

Symmetricon's time and frequency processor modules provide precise, versatile, and dependable timing for bus level integrated systems.

We work hard at building modules that fit into most computer bus architectures. In fact, we offer three different bus level product categories: PCI, VME, and PC.

Our time and frequency processor modules can be configured within a wide variety of computing environments (including Windows, Solaris, Linux, Unix, VxWorks, and more) and meet most interface requirements.

These modules allow the capability to customize your systems with interrupt driven algorithms, satisfying most timing requirements. In addition, these cards are configurable to provide precise time to a single computer, synchronize multiple interconnected computers, or act as a source for timing outputs. They can synchronize a computer clock to an input reference as well as act as a synchronized time generator for other connected boards or devices.

PCI and VME Software Availability

Symmetricon does not charge for software drivers



PCI Family Drivers

Operating System	Form
Dec UNIX	Source Code
IRIX	Source Code
LabVIEW	Source Code
LINUX	Symmetricon
LynxOS	Source Code
Open VMS	Source Code
PowerMAC	Source Code
pSOS	Source Code
QNX	Source Code
QRTP	Source Code
Solaris 2.5.1 (2.6)	Source Code
Solaris 2.7 (Solaris 7)	Source Code
Solaris 2.8 (Solaris 8, 9, 10)	Symmetricon
VISA	Source Code
VxWorks	Source Code
2000/XP/VISTA/7	Symmetricon
Server 2003/2008	Symmetricon

bc635/637VME & TTM635/637VME Drivers

Operating System	Form
HP UX 9.x	Source Code
HP UX 10.x	Source Code
HP RT 1.x	Source Code
HP RT 2.x	Source Code
LabVIEW	Source Code
Solaris 2.5.1 (2.6)	Source Code
Solaris 2.7 (Solaris 7)	Source Code
System V UX	Source Code
VxWorks	Source Code

Source Code is software that has been maintained by users of these bus cards for that particular operating system. Symmetricon provides this software at no charge as a convenience for customers. Symmetricon is not responsible for the usability of the source code to the customer application and does not provide any technical assistance/support of the source code. From time to time customers will enhance the software for current operating systems and return a copy of the updated software to Symmetricon. Symmetricon in turn makes the software available to other users at no charge.

Symmetricon software is compiled software for the specific bus card and target operating system that is actively maintained by Symmetricon. There is **no** charge for this software.

PCI Bus Card Feature Matrix

	bc635PCle	bc635PCI-V2	bc635PCI-U	PCI-SG 2U
Product Life Cycle Status	New	New	Lagacy	Lagacy
Sync Inputs				
GPS	optional (bc637PCle) 170 nanosecond accuracy	optional (bc637PCI-V2) (1) 170 nanosecond accuracy		optional (GPS-PCI 2U) 1 microsecond accuracy
1PPS	■	■	■	■
AM and DCLS time code inputs	■	■	■	■
IRIG A, B, IEEE 1344	■	■	■	■ (2)
IRIG E, G, NASA 36, XR3, 2137	■	■		
Sync Outputs				
1PPS	■	■	■	■
IRIG B, IEEE 1344	■	■	■	■ (2)
IRIG A, E, G, NASA 36, XR3, 2137	■	■		
Simultaneous AM and DCLS time code outputs	■	■		
Timing Functions				
Accuracy (3)	1 microsecond	1 microsecond	1 microsecond	1 microsecond
100ns Resolution	■	■	■	■
BCD Time	■	■	■	■
Unix/Binary Time	■	■	■	
1, 5, 10 MPPS output	■	■	■	■
Programmable Rate Generation Outputs/Interrupts	0.0000001 PPS to 10 MPPS	0.0000001 PPS to 10 MPPS	<1 PPS to 250 KPPS	1 PPS to 1 MPPS
Event Time Capture/Interrupts	3x Event Captures	1x Event Captures	1x Event Captures	1x Event Captures
Time Compare (Alarm) Output/Interrupts	■	■	■	■
Real Time Clock (In the event of a power failure.)	Battery backed	Battery backed	Battery backed	3 day limit
Flywheeling/Holdover	■	■	■	■
OCXO for Extended Flywheel Accuracy; 10 MHz sine out	optional	optional	optional	
External Freq. Input – Disciplining Local Oscillator	1 PPS, 10 MHz	1 PPS, 10 MHz	1 PPS, 10 MHz	1 PPS
External Freq. Input – Cesium/Rubidium Direct	10 MHz	10 MHz	10 MHz	
PCI Express, low profile card size, standard and low profile cover plates	■			
Standard half size card (4.2" x 6.875")		■	■	■
3.3V and 5.0V Universal Signaling on PCI Local Bus; PCI-X Compatible		■	■	■
Software and Drivers (included at no extra charge)				
Windows	■	■	■	■
Solaris	■	■	■	
Linux	■	■	■	

(1) The bc637PCI-V2 is the replacement for the discontinued bc637PCI-U.

(2) No IEEE 1344 support.

(3) Accuracy is a function of the input reference. Time codes are generally 1-5 microseconds, GPS is 170 nanoseconds to 1 microsecond depending on model. See datasheets for full details.

bc635PCle

PCI Express Time & Frequency Processor

KEY FEATURES

- IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 & 2137 Time Code Inputs and Outputs
- Simultaneous AM and DCLS Time Code Inputs and Outputs
- 100-Nanosecond Clock Resolution for Time Requests
- Programmable $\ll 1$ PPS to 100 MPPS DDS Rate Synthesizer Output/Interrupt
- 1, 5, or 10 MHz Rate Generator Output
- 1 PPS and 10 MHz Inputs
- Three (3) External Event Time Capture/Interrupts
- Programmable Time Compare Output/Interrupt
- Zero Latency Time Reads
- Battery Backed Real Time Clock (RTC)
- Low Profile PCI Express Form Factor
- Linux, Solaris & Windows Software Drivers/SDKs Included
- Superior User Interface & Documentation
- Optional OCXO Upgrade

KEY BENEFITS

- Precise Sub-Microsecond Time Available to Host Computer Applications
- Easy Integration Facilitated with included Windows, Linux & Solaris SDKs & Drivers
- Extremely Fast Time Reads
- Programmable Time & Frequency Functions to Quickly Customize for Specific Applications
- Wide Variety of Time Codes Facilitate Easy Integration with Existing Systems
- Dedicated and Responsive Technical Support to Assist in PCIe Card Integration
- Very Well Documented for Easy & Fast System Integration

Symmetricom's bc635PCle timing module provides unparalleled precise time and frequency functions to the host computer and peripheral data acquisition systems. Integration into a custom application is easy and very efficient through the use of the full-featured Windows, Linux and Solaris SDKs/drivers included standard with the module.

Time is typically acquired from time code signals such as IRIG B. Extensive time code generation and translation are both supported. The translator reads and disciplines the internal oscillator to either the amplitude modulated (AM) and DC level shift (DCLS) formats of IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 or 2137 time codes. The generator outputs either IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 or 2137 in both AM and/or DCLS formats.

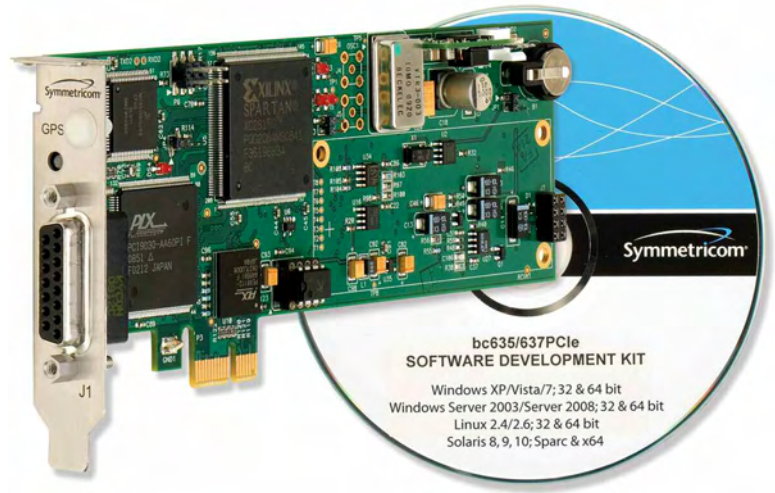
Central to the operation of the module is a disciplined 10 MHz oscillator that is either a TCXO or optional OCXO that provides the timing module's 100-nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the PCIe bus with no PCIe bus wait states, which allows for very high speed, low latency time requests. The 10 MHz oscillator drives the module's frequency and time code generator circuitry. If the input reference is lost, the module will continue to maintain time (flywheel) based on the 10 MHz oscillator's drift rate. The optional OCXO oscillator improves flywheel drift performance over the standard TCXO. If power is lost, a battery backed real time clock (RTC) maintains the time.

The module has a state-of-the-art DDS rate synthesizer with a range from 0.0000001 PPS to 100 MPPS. The module may also be programmed to generate an interrupt at a precise predetermined time based on a time compare (Strobe). Three Event Time Capture inputs provide a means of latching time of different external events.

A key feature of the bc635PCle is the ability to generate interrupts on the PCIe bus at programmable rates. These interrupts are useful to synchronize applications on the host computer as well as signal specific timing events over the bus.

The external frequency input is a unique feature allowing the time and frequency of the bc635PCle to be derived from an external oscillator that may also be disciplined (DAC voltage controlled) based on the selected input reference. The module may be operated in generator (undisciplined) mode where an external 10 MHz from a Cesium or Rubidium standard is used as the frequency reference. This creates an extremely stable PCIe based clock for all bc635PCle timing functions.

Integration of the module is easily facilitated with the included SDKs/drivers for 32/64 bit Windows and Linux, and 64 bit Solaris.



bc635PCle Time & Frequency Processor & Included SDKs/Drivers

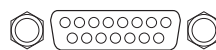


bc635PCIe SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Real Time Clock
 - Bus request resolution: 100 nanoseconds
 - Latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary
- Synchronization sources: Time code, 1 PPS
- Time code translator (inputs)
 - Time code formats: IRIG A, B, G, E, IEEE 1344, NASA 36, XR3, 2137
 - Time accuracy: <5 μ S (AM carrier frequencies 1 kHz or greater)
<1 μ S (DCLS)
 - AM ratio range: 2:1 to 4:1
 - AM Input amplitude: 1 to 8V p-p
 - AM Input impedance: >5k Ω
 - DCLS Input, Event2: 5V HCMOS >2V high, <0.8V low
- Time code generator (outputs)
 - Time code format: IRIG A, B, G, E, IEEE 1344, NASA 36, XR3, 2137
 - AM ratio: 3:1 +/- 10%
 - AM amplitude: 3.5 +/- 0.5Vpp into 50 Ω
 - DCLS amplitude: 5V HCMOS, >2V high, < 0.8V low into 50 Ω
- Timing functions (outputs are rising edge on time)
 - DDS rate synthesizer
 - Frequency range: 0.0000001 PPS to 100 MPPS
 - Output amplitude: 5V HCMOS, >2V high, < 0.8V low into 50 Ω , square wave
 - Jitter: <2 nS p-p
- Legacy pulse rate synthesizer (Heartbeat, aka Periodic)
 - Frequency range: <1 Hz to 250 kHz
 - Output amplitude: 5V HCMOS, >2V high, < 0.8V low into 50 Ω , square wave
- Time compare (Strobe)
 - Compare range: 1 μ S through days
 - Output amplitude: 5V HCMOS, >2V high, < 0.8V low into 50 Ω , 1 μ S pulse
- 1 PPS Output: 5V HCMOS, >2V high, < 0.8V low into 50 Ω , 60 μ S pulse
- 1 PPS Input, Event3: 5V HCMOS, >2V high, < 0.8V low
- External Event Input: 5V HCMOS, >2V high, < 0.8V low, zero latency
- External 10 MHz oscillator: Digital 40% to 60% or sine wave, 0.5 to 8Vp-p, >10k Ω
- Oscillator Control Voltage: Jumper selectable 0-5VDC or 0-10VDC
- On-board disciplined oscillator
 - Frequency: 10 MHz
 - 1, 5, or 10 MHz output: 5V HCMOS, >2V high, < 0.8V low into 50 Ω
 - Stability:
 - Standard TCXO: 5.0E-8 short term 'tracking'
5.0E-7/day long term 'flywheeling'
 - Optional OCXO: 2.0E-9 short term 'tracking'
5.0E-8 /day long term 'flywheeling'
- Real-time clock (RTC)
 - Battery backed time and year information
- PCIe Specification:
 - Single lane PCI Express (PCIe) Interface, r1.0a compatible
 - Standard height Low Profile PCIe
 - Size: +3.3V @ 400 mA
 - Power: +12V @ 250 mA (TCXO), 350 mA (OCXO)

