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TrueTime

Model 560-5203-0
DISCIPLINED TCXO OSCILLATOR MANUAL

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SECTION ONE

1. FUNCTIONAL DESCRIPTION

1.1. PURPOSE OF EQUIPMENT

The Model 560-5203-0 Disciplined Oscillator card provides an accurate frequency source, a TCXO quartz oscillator, which is disciplined (locked) by either external frequency reference(s) or by GPS (if the 560-5202 GPS rear card is installed behind the 560-5203-0 Oscillator card).

The external frequency reference, which will be called Aux Ref in this manual, and the GPS disciplining modes may be enabled or disabled by on-card DIP switches depending on the system requirements. NOTE: The 560-5202 GPS option card is not required to discipline the 560-5203-0's TCXO quartz oscillator.

1.2. GPS DISCIPLINING MODE

Refer to the 560-5202 manual for a complete description of this option. The GPS Oscillator disciplining option requires that the 560-5202 GPS rear card be installed directly behind the 560-5203-0 Oscillator card and that the GPS Mode DIP switch on the Oscillator card be enabled. When the GPS Mode is used in conjunction with the Aux Ref Mode, GPS has priority to discipline the local oscillator. When both modes are used, the Aux Ref source will provide local oscillator disciplining only when GPS is not a viable disciplining source. Refer to the 560-5202 manual for specifications on the timing outputs, serial port, and other features that are available on the 560-5203-0 Oscillator card when the GPS (timing) option is installed.

1.3. OVERVIEW

This manual only covers the 560-5203-0 Oscillator card when operating in Aux Ref Mode. Refer to the 560-5202 GPS card manual for details regarding the 560-5203-0 Oscillator card when operating in GPS Mode. Note that the GPS option only provides additional features for the Oscillator card, all specifications in this manual also apply to the Oscillator card when operating in GPS Mode.

1.4. PHYSICAL SPECIFICATIONS

Dimensions:	1.6"w X 3.94"h X 8.66"d (4 cm X 10 cm X 22 cm)
Weight:	Approximately 0.7 pound (0.32 kg)
Rack Slots:	2

1.5.

ENVIRONMENTAL SPECIFICATIONS

Operating Temp:	0° to +50°C
Storage Temp:	-40° to +85°C
Humidity:	Up to 95% relative, non-condensing
Cooling Mode:	Convection

1.6. POWER REQUIREMENTS

Voltage:	18-72 VDC
Power:	7 W

1.7. AUXILIARY REFERENCE INPUT(S) REFA, REFB, 7F, 8F

Function:	REFA or 7F -- Primary External Disciplining Reference for Oscillator REFB or 8F -- Secondary External Disciplining Reference for Oscillator
Input Amp/Freq:	3-5 Vpp at 1 MHz
Input Amp/Freq:	2-5 Vpp at 5 or 10 MHz

1.8. OUTPUT FREQUENCY SPECIFICATIONS

Function:	Reference Mode: must be set to drive REFC Input Mode: Drives REFA or REFB or REFC (switch-selectable)
Output Frequency:	Input Mode: 1 or 5 or 10 MHz Reference Mode: set for REFA & REFB frequency (switch-selectable)
Output Amplitude:	3 Vpp into 50 ohms
Frequency Stability:	Equal to input reference
Temp. Stability:	3×10^{-6} over 0 to +50°C when not tracking satellites (GPS) or no External Oscillator (Aux Ref) control
Oscillator Aging:	2×10^{-6} per year.
To Initial Lock:	< 20 minutes

1.9. CARD COMPATIBILITY

One Oscillator Location:	2-slot module Slot 1 (left-most slot position)
2nd Oscillator Location:	2-slot module Slot 3
Compatibility:	See Card Compatibility Matrix

SECTION TWO

2. OPERATION AND INSTALLATION

2.1. AUX REF DISCIPLINING MODE

When the Aux Ref Mode is enabled (DIP switch), the Oscillator uses the 56000 DRC backplane frequency reference bus to receive the Oscillator disciplining reference(s) and to distribute the Oscillator output. The 56000 DRC chassis has up to five frequency reference bus lines -- REFA, REFB, REFC (standard) and the optional buses 7F and 8F. The 560-5203-0 Oscillator uses up to two of the frequency reference bus lines as inputs (primary and secondary) to discipline the local oscillator. Note that only one Aux Ref (external frequency reference) input is required to discipline the local Oscillator -- the second Aux Ref input provides disciplining redundancy.

When the Oscillator card is operated in Aux Ref Mode, another operating mode choice must be made (DIP switch) to use either Reference or Input Mode. Reference Mode is used when the 56000 system has only one Oscillator installed and Input Mode is used when two Oscillator assemblies (for redundant operation) are installed in the 56000 system. Both Reference and Input Modes offer the Oscillator card two Aux Ref disciplining inputs (primary and secondary).

The 560-5203-0 Oscillator card performs automatic frequency detection (1, 5, or 10 MHz) of the Aux Ref disciplining inputs and also provides automatic switching between the primary and, if enabled, secondary Aux Ref sources based on a coarse frequency detection circuit. The Oscillator card cannot determine with any accuracy which frequency source should be used and depends on the Aux Ref source fault status to switch input references.

Fault status is a logic level output from external Aux Ref sources that connect to the 560-5179-1 Fault Monitor CPU card (refer to the 560-5179-1 manual). Connections to the P (primary) and S (secondary) Fault Status inputs on the Fault Monitor CPU card allows switching the 560-5203-0 Oscillator to steer and lock to a known good frequency. If the primary Aux Ref source provides a fault to the Fault Monitor CPU card and the secondary Aux Ref source is enabled (with no fault), the CPU commands the Oscillator card to switch to the secondary Aux Ref source. If only a primary Aux Ref source is used, the S (secondary) Fault Status input on the Fault Monitor CPU card and the secondary Aux Ref input on the Oscillator card must be disabled (DIP switch).

In either Reference or Input Modes, the Oscillator provides a continuous, stable reference that flywheels through any external reference perturbations and provides backup during any loss of external reference. The 560-5203-0 Oscillator phase locking and long term averaging

technique provides a very stable frequency source that has a long-term stability equal to the external reference.

The differences between the Aux Ref Reference and Input operating modes is described in the following paragraphs.

2.2. REFERENCE MODE

In a system that has only one 560-5203-0 Oscillator card installed, and Aux Ref Mode is enabled, the Aux Ref operating mode should be set to Reference. In this mode the Aux Ref disciplining signals are distributed on backplane bus lines REFA (primary) and REFB (secondary). The primary Aux Ref disciplining signal must be connected to the REFA input and if a second Aux Ref source is desired, to the REFB input. The Oscillator will steer and lock to the highest priority Aux Ref signal that is usable. If the secondary Aux Ref source (REFB) if not used, the input should be disabled on the Oscillator card (DIP switch).

