99010	0.98847	0.98684	0.98522	**60**
61	0.98361	0.98200	0.98039	0.97879	0.97720	0.97561	0.97403	0.97245	0.97087	0.96931	**61**
62	0.96774	0.96618	0.96463	0.96308	0.96154	0.96000	0.95847	0.95694	0.95541	0.95390	**62**
63	0.95238	0.95087	0.94937	0.94787	0.94637	0.94488	0.94340	0.94192	0.94044	0.93897	**63**
64	0.93750	0.93604	0.93458	0.93313	0.93168	0.93023	0.92879	0.92736	0.92593	0.92450	**64**
65	0.92308	0.92166	0.92025	0.91884	0.91743	0.91603	0.91463	0.91324	0.91185	0.91047	**65**
66	0.90909	0.90772	0.90634	0.90498	0.90361	0.90226	0.90090	0.89955	0.89820	0.89686	**66**
67	0.89552	0.89419	0.89286	0.89153	0.89021	0.88889	0.88757	0.88626	0.88496	0.88365	**67**
68	0.88235	0.88106	0.87977	0.87848	0.87719	0.87591	0.87464	0.87336	0.87209	0.87083	**68**
69	0.86957	0.86831	0.86705	0.86580	0.86455	0.86331	0.86207	0.86083	0.85960	0.85837	**69**
70	0.85714	0.85592	0.85470	0.85349	0.85227	0.85106	0.84986	0.84866	0.84746	0.84626	**70**
71	0.84507	0.84388	0.84270	0.84151	0.84034	0.83916	0.83799	0.83682	0.83565	0.83449	**71**
72	0.83333	0.83218	0.83102	0.82988	0.82873	0.82759	0.82645	0.82531	0.82418	0.82305	**72**
73	0.82192	0.82079	0.81967	0.81855	0.81744	0.81633	0.81522	0.81411	0.81301	0.81191	**73**
74	0.81081	0.80972	0.80863	0.80754	0.80645	0.80537	0.80429	0.80321	0.80214	0.80107	**74**
75	0.80000	0.79893	0.79787	0.79681	0.79576	0.79470	0.79365	0.79260	0.79156	0.79051	**75**
76	0.78947	0.78844	0.78740	0.78637	0.78534	0.78431	0.78329	0.78227	0.78125	0.78023	**76**
77	0.77922	0.77821	0.77720	0.77620	0.77519	0.77419	0.77320	0.77220	0.77121	0.77022	**77**
78	0.76923	0.76825	0.76726	0.76628	0.76531	0.76433	0.76336	0.76239	0.76142	0.76046	**78**
79	0.75949	0.75853	0.75758	0.75662	0.75567	0.75472	0.75377	0.75282	0.75188	0.75094	**79**
80	0.75000	0.74906	0.74813	0.74720	0.74627	0.74534	0.74442	0.74349	0.74257	0.74166	**80**
81	0.74074	0.73983	0.73892	0.73801	0.73710	0.73620	0.73529	0.73439	0.73350	0.73260	**81**
82	0.73171	0.73082	0.72993	0.72904	0.72816	0.72727	0.72639	0.72551	0.72464	0.72376	**82**
83	0.72289	0.72202	0.72115	0.72029	0.71942	0.71856	0.71770	0.71685	0.71599	0.71514	**83**
84	0.71429	0.71344	0.71259	0.71174	0.71090	0.71006	0.70922	0.70838	0.70755	0.70671	**84**
85	0.70588	0.70505	0.70423	0.70340	0.70258	0.70175	0.70093	0.70012	0.69930	0.69849	**85**
86	0.69767	0.69686	0.69606	0.69525	0.69444	0.69364	0.69284	0.69204	0.69124	0.69045	**86**
87	0.68966	0.68886	0.68807	0.68729	0.68650	0.68571	0.68493	0.68415	0.68337	0.68259	**87**
88	0.68182	0.68104	0.68027	0.67950	0.67873	0.67797	0.67720	0.67644	0.67568	0.67492	**88**
89	0.67416	0.67340	0.67265	0.67189	0.67114	0.67039	0.66964	0.66890	0.66815	0.66741	**89**
90	0.66667	0.66593	0.66519	0.66445	0.66372	0.66298	0.66225	0.66152	0.66079	0.66007	**90**
91	0.65934	0.65862	0.65789	0.65717	0.65646	0.65574	0.65502	0.65431	0.65359	0.65288	**91**
92	0.65217	0.65147	0.65076	0.65005	0.64935	0.64865	0.64795	0.64725	0.64655	0.64586	**92**
93	0.64516	0.64447	0.64378	0.64309	0.64240	0.64171	0.64103	0.64034	0.63966	0.63898	**93**
94	0.63830	0.63762	0.63694	0.63627	0.63559	0.63492	0.63425	0.63358	0.63291	0.63224	**94**
95	0.63158	0.63091	0.63025	0.62959	0.62893	0.62827	0.62762	0.62696	0.62630	0.62565	**95**
96	0.62500	0.62435	0.62370	0.62305	0.62241	0.62176	0.62112	0.62048	0.61983	0.61920	**96**
97	0.61856	0.61792	0.61728	0.61665	0.61602	0.61538	0.61475	0.61412	0.61350	0.61287	**97**
98	0.61224	0.61162	0.61100	0.61038	0.60976	0.60914	0.60852	0.60790	0.60729	0.60667	**98**
99	0.60606	0.60545	0.60484	0.60423	0.60362	0.60302	0.60241	0.60181	0.60120	0.60060	**99**
MPH	**.0**	**.1**	**.2**	**.3**	**.4**	**.5**	**.6**	**.7**	**.8**	**.9**	**MPH**