- Connector Timing I/O: 15-pin 'DS'



Pin	Direction	Signal
1	input	External 10 MHz
2		Ground
3	output	Strobe
4	output	1 PPS
5	output	Time Code (AM)
6	input	External Event1
7	input	Time Code (AM)
8		Ground
9	output	Oscillator Control Voltage
10	input	Time Code (DCLS); Event2
11	output	Time Code (DCLS)
12		Ground
13	output	1, 5, 10 MHz
14	input	External 1 PPS; Event3
15	output	Heartbeat/DDS



bc635PCIe Low profile and standard cover panels

- Complete specifications can be found in the manual located at <http://www.symmetric.com>

ENVIRONMENTAL SPECIFICATIONS

- Environment
 - Temperature:
 - Operating: 0°C to 70°C
 - Storage: -30°C to 85°C
 - Humidity
 - Operating: 5% to 95% non-condensing
 - Operating altitude: Up to 18,000 meters MSL

- Certifications: FCC, CE(RoHS)

SOFTWARE

- The bc635PCIe includes on CD the SDKs and drivers for the 32/64 bit versions of Windows and Linux, and 64 bit Solaris. Included are test application programs with source code so that you can review the bc635PCIe card status and adjust board configuration and output parameters. Each SDK includes an extensive list of function calls to quickly and easily speed integration of the bc635PCIe card into your target environment. For Windows, an additional clock utility program, TrayTime, is provided that can be used to automatically update the host computer's clock.
- The bc635PCIe firmware is easily field-upgradeable over the PCIe bus.



PRODUCT INCLUDES

- bc635PCIe Time & Frequency Processor board; Standard height and low-profile cover plates; one year warranty; PCIe User's Guide CD; Windows, Linux and Solaris SDK/Driver software CD.

OPTIONS

- GPS synchronization, see bc637PCIe product
- OCXO (oven controlled crystal oscillator) for extended holdover
- 15-Pin 'D' connector (J1) to BNC adapter cables



bc637PCle

GPS Synchronized, PCI Express Time & Frequency Processor

KEY FEATURES

- GPS Synchronized with 170 Nano Second RMS Accuracy to UTC
- IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 & 2137 Time Code Inputs and Outputs
- Simultaneous AM and DCLS Time Code Inputs and Outputs
- 100-Nanosecond Clock Resolution for Time Requests
- Programmable $\ll 1$ PPS to 100 MPPS DDS Rate Synthesizer Output/Interrupt
- 1, 5, or 10 MHz Rate Generator Output
- 1 PPS and 10 MHz Inputs
- Three (3) External Event Time Capture/Interrupts
- Programmable Time Compare Output/Interrupt
- Zero Latency Time Reads
- Battery Backed Real Time Clock (RTC)
- Low Profile PCI Express Form Factor
- Linux, Solaris & Windows Software Drivers/SDKs Included
- Superior User Interface & Documentation
- Optional OCXO Upgrade

KEY BENEFITS

- Precise Sub-Microsecond Time Available to Host Computer Applications
- Easy Integration Facilitated with included Windows, Linux & Solaris SDKs & Drivers
- Extremely Fast Time Reads
- Programmable Time & Frequency Functions to Quickly Customize for Specific Applications
- Wide Variety of Time Codes Facilitate Easy Integration with Existing Systems
- Dedicated and Responsive Technical Support to Assist in PCle Card Integration
- Very Well Documented for Easy & Fast System Integration



Symmetricom's GPS referenced bc637PCle timing module provides unparalleled precise time and frequency functions to the host computer and peripheral systems. Precise time is acquired from the GPS satellite system or from time code signals. GPS synchronization provides 170 nanosecond RMS accurate time to UTC (USNO) enabling the bc637PCle to precisely synchronize multiple computers to UTC. Integration into a custom application is easy and very efficient through the use of the full-featured Windows, Linux and Solaris SDKs/drivers included standard with the module.

Extensive time code generation and translation are both supported. The translator reads and disciplines the internal oscillator to either the amplitude modulated (AM) and DC level shift (DCLS) formats of IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 or 2137 time codes. The generator outputs either IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 or 2137 in both AM and/or DCLS formats.

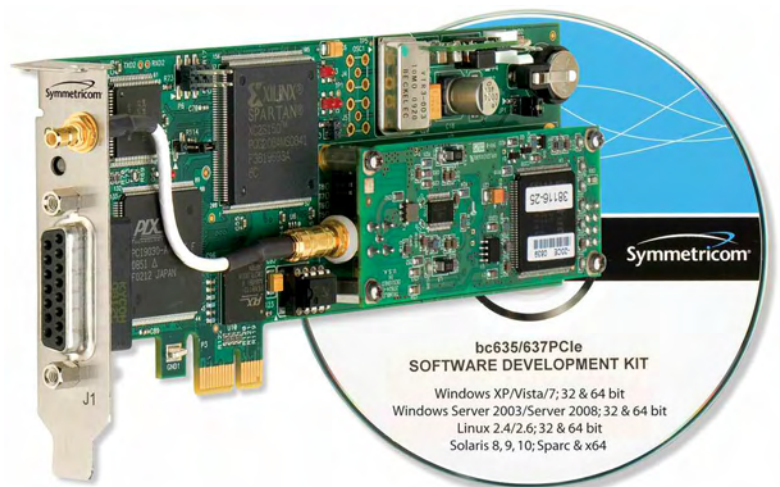
Central to the operation of the module is a disciplined 10 MHz oscillator that is either a TCXO or optional OCXO that provides the timing module's 100-nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the PCle bus with no PCle bus wait states, which allows for very high speed, low latency time requests. The 10 MHz oscillator drives the module's frequency and time code generator circuitry. If the input reference is lost, the module will maintain time (flywheel) based on the 10 MHz oscillator's drift rate. The optional OCXO oscillator improves flywheel drift performance over the standard TCXO. If power is lost, a battery backed real time clock (RTC) maintains the time.

The module has a state-of-the-art DDS rate synthesizer with a range from 0.0000001 PPS to 100 MPPS. The module may also be programmed to generate an interrupt at a precise predetermined time based on a time compare (Strobe). Three Event Time Capture inputs provide a means of latching time of different external events.

A key feature of the bc637PCle is the ability to generate interrupts on the PCle bus at programmable rates. These interrupts are useful to synchronize applications on the host computer as well as signal specific timing events over the bus.

The unique external frequency input allows the time and frequency of the bc637PCle to be derived from an external oscillator that may also be disciplined (DAC voltage controlled) based on the selected input reference. The module may be operated in generator (undisciplined) mode where an external 10 MHz from a Cesium or Rubidium standard is used as the frequency reference. This creates an extremely stable PCle based clock for all bc637PCle timing functions.

Integration of the module is easily facilitated with the included SDKs/drivers for 32/64 bit Windows and Linux, and 64 bit Solaris.



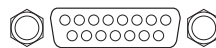
bc637PCle GPS Synchronized Time & Frequency Processor & Included SDKs/Drivers

bc637PCIe SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- GPS Receiver/Antenna
 - 12 channel parallel receiver
 - GPS time traceable to UTC(USNO)
 - Accuracy: 170 ns RMS, 1 μ Sec peak to peak to UTC(USNO), at stable temperature and ≥ 4 satellites tracked.
 - Maximum Belden 9104 cable length: 150' (45 m). For longer cable runs see Options.
- Real Time Clock
 - Bus request resolution: 100 nanoseconds
 - Latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary
- Synchronization sources: GPS, Time code, 1 PPS
- Time code translator (inputs)
 - Time code formats: IRIG A, B, G, E, IEEE 1344, NASA 36, XR3, 2137
 - Time accuracy: $< 5 \mu$ S (AM carrier frequencies 1 kHz or greater)
 - $< 1 \mu$ S (DCLS)
 - AM ratio range: 2:1 to 4:1
 - AM Input amplitude: 1 to 8V p-p
 - AM Input impedance: $> 5k\Omega$
 - DCLS Input, Event2: 5V HCMOS $> 2V$ high, $< 0.8V$ low
- Time code generator (outputs)
 - Time code format: IRIG A, B, G, E, IEEE 1344, NASA 36, XR3, 2137
 - AM ratio: 3:1 +/- 10%
 - AM amplitude: 3.5 +/- 0.5Vpp into 50Ω
 - DCLS amplitude: 5V HCMOS, $> 2V$ high, $< 0.8V$ low into 50Ω
- Timing functions (outputs are rising edge on time)
 - DDS rate synthesizer
 - Frequency range: 0.0000001 PPS to 100 MPPS
 - Output amplitude: 5V HCMOS, $> 2V$ high, $< 0.8V$ low into 50Ω , square wave
 - Jitter: < 2 ns p-p
 - Legacy pulse rate synthesizer (Heartbeat, aka Periodic)
 - Frequency range: < 1 Hz to 250 kHz
 - Output amplitude: 5V HCMOS, $> 2V$ high, $< 0.8V$ low into 50Ω , square wave
 - Time compare (Strobe)
 - Compare range: 1 μ S through days
 - Output amplitude: 5V HCMOS, $> 2V$ high, $< 0.8V$ low into 50Ω , 1 μ S pulse
 - 1 PPS Output: 5V HCMOS, $> 2V$ high, $< 0.8V$ low into 50Ω , 60 μ S pulse
 - 1 PPS Input, Event3: 5V HCMOS, $> 2V$ high, $< 0.8V$ low
 - External Event Input: 5V HCMOS, $> 2V$ high, $< 0.8V$ low, zero latency
 - External 10 MHz oscillator: Digital 40% to 60% or sine wave, 0.5 to 8Vp-p, $> 10k\Omega$
 - Oscillator Control Voltage: Jumper selectable 0-5VDC or 0-10VDC
- On-board disciplined oscillator
 - Frequency: 10 MHz
 - 1, 5, or 10 MHz output: 5V HCMOS, $> 2V$ high, $< 0.8V$ low into 50Ω
 - Stability:
 - Standard TCXO: 5.0E-8 short term 'tracking'
 - 5.0E-7/day long term 'flywheeling'
 - Optional OCXO: 2.0E-9 short term 'tracking'
 - 5.0E-8/day long term 'flywheeling'
- Real-time clock (RTC)
 - Battery backed time and year information
- PCIe Specification:
 - Single lane PCI Express (PCIe) Interface, r1.0a compatible
 - Size: Standard height Low Profile PCIe
 - Power: +3.3V @ 400 mA
 - +12V @ 300 mA (TCXO), 400 mA (OCXO)