When the 560-5203-0 Oscillator card is operated in Reference Mode, the frequency output from the Oscillator card must be set to match the frequency of the Aux Ref source(s) (REFA and REFB). In Reference Mode, the Oscillator must be set to distribute its output on REFC.

2.3. REFERENCE MODE FAULT STATUS

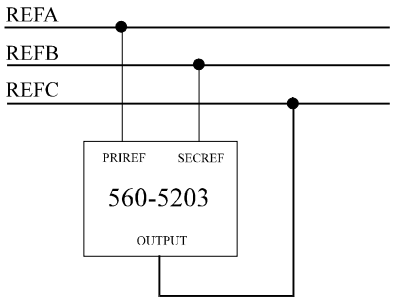
The primary Aux Ref signal REFA and if used, the secondary Aux Ref signal REFB, are monitored for fault status by the 560-5179-1 Fault Monitor CPU card. Fault status is a logic level output from the external Aux Ref source that should be connected to the Fault Monitor CPU card. The Fault status terms are used by the Fault monitor CPU card to control primary/secondary Aux Ref switching on the 560-5203-0 Oscillator card.

In Reference Mode, the 560-5203-0 Oscillator uses the disciplining reference inputs from REFA and REFB. When the REFA disciplining source fault status is detected by the CPU (via status input “P” (primary), the REFA (primary) disciplining reference input on the Oscillator card is disabled. The REFB (secondary) disciplining reference input on the Oscillator card is controlled similarly via status input “S” (secondary) -- the REFB disciplining reference input is turned off whenever a fault condition exists. If the REFA and or REFB reference input is used, but the fault status from the external oscillator(s) is not used, the status inputs for these references should be disabled on the 560-5179-1 Fault Monitor CPU card (PSRC=D, SSRC=D commands). Refer to the 560-5179-1 manual. The CPU’s fault status inputs “P” and “S” control feature ensures that only a viable external reference oscillator is used to discipline the 560-5203-0 Oscillator.

If only one Aux Ref disciplining input is used, this input must be connected to REFA (primary). The secondary Aux Ref input on the

Oscillator card should be disabled (DIP switch SEN = OFF) as well as the secondary status input on the Fault Monitor CPU card. When a primary fault status signal is detected by the CPU card, the primary Aux Ref input on the 560-5203-0 Oscillator card is turned off and the Oscillator will flywheel at the current frequency. If the primary Aux Ref source becomes viable again, CPU fault status and on-card frequency detection is OK, the disciplining source for the Oscillator will switch back on and the Oscillator will steer and lock to the primary Aux Ref source.

The following diagram depicts the 560-5203-0 in Reference Mode.



2.4. INPUT MODE

In a system that has <u>two</u> 560-5203-0 Oscillator cards installed and Aux Ref Mode is enabled, the Aux Ref operating mode should be set to <u>Input</u>. When the Oscillator is used in this mode, the disciplining Aux Ref signal(s) are distributed on 7F (primary) and 8F (secondary). The Oscillator will steer and lock to the highest priority Aux Ref signal that is viable. The output from each of the cards is delivered to other system cards via the backplane frequency bus on REFA or REFB or REFC. When the 560-5203-0 Oscillator cards are operated in Input Mode, the outputs from the two Oscillators may be set for 1, 5, or 10 MHz (but set the same) and may be distributed on REFA or REFB or REFC.

NOTE: Input 7F is the same backplane bus line as IN7 and input 8F is the same backplane bus line as IN8, therefore, the standard 56000 system timing line inputs <u>IN7 and IN8 are not available when operating the 560-5203-0 Oscillators in Input Mode.</u> Also note that the backplane timing line terminator switch positions 7 and 8 should be ON (50 ohms).

If the 56000 system is configured to use the non-disciplining third external system reference input, REFC, the outputs from the 560-5203-0 Oscillators must be set for the same frequency as this reference.

2.5.

INPUT MODE FAULT STATUS

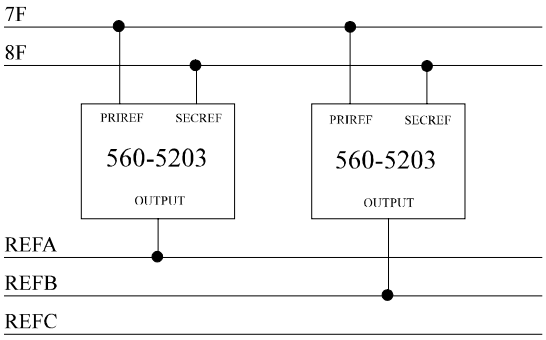
The primary Aux Ref signal (7F), and if used, the secondary Aux Ref signal (8F) are monitored for fault status by the 560-5179-1 Fault Monitor CPU card. Fault Status is a logic level output from the external Aux Ref source that should be connected to the Fault Monitor CPU card. The Fault status terms are used by the Fault monitor CPU card to control primary/secondary Aux Ref switching on the 560-5203-0 Oscillator card.

In Input Mode, the 560-5203-0 Oscillator uses the disciplining reference inputs from 7F and 8F. When the 7F disciplining source's fault status is detected by the CPU (via status input "P" (primary), the 7F (primary) disciplining reference input on the Oscillator card is disabled. The 8F (secondary) disciplining reference input on the Oscillator card is controlled similarly via status input "S" (secondary) -- the 8F disciplining reference input is turned off whenever a fault condition exists. If the 7F and or 8F reference input is used, but the fault status from the external oscillator(s) is not used, the status inputs for these references should be disabled on the 560-5179-1 Fault Monitor CPU card (PSRC=D, SSRC=D commands). Refer to the 560-5179-1 manual. The CPU's fault status inputs "P" and "S" control feature ensures that only a viable external reference oscillator is used to discipline the 560-5203-0 Oscillators.

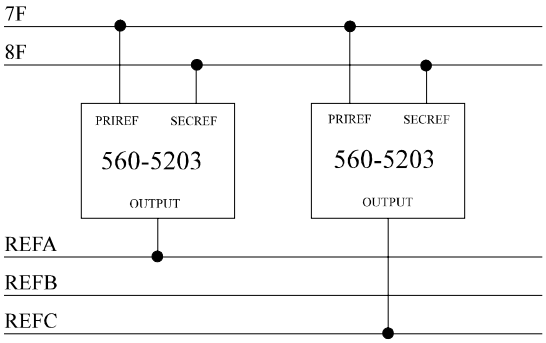
If only one Aux Ref disciplining input is used, this input must be connected to 7F (primary). The secondary Aux Ref input on the Oscillator cards should be disabled (DIP switch SEN = OFF) as well as the secondary status input on the Fault Monitor CPU card. When a primary fault status signal is detected by the CPU card, the primary Aux Ref input on the 560-5203-0 Oscillator cards is turned off and the Oscillators will flywheel at the current frequency. If the primary Aux Ref source becomes viable again, CPU fault status and on-card frequency detection is OK, the disciplining source for the Oscillator will switch back on and the Oscillators will steer and lock to the primary Aux Ref source.

