

1.544 MHz Frequency Synthesizer Option

SECTION XX-I - GENERAL INFORMATION

1-1 INTRODUCTION

1-2 The Frequency Synthesizer Option (86-392-5) has been configured to output a 1.544 MHz TTL into 50 ohm square wave on a rear panel BNC connector.

1-3 FREQUENCY SYNTHESIZER OUTPUT SPECIFICATIONS

Square Wave Output: (OPTION) TTL levels into 50 Ohms.
Connector: Female BNC

SECTION XX-II - INSTALLATION

2-1 INTRODUCTION

2-2 No installation is required when this option is purchased with the receiver. The following installation instructions apply only to installation after the initial purchase of the receiver.

2-3 FIELD INSTALLATION

2-4 Supplied with the Frequency Synthesizer Option are the following items:

1. Assembly 86-392-5
2. Mounting hardware
3. Firmware and Replacement Instructions

2-5 **Warning:** Only a qualified technician should attempt installation of this option. Dangerous voltages are present which can cause electric shock that could result in severe injury or even death. Disconnect all power before disassembling the unit!

2-6 The only equipment required for installation is a Phillips screwdriver and an EPROM extraction tool.

2-7 If the receiver is rack mounted, first remove it from the rack as described in Section II of this manual. Installation requires inserting the 86-392-5 Assembly into an empty option slot.

2-8 Remove the top lid and retain the screws. Remove the cover plate of an empty option slot and save the screws. Slide the option assembly into the guides on the side rails of the slot and firmly press the assembly connector into the Bus Backplane Assembly connector. Secure the option to the chassis with the previously saved screws. Install the new EPROM as described in

the EPROM Replacement Instructions sent with the option. Replace the lid and secure with the previously saved screws.

SECTION XX-III - OPERATION

3-1 INTRODUCTION

3-2 The 86-392-5 Frequency Synthesizer Option Board has been configured for a fixed frequency output of 1.544 MHz. A PLL consisting of a VCXO using a 9.264 MHz crystal and associated circuitry provide the Time Stable reference output.

SECTION XX-IV - THEORY OF OPERATION

4-1 INTRODUCTION

4-2 The XL-DC Processor Assembly 87-612 and the 86-392-5 Assembly implement the Frequency Synthesizer Option. Refer to Section IV of the manual for the theory of operation of all assemblies except the Frequency Synthesizer Assembly which is explained below.

4-3 FREQUENCY SYNTHESIZER ASSEMBLY 86-392-5

4-4 Reference drawing 86-392-5 sheet 2. The Processor Assembly 87-612 initializes the the 86-392-5 Assembly at power on. U12's divide by M, N, P are set to the proper divides and custom multiplexer U16 is set to the proper values to produce the 1.544 MHz output.

4-5 The 9.264 MHz voltage controlled crystal oscillator output is connected to U12 where it is divided by 6 in the "DIVIDE BY P" counter to yield a square wave 1.544 MPPS signal. The 1.544 MPPS signal is divided by 1,544 in the "DIVIDE BY M" counter to yield the loop compare frequency of 1 KPPS.

4-6 Both the reference (clock's timing chain) 1 KPPS and the 9.264 MHz VCXO derived 1 KPPS signals are connected to U15, a 74HC4046 used only for phase detection. U15's phase detector error term is amplified, filtered, and then connected back to the 9.264 MHz VCXO.

4-7 The stability of the 1.544 MPPS signal is a function of the drift rate error of the system oscillator (refer to keypad function 71) providing GPS based timing outputs.

4-8 The square wave 1.544 MPPS from this 86-392-5 board is driven by a LM6321 buffer (U21) that can drive a 50 ohm load at TTL levels. A 50 ohm resistive termination is required for this output.

SECTION XX-V - MAINTENANCE AND TROUBLESHOOTING

5-1 INTRODUCTION

5-2 This option has been designed to provide maintenance-free operation. Under normal use, it will require no calibration or adjustment. This section contains basic troubleshooting techniques.

5-3 TROUBLESHOOTING

5-4 The following test equipment is required for troubleshooting and adjustments:

1. 25 Mhz Oscilloscope

5-5 INCORRECT OUTPUT

5-6 Before assuming a clock malfunction, first be certain that the instrument using the Frequency Synthesizer Option is functioning properly. Verify that all connectors are secure and that coax cables are good. Verify that the XL-DC has acquired satellite signal and remains locked.