- Connector
 - GPS Antenna: SMB socket
 - Timing I/O: 15-pin 'DS'



Pin	Direction	Signal
1	input	External 10 MHz
2		Ground
3	output	Strobe
4	output	1 PPS
5	output	Time Code (AM)
6	input	External Event1
7	input	Time Code (AM)
8		Ground
9	output	Oscillator Control Voltage
10	input	Time Code (DCLS); Event2
11	output	Time Code (DCLS)
12		Ground
13	output	1, 5, 10 MHz
14	input	External 1 PPS; Event3
15	output	Heartbeat/DDS



bc637PCIe Low profile and standard cover panels

- Complete specifications can be found in the manual located at <http://www.symmetricom.com>

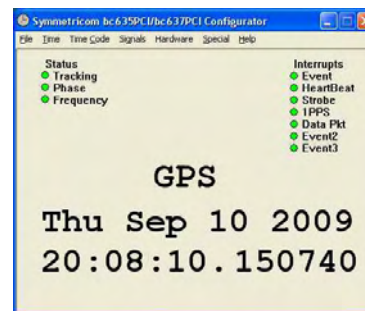
ENVIRONMENTAL SPECIFICATIONS

- Environment

Temperature:	Module	GPS Antenna
Operating:	0°C to 70°C	-40°C to 70°C
Storage:	-30°C to 85°C	-55°C to 85°C
Humidity:		
Operating:	5% to 95% non-condensing	100% condensing
Operating altitude:	Up to 18,000 meters MSL	
- Certifications: FCC, CE(RoHS)

SOFTWARE

- The bc637PCIe includes on CD the SDKs and drivers for the 32/64 bit versions of Windows and Linux, and 64 bit Solaris. Included are test application programs with source code so that you can review the bc637PCIe card status and adjust board configuration and output parameters. Each SDK includes an extensive list of function calls to quickly and easily speed integration of the bc637PCIe card into your target environment. For Windows, an additional clock utility program, TrayTime, is provided that can be used to automatically update the host computer's clock.
- The bc637PCIe firmware is easily field-upgradeable over the PCIe bus.



PRODUCT INCLUDES

- bc637PCIe GPS synchronized Time & Frequency Processor board; L1 GPS antenna; 50' (15 m) Belden 9104 coaxial cable; 1 ft. antenna mounting mast (30 cm) with two Clamps; standard height and low-profile cover plates; one year warranty; PCIe User's Guide CD; Windows, Linux and Solaris SDK/Driver software CD.

OPTIONS

- OXCO (oven controlled crystal oscillator) for extended holdover
- 15-Pin 'D' connector (J1) to BNC adapter cables
- GPS antenna in-line amplifier for cable runs to 300' (90 m)
- GPS antenna down/up converter for cable runs to 1500' (457 m)
- Lightning arrestor

bc635PCI-V2

PCI Time & Frequency Processor

KEY FEATURES

- IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 & 2137 Time Code Inputs and Outputs
- Simultaneous AM or DCLS Time Code Inputs
- Simultaneous AM and DCLS Time Code Outputs
- 100-nanosecond clock resolution for time requests
- Programmable $\ll 1$ PPS to 100 MPPS DDS Rate Synthesizer Output/Interrupt
- 1, 5, or 10 MHz Rate Generator Output
- 1 PPS or 10 MHz Inputs
- External Event Time Capture/Interrupt
- Programmable Time Compare Output/Interrupt
- Zero Latency Time Reads
- Battery Backed Real Time Clock (RTC)
- PCI Local Bus Operation
- Universal Signaling (3.3V or 5.0V Bus)
- CE(RoHS) Compliant
- Linux, Solaris & Windows Software Drivers/SDKs available
- Optional OCXO Upgrade

Symmetricom's bc635PCI-V2 timing module provides unparalleled precise time and frequency to the host computer and peripheral data acquisition systems. Time is typically acquired from time code signals such as IRIG B.

Central to the operation of the module is a disciplined 10 MHz oscillator that is either an on-board TCXO (or optional OCXO) or an off-board External oscillator that can provide the timing module's 100-nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the PCI bus with no PCI bus wait states, which allows for very high-speed time requests. The selected on-board or off-board 10 MHz oscillator drives the module's frequency and time code generator circuitry. If the input reference is lost, the module will continue to maintain time (flywheel) based on the selected 10 MHz oscillator's drift rate. The optional OCXO oscillator improves flywheel drift performance over the standard TCXO. If power is lost, a battery-backed real time clock (RTC) is available to maintain time.

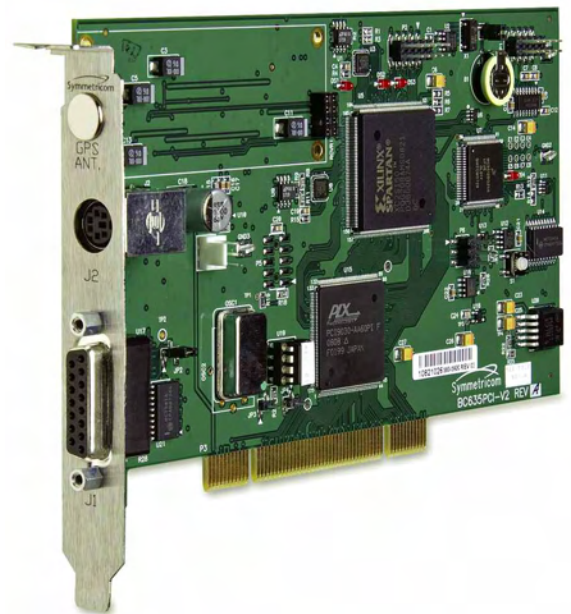
Extensive time code generation and translation are supported. The generator outputs either IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 or 2137 in both amplitude modulated (AM) and DC level shift (DCLS) formats. The translator reads and may be used to discipline the 10 MHz oscillator to either the AM or DCLS format of IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 or 2137 time codes.

The module also has a state-of-the-art DDS rate synthesizer capable of 0.0000001 PPS to 100 MPPS. The module may also be programmed to generate a single interrupt at a predetermined time based on a time compare (Strobe). An Event Time Capture feature provides a means of latching time of an external event.

A key feature of the bc635PCI-V2 is the ability to generate interrupts on the PCI bus at programmable rates. These interrupts can be used to synchronize applications on the host computer as well as signal specific events.

The external frequency input is a unique feature allowing the time and frequency of the bc635PCI-V2 to be derived from an external oscillator that may also be disciplined (DAC voltage controlled) based on the selected input reference. The module may be operated in generator (undisciplined) mode where an external 10 MHz from a Cesium or Rubidium standard is used as the frequency reference. This creates an extremely stable PCI based clock for all bc635PCI-V2 timing functions.

The bc635PCI-V2 automatically supports both 3.3V and 5.0V signaling of the PCI bus. Integration of the module is easily facilitated with optional drivers for Windows 2000/XP, Linux, or Solaris.



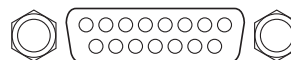
bc635PCI-V2 Time & Frequency Processor.

bc635PCI-V2 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Real Time Clock
 - Bus request resolution: 100 nanoseconds BCD
 - Latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary 1 μ S to 999.999 mS
- Synchronization sources: Time code, 1 PPS
- Time code translator (inputs)
 - Time code formats: IRIG A, B, G, E, IEEE 1344, NASA 36, XR3, 2137
 - Time accuracy: <5 μ S (AM carrier frequencies 1 kHz or greater)
 - <1 μ S (DCLS)
 - AM ratio range: 2:1 to 4:1
 - AM Input amplitude: 1 to 8V p-p
 - AM Input impedance: >5k Ω
 - DCLS Input: 5V HCMOS >2V high, <0.8V low, 270 Ω
- Time code generator (outputs)
 - Time code format: IRIG A, B, G, E, IEEE 1344, NASA 36, XR3, 2137
 - AM ratio: 3:1 +/- 10%
 - AM amplitude: 3.5V p-p +/- 0.5V into 50 Ω
 - DCLS amplitude: 5V HCMOS, >2V high, <0.8V low into 50 Ω
- Timing functions (outputs are rising edge on time)
 - DDS rate synthesizer
 - Frequency range: 0.0000001 PPS to 100 MPPS
 - Output amplitude: 5V HCMOS, >2V high, < 0.8V low into 50 Ω , square wave
 - Jitter: <2 nS p-p
 - Legacy pulse rate synthesizer (Heartbeat, aka Periodic)
 - Frequency range: <1 Hz to 250 kHz
 - Output amplitude: 5V HCMOS, >2V high, < 0.8V low into 50 Ω , square wave
 - Time compare (Strobe)
 - Compare range: 1 μ S through days
 - Output amplitude: 5V HCMOS, >2V high, < 0.8V low into 50 Ω , 1 μ S pulse
 - 1 PPS Output: 5V HCMOS, >2V high, < 0.8V low into 50 Ω , 60 μ S pulse
 - 1 PPS Input: 5V HCMOS, >2V high, < 0.8V low, 270 Ω
 - External Event Input: 5V HCMOS, >2V high, < 0.8V low, 270 Ω , zero latency
 - External 10 MHz oscillator: Digital 40% to 60% or sine wave, 0.5 to 8Vp-p, >10k Ω
 - Oscillator Control Voltage: Jumper selectable 0-5VDC or 0-10VDC into 1k Ω
- On-board disciplined oscillator
 - Frequency: 10 MHz
 - 1, 5, or 10 MHz output: 5V HCMOS, >2V high, < 0.8V low into 50 Ω
 - Stability:
 - Standard TCXO: 5.0E-8 short term 'tracking'
 - 5.0E-7/day long term 'flywheeling'
 - Optional OCXO: 2.0E-9 short term 'tracking'
 - 5.0E-8 /day long term 'flywheeling'
- Real-time clock (RTC)
 - Battery backed time and year information
- PCI local bus™
 - Specification: 2.2 compliant
 - 2.3 compatible
 - PCI-X compatible
 - Size: Single-width (4.2" x 6.875")
 - Device type: PCI Target, 32 bit, universal signaling
 - Data transfer: 8-bit, 32-bit
 - Interrupt levels: Automatically Assigned (PnP)
 - Power:
 - TCXO: +5V @ 700 mA
 - OCXO: +5V @ 800 mA, 1.1 A at start-up
 - +12V @ 50 mA

- Connectors
 - Firmware update port: 6 pin, PS2 mini-DIN J2
 - Timing I/O: 15-pin 'DS' J1



Pin	Direction	Signal
1	input	External 10 MHz
2		Ground
3	output	Strobe
4	output	1 PPS
5	output	Time Code (AM)
6	input	External Event
7	input	Time Code (AM)
8		Ground
9	output	Oscillator Control Voltage
10	input	Time Code (DCLS)
11	output	Time Code (DCLS)
12		Ground
13	output	1, 5, 10 MHz
14	input	External 1 PPS
15	output	Heartbeat/DDS

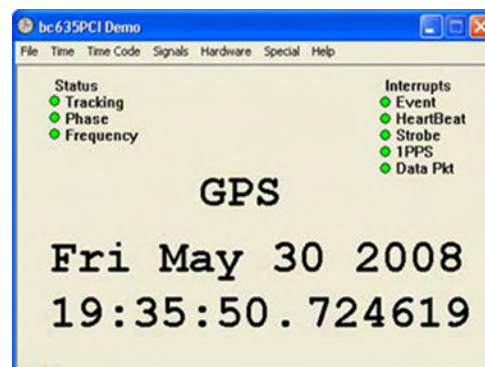
- Complete specifications can be found in the manual located at <http://www.symmetricom.com>

ENVIRONMENTAL SPECIFICATIONS

- Environment
 - Temperature:
 - Operating: 0°C to 70°C
 - Storage: -30°C to 85°C
 - Humidity
 - Operating: 5% to 95% non-condensing
 - Operating altitude: Up to 18,000 meters MSL
- Certifications: FCC, CE(RoHS)

SOFTWARE

- The bc635PCI-V2 includes the Symmetricom bc635pcidemo.exe application program for Windows 2000/XP. Using this program you can review the bc635PCI-V2 card status and adjust board configuration and output parameters. An additional clock utility program, TrayTime, is provided that can be used to update the Host computer's clock.



