

TCG 01-E & TCG 02-E Firmware Release Notes

VERSION F2.25r5 (November 2017)

- **Improvement:**

Added a “maximum inaccuracy check” option, which allows a time inaccuracy threshold to be set, at which the clock will leave holdover and indicate out of sync. This option can be used instead of, or in addition to, the “holdover timeout” option, which causes the clock to indicate out of sync after a specified time in holdover.

The “maximum inaccuracy check” option is useful for ensuring that the clock does not exceed a specific accuracy level. The clock will automatically take into account factors such as the fitted frequency reference and time in sync to determine how long to remain in holdover.

If both “holdover timeout” and “maximum inaccuracy check” are enabled, the clock will leave holdover and indicate out of sync only when **both** the holdover time has expired, and the inaccuracy threshold has been crossed.

Sync

Outputs always report 'Good' Quality

Enable holdover timeout

days hours minutes

0 5 0

Enable maximum inaccuracy check

10 uS

Never leave Sync (Test Mode)

- **Improvement:**

Added the ability to independently suppress individual outputs based on inaccuracy threshold or holdover timeout. When “holdover timeout expires” is selected, that particular output will stop providing a time signal when the clock is out of sync and the specified holdover time has expired.

When “Inaccuracy threshold is exceeded” is selected, that particular output will stop providing a time signal when the clock is out of sync and the reported inaccuracy has exceeded the specified maximum inaccuracy. When “Never” is selected, that particular output will continue to provide a time signal even when the clock is out of sync.

This applies to the following ports:

- Configurable IRIG-B / Pulse output ports (P2, P3, P4 pin 1)
- P4 serial string output port
- P5 AM IRIG-B output port
- P11 configurable IRIG-B / Pulse output port (TCG 02-E M2 expansion)
- P9 configurable IRIG-B / Pulse output port (TCG 02-E M3 expansion)

IRIG-B / Pulse Output Port

User defined pulse Inverted

Pulse Output

Every Pulses Hundredths

Second 1 Offset 00

Duration 01

Suppress Output When Holdover timeout expires

VERSION F2.25r2 (29 July 2015)

- **New feature:**

The serial string output on P4 can now be configured to provide a 9-bit serial output instead of the original 8-bit serial output. The configuration tool 4.1.0.5 or later is required to select the new serial string options. The new configuration options are as follows.

Configuration Option	No. Data Bits	Parity	No. Stop Bits
8-O-1 (New)	8	Odd	1
8-E-1 (New)	8	Even	1
8-N-1	8	None	1
7-O-1	7	Odd	1
7-E-1	7	Even	1

- **Improvement:**

A 5 second delay has been added before the Sync relay indicates "In Sync". This change has been made to bring the sync relay in alignment with the other sync indicators on the clock. The 5 second delay in announcing sync ensures that momentary acquisition and subsequent loss of sync (lasting less than 5 seconds) do not create multiple event logs.

- **Improvement:**

The signal-to-noise ratio threshold used to define a 'good' timing satellite has been increased from 32dB to 35dB. By only accepting satellites which have a strong (and reliable) signal the precision of the clock is improved. Note that that a good antenna installation will see more than four satellites with signal level above 35db at all times. If your clock is reporting fewer than 4 satellites with signal strength greater than 35db then the antenna installation should be reviewed. See the Downloads page on the Tekron website for antenna installation information.

- **Improvement:**

GPS qualification checks have been strengthened to prevent the clock from attempting to sync to a poor GPS signal.

A 'shadow clock' is now used, which is only updated from GPS after qualification has occurred, and a qualification timer is used to ensure that the GPS status remains 'good' for five consecutive seconds.

If your antenna is installed at a site with poor signal quality these checks will put the clock into holdover during the periods of degraded GPS quality. If the GPS degradation lasts longer than the holdover period the clock will signal that is out of sync. This improvement increases the accuracy of the clock during normal operation and improves the reporting of poor GPS synchronization.

- **Improvement:**

If an antenna fault is detected and there is a valid IRIG-B input available the clock will now sync to the IRIG-B even if GPS signal is still available. Previously, the clock would not fall back to an IRIG-B time source until the GPS receiver had lost synchronization. This ensures that the clock does not attempt to remain synchronized to an unreliable GPS signal when a suitable IRIG-B signal is available. All GPS information is ignored when in this state.

