TCG 02-G
GNSS Clock

The TCG 02-G is a highly accurate, full featured GPS and GLONASS (GNSS) clock. With multiple oscillator options, Time Codes, and Frequency outputs, it fits almost any timing application.

With enhanced cyber security features that support NERC CIP requirements, the TCG 02-G is designed for use in modern day smart grid / smart substations, electricity distribution, transmission, and generation protection. In addition, industrial application systems and traditional substations are equally provided for.

This master clock synchronizes multiple IEDs (Intelligent Electronic Devices) within a network, including protection relays, synchrophasors, event recording and remote telemetry units to enable accurate time stamping. The TCG 02-G is available as a base unit or with one of three expansion module options.

Key Features

- References GPS and GLONASS networks
- Multi-level password protection
- Isolated singular or dual power supplies
- High power line drivers
- Low noise characteristics due to balanced pair distribution
- UTC and LST with user defined DST options
- Master/ Slave function
- Up to 9 outputs
- Supports IEC61850
- Enhanced Security and encryption that exceed NERC CIP requirements
- Remote configuration and firmware upgrades
- OCXO/Atomic options

Supports

- DC IRIG-B or Modified Manchester: TTL, RS232, RS422/RS485, HV MOSFET
- AM IRIG-B (Modulated)
- Serial Strings
- User defined pulses
- Simulated DCF77 receiver time code signals
- Frequency outputs
- T1/E1/J1 support
- Event Recording
- NTP/SNTP (IEC 61850) *
- PTP (IEEE 1588 v2, C37.238 Power Profile, ITU G.8265.1 Telecom profile (slave only), and ITU G.8275.1 Telecom profile (master and slave)) *

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*Some optional features may incur extra costs

Physical

- 19" rack mount, 1U high
- (W) 430 mm x (D) 270 mm x (H) 45 mm, 2.0 kg, IP40 (Ingress Protection rating)

Front Panel

The TCG 02-G has a 2 line x 16 character FSTN LCD display and two LEDs indicating multiple statuses, including:

- Sync Status
- Antenna cable fault
- Satellite acquisition mode
- Display mode button

GNSS Receiver

L1, C/ A code, 32 Channel Parallel-tracking receiver

Frequency:

GPS L1 C/A:	1575.42 MHz
GLONASS L1:	1589 to 1605 MHz

Sensitivity:

Acquisition:	-148 dBm
Tracking:	-160 dBm

Oscillator – TCXO

Holdover characteristics operating at 25 degrees C:

- TCXO 1PPS drifts 0.55 ms over a 24-hour period.
- Drift rate: 7 ppb per second

Inputs and Outputs

- 2 x independently programmable outputs, either: TTL 0 - 5 V, 150 mA (BNC or 2-pin)
- RS422 +/- 5 V, 50 loads (2-pin)
- HV switch MOSFET 300 V 1 A (2-pin)

Fiber TX (62.5/ 125 µm, λ 820 nm), compatible with multi-mode fiber (ST Fiber connectors)

Timing accuracy: <100 ns to UTC

Plus:

- 1 x RS232/ RS422 serial port, DCE wired (DB9) RS232: Signals are +/- 9 V, 15 mA.
- RS422 +/- 5 V, 50 unit loads

Serial time messages can be configured to be output at 1200, 2400, 4800, 9600, 19200 and 38400 baud. The signal output on P4 Pin 1 is the same as the configured programmable output on the expansion module.

Timing accuracy of the RS232/ RS422 port:

- Serial Message: <1 bit time
- Pulse/ or IRIG-B time code: <1.5 µs to UTC

Plus:

- 2 x Power supply alarms (Form A contacts) Contact rating: 200 V, 150 mA DC or 150 V, 100 mA AC
- 1 x Antenna fail alarm (2 pin - Form A contact) Contact rating: 200 V, 150 mA DC or 150 V, 100 mA AC
- 1 x Sync relay (2 pin - Form A contact)
- Contact rating: 200 V, 150 mA DC or 150 V, 100 mA AC

Plus: Network Time Server Port

1 x RJ-45 10/100 Mbps UTP connector
Timing accuracy: <100 ns to UTC
This UTP network interface option allows the TCG 02-G to function as a Stratum 1 NTP/ SNTP Time Server, and a PTP grandmaster.

Protocols Supported:
ARP, UDP, ICMP, TFTP, DHCP, SNMP V1, V2, and V3; VLAN.

IEEE 1588 v2 support *

As per Network Time Server above plus PTP (IEEE1588) v2 operation. GrandMaster (GNSS) or ordinary clock functions Profile selection:

- Default
- IEEE C37.238 Power Profile (full support)
- ITU G.8265.1 Telecom Profile (slave only)
- ITU G.8275.1 Telecom Profile (full support)
- IEC 61850-9-3 Power Utility Profile (full support)
- 1-step tx, 1-step/ 2-step rx
- Layer 2 or Layer 3 mapping
- Peer to Peer and End to End delay support
- Typical clock PPS accuracy (single sub-net) <100 ns

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Expansion Options

Expansion Module 2*

1 x Network time server port – RJ-45 connector 10/100 Mbps
Timing Accuracy: <100 ns to UTC

This UTP network interface option allows the TCG 02-G to function as a Stratum 1 NTP/SNTP Time Server.

Protocols Supported:
ARP, UDP, ICMP, TFTP, DHCP, SNMP V1, V2, and V3; VLAN.