PRODUCT INCLUDES

- bc635PCI-V2 Time & Frequency Processor board, one year warranty, PCI User's Guide CD, Windows software CD.

OPTIONS

- GPS synchronization, see bc637PCI-V2
- OCXO (oven controlled crystal oscillator) for extended holdover
- 'D' connector (J1) to BNC adapter
- SDK (Software Development Kit) for: Windows 2000/XP, Linux, Solaris [Contact factory for additional drivers]

bc637PCI-V2

GPS Synchronized, PCI Time & Frequency Processor

KEY FEATURES

- GPS synchronized with 170 nanosecond RMS accuracy to UTC
- IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 & 2137 Time Code Inputs and Outputs
- Simultaneous AM or DCLS Time Code Inputs
- Simultaneous AM and DCLS Time Code Outputs
- 100-nanosecond clock resolution for time of day requests
- Programmable <<1 PPS to 100 MPPS DDS Rate Synthesizer Output/Interrupt
- 1, 5, or 10 MHz Rate Generator Output
- 1 PPS or 10 MHz Inputs
- External Event Time Capture/Interrupt
- Programmable Time Compare Output/Interrupt
- Zero Latency Time Reads
- Battery Backed Real Time Clock (RTC)
- PCI Local Bus Operation
- Universal Signaling (3.3V or 5.0V Bus)
- CE(RoHS) Compliant
- Linux, Solaris & Windows Software Drivers/SDKs available
- Optional OCXO Upgrade

Symmetricon's GPS referenced bc637PCI-V2 timing module provides precise time and frequency to the host computer and peripheral data acquisition systems. Precise time is acquired from the GPS satellite system or from time code signals. GPS synchronization provides 170 nanosecond RMS accurate time to UTC (USNO) and enables the bc637PCI-V2 to be an ideal master clock for precisely synchronizing multiple computers to UTC.

Central to the operation of the module is a disciplined 10 MHz oscillator that is either an on-board TCXO (or optional OCXO) or an off-board External oscillator that can provide the timing module's 100-nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the PCI bus with no PCI bus wait states, which allows for very high-speed time requests. The selected on-board or off-board 10 MHz oscillator drives the module's frequency and time code generator circuitry. If the input reference is lost, the module will continue to maintain time (flywheel) based on the selected 10 MHz oscillator's drift rate. The optional OCXO oscillator improves flywheel drift performance over the standard TCXO. If power is lost, a battery-backed real time clock (RTC) is available to maintain time.

Extensive time code generation and translation are supported. The generator outputs either IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 or 2137 in both amplitude modulated (AM) and DC level shift (DCLS) formats. The translator reads and may be used to discipline the 10 MHz oscillator to either the AM or DCLS format of IRIG A, B, G, E, IEEE 1344, NASA 36, XR3 or 2137 time codes.

The module also has a state-of-the-art DDS rate synthesizer capable of 0.0000001 PPS to 100 MPPS. The module may also be programmed to generate a single interrupt at a predetermined time based on a time compare (Strobe). An Event Time Capture feature provides a means of latching time of an external event.

A key feature of the bc637PCI-V2 is the ability to generate interrupts on the PCI bus at programmable rates. These interrupts can be used to synchronize applications on the host computer as well as signal specific events.

The external frequency input is a unique feature allowing the time and frequency of the bc637PCI-V2 to be derived from an external oscillator that may also be disciplined (DAC voltage controlled) based on the selected input reference. The module may be operated in generator (undisciplined) mode where an external 10 MHz from a Cesium or Rubidium standard is used as the frequency reference. This creates an extremely stable PCI based clock for all bc637PCI-V2 timing functions.

The bc637PCI-V2 automatically supports both 3.3V and 5.0V signaling of the PCI bus. Integration of the module is easily facilitated with optional drivers for Windows 2000/XP, Linux, or Solaris.



bc637PCI-V2 GPS Synchronized, Time & Frequency Processor.

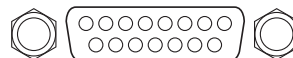
bc637PCI-V2 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- GPS Receiver/Antenna
 - 12 channel parallel receiver
 - GPS time traceable to UTC(USNO)
 - Accuracy: 170 ns RMS, 1 μ sec peak to peak to UTC(USNO), at stable temperature and ≥ 4 satellites tracked.
 - Maximum Belden 9104 cable length: 150' (45 m). For longer cable runs see Options.
- Real Time Clock
 - Bus request resolution: 100 nanoseconds BCD
 - Latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary 1 μ S to 999.999 mS
- Synchronization sources: GPS, Time code, 1 PPS
- Time code translator (inputs)
 - Time code formats: IRIG A, B, E, G, IEEE 1344, NASA 36, XR3, 2137
 - Time accuracy: $<5 \mu$ S (AM carrier frequencies 1 kHz or greater) $<1 \mu$ S (DCLS)
 - AM ratio range: 2:1 to 4:1
 - AM Input amplitude: 1 to 8V p-p
 - AM Input impedance: $>5k\Omega$
 - DCLS Input: 5V HCMOS $>2V$ high, $<0.8V$ low, 270 Ω
- Time code generator (outputs)
 - Time code format: IRIG A, B, E, G, IEEE 1344, NASA 36, XR3, 2137
 - AM ratio: 3:1 +/- 10%
 - AM amplitude: 3.5V p-p +/- 0.5V into 50 Ω
 - DCLS amplitude: 5V HCMOS, $>2V$ high, $<0.8V$ low into 50 Ω
- Timing functions (outputs are rising edge on time)
 - DDS rate synthesizer
 - Frequency range: 0.0000001 PPS to 100 MPPS
 - Output amplitude: 5V HCMOS, $>2V$ high, $<0.8V$ low into 50 Ω , square wave
 - Jitter: <2 ns p-p
 - Legacy pulse rate synthesizer (Heartbeat, aka Periodic)
 - Frequency range: <1 Hz to 250 kHz
 - Output amplitude: 5V HCMOS, $>2V$ high, $<0.8V$ low into 50 Ω , square wave
 - Time compare (Strobe)
 - Compare range: 1 μ S through days
 - Output amplitude: 5V HCMOS, $>2V$ high, $<0.8V$ low into 50 Ω , 1 μ S pulse
 - 1 PPS Output: 5V HCMOS, $>2V$ high, $<0.8V$ low into 50 Ω , 60 μ S pulse
 - Accuracy the same as GPS Receiver specification above, or relative to the input time code.
 - 1 PPS Input: 5V HCMOS, $>2V$ high, $<0.8V$ low, 270 Ω
 - External Event Input: 5V HCMOS, $>2V$ high, $<0.8V$ low, 270 Ω , zero latency
 - External 10 MHz oscillator: Digital 40% to 60% or sine wave, 0.5 to 8Vp-p, $>10k\Omega$
 - Oscillator Control Voltage: Jumper selectable 0-5VDC or 0-10VDC into 1k Ω
- On-board disciplined oscillator
 - Frequency: 10 MHz
 - 1, 5, or 10 MHz output: 5V HCMOS, $>2V$ high, $<0.8V$ low into 50 Ω
 - Stability:
 - Standard TCXO: 5.0E-8 short term 'tracking'
 - 5.0E-7/day long term 'flywheeling'
 - Optional OCXO: 2.0E-9 short term 'tracking'
 - 5.0E-8 /day long term 'flywheeling'
- Real-time clock (RTC)
 - Battery backed time and year information
- PCI local bus™
 - Specification: 2.2 compliant
 - 2.3 compatible
 - PCI-X compatible
 - Size: Single-width (4.2" x 6.875")
 - Device type: PCI Target, 32 bit, universal signaling
 - Data transfer: 8-bit, 32-bit
 - Interrupt levels: Automatically Assigned (PnP)
 - Power:
 - TCXO: +5V @ 700 mA
 - OCXO: +5V @ 800 mA, 1.1 A at start-up
 - +12V @ 50 mA

Connectors

GPS Antenna:	SMB socket
Firmware update port	6 pin, PS2 mini-DIN J2
Timing I/O:	15-pin 'DS' J1



Pin	Direction	Signal
1	input	External 10 MHz
2		Ground
3	output	Strobe
4	output	1 PPS
5	output	Time Code (AM)
6	input	External Event
7	input	Time Code (AM)
8		Ground
9	output	Oscillator Control Voltage
10	input	Time Code (DCLS)
11	output	Time Code (DCLS)
12		Ground
13	output	1, 5, 10 MHz
14	input	External 1 PPS
15	output	Heartbeat/DDS

- Complete specifications can be found in the manual located at <http://www.symmetricom.com>

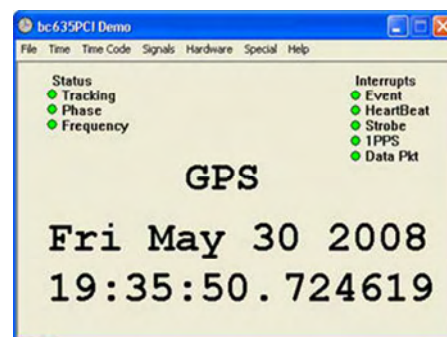
ENVIRONMENTAL SPECIFICATIONS

- Environment

Temperature:	Module	GPS Antenna
Operating:	0°C to 70°C	-40°C to 70°C
Storage:	-30°C to 85°C	-55°C to 85°C
Humidity:		
Operating:	5% to 95% non-condensing	100% condensing
Operating altitude:	Up to 18,000 meters MSL	
- Certifications: FCC, CE(RoHS)

SOFTWARE

- The bc637PCI-V2 includes the Symmetricom bc635pci demo and bc637PCI GPS Demo application programs for Windows 2000/XP. Using this program you can review the bc637PCI-V2 card status and adjust board configuration and output parameters. Bc637pcidemo provides direct access to the GPS receiver used on the bc637PCI-V2 board. An additional clock utility program, TrayTime, is provided that can be used to update the Host computer's clock.



PRODUCT INCLUDES

- bc637PCI-V2 GPS synchronized Time & Frequency Processor board, L1 GPS antenna, 50' (15 m) Belden 9104 coaxial cable, 1 ft. antenna mounting mast (30 cm) with two clamps, one year warranty, PCI User's Guide CD, Windows software CD.