Optional Firmware and Hardware Modifications for the TIMEWISE 798A

The Timewise 798A is designed to be the most comprehensive class A rally computer possible. Within the limits of ease of use, the 798A provides all the features needed in the great majority of rally situations. Nevertheless, Timewise recognizes that many rallyists have their own style of rallying and often have a preconceived notion about the proper techniques of doing things. Additionally, new applications and/or changes in governing rally regulations are not always anticipated at the time of manufacture.

Timewise offers a number of modifications that can be installed in the 798A. The following is a brief description of currently available options. To have an option installed in your 798A, you usually must return the instrument to Timewise. Option prices range from $15 to $160, plus shipping. Call Timewise for details.

Please! Contact Timewise if you have a desire for a modification or custom option not listed here. Timewise will do whatever possible to accommodate your individual needs.

Option 1 Log of data (main odometer, clock, calculated time, and CAST) of the 56 most recent splits, CASTs, truncates, transits, resets, and preset loads.

Option 2 Automatic reverse (off-course) when vehicle backs up. A single electrical connection to the remote **CAST** input from the vehicle's reverse/back-up light circuit causes the 798A to automatically go into the reverse mode, regardless of the **FORWARD–PARK–REVERSE** switch. Remotely activating **CAST** is disabled.

Option 3 Add an event timer and the ability to instantly reset the error and odometer. The error can also be continuously shown in the main unit's auxiliary display, where it may be split. This option makes it easy to determine how much time is lost at stops, turns, speed changes, etc.

Option 4 Not available.

Option 5 Add the ability to adjust the auxiliary odometer.

Option 6 Add the ability to set a CAST with .01 mph (kph) resolution.

Option 7 Add a "remote auxiliary display select" input to the back of the 798A. An external switch can then be used to toggle between two different parameters in the driver's module auxiliary display.

Option 8 Add a rear panel BNC connector that outputs a 1 pulse/second electrical signal.

Option 9 Adjustable offset bias (+0.9 to –0.9 units) for the driver's **ERROR** display.

Option 10 Discretionary "Intelli-Fix" ORM correction during a **LAST CAST** adjustment.

Option 11 Automatically execute a CAST when the main odometer reaches a preset distance.

Option 12 Locking (i.e., pull out to move) **FORWARD–PARK–REVERSE** toggle switch.

Option 13 Remote reset of the main computer's **Auxiliary** display.

Option 14 Short actuator on **+/- 10.00** toggle switch.

Option 15 Short actuator on **FORWARD–PARK–REVERSE** toggle switch.

Option 16 Using a remote switch, adds ability to automatically display the Auxiliary Odometer in the driver's module, with it being simultaneously reset to zero.

Option 17 Ability to truncate the calculated time to exact whole minutes.

Option 18 Selectable "normal" (0.0001), Semi-Intelli-CAST (0.001), or Intelli-CAST (0.01) odometer resolution upon a CAST.