Plus:

2 x isolated digital inputs which can be configured for synchronization to an external TTL DC IRIG-B source and/or event recording: 0-5 V TTL (2 pin)

Timing accuracy: <100 ns to UTC

Plus:

1 x Programmable output, either:
TTL 0 - 5 V, 75 mA (BNC) or Fiber Digital TX (62.5/ 125 µm, λ 820 nm), compatible with multi-mode fiber (ST Fiber connectors)
Timing accuracy: <100 ns to UTC

Plus:

4 x IRIG-B outputs, either:
- IRIG-B switchable between TTL 0 - 5 V, 25 mA and AM IRIG-B (BNC)
- Fiber Digital IRIG-B TX (62.5/ 125 µm, λ 820 nm), compatible with multi-mode fiber (ST Fiber connectors)

Timing accuracy:
TTL/Fiber <100 ns to UTC Timing accuracy, AM IRIG-B: <2 µs to UTC

Expansion Module 3*

1 x Programmable output, either:
- TTL 0 - 5 V, 75 mA (BNC)
- Fiber Digital TX (62.5/125 µm, λ 820 nm), compatible with multi-mode fiber (ST Fiber connectors)
Timing accuracy: <100 ns to UTC

Plus:

3 x IRIG-B outputs, either:
- IRIG-B switchable between TTL 0 - 5 V, 25 mA and AM IRIG-B (BNC)
- Fiber Digital IRIG-B TX (62.5/ 125 µm, λ 820 nm), compatible with multi-mode fiber (ST Fiber connectors)
Timing accuracy TTL/Fiber: <200 ns to UTC
Timing accuracy AM IRIG-B: <2 µs to UTC

Plus:

2 x T1/E1/10M BNC outputs
T1, E1, and 10M modes are software configurable Switchable between sine and square wave formats

Plus:

2 x T1/E1/J1 RJ48 outputs
T1, E1 and J1 modes are software configurable

Environment and Electrical

Power Supply*:   MV = 20 - 75 Vdc (2 pin)
                             HV = 90 - 300 Vdc (2 pin)
                             HV = 90 - 300 Vdc / 85 - 250 Vac (IEC320 inlet)
Redundant power supply optional
- Power drain: 12W max
- Operating temperature:
                             -10 to 65°C
- Humidity: 10 to 95% RH
                             (non condensing)
- Isolation:
Outputs to base unit: 2.5 kV
Power supply to I/O: 3.5 kV

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Optional Accessories

Physical

- GNSS antenna
- Antenna cable
- Adjustable antenna mount
- Lightning protection kit

Refer to tekron.com for full technical specifications

Oscillator Options

OCXO

1PPS

Precision:
<±50ns UTC Time
Holdover Characteristics:

- <±5 µs/8 hours (48-hours aging)
- ±10 µs/18 hours (48-hours aging)
- ±10 µs/24 hours (7-days aging)

10MHz

Stability:
<±1.0x10^(-9) Peak to Peak
Precision:

- <±1.0x10^(-12) Average per 24 hours
- <±1.0x10^(-10) Root Allan
- Variance (tau=1 second)

Holdover Characteristics:
<±1.0x10^(-10) / 24 hours Common to 48-hours aging and 7-days aging

Atomic

Please contact us for information

Please note that NTP and IRIG-B slave functionality is not available with OCXO and atomic options


Contact Us

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- Sales Freephone: (Australia) 1800 506 311
- Sales Freephone: (North America) 1800 256 2309

Note: The quickest and most effective method to request a quote is through the online quote request form on the Tekron website.

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Configuration Software

Windows based configuration software is available for download on the Tekron website. Remote configuration over Ethernet includes the following user adjustable features:

- Multi-level access control
- Privacy and authentication methods equivalent to SNMP USM
- "Supervisor-mode" prevents non-approved changes
- Test mode
- Commissioning tool
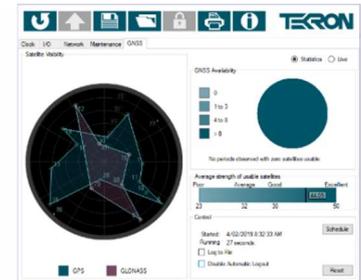
Timing and Synchronization

Worldwide daylight savings and local time configuration can be set up using either rule based or fixed date methods. Test mode allows equipment checks to be made prior to full installation, and adjustable hold-over times help provide resilience against GNSS dropouts. Adjustable fields allow for compensation of delays, such as the delay of a GNSS signal through an antenna cable.

Programmable Outputs

- IRIG-B (B00x / B22x) time code with selectable C37.118.1 and AFNOR S87-500 extensions
- DCF77 time code, 1 kHz square wave
- User defined pulse sequences:
    Repetition rates from 20 ms to 24 hours
    Offsets and durations from 10 ms to 24 hours

Serial Strings

- NMEA-0183 ZDA
- NMEA-0183 RMC
- IRIG J-17
- Tekron A - H (Eight protocols for plug and play compatibility with a wide range of equipment).

SNMP

- v1, v2c, and v3 support can be independently enabled
- Configurable v1, v2c community names and security groups
- Fully configurable via SNMP
- v3 User-based Security Module (USM) support
- USM authentication methods: MD5, SHA
- USM privacy methods: DES, AES
- USM MIB support
- Notifications
- SNMP trap generation v1, v2c, and v3
- SNMPv3 traps can be authenticated and privatized via USM
- Syslog (RFC-3164 and 5424 varieties)

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