OPTIONS

- OCXO (oven controlled crystal oscillator) for extended holdover
- D' connector (J1) to BNC adapter
- SDK (Software Development Kit) for: Windows 2000/XP, Linux, Solaris (Contact factory for additional drivers)
- GPS antenna in-line amplifier for cable runs to 300' (90 m)
- GPS antenna down/up converter for cable runs to 1500' (457 m)
- Lightning arrestor





bc635PCI-U

PCI Time & Frequency Processor

KEY FEATURES

- PCI Local Bus Operation
- 3.3V and 5.0V Universal Signaling
- IRIG A, B and IEEE 1344 Time Code Inputs
- 1 PPS or 10 MHz Inputs
- IRIG B Time Code Output
- 1, 5, or 10 MHz Rate Generator Output
- Programmable <1 Hz to 250kHz Rate Synthesizer Output/Interrupt
- External Event Time Capture/Interrupt
- Programmable Time Compare Output/Interrupt
- Zero Latency Time Reads
- Battery Backed Clock
- Extensive Software Drivers/SDKs Available
- Optional OCXO Upgrade

Symmetricom's bc635PCI-U timing module provides precision time and frequency reference to the host computer and peripheral data acquisition systems. Time is typically acquired from time code signals such as IRIG B. The bc635PCI-U automatically supports both the 3.3V and 5.0V signaling of the PCI bus. Integration of the module is easily facilitated with optional drivers for Windows 2000/XP, Linux or Solaris.

Central to the operation of the module is a disciplined 10 MHz oscillator and 100 nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the PCI bus with zero latency, which allows for very high speed time requests. The on-board oscillator is rate-matched (disciplined) to the input time source and drives the precision 10 MHz frequency output and time code generator circuitry. If the time input is lost, the module will continue to maintain time (flywheel). An optional OCXO oscillator substantially improves flywheel drift performance. If power is lost, a battery-backed clock is available to maintain time.

Both time code generation and translation are supported. The generator supplies IRIG B time code output that is synchronized to the input time source. The translator reads IRIG A, IRIG B and IEEE-1344 time codes.

An Event Time Capture feature provides a means of latching time for an external event input. The module can also be programmed to generate a periodic pulse rate as well as generate a single interrupt at a predetermined time (Time Compare).

A key feature of the bc635PCI-U is the ability to generate interrupts on the PCI bus at programmable rates. These interrupts can be used to synchronize applications on the host computer as well as signal specific events. The external frequency input is a unique feature allowing the internal timing of the bc635PCI-U to slave to the 10 MHz output from a Cesium or Rubidium standard. This creates an extremely stable PCI based clock for all bc635PCI-U timing functions and is superior to any disciplining technique.



bc635PCI-U Time & Frequency Processor

bc635PCI-U SPECIFICATIONS

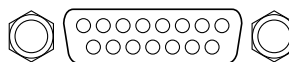
ELECTRICAL SPECIFICATIONS

- Real time clock
 - Bus request resolution: 100 nanoseconds
 - Latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary
- Time code translator
 - Time code formats: IRIG A, IRIG B, IEEE 1344 (Modulated or DCLS)
 - Time accuracy: <5 μ S (modulated) <1 μ S (DCLS)
 - Modulation ratio: 3:1 to 6:1
 - Input amplitude: 500 mV to 5V P-P
 - Input impedance: >10K Ω , AC coupled
- Time code generator
 - Time code format: IRIG B
 - Modulation ratio: 3:1
 - Output amplitude: 4 V P-P (fixed) into 50 Ω
 - DC level shift: TTL/CMOS, 50 Ω
- Timing functions
 - Pulse rate synthesizer (TTL, 50 Ω): <1 Hz to 250 kHz
 - Time compare (TTL, 50 Ω): Programmable 1 μ Sec through hours
 - Event capture (TTL, 50 Ω): 100 nSec resolution, zero latency
 - 1 PPS pulse rate (TTL, 50 Ω): Positive edge on-time
- Disciplined oscillator
 - Frequency: 10 MHz
 - Outputs (TTL): 1, 5, or 10 MHz (selectable)
 - Rate stability
 - Standard VCXO: 5.0E-8 short term 'tracking' 5.0E-7/day long term 'flywheeling'
 - Optional oven osc: 2.0E-9 short term 'tracking' 5.0E-8 /day long term 'flywheeling'
 - Sync sources: GPS, Time Code, 1 PPS, 10 MHz
- PCI local bus™
 - Specification:
 - PCI Local Bus™:
 - 2.2 compliant
 - 2.3 compatible: does not provide interrupts at system start-up and therefore does not support the PCI Local Bus Specification Revision 2.3 feature of software disable of interrupts at start-up
 - PCI-X compatible
 - Not compatible with dual core processors
 - Size: Single-width (4.2" x 6.875")
 - Device type: PCI Target, 32 bit, 5V signalling
 - Data transfer: Byte, Half Word, Word
 - Interrupt levels: Automatically Assigned (PnP), not supported in Windows 98
 - Power:
 - +5V @ 350 mA
 - +12V @ 400 mA
 - 12V @ 70 mA

Connector

J1 - Module I/O:

15-pin 'DS'



Pin	Direction	Signal
1	input	External 10 MHz input
2	n/a	Ground
3	output	Strobe output
4	output	1 PPS output
5	output	Time Code output (AM)
6	input	External Event input
7	input	Time Code input (AM)
8	n/a	Ground (Recommended Time Code return)
9	output	Oscillator Control Voltage output
10	input	Time Code input (DCLS)
11	output	Time Code output (DCLS)
12	n/a	Ground
13	output	1, 5, 10 MHz output
14	input	External 1 PPS input
15	output	Periodic Pulse output

- Complete specifications can be found in the manual located at:

www.symmetricom.com/media/files/downloads/product-manuals/bc635%2D637PCI%2DU.pdf

ENVIRONMENTAL SPECIFICATIONS

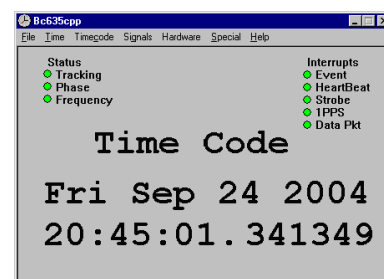
Environment

	Module	Ant/Rcvr
Temperature		
Operating:	0°C to 70°C	-40°C to 70°C
Storage:	-30°C to 85°C	-55°C to 85°C
Humidity		
Operating:	5% to 95%* *non-condensing	95%
Operating altitude:	Up to 18,000 meters MSL	

SOFTWARE

- The bc635PCI-V2 includes the Symmetricom Demonstration driver, bc635cpp, an application program for Windows 2000/XP. Using this program you can review the bc635PCI-U card status and adjust board configuration and output parameters. An additional clock utility program, TrayTime, is provided to update the PC clock. This software operates as a background task keeping the host computer clock synchronized to the bc635PCI-U card.

The bc635cpp.exe utility can be used to query current settings, modify settings and retrieve or monitor data generated by the card.



PRODUCT INCLUDES

- bc635PCI-U Time & Frequency Processor board, one year warranty, PCI User's Guide, Windows Demonstration software CD.

OPTIONS

- For GPS synchronization, see bc637PCI-V2 datasheet at www.symmetricom.com/products/gps%2Dsolutions/bus%2Dlevel%2Dtiming/bc637PCI%2DV2/
- Ovenized crystal oscillator for extended holdover
- 'D' connector (J1) to BNC adapter
- Drivers: Windows 2000/XP, Linux or Solaris
- Contact factory for additional driver support



bc635/637PMC

PCI Mezzanine Time & Frequency Processor

KEY FEATURES

- PCI Local Bus Operation
- GPS or Time Code Inputs
- Time Code Outputs
- Pulse Rate Outputs
- Frequency Outputs (1, 5, or 10 MHz)
- External Event Capture Register/Interrupt
- Programmable Periodic Output/Interrupt
- Programmable Time Strobe Output/Interrupt
- 10 mm Stacking Height
- Micro-Miniature or SMB Output Connectors
- Fully Supports "BUSMODE" Enabling
- IEEE 1344 Compliant IRIG B Time Code

Symmetricon's bc635/637PMC receiver module provides precision time and frequency reference to the host computer system and peripheral data acquisition systems. Time is acquired from either the GPS satellites using a supplied antenna/receiver (bc637PMC only) or from time code signals, typically IRIG B. Integration of the module is facilitated with optional drivers for Windows NT/2000/XP, Linux, Solaris, or VxWorks. Central to the operation of the module is a disciplined 10 MHz oscillator and 100 nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the PCI bus with zero latency, which allows for very high speed time requests. The oscillator is rate-matched (disciplined) to

the input time source and drives the precision 10 MHz frequency output and time code generator circuitry. If time is lost, the module will continue to maintain time (flywheel).

Both time code generation and translation are supported. The generator supplies IRIG B time code output that is synchronized to the input time source. The translator decodes IRIG A, IRIG B or NASA 36.

An Event Time Capture feature provides a means of latching time for an event input. The module can also be programmed to generate a periodic pulse rate as well as to generate a single time strobe at a pre-determined time.



PMC Time & Frequency Processor (shown with optional antenna/receiver, bc637PMC)

bc635/637PMC SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Real time clock
 - Bus request resolution: 100 nanoseconds
 - Latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary
- Time code translator
 - Time code formats: IRIG A, IRIG B*, NASA 36 (Modulated or DCLS)
 - Time accuracy: <5 μ S (modulated)
<1 μ S (DCLS)
 - Modulation ratio: 3:1 to 6:1
 - Input amplitude: 500 mV to 5V P-P
 - Input impedance: >10K Ω
 - * See IEEE 1344 compliance below
- Time code generator
 - Time code format: IRIG B*
 - Modulation ratio: 3:1
 - Output amplitude: 4 V P-P (fixed) into 50 Ω
 - DC level shift: TTL/CMOS
 - * See IEEE 1344 compliance below
- IEEE 1344 compliance

The translator processes the 27 control function bits of IRIG B time code as set forth in IEEE 1344 (see page 52 of this catalog). The 27 control function bits provided by the input IRIG B time code are output in the generated IRIG B time code one time frame after received. If the input IEEE 1344 bits are not present in the input IRIG B time code, the last two digits of year are placed in bits 1-9 of the control function field of the generated IRIG B time code.
- Timing functions
 - Heartbeat clock (TTL, 50 Ω): Programmable Periodic, <1 Hz to 250 kHz
 - Time strobe (TTL, 50 Ω): Programmable 1 μ Sec through hours
 - Event capture (TTL, 50 Ω): 100 nSec resolution, zero latency
 - 1 PPS pulse rate (TTL, 50 Ω): Positive edge on-time
- Disciplined oscillator
 - Frequency: 10 MHz
 - Outputs: 1, 5, or 10 MHz (selectable)
 - Rate stability: 5.0E-8 short term 'tracking'
5.0E-7 /day long term 'flywheeling'
 - Sync sources: GPS, Time Code, 1 PPS, 10 MHz
- PCI local bus™
 - Specification: Fully compliant with IEEE P1386/Draft 2.0 and IEEE P1386.1/Draft 2.0*
 - Size: Standard (2.913" x 5.866")
 - Stacking height: 10 mm
 - Device type: PCI Target, 32 bit, 5V signalling
 - Data transfer: Byte, Half Word, Word
 - Interrupt levels: Automatically Assigned (PnP)
 - Power: +5 VDC @ 350 mA

*Does not fit in MVME5500 PMC2 slot

[For detailed information, click here to access the Field Service Bulletin](#)