- **Improvement:**
Added a configurable option to repeat the “59” second value, on the IRIG-B output, during a leap event has been added. Previously, a “60” second value was always produced during a leap event. This option allows compatibility with IEDs that do not correctly handle a “60” in the incoming IRIG-B time code. Requires Configuration Tool 4.1.1.0 or later.
- **Improvement:**
GPS leap second acceptance has been altered to reject inconsistent leap second information and improve reliability. GPS leap second information requests are now made every 12.5 minutes, and the leap second information is accepted only if two consistent messages are received in a row.
- **Improvement:**
The clock will now accept notification of an upcoming leap second event from the Ethernet module. This ensures that the clock will correctly handle a leap second event when operating as a PTP slave.
- **Bug Fix:**
A configuration change made just prior to a leap second event, and after the leap second notifications are raised, will no longer cancel the leap second notification. Previously, the warm reset that occurs when a configuration is stored would reset the pending leap second indicator.
- **Improvement:**
The model, firmware version and serial number display page is now shown on the front panel LCD if the front panel button is pressed while “Waiting for sats” is shown on the LCD.
- **Improvement:**
The acceptance of timing information from the Ethernet module has been altered to improve the accuracy of the clock when operating as a PTP slave.
- **Improvement:**
The default TAI -> UTC offset has been updated to the current value 36s.
- **Bug Fix:**
The IRIG-B time quality is now determined in the same way as the synchronization state of the clock , ensuring that the IRIG-B time quality reflects the true sync state of the clock. Previously the IRIG-B signal could indicate a high quality a couple of seconds before the clock comes into sync.

Previously, the time quality of the IRIG output signal was determined on the basis of the number of ‘active’ timing satellites, while the synchronization state of the clock was determined on the basis of the number of ‘good’ satellites (‘good’ satellites are active timing satellites with a signal-to-noise ratio greater than 35dB).

- **Bug Fix:**
The state of the alarm relays is no longer altered when a configuration is stored. Previously, the sync alarm could be incorrectly cleared when a configuration is stored.
- **Bug Fix:**
Test mode now works correctly for clocks fitted with two Ethernet modules. Previously, clocks fitted with two Ethernet modules were prevented from entering test mode.
- **Bug Fix:**
“No IRIG-B Input” alarm is now cleared correctly. Previously, this alarm could incorrectly remain active when IRIG-B input monitoring is disabled.

VERSION F2.24 (13 February 2015)

- **Bug Fix:**
Corrected the default number of leap seconds.

Due to consistency checks on the incoming GPS signal, Tekron clocks will only store the value of leap seconds (the offset between GPS time and UTC time) if the reported 'present_#_leapsecs', and 'future_#_leapsecs' values, retrieved from the internal GPS receiver, are equal. If these two values are different, as occurs when an upcoming leap second adjustment is advertised in the GPS signal, then the clock will use its previously stored value (or a default value "hardwired" in the firmware if no previous value has yet been stored). This strategy ensures that clocks that are installed and operating before a new leap second transition is advertised will always operate with the correct UTC time, and will execute the new leap second correctly.

When clock firmware is upgraded the stored leap-second value is reset to a default. This default leap second value is used to calculate UTC time until the clock can retrieve new data from the GPS receiver. It follows that, if the firmware default value is not correct, then the UTC time reported by the clock will be incorrect until the true value is retrieved - that is within 15 minutes usually. However, if a firmware upgrade is carried out when a new leap second is being advertised, then the default value will remain in use until the new leap second occurs.

A new leap second, to come into effect at midnight on June 30 2015, has been advertised in the GPS data since January 21 2015. Tekron Clocks that have had a firmware upgrade since that date will have an incorrect default leap second value and will therefore show their UTC time outputs as leading by 1 second. If no corrective action is taken the clock will execute the new leap second 1 second early and will remain 1 second early until approximately 7 hours into July 1 2015. At this time they will lose another second (by repeating a second at an arbitrary time) and will revert to correct UTC time. They will operate correctly from that point on.

VERSION F2.21 - F2.23 (Not Released)

VERSION F2.20 (9 January 2015)

- **Bug Fix:**
Corrected 16 bit overflow error, which resulted in all Ethernet based timing packets providing a date 16,384 days prior to the correct date e.g. the 1st of Jan 2015, the date was shown as the 22nd Feb 1970. This overflow error only occurs after the 31st of December 2014.

