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Symmetricom

TymMachine 7000

Programmable Time System

KEY FEATURES

- Dual-Function Time Code Generator and Time Code Translator
- Most Options Easily Added or Removed in the Field
- Continuous Uninterruptible Time Code Generator
- Synchronized Time Code Generator with Oscillator Disciplining
- Generates IRIG A132, B122, G142, NASA 36, 2137, XR3 or ANG & Q53 (250 Hz) [BCD TIME ONLY]
- Generates IRIG B120 (with Control Functions & Straight Binary Seconds)
- Selectable Filters Improve Translator Performance
- RS-232 Input/Output Control/Data Port
- RS-232 Burst Time Word Output
- Setup/Control Utility Program for Windows 95/98/NT/2000
- Operating Parameters Saved Through Power Loss
- Battery Backed Clock Keeps Time for 30 Days Without Power
- Independent Generator and Translator Pulse Rates
- Dedicated 0.6-inch LED Time Display
- Automatic Self-Test Diagnostics

INTRODUCTION

Symmetricom's TymMachine™ 7000 is both a time code generator and a time code translator that can easily be switched to function as a synchronized time code generator. An integral serial RS-232 port allows control of many of the variables via the utility program. Optional capabilities, such as Video Time Insertion, Parallel Time Output, and Tape Search & Control are provided by means of plug-in modules that are easily installed in option slots in the rear of the chassis.

The Time Code Generator outputs IRIG B120 (with Control Functions and Straight Binary Seconds) via a BNC connector, and also outputs a selected code (either IRIG A132, B122, G142, NASA 36, 2137, XR3 or ANG &Q53 (250 Hz) [BCD TIME ONLY] via another BNC connector. The generator can be set to operate independently, even while the translator is processing a time code input. The Time Code Translator reads any of 14 different time codes at various speeds (tape speed-up and slow-down) and both forward and reverse directions. The time code input is conditioned by both a lowpass filter and a phase-locked tracking filter to provide the ultimate in performance when translating time codes that are contaminated by noise and distortion.

Most operating parameters are stored in non-volatile memory, making initialization after a power loss unnecessary. A rechargeable battery prevents time loss after an external power failure. The unit runs automatic self-test diagnostics each time power is turned on. Any abnormal test result is displayed on the front panel to aid in determining the proper corrective action.



TymMachine 7000

SPECIFICATIONS

COMMON FUNCTIONS

The TymMachine 7000 is built with a generous complement of built in functions, and a four slot option bay to allow optional functions to be added in the field merely by inserting the desired option module. The TymMachine 7000 Configuration Guide includes a comprehensive list of all options available.

OPERATOR CONTROLS

A two-row, 40-character LCD display provides a menu-oriented selection of all controllable functions. Control selections are entered via the keypad, located below the display.

TIME DISPLAY

Time is displayed via a digital LED display on the front panel. Either Generator time or Translator time is displayed, depending on selections made via the menu/keypad.

Format

Days/ID : Hours : Minutes : Seconds

Digit Height:

0.6" (1.52cm)

DIAGNOSTIC TOOLS

The TymMachine 7000 performs an automatic self-diagnostic test each time power is applied. The last test passed is displayed for easy troubleshooting in the event of a failure.

RS-232 INPUT/OUTPUT (PORT A)

Most functional parameters can be set and the status checked by a computer via this serial port. ASCII character strings are used to form the commands to the unit. Time to the nearest 0.1 millisecond can also be output upon request.

RS-232 TIME WORLD OUTPUT (PORT B)

This serial port outputs time (days - milliseconds) at a periodic rate as determined by DIP switch settings. Alternatively, the time word output can be triggered by receipt of any 8-bit character, as set by a DIP switch.

INTERFACE CONNECTORS

The interface connectors for the basic TymMachine 7000 are provided on the rear panel, as shown below. The connectors for each plug-in module are located on the module.