The following diagrams depict the 560-5203-0 Oscillators in the three different Input Mode configurations.

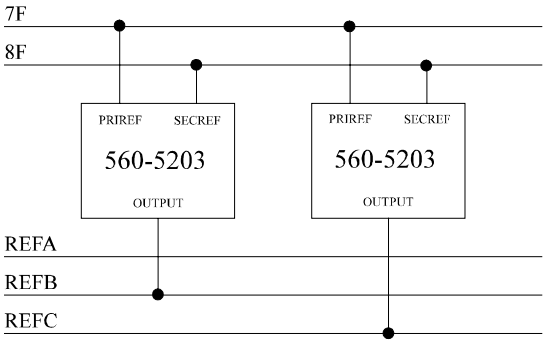
INPUT MODE #1



INPUT MODE #2



INPUT MODE #3



2.6. FRONT PANEL LED

The Oscillator card has a bicolor RED/GREEN LED mounted to the front panel. This LED has the following states due to various fault conditions on the card:

SOLID RED represents a local power supply failure.

BLINKING RED represents GPS faults (refer to the 560-5202 manual for possible GPS fault conditions). When the card is configured for Aux Ref Mode only, this indication is not used.

BLINKING ORANGE represents Aux Ref faults:

1. Primary Aux Ref source bad.
2. Secondary (when enabled) Aux Ref source bad.
3. PLL (on XL2) not locked. This PLL must be locked for Aux Ref Oscillator disciplining to occur.

SOLID ORANGE represents No Aux Ref faults but the Oscillator has not locked to the external oscillator disciplining source.

GREEN (or OFF) represents no Aux Ref faults and the Oscillator is locked to the external oscillator disciplining source. The GREEN LED enable switch "GRN" must be ON for the GREEN LED to illuminate. When the GREEN enable switch is OFF, the GREEN indication is replaced by LED OFF.

2.7. SETUP

The following setup applies to the 560-5203-0 card that is set to use Aux Ref Mode to discipline the Oscillator. The setup involves selection of the Aux Ref operating mode (Reference or Input), secondary Aux Ref input enable/disable, the Oscillator output frequency, the backplane frequency bus to drive and the Green LED control switch.

Use steps 1 through 8 to perform the setup procedure:

1. 560-5203-0 Required Settings	SW1-5 thru 8	(BRD0 - BRD3)
2. Aux Ref Mode (enable)	SW2-2	(AUX)
3. Operating Mode (Reference/Input)	SW2-3	(REF/IN)
4. Secondary Aux Ref Input (ON/OFF)	SW2-4	(SEN)
5. Timing Output Latch Enable	SW2-7	(#7)
6. Output Frequency (1, 5, 10 MHz)	SW1-1 and 2	(FRQ0 - FRQ1)
7. Output Drive Select (REFA/B/C)	SW1-3 and 4	(DRV0 - DRV1)
8. Green LED control	SW2-8	(GRN)

2.7.1. 560-5203-0 REQUIRED SETTINGS

SW1 positions 5, 6, 7 and 8 (BRD0, BRD1, BRD2, BRD3) sets the card type. This setting indicates what type of disciplined oscillator is used. SW1 MUST be set as follows:

Required Settings	
SW1-5 (BRD0)	OFF
SW1-6 (BRD1)	OFF
SW1-7 (BRD2)	OFF
SW1-8 (BRD3)	OFF

2.7.2. AUX REF ENABLE

Set SW2-2 (AUX) ON to enable Aux Ref Mode.

Aux Ref Enable	
SW2-2 (AUX)	ON

2.7.3. OPERATING MODE -- REFERENCE / INPUT

Set SW2-3 (REF/IN) for the desired operating mode -- Reference or Input. Reference Mode is used for single 560-5203-0 Oscillator installations; Input Mode is used when two 560-5203-0 Oscillators are installed. Note: Reference Mode disciplining inputs are REFA / REFB; Input Mode disciplining inputs are 7F/8F.

Reference / Input Mode (REF/IN)	
SW2-3 ON	Input
SW2-3 OFF	Reference

2.7.4. SECONDARY AUX REF SOURCE ENABLE

Use SW2-4 (SEN) to control whether a secondary Aux Ref disciplining source is to be used or not. NOTE: Reference Mode secondary input references REFB; Input Mode references 8F.

Secondary Aux Ref Source (SEN)	
SW2-4 ON	Enabled
SW2-4 OFF	Disabled

2.7.5. TIMING OUTPUT LATCH ENABLE

Use SW2-7 to latch the 1 PPS and IRIG B signals to the timing bus when GPS unlocks. Otherwise, these outputs are disabled when GPS is in unlocked status.

Timing Output Latch Enable (#7)	
SW2-7 ON	Enabled
SW2-7 OFF	Disabled

2.7.6. OUTPUT FREQUENCY SELECT (1, 5, 10 MHz)

Set SW1-1 and SW1-2 (FRQ0 and FRQ1) to select the Oscillator's output frequency. NOTE: When the Oscillator is operated using Reference Mode, the Oscillator output frequency must be set to match the REFA frequency.

Output Freq	10 MHz	5 MHz	1 MHz	0
SW1-1 (FRQ0)	ON	OFF	ON	OFF
SW1-2 (FRQ1)	OFF	ON	ON	OFF

2.7.7. OSCILLATOR DRIVE SELECT (REFA,B,C)

Set SW1-3 and SW1-4 (DRV0 and DRV1) to select which frequency bus to distribute the Oscillator's output. NOTE: When using Reference Mode, the driven output must be REFC.

Drive Select	REFA	REFB	REFC	0
SW1-3 (DRV0)	ON	OFF	ON	OFF
SW1-4 (DRV1)	OFF	ON	ON	OFF

2.7.8. GREEN LED CONTROL

Use SW2-8 (GRN) to control the front panel status LED. When the switch is ON, a GREEN LED indication is displayed when the Oscillator is locked to the Aux Ref source. When the switch is turned OFF, Oscillator lock is displayed as LED OFF.