Set Clock	Select **Clock** on rotary switch, momentarily actuate **RESET** (on **RESET–SHIFT** switch), depress **SHIFT**, set clock to time when **SHIFT** depressed.
Synchronize Clock	Select **Clock**, actuate and hold **RESET** (on **RESET–SHIFT** switch), actuate any “**+ / –** ” switch.
Change Clock Mode	Select “special functions”, actuate the “**+ / –** ” **.01** (**Time Format**) switch.
Change Error Mode	Select “special functions”, depress and hold **SHIFT**, actuate the “**+ / –** ” **.01** (**Error Format**) switch.
Select Intelli-CAST Mode	Select “special functions”, actuate the “**+ / –** ” **1.00** (**Intelli-CAST**) switch.
Change Odometer Transducer Input	Select “special functions”, depress **SHIFT**, actuate the “**+ / –** ” **10.00** (**Odo Input**) switch; or, select **Factor**, actuate and hold **RESET** (on **RESET–SHIFT** switch), actuate any “**+ / –** ” switch.
Change Input 2 “Divide-by” Ratio	Select “special functions”, depress and hold **SHIFT**, actuate the “**+ / –** ” **1.00** (**Input ÷ Ratio**) switch.
Permanently View .001 Miles	Select “special functions”, actuate the “**+ / –** ” **.001** (**Odo Format**) switch.
Temporarily View .001 Miles	Select **Adjust ORM**.
Change Speed Format	Select “special functions”, depress and hold **SHIFT**, actuate the “**+ / –** ” **.001** (**Speed Format**) switch.
Change Driver’s Auxiliary Display	Select “special functions”, actuate the “**+ / –** ” **10.00** (**Remote Aux**) switch.
Adjust Display Intensity	Select “special functions”, actuate the “**+ / –** ” **.10** (**Brightness**) switch.
Adjust Driver’s Display Intensity	Select “special functions”, depress **SHIFT**, actuate the “**+ / –** ” **.10** (**Remote Brightness**) switch.
Adjust Main Odometer Only	Select **Odometer**, adjust odometer.
Adjust the Odometer and Calc Time Concurrently - Method #1	Select **Adjust ORM**, adjust odometer.
Adjust the Odometer and Calc Time Concurrently - Method #2	Select **Odo & Time**, adjust odometer, if necessary change calculation speed while depressing **SHIFT**, de-select **Odo & Time**.
Reset Main Odometer	Depress and hold **SHIFT**, depress **TRUNCATE**.
Truncate Main Odometer	Depress **TRUNCATE**.
Truncate Calculated Time	Depress **TRUNCATE**.
Adjust Calculated Time	Select **Calc Time**, adjust calculated time.

Pause [Gain]	Select **Calc Time**, add [subtract] amount to [from] calculated time.
Reset Auxiliary Odometer	Select **ODO** on **TIME–Δ–ODO** switch, actuate **RESET** (on **RESET–SHIFT** switch).
Reset Auxiliary Calculated Time	Select **TIME** on the **TIME–Δ–ODO** switch, actuate **RESET** (on **RESET–SHIFT** switch).
Reset Odometer "Delta" Counter	Select "Δ" position on **TIME–Δ–ODO** switch, select **Odometer** or **Adjust ORM**, actuate **RESET** (on **RESET–SHIFT** switch).
Reset Calc Time "Delta" Counter	Select "Δ" position on the **TIME–Δ–ODO** switch, select **Calc Time**, actuate **RESET** (on **RESET–SHIFT** switch).
Set Next CAST	Select **Next Speed**, adjust **NEXT SPEED** display.
Change to Next CAST	Actuate **CAST**.
Adjust Active CAST	Select **Speed** (select **Next Speed** and depress **SHIFT**), adjust **SPEED** display.
Correct Last CAST Odometer Measurement	Select **LAST CAST**, adjust **ODOMETER** display.
Correct Last CAST Odometer Measurement w/ Automatic ORM correction	*On a 798A outfitted with Option 10*, turn the rotary switch to **Adjust ORM**, Select **LAST CAST**, adjust **ODOMETER** display. If the ORM is not to be corrected, do not select **Adjust ORM** while making the adjustment.
Enter Transit Zone	Depress and hold **SHIFT**, actuate **CAST**.
Adjust Factor	Select **Factor**, adjust value in clock display to new factor.
Change to different Factor	Select **Factor**, depress and hold **SHIFT**, actuate any "**+ / –** " switch.
Automatic Factor Calculation	Reset main odometer at start of odometer check, select **Odo Check**, set odometer check mileage in auxiliary display, at end of odometer check select **Compute Factor** (select **Odo Check** and **SHIFT**), actuate any "**+ / –** " switch.
Sample Factor Calculation	Proceed as in **Automatic Factor Calculation**, but actuate **RESET** (on the **RESET–SHIFT** switch) at end of odometer check.
Set Odometer Alarm	Select **Alarm**, select **ODO** position on the **TIME–Δ–ODO** switch, adjust alarm mileage in **AUXILIARY** display.
Start a Leg	At outmarker actuate **TRUNCATE**, set out time, adjust (or reset) odometer, set CAST.
Set Preset Values	Select **Preset**, select among **TIME**, **ODO**, or Δ (for speed) on the **TIME–Δ–ODO** switch, setting each parameter (in the **AUXILIARY** display) as necessary.
Load Preset Values	Select **Preset**, depress and hold **SHIFT**, actuate **CAST**.