PRIMARY POWER

Voltage:	85-264 VAC
Frequency:	47-440 Hz
Consumption:	<30 watts

ENVIRONMENT

Temperature:	0ºC to 50ºC
Humidity:	0 to 95% RH, without condensation
Dimensions	
Chassis:	1.75" H x 19" W x 17" D (4.45 cm x 48.26 cm x 43.18 cm)

OPTIONS

PARALLEL BCD TIME OUTPUT MODULE

Outputs time as days, hours, minutes, seconds and fractions of seconds to the nearest 10 microsecond at real time tape speed and any speedup ratio from 2:1 to 16:1 (up to 8:1 for IRIG G).

MULTI-CODE TIME CODE ENCODER MODULE

Generates one of seven time codes as determined by operator selection via the LCD panel. This module also regenerates translator codes. The regenerate mode tracks IRIG A, B, G, NASA 36, 2137, XR3 or AN/GSQ-53 time code.

VIDEO TIME INSERTION MODULE

NTSC, RS-170 and PAL video can be processed with a time tag to the nearest millisecond.

50Ω DISTRIBUTION MODULE

Three groups of '1 in X 3 out' are provided on this module. The inputs can be bussed to provide any grouping desired. Multiple modules can be supported in the same chassis.



Rear View

J1 - Power Input
J2 - RS-232 Input/Output
J3 - Pulse Rates, Translator Status
J4 - Multicode Time Code Output (DCLS)
J5 - External Time Base Input/10 MHz Out
J6 - 1PPS / External Start Input
J7 - AGC Time Code Output
J8 - Time Code Input
J9 - RS-232 Burst Time Output
J10 - IRIG B120 Time Code Output (AC)
J11 - IRIG B000 Time Code Output (DCLS)
J12 - Multicode Time Code Output (AC)
M1 - Bottom Left Option Module
M2 - Bottom Right Option Module
M3 - Top Left Option Module
M4 - Top Right Option Module

CHASSIS SLIDES

Chassis slides mount on standard RETMA rails (both front and rear rails are required).

TIME CODE GENERATOR FUNCTIONS

The TymMachine 7000 Time Code Generator develops a standard IRIG B serial time code with BCD seconds through days, 27 control function bits and 17 bits of straight binary seconds (IRIG B120). A selected time code is also output that produces IRIG A132, B122, G142, NASA 36, 2137, XR3 or AN/GSQ-53 as determined by operator input. Both time code outputs are output as amplitude modulated sine wave carriers, and the DC level shift (DCLS) code form.

Other time code outputs can be generated by adding one or more plugin option modules.

GENERATOR TIME BASE OSCILLATOR

Crystal Oscillator	(standard)
Aging rate:	$1X10^{-7}$/day (0°C to 50°C)
Oven Controlled Quartz Oscillator	(Option)
Aging rate:	$5X10^{-10}$/day (0°C to 50°C)

EXTERNAL OSCILLATOR INPUT

An external frequency source can be used as a time base instead of the internal oscillator. If the external signal is interrupted, clocking automatically switches to the internal oscillator.

Either a sine wave or a square wave input is automatically accepted of 1 MHz to 10 MHz. The frequency must be an integral number of MHz, such as 2 MHz, 3 MHz or 4 MHz and so on. Input impedance is 50 ohms. Signal amplitude can be between 1.0 - 5.0 V P-P.

TIME CODE OUTPUT

Format:	IRIG B120 (fixed), IRIG A132, B122, G142, NASA 36, 2137, XR3, AN/GSQ-53 (selected)
Amplitude:	0 to 5 V P-P into a 50Ω load, adjustable
Modulation:	2:1 to 6:1, adjustable (3:1 normal)

BATTERY BACKED CLOCK

Timekeeping operation is maintained for up to 30 days after loss of primary power (with a full battery charge). When primary power is restored, the generator starts running with the correct time.

PULSE RATE OUTPUTS

Rates:	1PPS, 10 PPS, 100 PPS, 1 KPPS
Duty cycle:	50%
On-time:	Rising edge is on-time
Output level:	Logic "0" = 0.4 VDC Logic "1" - 2.4 VDC

EXTERNAL START

The generator can be started from a preset time by a DC pulse from an external source. The trigger can be either a positive-going or a negative-going edge.