Green LED Control (GRN)	
SW2-8 ON	GREEN
SW2-8 OFF	OFF

2.8. OPERATION

Upon installation, the Oscillator locks to the currently-highest priority (primary/secondary) disciplining reference. This occurs automatically after Oscillator power is cycled via hot swap or power-up. The process involves local oscillator warm-up and steering. Initial lock-up time, which varies with temperature, is typically <20 minutes. Prior to Aux Ref lock, the Oscillator output is enabled but the Oscillator FAULT is active (indicated by front panel LED references ORANGE). Once locked, the fault condition is deactivated (indicated by front panel LED references GREEN or OFF). If the disciplining reference is lost, the Oscillator flywheels at the current frequency.

2.9. HOT SWAPPING

All cards, input cables and output cables are hot swappable. It is not necessary to remove chassis power during insertion or removal. Hot swapping and reference-source changes are abrupt, the effects difficult to characterize; however, the system is designed to protect against permanent effects and minimize temporary effects of these events.

Adjacent-card hot swapping has a negligible effect on the Oscillator. The oscillator is highly-isolated from transient effects; and, the hot swapping event typically lasts less than one clock-period. The effect of redundant power supply switch-over is also negligible.

The effect of a reference-source change does not affect the Oscillator; however, it has varying effects on various function cards as discussed in specific manuals.

The disciplining reference input is delivered via backplane buses REFA and REFB when operating using Reference Mode or 7F (IN7 bus) and 8F (IN8 bus) when the 560-5203-0 is using Input Mode. The Oscillator uses the currently-highest priority reference signal (REFA, 7F references primary and REFB, 8F references secondary) to discipline the local Oscillator. If a switch is made from the primary to the secondary input reference, the Oscillator locks to the new reference with negligible effect on the output frequency due to the long-term average that is made on the disciplining reference input frequency.

Hot swapping of an Oscillator affects the system in varying ways depending upon whether the Oscillator is configured to drive REFA, REFB, or REFC. These effects are discussed in individual card manuals. If the Oscillator that is being Hot swapped is the primary frequency source for the system (REFA), the user should use the REFB! or REFC! command (560-5179-1 Fault monitor CPU serial port) to temporarily switch the system frequency cards to a viable source. After the Hot swapped primary (REFA) oscillator card has locked, the user should restore the automatic frequency selection by using the REF command. Refer to the 560-5179-1 manual.

2.10. REMOVAL AND INSTALLATION

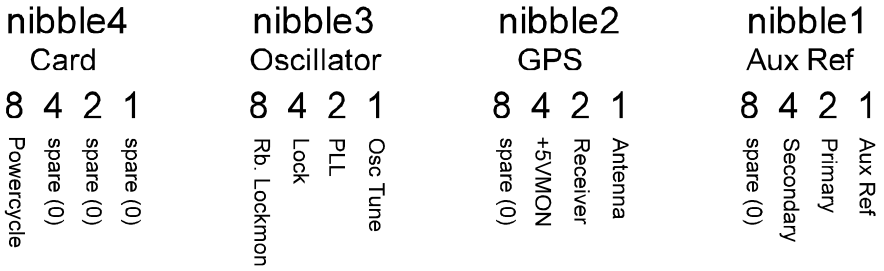
CAUTION: Individual components on this card are sensitive to static discharge. Use proper static discharge procedures during removal and installation.

Refer to CARD COMPATIBILITY section prior to installing a new card.

To remove a card, loosen the retaining hardware at the top and bottom of the assembly, then firmly pull on the handle at the bottom of the card. Slide the card out of the chassis. Refer to the SETUP section for any required switch settings or set them identically to the card being replaced. Reinstall the card by fitting it into the card guides at the top and bottom of the chassis and sliding it in slowly, avoiding contact between the bottom side of the card and the adjacent card front panel, until it mates with the connector. Seat the card firmly to avoid contact bounce. Secure the screws at the top and bottom of the card assembly.

2.11. DETAILED STATUS VIA CPU

The Fault Monitor CPU has access to detailed 560-5203-0 card status. When the CPU card provides the verbose mode serial report, fault status is available in a 2-byte format, with each binary nibble displayed as a hexadecimal (HEX) character. The 2-byte fault status has the following meaning:



Each of the four nibbles is grouped by category for easy visual identification of an offending fault. All faults are asserted as a logic 1. The faults are latched on the Oscillator card and must be cleared by the 560-5179-1 Fault Monitor CPU "CL" command.

Aux Ref faults are suppressed when the Aux Ref operating mode is disabled (AUX DIP switch OFF). GPS faults are suppressed when the GPS operating mode is disabled (GPS DIP switch OFF).

(Aux Ref) Nibble1 bit 0 -- Aux Ref:
Primary and if enabled, secondary disciplining source(s) not usable by the 87-902 XL2 card (oscillator disciplining card). This fault may be due to the external oscillator being off frequency or not connected.

(Aux Ref) Nibble1 bit 1 -- Primary:
The primary disciplining source is bad (frequency or amplitude).

(Aux Ref) Nibble1 bit 2 -- Secondary ("SEN" = ON):
When enabled, the secondary disciplining source is bad (frequency or amplitude).

(Aux Ref) Nibble1 bit 3 -- spare (0):
This bit is always 0.

(GPS) Nibble2 bits 0-3 -- Refer to the 560-5202 manual for GPS fault descriptions.

(Oscillator) Nibble3 bit 0 -- Osc Tune:
This fault is asserted when the tuning voltage for the disciplined local oscillator has nearly reached the maximum (or minimum) value. When this fault persists, the Oscillator card may need to be returned to the factory for calibration.

(Oscillator) Nibble3 bit 1 -- PLL:
The PLL on the 87-902 XL2 (oscillator disciplining card) is not locked. This PLL must be locked (no fault asserted) before the local oscillator can be disciplined to the external frequency reference (Aux Ref).

(Oscillator) Nibble3 bit 2 -- Lock:
This fault is asserted when the local oscillator is not locked.

(Oscillator) Nibble3 bit 3 -- Rb. Lockmon:
This fault is available only on Oscillator cards that have a Rubidium local oscillator. This bit is always 0 on the 560-5203-0 card.

(Card) Nibble4 bit 0-3:
These three bits are always 0.

(Card) Nibble4 bit 3 -- Powercycle:
This bit is initially set when the Oscillator is powered-up and is immediately cleared (0 value) after the Fault Monitor CPU card detects the card.