5-7 If the 1.544 MHz Frequency Synthesizer output frequency is not correct, monitor the output voltage of U17 pin 1 with an oscilloscope. The output voltage should be adjusted to 0 volts using trim capacitor C21. If a stable output voltage is unobtainable, monitor U15 pins 3 and 14 with an oscilloscope for the common compare frequency of 1 KHz. The two waveforms should remain locked to each other under proper operation - if not, recycle clock power and check again. If adjusting trim capacitor C21 does not provide a solution to the failure, please contact a TrueTime Customer Service Representative.

SECTION XX

3-93

2.048 MHz Frequency Synthesizer Option

SECTION XX-I - GENERAL INFORMATION

1-1 INTRODUCTION

1-2 The Frequency Synthesizer Option has been configured to output a Time Stable 2.048 MHz sine wave or a TTL square wave to a rear panel BNC connector.

1-3 FREQUENCY SYNTHESIZER OUTPUT SPECIFICATIONS

Sine Wave Output: (OPTION) Factory set to 1 VRMS into 50 Ohms.
Square Wave Output: (OPTION) TTL levels into 50 Ohms.
Connector: Female BNC

SECTION XX-II - INSTALLATION

2-1 INTRODUCTION

2-2 No installation is required when this option is purchased with the receiver. The following installation instructions apply only to installation after the initial purchase of the receiver.

2-3 FIELD INSTALLATION

2-4 Supplied with the Frequency Synthesizer Option are the following items:

1. Assembly 86-392-(OPTION)
2. Mounting hardware
3. EPROM set and Replacement Instructions

2-5 **Warning:** Only a qualified technician should attempt installation of this option. Dangerous voltages are present which can cause electric shock that could result in severe injury or even death. Disconnect all power before disassembling the unit!

2-6 The only equipment required for installation is a Phillips screwdriver and an EPROM extraction tool.

2-7 If the receiver is rack mounted, first remove it from the rack as described in Section II of this manual. Installation requires inserting the 86-392 Assembly into an empty option slot.

2-8 Remove the top lid and retain the screws. Remove the cover plate of an empty option slot and save the screws. Slide the option assembly into the guides on the side rails of the slot

and firmly press the assembly connector into the Bus Backplane Assembly connector. Secure the option to the chassis with the previously saved screws. Install the new EPROMs as described in the EPROM Replacement Instructions sent with the option. Replace the lid and secure with the previously saved screws.

SECTION XX-III - OPERATION

3-1 INTRODUCTION

3-2 The 86-392 Frequency Synthesizer Option Board has been configured for a fixed frequency output of 2.048 MHz. A PLL consisting of a VCXO using a 8.192 MHz crystal and associated circuitry provide the Time Stable reference output.

SECTION XX-IV - THEORY OF OPERATION

4-1 INTRODUCTION

4-2 The Processor Assembly 86-320, Timing Assembly 86-330 and Assembly 86-392 implement the Frequency Synthesizer Option. Refer to Section IV of the manual for the theory of operation of all assemblies except the Frequency Synthesizer Assembly which is explained below.

4-3 FREQUENCY SYNTHESIZER ASSEMBLY 86-392

4-4 Reference drawing 86-392-1 sheet 1. The Processor Assembly 86-320 provides the programmable divide by N data to U12 at unit power on (INITIALIZATION). Timing Assembly 86-330 provides the Time Stable 1 MHz (synchronized to UTC-USNO).

4-5 U15 phase detector compares the system 1 MHz (divided down to 8 KHz by the "N" programmable counter U12) and the 8.192 MHz VCXO output (divided down to 8 KHz by pre-scaler U13 and the divide by "M" programmable counter U12) to keep the loop locked. The tri-state phase detector output (U15) is connected to gain stage and integrator U17 which controls varactor diode D2 for phase error control of the oscillator. The 4.096 MHz from pre-scaler U13 is divided by 2 with the programmable divide by "P" section of U12 to produce the 2.048 MHz frequency rate. This output is connected to U16, a PAL configured as a multiplexer, and selected to output the 2.048 MHz to J4. The 2.048 MHz square wave signal from J4 is optionally connected to a 50 ohm TTL driver U21 or to a square wave to sine wave converter circuit in the case of the sine wave output option. The sine wave converter section has tuned circuits for 2.048 MHz as well as AGC control for constant output over temperature.