SYNC/VERIFY PRESET

This function allows the translator section to preset and start the generator, based on the time code currently being read. Once started, the generator continues running independently from its internal (or external) time base.

ADVANCE/RETARD

The phase of the internal clock can be manually advanced or retarded in increments ranging from 1 microsecond to 100 milliseconds per second. This provides a convenient and accurate means of aligning the generator outputs to an external time standard.

GENERATOR SPEEDUP

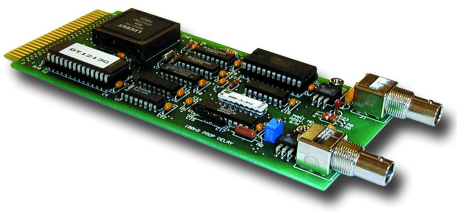
The generator can be set via the front panel to run at any speedup ratio from 2:1 to 32:1.

SYNCHRONIZED TIME CODE GENERATOR

This mode of operation uses the translator to read an input time code, which is used as a reference to steer and synchronize the generator. It can be within ±250 nanoseconds of the reference time code, depending on the quality and type of code. In this mode the TymMachine 7000 tracks IRIG A, B, G, NASA 36, 2137, XR3 or AN/GSQ-53 time code.

OPTIONS GUIDE

Each option for the TM7000 is identified by an option number, which is listed on the following pages. The options are provided by means of a plug-in module that is installed into any available slot in the rear expansion bay. An option can occupy one or two adjacent slots. Each description given below indicates the size of the option in terms of slots. For example, the Tape Search Module (Option 02A) is a wide plug-in that occupies two option slots (side-byside). Another example is the 50Ω Distribution Module (Option 39A), which is a single width module that has large components that require that the module be installed in a bottom slot and that the slot directly above be empty. Every option is annotated with the number of slots required for installation.



Single Time Code Encoder Module

02A TAPE SEARCH

Double width module that provides direct motion control to an instrumentation tape drive to replay a selected segment of the tape based on time code recorded on the tape. Includes auxiliary outputs (START pulse, STOP pulse, INTERVAL level/relay, EARLY CLOSURE relay) and tape speed selection relays.

Slots: 2 (Horizontal)

04B MULTISPEED BCD (D-hmS)

Single width module that outputs days through 0.00001 second resolution while translating any time code. This module will also provide the same resolution while replaying a time code from a tape at fast replay speeds. This module operates at real time speeds and faster.

Slots: 1

07A RS-232 TIME OUTPUT

The basic TM7000 provides one Time Output port; however, multiple ports can be installed via this option module. Single width module provides time output only. A time request is triggered by assertion of the RTS signal by the external device or upon receipt of a single character (set by DIP switch).

Slots: 1

14 SINGLE CODE SERIAL ENCODER

Single width module that generates one serial time code. Both the modu lated (AC) and unmodulated (DC) forms of the code are output. Codes that are available are:

Option 14A= IRIG A
Option 14B= IRIG B
Option 14C= IRIG E (100 Hz)
Option 14D= IRIG E' (1 kHz)
Option 14E= IRIG G
Option 14F= IRIG H (100 Hz)
Option 14G= IRIG H' (1 kHz)
Option 14H= NASA 28
Option 14I= NASA 36
Option 14J= XR3
Option 14L= 2137

Slots: 1

15 MULTICODE SERIAL ENCODER

The basic TM7000 provides one Time Output port, however, multiple ports can be installed via this option module. Single width module that generates either IRIG A, B, G, XR3, 2137 or NASA 36 by operator selection. In the TM7000 this module can regenerate any of its codes from the time code input to the Translator.

Slots: 1

17 READ DC TIME CODE

Single width module that provides the capability to translate an unmodulated time code (DC level shift).

Slots: 1

18 FIVE-RATE SLOW CODE

Single width module that outputs a pulse width/ amplitude modulated DC level shift time code at one of five operator-selected pulse/frame rates. Used for annotating strip charts.