- GPS Subsystem (bc637PMC only)
 - Time accuracy: <1 μ Second
 - Position accuracy: 10 to 20 meters SEP (SA off)
 - Maximum velocity: 300 meters/sec (1,080 KPH)
 - Number of channels: 8
 - Receiver frequency: 1.575 GHz (L1, C/A code)
 - Time to first fix: Brief power off: 1.5 minutes
(1, 3, and 4 satellites)
Worst case: 5 to 15 minutes
 - Solution modes: 1, 3, and 4 satellites

- Connector types
 - J1 - GPS Interface 9-pin micro 'DP'
 - J2 - Time Code In SMB socket
 - J3 - Time Code Out SMB socket
 - J4 - Module I/O 15-pin micro 'DP'

ENVIRONMENTAL SPECIFICATIONS

- | | Module | Ant/Rcvr |
|-------------|-----------------|---------------|
| Temperature | | |
| Operating: | 0°C to 70°C | -40°C to 70°C |
| Storage: | -30°C to 85°C | -55°C to 85°C |
| Humidity | | |
| Operating: | 5% to 95%* | 95% |
| | *non-condensing | |

OPTIONS

- Extended length GPS antenna cable
- Isolation transformer time code input
- 'D' connector (J1) to BNC adapter
- 15 pin high-density 'DP' to 15 pin 'DP' adapter cable
- Drivers: Windows NT/2000/XP, and Linux, Solaris, VxWorks
- Contact factory for additional driver support

ORDERING INFORMATION

- | | |
|-----------------|--|
| BC12073-1001 | bc635PMC Time & Frequency Processor w/SMB-to-BNC I/O cables |
| BC12073-2000 | bc637PMC GPS Time & Frequency Processor (includes GPS antenna/receiver & 50' (15 m) cable) |
| PCI-WINSDK | PCI Windows software developer's kit |
| PCI-LXDRV | PCI Linux Driver |
| PCI-VXDRV | PCI VxWorks Driver (PPC target) |
| PCI-SDRV32 | PCI 32-bit Solaris Driver |
| PCI-SDRV64 | PCI 64-bit Solaris Driver |
| BC11576-1000 | 'D' to BNC adapter (provides IRIG in, IRIG out, 1 pps out, event in, periodic out) |
| BC11576-9860115 | 'D' to BNC adapter (provides IRIG in, IRIG out, 1 pps out, 1 pps in, event in) |
| PCI-BNC-CCS | 'D' to BNC adapter (provides IRIG in, IRIG out, 1 pps out, 1 pps in, event in, DCLS out) |
| PMC-GPS | PMC 9-pin micro-D to 15-pin HD Adapter |
| PMC-I/O | PMC I/O cable (15-pin micro-D to 15-pin DS) |
| 812597-050 | Spare RS422 50' (15 m) antenna cable* |
| 812597-100 | Spare RS422 100' (30 m) antenna cable* |
| 812597-200 | Spare RS422 200' (60 m) antenna cable* |

* Contact factory regarding longer cabling requirements.



bc635/637CPCI

Compact PCI Time & Frequency Processor

KEY FEATURES

- CompactPCI™ Bus Operation
- GPS or Time Code Inputs
- Time Code Outputs
- Pulse Rate Outputs
- Frequency Outputs (1, 5, or 10 MHz)
- External Event Capture Register/Interrupt
- Programmable Periodic Output/Interrupt
- Programmable Time Strobe Output/Interrupt
- IEEE 1344 Compliant IRIG B Time Code
- Windows NT/2000/XP Support

Symmetricom's bc635/637 CompactPCI receiver module provides precision time and frequency reference to the host computer system and peripheral data acquisition systems. Time is acquired from either the GPS satellites using a supplied antenna/receiver (bc637CPCI only) or from time code signals, typically IRIG B. Integration of the module is facilitated with optional drivers for Windows NT/2000/XP, Linux, Solaris and VxWorks. CompactPCI uses industry standard mechanical components and high-performance connector technologies to provide a system that is optimized for rugged applications.

Central to the operation of the module is a disciplined 10 MHz oscillator and 100 nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the CPCI bus with zero latency, which allows for very high speed time requests. The oscillator is rate-matched (disciplined) to the

input time source and drives the precision 10 MHz frequency output and time code generator circuitry. If time is lost, the module will continue to maintain time (flywheel). Both time code generation and translation are supported. The generator supplies IRIG B time code output that is synchronized to the input time source. The translator decodes IRIG A, IRIG B and NASA 36.

An Event Time Capture feature provides a means of latching time for an event input. The module can also be programmed to generate a periodic pulse rate as well as to generate a single time strobe at a pre-determined time.



CPCI Time & Frequency Processor (shown with optional antenna/receiver, bc637CPCI)

bc635/637CPCI SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Real time clock
 - Bus request resolution: 100 nanoseconds
 - Latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary
- Time code translator
 - Time code formats: IRIG A, IRIG B*, NASA 36 (Modulated or DCLS)
 - Time accuracy: <5 μ S (modulated) <1 μ S (DCLS)
 - Modulation ratio: 3:1 to 6:1
 - Input amplitude: 500 mV to 5V P-P
 - Input impedance: >10K Ω
 - * See IEEE 1344 Compliance below
- Time code generator
 - Time code format: IRIG B*
 - Modulation ratio: 3:1
 - Output amplitude: 4 V P-P (fixed) into 50 Ω
 - DC level shift: TTL/CMOS
 - * See IEEE 1344 Compliance below
- IEEE 1344 compliance

The translator processes the 27 control function bits of IRIG B time code as set forth in IEEE 1344 (see page 52 of this catalog). The 27 control function bits provided by the input IRIG B time code are output in the generated IRIG B time code one time frame after received. If the input IEEE 1344 bits are not present in the input IRIG B time code, the last two digits of year are placed in bits 1-9 of the control function field of the generated IRIG B time code.
- Timing functions
 - Heartbeat clock (TTL, 50 Ω): Programmable Periodic, <1 Hz to 250 kHz
 - Time strobe (TTL, 50 Ω): Programmable 1 μ Sec through hours
 - Event capture (TTL, 50 Ω): 100 nSec resolution, zero latency
 - 1 PPS pulse rate (TTL, 50 Ω): Positive edge on-time
- Disciplined oscillator
 - Frequency: 10 MHz
 - Outputs: 1, 5, or 10 MHz (selectable)
 - Rate stability
 - Standard VCXO: 5.0E-8 short term 'tracking' 5.0E-7/day long term 'flywheeling'
 - Optional oven osc: 2.0E-9 short term 'tracking' 5.0E-8/day long term 'flywheeling'
 - Sync sources: GPS, Time Code, 1 PPS, 10 MHz
- PCI local bus™
 - Specification: CompactPCI Specification PICMG 2.0 R2.1 Specification 2.2
 - Size: Single-width 3U (3.94" x 6.3")
 - Device type: PCI Target, 32 bit, 5V signalling
 - Data transfer: Byte, Half Word, Word
 - Interrupt levels: Automatically Assigned (PnP)
 - Power: +5 VDC @350 mA +12 VDC @10 mA (bc635PCI) +12 VDC @ 100 mA (bc637PCI) -12 VDC @10 mA
- GPS subsystem (bc637PCI only)
 - Time accuracy: <1 μ Second
 - Position accuracy: 10 to 20 meters SEP (SA off)
 - Maximum velocity: 300 meters/sec (1,080 KPH)
 - Number of channels: 8
 - Receiver frequency: 1.575 GHz (L1, C/A code)
 - Time to first fix: Worst case: 5 to 15 minutes
 - Solution modes: 1, 3, and 4 satellites
- Connector types
 - J1 - Module I/O: 15-pin 'DS'
 - J2 - GPS interface: 15-pin high-density 'DP'

ENVIRONMENTAL SPECIFICATIONS

	Module	Ant/Rcvr
Temperature		
Operating:	0°C to 70°C	-40°C to 70°C
Storage:	-30°C to 85°C	-55°C to 85°C
Humidity		
Operating:	5% to 95%*	95%
	*non-condensing	
Operating altitude:	Up to 18,000 meters MSL	

OPTIONS

- Extended length GPS antenna cable
- Isolation transformer time code input
- Ovenized crystal oscillator
- 'D' connector (J1) to BNC adapter
- Drivers: Windows NT/2000/XP, Linux, Solaris, VxWorks
- Contact factory for additional driver support

ORDERING INFORMATION

BC12063-1000	bc635CPCI Time & Frequency Processor
BC12063-2000	bc637CPCI GPS Time & Frequency Processor (includes GPS antenna/receiver & 50' (15 m) cable)
BC11736-2000	Ovenized oscillator option (factory installed)
PCI-WINSDK	PCI Windows software developer's kit
PCI-LXDRV	PCI Linux Driver
PCI-VXDRV	PCI VxWorks Driver (PPC target)
PCI-SDRV32	PCI 32-bit Solaris Driver (Solaris 5 & Solaris 6)
PCI-SDRV64	PCI 64-bit Solaris Driver (Solaris 7 & Solaris 8)
BC11576-1000	'D' to BNC adapter (provides IRIG in, IRIG out, 1 pps out, event in, periodic out)
BC11576-9860115	'D' to BNC adapter (provides IRIG in, IRIG out, 1 pps out, 1 pps in, event in)
PCI-BNC-CCS	'D' to BNC adapter (provides IRIG in, IRIG out, 1 pps out, 1 pps in, event in, DCLS out)
812591-050-xxx	Spare RS422 50' (15 m) antenna cable*
812591-100-xxx	Spare RS422 100' (30 m) antenna cable*
812591-200-xxx	Spare RS422 200' (60 m) antenna cable*

* Contact factory regarding longer cabling requirements.



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TTM635VME

VME Time & Frequency Processors

KEY FEATURES

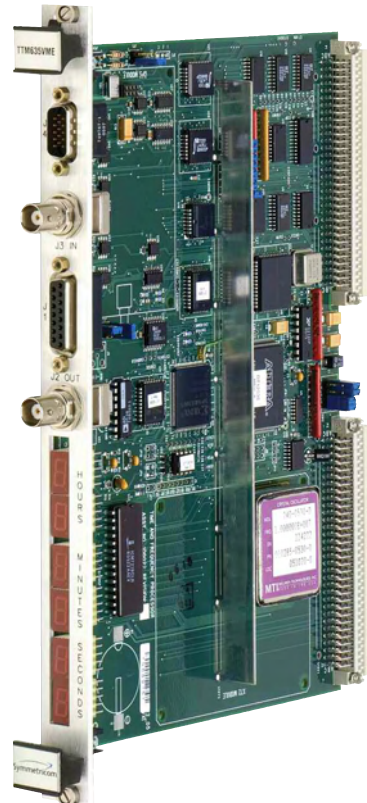
- 6U, Single Width VME
- Time Code Inputs
- Time Code Output
- 1PPS Pulse Rate Output/Interrupt
- Frequency Outputs (1, 5, 10 MHz)
- External Event Capture/Interrupt
- Programmable Periodic Output/Interrupt
- Programmable Time Strobe Output/Interrupt
- Battery Backed Clock
- Extensive Driver Support

Symmetricom's TTM635VME time and frequency processor module provide precision time and frequency reference to the host computer and peripheral data acquisition systems. Time is acquired from time code signals, typically IRIG B. Integration of the module is facilitated with drivers for several operating systems (see Software). Time is displayed on the front panel (hours, minutes, seconds) via LED digits.