The following is an example of a Fault Monitor CPU serial verbose mode report:

TrueTime 56000 Site 01
Automatic Reports Enabled
Periodic Reports Disabled

Primary Inputs Selected	REFA No	REFB No	REFC Off	PRI OK	SEC OK	TER Off
1. Undefined	OK		Undefined		OK	
2. Undefined	OK		Undefined		OK	
3. 5203-0 XL2 LOCAL OSC	FAULT 0407		Undefined		OK	
4. Undefined	OK		Undefined		OK	

(card slots 5 through 20 not shown)

Refer to card slot three. The 5203-0 is an abbreviation of the 560-5203-0 oscillator card. The fault status for this card (0407) represents the following:

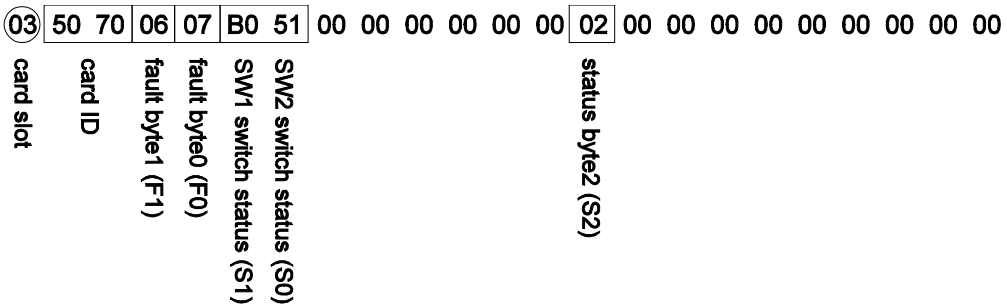
Bit Weight	Meaning
1	Aux Ref (primary and secondary) sources bad
2	Primary reference bad
+4	Secondary reference bad
7	
0	GPS faults = none (or mode disabled)
4	Oscillator not locked
0	No Card type faults

The Fault Monitor CPU has another serial output mode called machine report mode. This mode is usually used with a computer program to interrogate the 56000 system status. All faults are asserted as a logic 1. The faults are latched on the Oscillator card and must be cleared by the 560-5179-1 Fault Monitor CPU "CL" command.

The machine report mode displays hexadecimal (HEX) characters like the verbose mode report. (Refer to the fault descriptions mentioned previously.) The following is an example of a Fault Monitor CPU serial machine mode report:

TrueTime 56000 Site 01
AR1
PR10
P A1 B1 Co P1 S1 To
01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
03 50 70 05 07 B0 51 00 00 00 00 00 00 02 00 00 00 00 00 00 00 00 00
04 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
(card slots 05 through 14 HEX not shown)

Example from card slot 3 above:



1. 560-5203-0 card ID: 0x5070

2. Fault byte1 (F1) description:

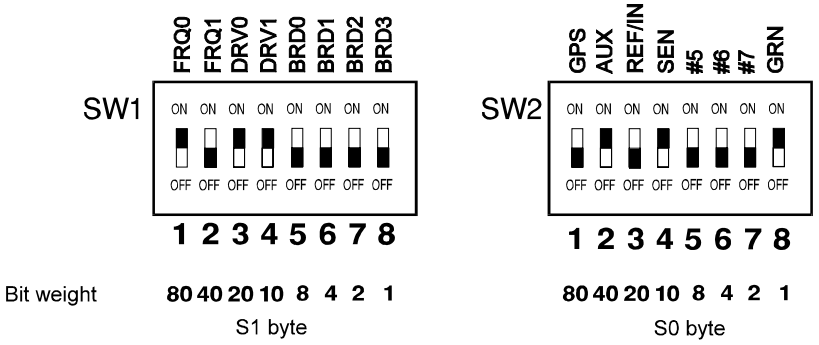
Bit	Weight HEX	Fault Meaning	From Example
0	01	Osc Tune	00
1	02	PLL	02
2	04	Lock	04
3	08	Rb. Lockmon	00
4	10	always 0	00
5	20	always 0	00
6	40	always 0	00
7	80	Powercycle	+00
			06

3. Fault byte0 (F0) description:

Bit	Weight HEX	Fault Meaning	From Example	
0	01	Aux Ref	01	
1	02	Primary	02	
2	04	Secondary	04	
3	08	always 0	00	
4	10	Antenna	00	GPS Mode only
5	20	Receiver	00	GPS Mode only
6	40	+5Vmon	00	GPS Mode only
7	80	always 0	+ 00	
			07	

4. Status byte1 (S1) and status byte0 (S0) descriptions:

   SW1 and SW2 switch status (settings) are displayed as four HEX nibbles. The switches are mapped to the machine report display in the following manner:



From the example:

Status byte1	=	80	Status byte0	=	40
		20			10
	+	10		+	01
		B0			51

5. Status byte2 (S2) description:

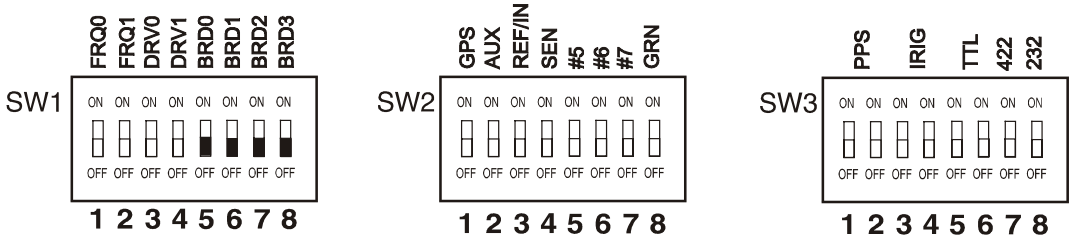
   The least significant nibble of this byte includes 3 status bits.

   Bit 0 = Oscillator has been locked to GPS = 1
   Bit 1 = The Oscillator has been locked (first time) = 1
   Bit 2 = GPS/AUX = 1 when using GPS to discipline the oscillator
   = 0 when using Aux Ref to discipline the oscillator
   Bit 4 = not used = 0

2.12.

560-5203-0 Switch Settings

(fill in the switch positions after configuring the card)



Output Frequency Select -- SW1-1,2 (FRQ0,FRQ1)

- ☐ 10 MHz = 1 ON, 2 OFF
- ☐ 5 MHz = 1 OFF, 2 ON
- ☐ 1 MHz = 1 ON, 2 ON

Output Drive Select -- SW1-3,4 (DRV0,DRV1)

- ☐ REFA = 3 ON, 4 OFF
- ☐ REFB = 3 OFF, 4 ON
- ☐ REFC = 3 ON, 4 ON

GPS Mode -- SW2-1 (GPS)

- ☐ OFF = Disabled
- ☐ ON = Enabled

Aux Ref Mode -- SW2-2 (AUX)

- ☐ OFF = Disabled
- ☐ ON = Enabled

Operating Mode -- SW2-3 (REF/IN)

- ☐ OFF = Reference Mode
- ☐ ON = Input Mode

Secondary Aux Ref control -- SW2-4 (SEN)

- ☐ OFF = Secondary Aux Ref Input Disabled
- ☐ ON = Secondary Aux Ref Input Enabled

Timing Output Latch Enable -- SW2-7 (#7)

- ☐ OFF = Timing outputs will not latch
- ☐ ON = Timing outputs latch at GPS lock

GREEN LED -- SW2-8 (GRN)

- ☐ OFF = No Green when locked
- ☐ ON = Green when locked

NOTE: SW3 selections only viable with GPS option.