Power-up procedures that enable elective features

Log speed "changed from", rather than "changed to"	Turn on the 798A with both **SHIFT** and **CAST** selected. Repeat to revert to factory default.
Enable "Delayed Truncate Action"	Turn on the 798A with both **SHIFT** and **TRUNCATE** selected. Repeat to disable.
Adjust "Speed" if unshifted (and "Next Speed" if shifted)	Turn on the 798A with both **SHIFT** and the "**– .001**" position of the "**+ / – .001**" switch selected. Repeat to revert to factory default.
Enable "Shift to Exit Forward"	Turn on the 798A with both **SHIFT** and the "**+ .001**" position of the "**+ / – .001**" switch selected. Repeat to disable.
Turn off right-hand minus sign in Error display	Turn on the 798A with both **SHIFT** and the "**– .01**" position of the "**+ / – .01**" switch selected. Repeat to revert to factory default.
Disable .01 Resolution CASTs (if Option 6 is present)	Turn on the 798A with both **SHIFT** and the "**+ .01**" position of the "**+ / – .01**" switch selected. Repeat to enable. (Option 6 is a standard feature of version 6.000 firmware.)
Enable GAR mode (if Option 3 is present)	Turn on the 798A with both **SHIFT** and the "**– 1.00**" position of the "**+ / – 1.00**" switch selected. Repeat to disable. (Option 3 is standard in 798As built after January 1, 2017.)

Procedures to operate less often used features

Temporarily disable Park/Reverse beeper	Depress **LAST CAST**. To re-enable, select **FORWARD** or depress **LAST CAST** again.
Adjust the beep length for the Park/Reverse alarm	Select **Alarm**, actuate **RESET** (on **RESET–SHIFT** switch), use the "**+ / – .001**" switch to change the number on the right of the **AUXILIARY** display. Actuate **SHIFT** to hear the new beep length.
Adjust the beep length for the Split alarm	Select **Alarm**, actuate **RESET** (on **RESET–SHIFT** switch), use the "**+ / – 10.00**" switch to change the number on the left of the **AUXILIARY** display. Actuate **SHIFT** to hear the beep length.
Execute a sample factor calculation	Proceed as for an automatic factor calculation, but actuate **RESET** (on the **RESET–SHIFT** switch) at end of odometer check.
Toggle datalog presentation mode (new first/old first)	Select **Log** on rotary switch, actuate and hold **RESET** (on the **RESET–SHIFT** switch), actuate any "**+ / –** " switch.
Toggle error offset on/off	Select **Calc Time**, actuate and hold **SHIFT**, actuate the "**+ / – .001**" switch.
Dismiss "P.Glitch" (bad input power) warning	Actuate **SHIFT** or turn the rotary switch.
Dismiss "Odo Alert" (odometer alarm) warning	Actuate any switch.
Dismiss "Input X Suspect" (faulty transducer) warning	Actuate **SHIFT**, or change the factor, or change transducer inputs, or (as of firmware version 5.009) turn the rotary switch.
Re-initialize the LED displays	Activate **LAST SPLIT** (a shifted **LAST CAST**) for up to two seconds. As of version 5.010 firmware actuating the **SHIFT** switch alone will re-initialize the displays.
Completely reset the 798A	Turn on the 798A with **RESET** (on the **RESET–SHIFT** switch) selected.