Central to the operation of the module is a disciplined 10 MHz oscillator and 100 nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the bus with zero latency, which allows for very high speed time requests. The oscillator is rate matched (disciplined) to the input time source and drives the precision 10 MHz frequency output and time code generator circuitry. If the time source is lost, the module will continue to maintain time (flywheel). If power is lost, a +/-10 PPM battery backed clock is available to maintain time.

Both time code generation and translation are supported. The generator supplies IRIG B or IRIG H time code output that is synchronized to the input time source. The translator decodes IRIG B, 2137 or XR3 time code inputs.

An event time capture feature provides a means of latching the time of an event input and/or generating a bus interrupt that is coincident with an external TTL pulse. The module can also be programmed to generate a periodic pulse rate/interrupt as well as to generate a strobe/interrupt at a single predetermined time.



VME Time & Frequency Processor

TTM635VME SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Real time clock
 - Bus request resolution: 100 nanoseconds
 - Bus request latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary
- Time code translator
 - Time code formats: IRIG A, IRIG B (modulated or DCLS) XR3, 2137 (modulated only)
 - Modulation ratio: 3:1 to 6:1
 - Input amplitude: 500 mV to 5 V P-P
 - Input impedance: >10K Ω (AC coupled)
- Time code generator
 - Time code format: IRIG B (modulated or DCLS) IRIG H (DCLS only)
 - Output amplitude: 0 V to 10 V P-P (adjustable)
 - DC level shift: TTL/CMOS
- Timing functions
 - Heartbeat (TTL, 50 Ω): Programmable periodic 2.3 MHz to 2.5 MHz
 - Time strobe (TTL, 50 Ω): Programmable, 1mS through hrs
 - Event capture (TTL, 50 Ω): 100 nS resolution, zero latency
 - 1PPS pulse rate (TTL, 50 Ω): Positive edge on-time
- Disciplined oscillator
 - Frequency: 10 MHz
 - Outputs (50): 1, 5, or 10 MHz (selectable)
 - Rate accuracy
 - Standard VCXO: 5.0E-8 short term (tracking) 5.0E-7/day long term (flywheeling)
 - Optional oven oscillator: 2.0E-9 short term (tracking) 5.0E-8/day long term (flywheeling)
 - Sync sources: GPS, time code, 1PPS, 10 MHz
- VME Bus
 - Size: 6Ux160 mm; B size, single
 - Address space: A16, AM codes \$29 and \$2D, 64 bytes
 - Data transfer: D16
 - Interrupter: D08[0], I[1-7], ROAK
 - Power: +5 VDC @ 1.5 A
+12 VDC @ 50 mA
+12 VDC @ 250 mA (GPS)
-12 VDC @ 30 mA
- Environment

	Module	Ant/Rec
Temperature		
Operating:	0°C to 70°C	-30°C to + 70°C
Storage:	-50°C to 125°C	-55°C to +100°C
Humidity		
Operating:	5% to 95%*	95%
	*non-condensing	

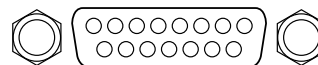
SOFTWARE

Customer source software drivers available for download at www.symmetric.com. Various operating systems available.

OPTIONS

- 'D' Connector (J1) to BNC Adapter
- Ovenized Crystal Oscillator
- Isolation Transformer Time Code Input
- Connectors

J1 Timing I/O: 15-pin 'DS'



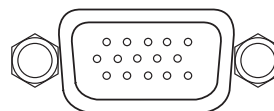
Pin	Direction	Signal
1	Input/Output	External 10MHz Input or Ovenized Oscillator Output*
2		Ground
3	Output	Strobe
4	Output	1 PPS
5	Output	Time Code (AM)
6	Input	External Event
7	Input	Time Code
8		Time Code Return/Ground
9	Output	Oscillator Control Output
10		Not Used
11	Output	Time Code (DCLS)
12		Ground
13	Output	1,5,10 MHz
14	Input	External 1 PPS
15	Output	Periodics

* Pin 1 is an output when the optional ovenized oscillator is installed.

J2 Out Time Code: BNC

J3 In Time Code: BNC

J4 Timing I/O: 15-pin 'DP'



Pin	Direction	Signal
1	Input	RS-422 Rx(+)
2	Input	RS-422 Rx(-)
3	Output	DCLS Out(+)**
4	Output	DCLS Out(-)**
5		Ground
6		Not Used
7	Output	**
8	Input	DCLS In (+)**
9	Input	DCLS In (-)**
10		Ground
11	Output	**
12	Output	**
13		Not Used
14		Ground
15	Output	**

** May also support some legacy timing functions found in the TTM637VME model. See manual for full details.



TTM635VME
Time & Frequency
Processor

Complete specifications can be found in the manual located at <http://www.symmetric.com>

bc635VME & bc637VME

VME Time & Frequency Processors

KEY FEATURES

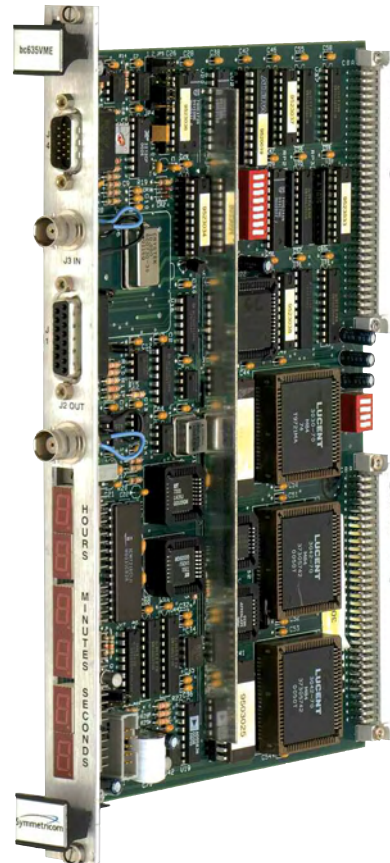
- 6U, Single Width VME
- GPS or Time Code Inputs
- Time Code Output
- 1 PPS Pulse Rate Output/Interrupt
- Frequency Outputs (1, 5, 10 MHz)
- External Event Capture/Interrupt
- Programmable Periodic Output/Interrupt
- Programmable Time Strobe Output/Interrupt
- Battery Backed Clock
- Extensive Driver Support

Symmetricom's bc635/637VME time and frequency processor modules provide precision time and frequency reference to the host computer and peripheral data acquisition systems. Time is acquired from either the GPS satellites using a supplied antenna/receiver (bc637VME only) or from time code signals, typically IRIG B. Integration of the module is facilitated with drivers for several operating systems (see software). Time is displayed on the front panel (hours, minutes, seconds) via LED digits.

Central to the operation of the module is a disciplined 10 MHz oscillator and 100 nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the bus with zero latency, which allows for very high speed time requests. The oscillator is rate matched (disciplined) to the input time source and drives the precision 10 MHz frequency output and time code generator circuitry. If the time source is lost, the module will continue to maintain time (flywheel). If power is lost, a +/-10 PPM battery backed clock is available to maintain time.

Both time code generation and translation are supported. The generator supplies IRIG B or IRIG H time code output that is synchronized to the input time source. The translator decodes IRIG B, 2137 or XR3 time code inputs.

An event time capture feature provides a means of latching the time of an event input and/or generating a bus interrupt that is coincident with an external TTL pulse. The module can also be programmed to generate a periodic pulse rate/interrupt as well as to generate a strobe/interrupt at a single predetermined time.



bc635VME Time & Frequency Processor

bc635/637VME SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Real time clock
 - Bus request resolution: 100 nanoseconds
 - Bus request latency: Zero
 - Major time format: Binary or BCD
 - Minor time format: Binary
- Time code translator
 - Time code formats: IRIG B (modulated or DCLS)
IRIG A (DCLS only)
XR3, 2137 (modulated only)
3:1 to 6:1
 - Modulation ratio: 3:1 to 6:1
 - Input amplitude: 500 mV to 5 V P-P
 - Input impedance: >10K Ω (AC coupled)
- Time code generator
 - Time code format: IRIG B (modulated or DCLS)
IRIG H (DCLS only)
 - Modulation ratio: 3:1
 - Output amplitude: 0 V to 10 V P-P (adjustable)
 - DC level shift: TTL/CMOS
- Timing functions
 - Heartbeat (TTL, 50 Ω): Programmable periodic
2.3 mHz to 2.5 MHz
 - Time strobe (TTL, 50 Ω): Programmable, 1mS through hrs
 - Event capture (TTL, 50 Ω): 100 nS resolution, zero latency
 - 1PPS pulse rate (TTL, 50 Ω): Positive edge on-time
- Disciplined oscillator
 - Frequency: 10 MHz
 - Outputs (50): 1, 5, or 10 MHz (selectable)
 - Rate accuracy
 - Standard VCXO: 5.0E-8 short term (tracking)
5.0E-7/day long term (flywheeling)
 - Optional oven oscillator: 2.0E-9 short term (tracking)
5.0E-8/day long term (flywheeling)
 - Sync sources: GPS, time code, 1 PPS, 10 MHz
- VME Bus
 - Size: 6Ux160 mm; B size, single width
 - Address space: A16, AM codes \$29 and \$2D, 64 bytes
 - Data transfer: D16
 - Interrupter: D08(O), I(1-7), ROAK
 - Power: +5 VDC @ 1.5 A
+12 VDC @ 50 mA
+12 VDC @ 250 mA (GPS)
-12 VDC @ 30 mA
- GPS Subsystem (bc637VME only)
 - Time accuracy: $\leq \pm 1$ microsecond
 - Position accuracy: 10 to 20 meters SEP
 - Maximum velocity: 300 meters/second (1,080 KPH)
 - Number of channels: 8
 - Receiver frequency: 1.757 GHz (L1, C/A code)
 - Time to first fix: Brief power off: 1.5 min.
(1, 3 and 4 satellites)
 - Solution modes: 1, 3 and 4 satellites
- Environment

	Module	Ant/Rec
Temperature		
Operating:	0°C to 70°C	-30°C to +70°C
Storage:	-50°C to 125°C	-55°C to +100°C
Humidity		
Operating:	5% to 95%*	95%

*non-condensing

SOFTWARE

Customer Source Software drivers available for download at www.symmetricom.com, various operating systems available.

OPTIONS

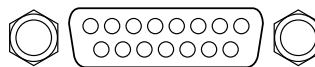
- Antenna cables, bc637 only¹
- Isolation transformer time code input
- Ovenized crystal oscillator
- 'D' connector (J1) to BNC adapter

¹ includes GPS antenna/receiver and 50' (15 m) cable; contact factory regarding longer cabling requirements

Connectors

J1 Timing I/O:

15-pin 'DS'



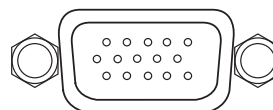
Pin	Direction	Signal
1	Input/Output	External 10MHz Input or Ovenized Oscillator Output*
2		Ground
3	Output	Strobe
4	Output	1 PPS
5	Output	Time Code (AM)
6	Input	External Event
7	Input	Time Code
8		Time Code Return/Ground
9	Output	Oscillator Control Output
10		Not Used
11	Output	Time Code (DCLS)
12		Ground
13	Output	1,5,10 MHz
14	Input	External 1 PPS
15	Output	Periodics

* Pin 1 is an output when the optional ovenized oscillator is installed.