SECTION THREE

3. THEORY OF OPERATION

3.1. GENERAL INFORMATION

This section contains a detailed description of the circuits in this card. These descriptions should be used in conjunction with the drawings in SECTION FOUR.

3.2. CIRCUIT BOARD DESCRIPTION

The 560-5203-0 card is, in its simplest form, a disciplined oscillator whose disciplining frequency is provided by two separate frequency sources in such a way that no glitches are generated when either of the inputs are lost. The 560-5203-0 Oscillator uses an 87-902 card, which is piggybacked onto it, to provide the oscillator disciplining function.

3.3. POWER SUPPLY

This card utilizes DC to DC Converters to provide the required voltages from the input 48 VDC. The power supplies are protected from overloads by a Polyswitch fuse device and a diode provides protection against polarity reversal of the input power. A PI section LC filter on the input of each converter reduces conducted emissions from the converters back into the mains. The input inductor and diode also minimize the effects of inrush current during hot-swapping. The output of each supply is filtered to reduce switching noise. The +12 VDC converter supplies +12V power and connects to a voltage inverter which provides -12V power.

3.4. OSCILLATORS AND BUFFERS

The local oscillator is disciplined to the Aux Ref input frequency. Voltage comparators provide isolation, voltage gain, and level translation. The Aux Ref disciplining signal may be 1, 5, or 10 MHz, but the 87-902 card requires 1 MHz. The Aux Ref disciplining input is frequency detected automatically and a divider is employed to count 5 and 10 MHz down to 1 MHz. The 87-902 card provides a 10 MHz (XL10MHZ) output locked to the Aux Ref input. Again, a divider is employed to generate 1, 5 or 10 MHz (see OUTPUT FREQUENCY SELECT Section) for output via one of the three frequency signal buses FREQA/B/C (see OSCILLATOR OUTPUT DRIVE SELECT). A 1.5 second time delay network is used to hold off the application of this frequency to the selected frequency bus (after reset has stabilized during power up or during a hot swap event).

3.5. FRONT PANEL STATUS LED

Refer to Section 2.4, FRONT PANEL LED for possible indications. The bicolor LED is powered by the isolated 48 VDC that is the input power to

the card. The RED / GREEN LED is controlled by an optically isolated dual solid state relay. This LED control method allows the solid RED LED fault indication to occur when local card power is bad.

3.6. BACKPLANE FAULT OUTPUT

The Backplane FAULT output (/FLTOUT) is a bi-directional signal used by the Fault Monitor CPU in conjunction with BD7:0, DIR and /STB for bi-directional serial communications with fault detection and status/control logic within the Xilinx FPGA.

3.7. TIMING OUTPUTS

The 560-5203-0 Oscillator card's timing outputs, 1 PPS and IRIG-B AM signals are only available when the card has the GPS option (560-5202 card) installed. These signals are commanded OFF when the card is operated with only Aux Ref Mode.

3.8. SERIAL PORT

The 560-5203-0 Oscillator card serial port (RS-232 and RS-422) is only available with the 560-5202 GPS option card installed.

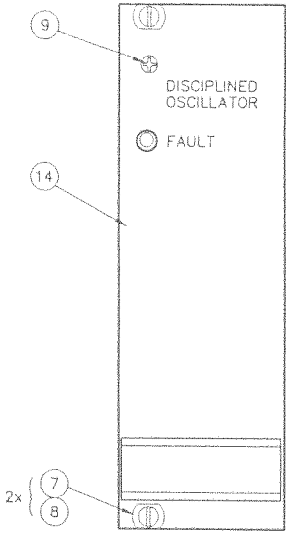
SECTION FOUR

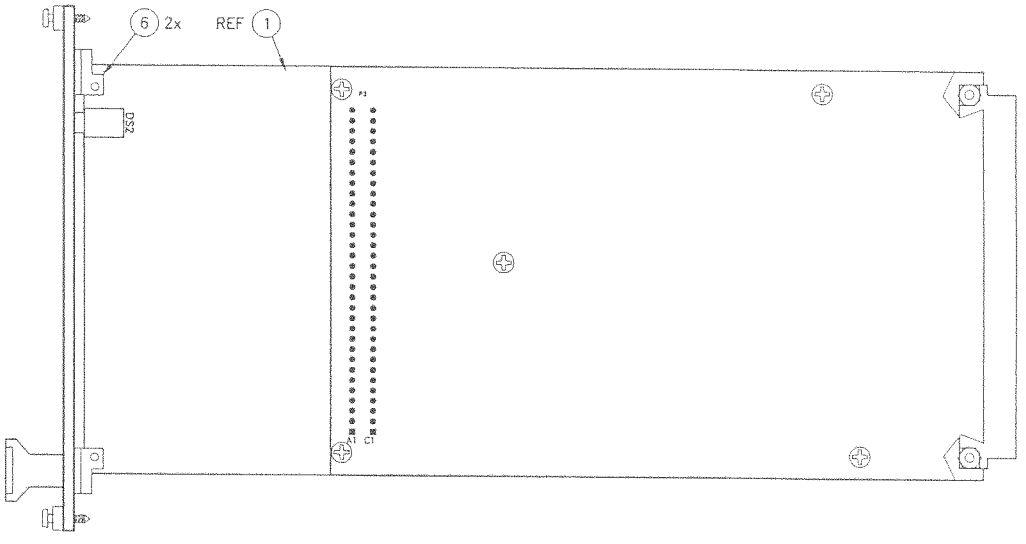
4. DETAILED DRAWINGS

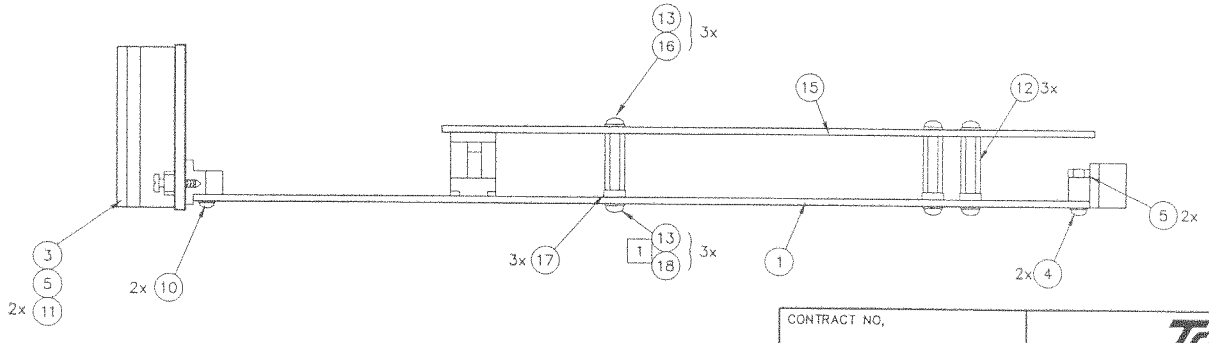
4.1. 560-5203-0 DETAILED DRAWINGS / BILL OF MATERIALS

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REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ADDED ITEMS 4 & 5	09/09/98	
B	CAR 1390	02/08/99	







[1] SECURE SCREWS USING LOCTITE (ITEM 18).