SECTION XX-V - MAINTENANCE AND TROUBLESHOOTING

5-1 INTRODUCTION

5-2 This option has been designed to provide maintenance-free operation. Under normal use, it will require no calibration or adjustment. This section contains basic troubleshooting techniques.

5-3 TROUBLESHOOTING

5-4 The following test equipment is required for troubleshooting and adjustments:

1. 25 Mhz Oscilloscope

5-5 INCORRECT OUTPUT

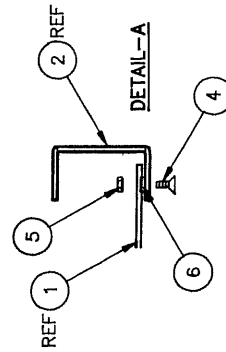
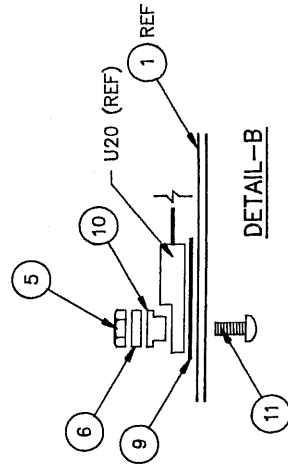
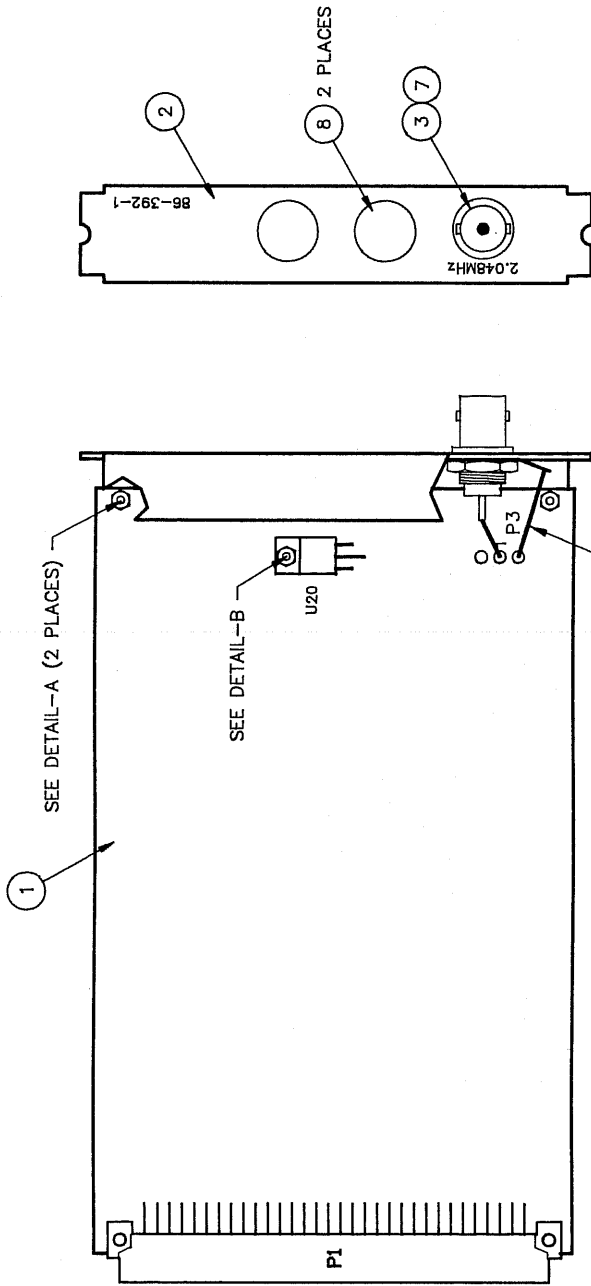
5-6 Before assuming a clock malfunction, first be certain that the instrument using the Frequency Synthesizer Option is functioning properly. Verify that all connectors are secure and that coax cables are good. Verify that the GPS-DC Mark III has acquired satellite signal and remains locked. If not, refer to "SATELLITE SIGNAL LOST PERMANENTLY OR NEVER ACQUIRED" in Section V.