Slots: 1

20B OVEN-CONTROLLED CRYSTAL OSCILLATOR (OCXO)

An oven-controlled quartz oscillator for the time code generator time base. The aging rate of the oscillator is 1E-9/day.

Slots: 0

27 VIDEO TRANSFER INSERTER

Single width module that processes either a composite video (NTSC or RS-170) signal to add time as 365:23:59:59:999 in the video field. Time is stored upon detection of the vertical frame pulse.

Slots: 1

32A 600Ω DISTRIBUTION MODULE

Single width module that provides three groups of "1-in X 3-out" distribution buffer amplifiers. Signal inputs and outputs are via miniature SMB coax connectors. Jumper pads are provided to connect a common input to two or three groups simultaneously. Mating SMB connectors are furnished.

Slots: 1

39A 50Ω DISTRIBUTION MODULE

Double height module that provides three groups of "1-in X 3-out" distribution buffer amplifiers. Signal inputs and outputs are via miniature SMB coax connectors. Jumper pads are provided to connect a common input to two or three groups simultaneously. Mating SMB connectors are furnished.

Slots: 2 (Vertical)

45 50Ω DISTRIBUTION

Provides one group of 1-in X 3-out distribution amplifier buffers on BNC connectors. The module provides a wide range of selectable pulse rates not available on the basic TM7000 unit. Jumpers on the module are used to select the desired pulse rate. Three configurations are available. Option 45A is a single-ended DC coupled amplifier with DC to 10 MHz bandwidth. Signal input and outputs are on BNC connectors. Option 45B accepts a TTL logic level input and outputs RS-422 levels. Signal input is on a BNC connector and outputs are on triax connectors. Option 45C is a transformer coupled buffer with 300 Hz to 300 kHz bandwidth. Signal input is on a BNC connector and outputs are on triax connectors.

Option 45A – DC to 10 MHz Buffers
Option 45B – TTL/RS-422 Buffers

Slots: 1

48 CHASSIS SLIDES

Chassis slides are available for the TM7000 for convenient rack mounting.

Option 48A Chassis Slides

Slots: 0

TIME CODE TRANSLATOR FUNCTIONS

The Translator reads time code signals in either forward or reverse direction. The "infinite bypass" time code validation function provides digital noise rejection, allowing the time outputs to remain unaffected by noise, distortion, momentary signal loss and other anomalies in the incoming time code signal.

High frequency noise is rejected at the input by a selectable lowpass filter. The corner frequency of the filter is automatically selected as a function of the selected time code and the tape replay speed ratio.

A phase-locked tracking filter generates a digital clock that is phase locked to the time code carrier frequency. This provides reliable time base reconstruction in the presence of signal distortion, baseline variations, and momentary signal losses. The center frequency of this filter is also automatically selected as a function of the code and of the tape replay speed ratio.

- Input code

Code format:	IRIG A, B, E, E', G, H, H', NASA 28, NASA 36, XR3, 2137, GSQ-53
Carrier frequency:	30 Hz to 2 MHz
Amplitude:	100 mV to 10 V P-P without adjustment
Input impedance:	Greater than 40K
Modulation ratio:	2:1 to 6:1 without adjustment
Direction:	Forward or reverse (automatic)

- Fail safe

  The TymMachine 7000 inherently protects against periodic loss of the input time code signal.

- Pulse rate outputs

Frequencies:	Input carrier rate Carrier rate divided by 10, 100, & 1000
Duty cycle:	50%
On-time:	Rising edge on-time
Output levels:	Logic "0" = 0.4 VDC Logic "1" = 2.4 VDC

DC CODE INPUT MODULE

Accepts an input time code signal that is the envelope of the modulated code (DCLS), with positive true or ground true level characteristics. Tape Search & Control Module A control interface to an instrumentation tape drive, allowing a selected segment of a recorded tape to be replayed based on a time code recorded on the tape. Virtually all instrumentation tape drives are accommodated, provided that they are equipped with a parallel unitary remote control interface. Contact Symmetricom for additional information about compatibility with a specific tape drive.

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