The LCD display on the clock reported the correct time and date and all other timing outputs continued to provide accurate and correct date and time, and were not affected by this anomaly in any way.

This bug also affects the time reported to the configuration software. When connected to a clock, the software reports "Time Unavailable". This applies to all clocks even those which do not have NTP or PTP licenses enabled.

This bug was introduced in firmware version F:2.00.

- **Improvement:**
Improvement made to the GPS reset routine, in the event of a '*' bug. The clock will complete a seamless reset, with no interruption to the IRIG-B timing outputs. Previously, incomplete IRIG-B timing frames may have been presented whilst the reset occurred.

VERSION F2.18 - F2.19 (Not Released)

VERSION F2.17 (9 October 2014 – Limited Release)

- **Bug Fix:**
Removed duplicated satellite data from FLAR reports.

VERSION F2.16 (1 June 2014 – Limited Release)

VERSION F2.15 (10 June 2014)

- **Improvement:**
Improved oscillator tuning algorithms for VCTCXO.
- **Improvement:**
Add C37.118 CTQ field to IRIG-B outputs.
- **Bug Fix:**
Fix location information in GPRMC serial strings.
- **Bug Fix:**
Strengthens serial communication to correct problems experienced through extended use of legacy serial configuration tool.

VERSION F2.14 (30 April 2013)

- **Bug Fix:**
Fixes a bug that could cause a system reset when acting as a fibre slave.

VERSION F2.13 (15 March 2013)

- **Improvement:**
Added further coding which discards invalid GPS messages.
- **Bug Fix:**
Fixed the GPS mask angle setting. The setting is now correctly stored in the clock. Bug introduced in F:2.08.

VERSION F2.12 (26 February 2013 – Limited Release)

- **Improvement:**
Saved the GPS receivers settings, into the receivers EEPROM. If an internal reset occurs, the communication lines reinitiate without manual intervention.
- **Bug Fix:**
The automated GPS receiver reset routine was fixed. Bug introduced in F:2.08.

VERSION F2.11 (Not Released)

VERSION F2.10 (Not Released)

- **Update**
Updated the copyright notice.

VERSION F2.09 (1 October 2012)

- **Improvement**
Added the ability to upgrade the embedded GPS receiver firmware via the TCG's serial port.

VERSION F2.08 (Not Released)

- **Improvement:**
Added initial coding for automated reset of GPS receiver, in the event of a communication loss.

VERSION F2.07 (23 August 2012)

- **Improvement:**
GPS syncing algorithm improved for time and pulse per second processing.
- **Bug Fix:**
When the number of satellites was less than 5, the report time was incorrect. This bug was introduced in the F2.06 release.
- **Bug Fix:**
When the week roll over occurs (Sunday 00:0 UTC), a discontinuity in time occurs. A time jump of exactly 1778 days will be observed. This time jump will last up to 15 seconds.

During this jump, the time of day will be reported correctly. The day of year, and year will be reported as 1778 days prior to the current date.

This bug was introduced in F2.00.

VERSION F2.06 (18th June 2012)

- **Improvement:**
When entering holdover the number of satellites being used is calculated using an improved algorithm.
- **Bug Fix:**
Certain TCG02-E hardware configurations were being identified as a TCG01-E on the front displayed and configuration tool.

VERSION F2.05 (Not Released)

VERSION F2.04 (1st Feb 2012)

- **Bug Fix:**
When the output P13, on the T1E1 hardware option, was configured, the 10 MHz was not displayed correctly. This was due to an incorrectly configured i/o pin. This bug was introduced in F2.01.

VERSION F2.03 (19th Jan 2012)

- **Bug Fix:**
During power up, the IRIG inputs prematurely reported that the clock was in sync.

VERSION F2.02 (14th Nov 2011)

- **Improvement:**
FLAR GPS reset was implemented, to fully reset GPS when requested.
- **Bug Fix:**
This was a rare bug, where the reported time could be one second early.
- **Bug Fix:**
The bug that prevented FLAR configuration changes being reported to the network configuration tool was fixed.

VERSION F2.00 (First Release)

- **Improvement:**
The LCD display angle parameter now survives a power cycle. It is now stored in EEPROM.
- **Improvement:**
A drive for all four alarm relays was added.
- **Improvement:**
Programmable Baud Rates are now supported for serial strings.
- **Bug Fix:**
The AM-IRIG output used the incorrect frequency.