5-7 If the 2.048 MHz Frequency Synthesizer output frequency is not correct monitor the output voltage of U17 pin 1 with an oscilloscope. The output voltage should be adjusted to 0 volts using trim capacitor C21. If a stable output voltage is unobtainable, monitor U15 pins 3 and 14 with an oscilloscope for the common compare frequency of 8 KHz. The two waveforms should remain locked to each other under proper operation - if not, recycle clock power and check again. If adjusting trim capacitor C21 does not provide a solution to the failure, please contact a TrueTime Customer Service Representative.

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ZONE	LTR	DESCRIPTION	DATE	APPROVED
	D	PRINT CREATED	06-09-93	KPK

REVISIONS	DATE	APPROVED
	06-09-93	KPK

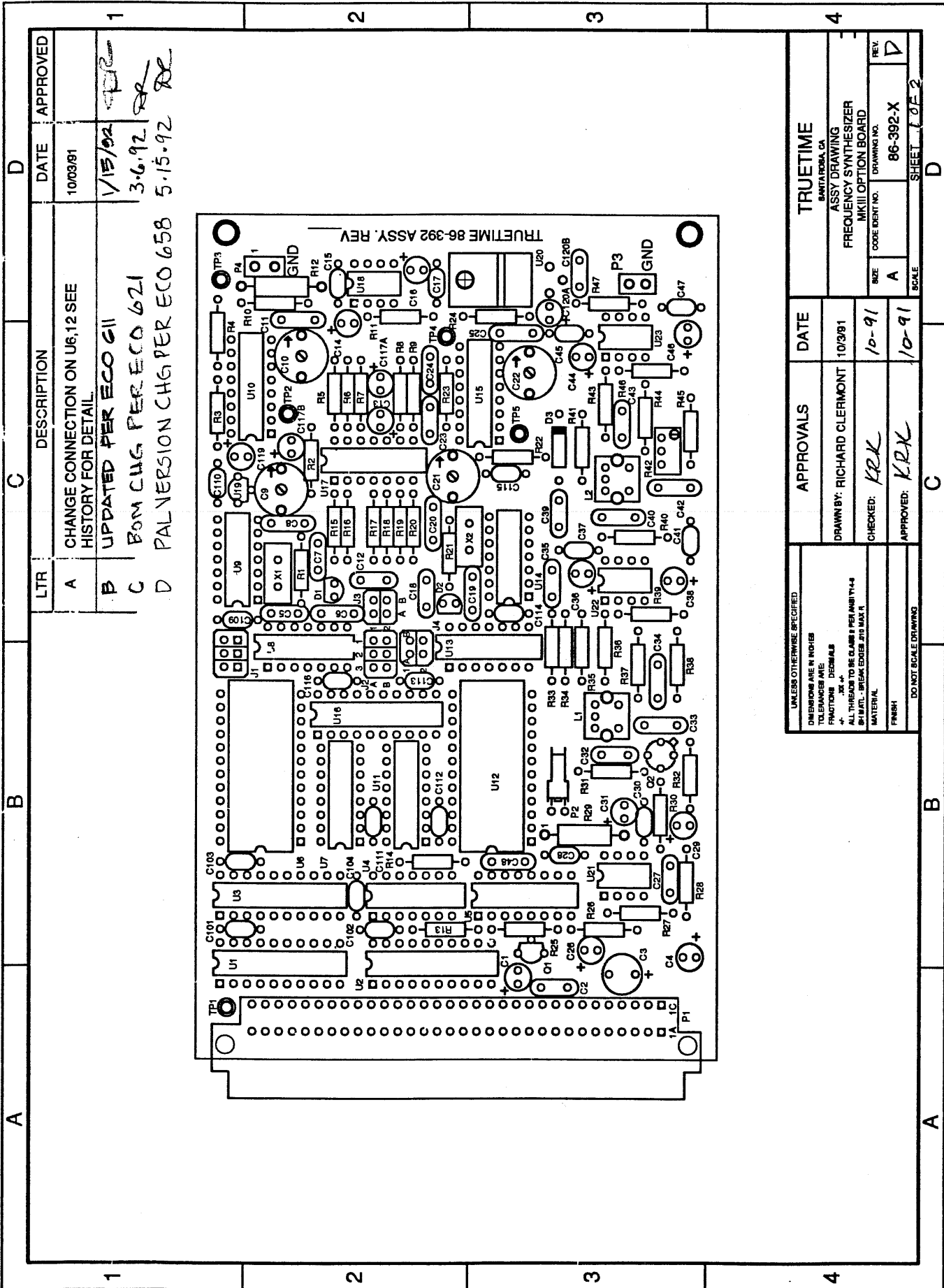


TrueTime SANTA ROSA, CA	
ASSEMBLY 2.048MHZ FREQ SYNTHESIZER	
APPROVALS	DATE
DRAWN BY D. EDILLOR	06-93
CHECKED BY	
APPROVED BY <i>KPK</i>	6-9-93
NEXT ASSY	
SIZE	CODE IDENT NO. DRAWING NO.
B	86-392-1 D
SCALE NONE	
SHEET 1 OF 1	

FILENAME: \86\392-1
 DATE: 06-08-93

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

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UOM LVL	REFERENCE DESCRIPTION
86-392-1	ASSY FREQ 2.048MHZ SINE	OPTION BOARD MKIII				EA	
0000-APPROVAL	PARTS LIST APPROVAL				1.00	EA	<i>KRK 6-10-93</i>
0000-PL	PARTS LIST REV LEVEL				1.00	EA	REV D (06-10-93)