NOTES: UNLESS OTHERWISE SPECIFIED.

CONTRACT NO,	
APPROVALS	DATE
DRAWN BY KOLLANDER	5/98
CHECKED BY	
APPROVED BY	3/99
NEXT ASSY	

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FINAL ASSY OSC (TCXO)

SIZE	CODE IDENT NO.	DRAWING NO.	REV
B		560-5203-0	B

SCALE NONE SHEET 1 OF 1

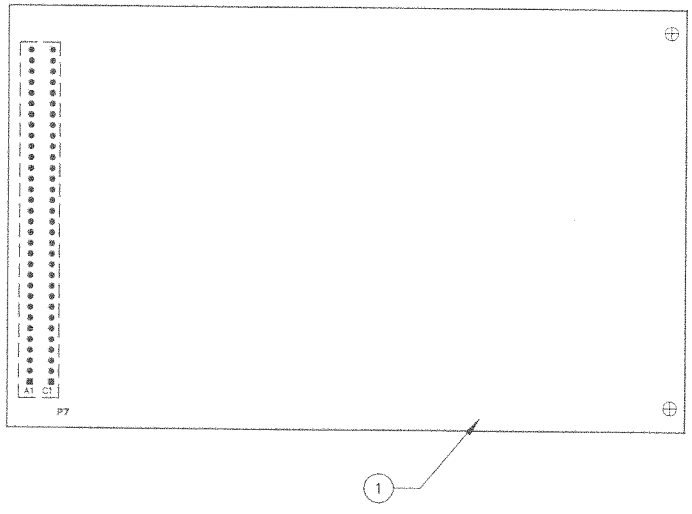
FILENAME: \560\5203-0
DATE: 02-08-99

MAX * BILL OF MATERIALS * SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	UOM	REV LVL	REFERENCE DESCRIPTION
560-5203-0	ASSY 56K OSC (TCXO)					EA		
0000-APPROVAL	PARTS LIST APPROVAL		000000		1.0000	EA		
0000-PL	PARTS LIST REV LEVEL		000000		1.0000	EA		REV B (02-16-99)
0000-PRINT	REFERENCE PRINT		000000		1.0000	EA		560-5203-0 REV B
182-8010	EPROM PROGRAMMING	56K GPS (TCXO)	000000		1.0000	EA		DOWNLOAD TO XL2
223-008	HANDLE FOR 3U X 8HP	SCHROFF 20808-062	000000		1.0000	EA		03
223-138	SCREW SH CH ZN M2.5X10	SCHROFF #21100-138	000000		2.0000	EA		04
223-144	NUT M2.5	SCHROFF #21100-144	000000		3.0000	EA		05
223-181	HOLDER (PB) DIE CAST	SCHROFF 20827-072	000000		2.0000	EA		06
223-379	SCREW CAP NP M2.5 X 11	SCHROFF #21100-379	000000		2.0000	EA		07
223-464	SLEEVE, STAINLESS	SCHROFF 21100-660	000000		2.0000	EA		08
223-500	SCREW PH FH NP M2.5X10	SCHROFF #21100-500	000000		1.0000	EA		09
240-004-002	SCREW PH PN SS 4-40X1/4	SCREW PAN	000000		6.0000	EA		13
249-005	SCREW M2.5 X 8	SCHROFF #21100-140	000000		2.0000	EA		10
249-007	SCREW SH CH ZN M2.5X12	SCHROFF 21100-148	000000		2.0000	EA		11
253-004	WSHR, FLAT #4 SS .209 OD	SMALL PATTERN (USE -004S)	000000		3.0000	EA		17
254-.312	WSHR SPLIT #4 SS	STAINLESS	000000		3.0000	EA		16
255-004-005S	SPACER HEX F-F 4-40X5/8	HH SMITH 9153	000000		3.0000	EA		12
282-001	SEALANT LOCTITE 222	LOCTITE 222	000000		0.0100	EA		18
345-033	OSC AUXINTOSC (14DIP)	CHAMPION K1525AA-10.0MHZ	000000		1.0000	EA		G2 (ON 87-902)
560-1245	PANEL,FRONT OSC (HISTAB)	FAB/SCREEN	000000		1.0000	EA		14
560-5203	ASSY 56K GPS (MOTHER)	MADE FROM 560-2203	000000		1.0000	EA		01
87-902	FNL ASSY GPS-XL2(FOR 56K)		000000		1.0000	EA		15
LA	LABOR ASSEMBLY COST HRS		000000		0	EA		
LT	LABOR TEST COST HOURS		000000		0	EA		
OSV560-5203-0	OUTSIDE LABOR 560-5203-0	PCA	000000		1.0000	EA		

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REVISIONS			
REV	DESCRIPTION	DATE	APPROVED





[1] INSTALL ITEM 2 ON BOTTOM OF BOARD WITH PIN 32 IN PIN 1.

NOTES: UNLESS OTHERWISE SPECIFIED.

FILENAME: 87\87-902
DATE: 09-24-98

CONTRACT NO.		TrueTime® "Where Customer Satisfaction is our Highest Priority" 2835 Duke Ct. Santa Rosa, CA 95407			
APPROVALS	DATE	FINAL ASSEMBLY GPS-XL2 (56K)			
DRAWN BY RNR	05/98				
CHECKED BY					
APPROVED BY KRK	9/98				
NEXT ASSY		SIZE B	CODE IDENT NO.	DRAWING NO. 87-902	REV N/C
		SCALE NONE		SHEET 1 OF 1	