J2 Out Time Code: BNC

J3 In Time Code: BNC

J4 Timing I/O: 15-pin 'DP'



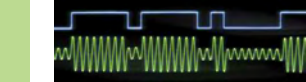
Pin	Direction	Signal
1	Input	RS-422 Rx(+)
2	Input	RS-422 Rx(-)
3	Output	RS-422 Tx(+)
4	Output	RS-422 Tx(-)
5		Ground
6		Not Used
7	Output	GPS 1PPS**
8	Input	GPS RS-422 1PPS+**
9	Input	GPS RS-422 1PPS-**
10		Ground
11	Output	GPS RS-422 Tx(-)**
12	Output	GPS RS-422 Tx(+)**
13		Not Used
14		Ground
15	Output	1GPS +12 VDC**

** GPS timing functions found in the bc637VME model. See manual for full details.

Complete specifications can be found in the manual located at <http://www.symmetricom.com>



bc635VME Time & Frequency Processor



PC03V

VMEbus Time Code Reader

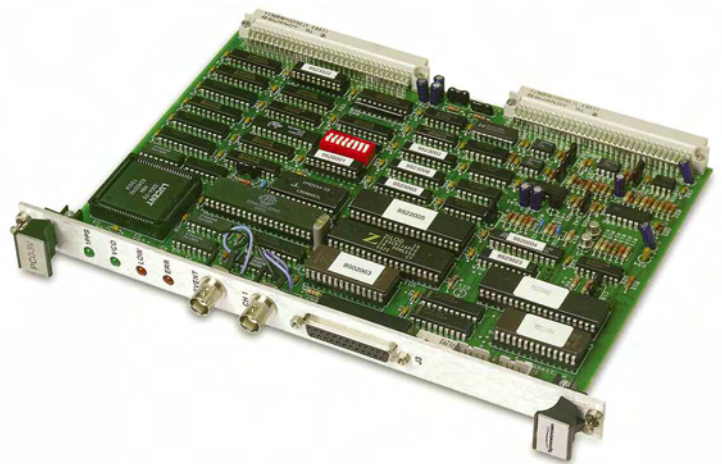
KEY FEATURES

- Translates IRIG A, IRIG B, IRIG G, 2137, XR3, NASA 36
- Translates Codes Forward, Reverse, High Speeds, Low Speeds
- Accepts Carrier Frequencies from 125 Hz to 500 kHz
- Zero Latency Access to Decoded Time
- Two Programmable Time Coincident Strokes/Interrupts
- Programmable Heartbeat Pulse/Interrupt
- External Event Time Capture/Interrupt

Symmetricon's PC03V is a double height VMEbus module designed to translate serial time code signals and to provide additional capabilities not normally found in a single board time code reader. Any of the six most commonly used time codes are translated in either the forward or reverse direction and at tape speeds that are slower or faster than real time. This makes the PC03V an ideal unit for use in tape search applications.

Time output resolution depends on the code type and whether the time code is coming in at the real time rate (i.e., from a satellite receiver or a central timing facility) or at a non-real time rate (i.e., from a magnetic tape recorder). When processing a time code at the real time rate, a synchronized 1 MHz time base reference maintains time of day (TOD) down to a resolution of 1 microsecond. In the case of a non-real time rate, the PC03V maintains TOD to carrier cycle resolution (e.g., 1 mS for IRIG B with a 1 kHz carrier).

High speed time tagging applications require minimal access time (the time from the data request until the requester receives the data — termed latency). To minimize this latency, the PC03V continually maintains current time from microseconds to days. In response to either a VMEbus READ at the PC03V Base Address Location (CAPTR, time capture register) or an external time capture strobe, the current time is transferred to, and held in, four 16 bit output registers for subsequent access across the bus. Internal handshake protocol logic ensures that the transfer does not take place during state changes.



VMEbus Time Code Reader

PC03V SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Time code input
 - Code formats: IRIG A, B, G; XR3, 2137, NASA 36
 - Carrier range: 125 Hz to 500 kHz
 - Code direction: Forward and reverse
 - Modulation ratio: 3:1 to 6:1
 - Input amplitude: 500 mV to 10 V P-P
 - Input impedance: >10K Ω
- Time data
 - Bus request resolution: 4 ms - XR3
1 ms - IRIG B, 2137 & NASA 36
100 μ s - IRIG A
10 μ s - for IRIG G
 - Bus request latency: Zero
 - Time format: Binary coded decimal (BCD)
- Timing functions
 - Heartbeat: TTL, active low, programmable periodic
 - Strobes 1 & 2: TTL, active high or low, 1 μ S to Hours
 - Event capture: TTL, positive or negative edge triggered, 50 nS minimum width
- VMEbus interface
 - Specification: Meets VMEbus Spec, Revision C.1
 - Size: 6Ux4HP (160 mm); B-size, single width
 - Address space: A16, AM codes \$29 and \$2D, 256 bytes
 - Data transfer: D16
 - Interrupter: D08(O), I[1-7], ROAK
 - Power: +5 VDC @ 1.7A
+12 VDC @ 100 mA
-12 VDC @ 100 mA

ENVIRONMENTAL SPECIFICATIONS

- Temperature: 0°C to 50°C
- Humidity: 10% to 80%, non-condensing
- Connector types
 - Time code inputs: BNC
 - Event input: BNC
 - Signal I/O: 25 pin 'D' socket; P2, rows A & C
 - PDC output: 20 pin header



bc824VXI

Rubidium Frequency Standard

KEY FEATURES

- Four Oscillator Modes
 - Free running
 - 10 MHz Synchronization
 - 1PPS Synchronization
 - IRIG B Synchronization
- Low Phase Noise Outputs
- 50 Nanosecond Clock Resolution
- Register/Message Based Device
- External Event Time Capture
- Programmable Periodics & Alarm
- IRIG B Output

The bc824VXI Rubidium Frequency Standard plug-in card is an ultra stable atomic oscillator supported by a C-size mainframe and resource manager configured in accordance with the VXIbus specification. The timing card will provide an ultra stable 10 MHz sine wave or TTL outputs with minimal noise. The bc824VXI employs both a rubidium oscillator and a low phase noise ovenized crystal oscillator (OCXO). The rubidium oscillator provides exceptional long term stability if the synchronizing input is lost. The OCXO phase locks to the rubidium oscillator, removing rubidium frequency spurs and providing an excellent noise floor.

The VXIbus Rubidium Frequency Standard Plug-in card is a register based device as well as a message based device. The message based interface capability will provide minimal access latency to the card via the system bus. The capability of the interrupt generation will allow interrupt driven algorithms to interface to the card. The bc824VXI will synchronize to an external 1PPS, 10 MHz reference or IRIG B time code. If the input source is lost, then time will be maintained in a flywheel state based on the on-board rubidium standard.



bc824VXI Rubidium Frequency Standard

bc824VXI SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

- Phase noise:
 - <-75 dBc/Hz @ 1 Hz
 - <-110 dBc/Hz @ 10 Hz
 - <-140 dBc/Hz @ 100 Hz
 - <-150 dBc/Hz @ 1 kHz
 - <-150 dBc/Hz @ 10 kHz
 - <-70 dBc Overall
- Spurious: <-70 dBc Overall
- Harmonics: <-50 dBc

DISCIPLINED OSCILLATOR

- Frequency: 10 MHz
- Outputs: 10 MHz
- Rate accuracy

Stability	Allen Variance
1 sec	1E-10
10 sec	3E-11
100 sec	1E-11
Aging	
Monthly:	<5E-11
Yearly:	<5E-10
Temperature coefficient	
0°C to 50°C	3E-10
-25°C to 70°C	6E-10
(includes aging, frequency offset over temperature range, setting accuracy and 10% input voltage change)	
- Accuracy at shipment: 5E-11 @ 25°C
- Frequency retrace: 5E-11 (after 1 hour power on, less than 25 hours power off)

SYNC SOURCES

- bc824VXI: Time Code, 1PPS, 10 MHz

REAL TIME CLOCK

- Bus request resolution: 100 nanoseconds
- Bus request latency: Zero
- Major time format: Binary or BCD
- Minor time format: Binary

TIME CODE TRANSLATOR

- Time code formats: IRIG B (modulated or DCLS)
- Modulation ratio: 3:1 to 6:1
- Input amplitude: 500 mV to 5 V P-P
- Input impedance: >10K Ω (AC coupled)
- Signal to noise ratio: 20 dB (minimum)

TIME CODE GENERATOR

- Time code format: IRIG B
- Modulation ratio: 3:1
- Output amplitude: 4 V P-P (fixed)
- DC level shift: TTL/CMOS

TIMING FUNCTIONS

- Heartbeat (TTL, 50 Ω): Programmable periodic 10 MHz to 3 Hz
- Event capture (TTL, 50 Ω): 100 ns resolution, zero latency
- Enhanced event (TTL, 50 Ω): 10 ns resolution, 50 μ s latency
- Event compare (TTL): Programmable, 1ms - hours
- 1PPS pulse rate (TTL, 50 Ω): Positive edge on-time

ENVIRONMENTAL SPECIFICATIONS

- Temperature

	Module
Operating:	0°C to 70°C
Storage:	-40°C to 75°C
- Humidity

Operating:	10% to 80%*
Storage:	5% to 95%
*non-condensing	

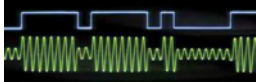
VXI BUS

- Address space: A16 only
- Data transfer: Byte, Half-Word, Word
- Power:

V	Warmup	Operating
+5 VDC	2A	1A
+12	2A	0.5A
-12	0.5A	0.5A
+24	3A @ 0C	1A
-24	0.4A	0.4A
- Input voltage sensitivity: <5E-11 (D = \pm 10% VDC)
- Warm-up time: Time to lock <4 min (25C)
6 minutes//1E-9

PHYSICAL SPECIFICATIONS

- Size: Double wide C-size
(9.2 in x 13.5 in)
- Weight: 4.25 lbs
- Connector types: 8 front panel BNC outputs
1 front panel BNC (10 MHz cal input)
15-pin 'D' connector
P1 & P2 per VXIbus specification
- LEDs: Power, Locked, Fault, Tracking



bc620AT

PC Time & Frequency Processor

KEY FEATURES

- PC, XT or AT Bus Operation (ISA/EISA Compatible)
- Time Code Inputs
- Time Code Output
- Pulse Rate Outputs
- Frequency Outputs (1, 5, or 10 MHz)
- External Event Capture/Interrupt
- Programmable Periodic Output/Interrupt
- Programmable Time Strobe Output/Interrupt
- Battery Backed Clock

Symmetricom's bc620AT time and frequency processor modules provide precision time and frequency reference to the host computer and peripheral data acquisition systems. Time is acquired from time code signals, typically IRIG B.

Central to the operation of the module is a disciplined 10 MHz oscillator and 100 nanosecond clock. Current time (days to 100 nanoseconds) can be accessed across the bus with zero latency, which allows for very high speed time requests. The oscillator is rate-matched (disciplined) to the input time source and drives the precision 10 MHz frequency output and time code generator circuitry. If the time source is lost, the module will continue to maintain time (flywheel). If power is lost, a 10 PPM battery backed clock is available to maintain time.

Both time code generation and translation are supported. The generator supplies IRIG B time code output synchronized to the input time source. The translator decodes either IRIG B, 2137, XR3 or NASA 36 time code inputs.

An event time capture feature provides a means of latching time for an event input. The module can also be programmed to generate a periodic pulse rate interrupt as well as to generate a single time strobe at a predetermined time.



PC Time & Frequency Processor