MAX * BILL OF MATERIALS * SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

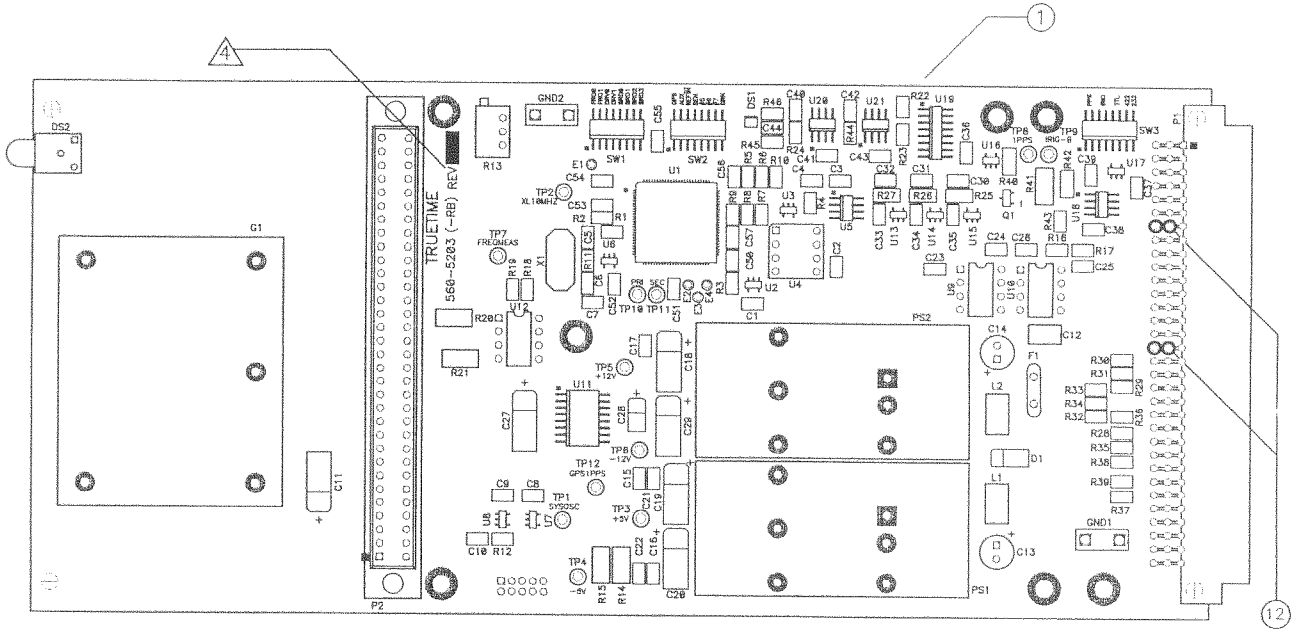
PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	UOM	REV LVL	REFERENCE DESCRIPTION
87-902	FNL ASSY GPS-XL2(FOR 56K)					EA		
0000-APPROVAL	PARTS LIST APPROVAL		0000		1.0000	EA		KRK/DC 7/98
0000-PL	PARTS LIST REV LEVEL		0000		1.0000	EA		REV N/C (05-21-98)
0000-PRINT	REFERENCE PRINT		0000		1.0000	EA		87-902 REV N/C
372-64PI	CONN 64-P ML INVERSE DIN	T&B 211-96450-6008	0000		1.0000	EA		02
86-902	ASSY GPS-XL2 (FOR 56K)	MADE FROM 085-900	0000		1.0000	EA		01
LA	LABOR ASSEMBLY COST HRS		0000		0	EA		
LT	LABOR TEST COST HOURS		0000		0	EA		

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
02	CORRECTED DS1 PIN SPACING, MODIFIED CIRCUITRY	06-25-98	
A	MODIFIED PER ECO #1187	02-09-99	KRK

NOTES: UNLESS OTHERWISE SPECIFIED

1. ASSEMBLE PER ASSEMBLY REQUIREMENTS DOCUMENT 421-11.
2. RESISTOR VALUES IN OHMS, CAPACITORS IN MICRO FARADS.
3. POLARIZED CAPACITORS ARE SHOWN WITH A ROUNDED EDGE INDICATING THE POSITIVE SIDE.

(4) STAMP 560-5203 (-RB) PCB ASSEMBLY REVISION LEVEL



TOP SIDE

(12) 4X PLACE FERRITE BEADS AROUND CONNECTOR LEADS BEFORE SOLDERING TO PC BOARD

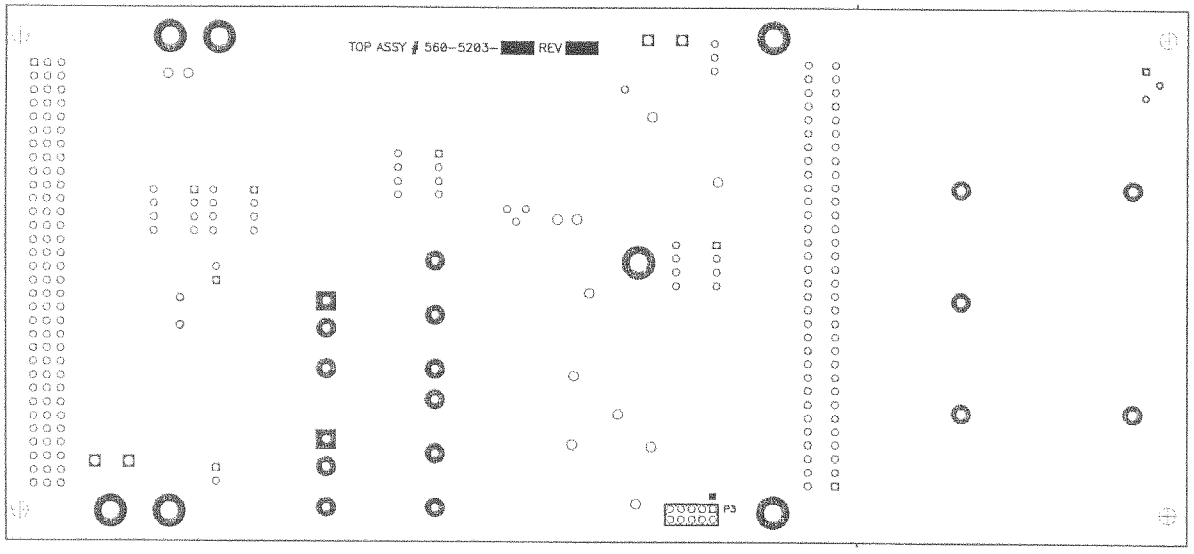
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APPROVALS		DATE
DRAWN BY	B.A.S.	05-19-98
CHECKED	KRK	
APPROVED		2/99

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Title	56000 XL2 MOTHERBOARD ASSEMBLY DRAWING, TOP SIDE	
Size B	Number 560-5203	Rev A
Date Mon Feb 08, 1999 14:09:57		Drawn by B.A.S.
Filename 2203-02.PCB		Sheet 1 of 5



BOTTOM SIDE

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Title	56000 XL2 MOTHERBOARD ASSEMBLY DRAWING, BOTTOM SIDE	
Size: B	Number: 560-5203	Rev: A
Date: Mon Feb 08, 1999 14:09:58	Drawn by: B.A.S.	
Filename: 2203-02.PCB	Sheet 2 of 5	

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