0000-PRINT	REFERENCE PRINT				1.00	EA	86-392-1 REV D
0001-PRINT	REFERENCE PRINT				1.00	EA	SCHEM SEE 86-392-X
002-037	RES 33 OHM 1/4W 5%	R25J330			1.00	EA	R36
002-042	RES 51 OHM 1/4W 5%	R25J510			2.00	EA	R40,47
002-049	RES 100 OHM 1/4W 5%	R25J201			1.00	EA	R43
002-065	RES 470 OHM 1/4W 5%	R25J471			8.00	EA	R28,30,32,37-39,44,46
002-073	RES 1K OHM 1/4W 5%	R25J102			1.00	EA	R45
002-097	RES 10K OHM 1/4W 5%	R25J103			1.00	EA	R41
002-115	RES 56K OHM 1/4W 5%	R25J563			1.00	EA	R35
002-122	RES 110K OHM 1/4W 5%	R25J114			1.00	EA	R33
002-145	RES 1 MEG OHM 1/4W 5%	R25J105			1.00	EA	R34
002-153	RES 2.2 MEG OHM 1/4W 5%	R25J225			1.00	EA	R31
019-007	POT 1K 20 TURN T ADJ ^	BECKMAN 68WR1K			1.00	EA	R42
029-022	CAP MICA 39PF V R 5%	CORNELL CD15ED390J03			2.00	EA	C33,40
029-050	CAP MICA 470PF V R 5%	CORNELL D155F471J03			2.00	EA	C34,42
036-095	CAP MONO 0.1UF 100V R 20%	MURATA RPE12275U104M50V			5.00	EA	C27,35,39,43,120B
036-101	CAP MONO .1UF 50V	KEMET C410C104(1)SUSCA			4.00	EA	C37,41,45,47
036-120	CAP MONO 1UF 50V R	MURATA RPE12375U105M50V			1.00	EA	C32
037-033	CAP TANT 2.2UF 35V R	NEMCO TB2.2/35 K1			6.00	EA	C29,36,38,44,46,120A
045-150	INDUCTOR 150UH	TOKO A7BRS-T1042Z			2.00	EA	L1,2
175-211	XSISTOR 3N211	3N211 OBSOLETE;USE MFE211			1.00	EA	02
176-7906	7906CT	MOTOROLA MC7906CT			1.00	EA	U20
176-CLC404AJP	CLC404AJP WB HSR OP AMP	COMLINEAR CLC404AJP			2.00	EA	U22,23
218-337	REAR PNL PLT, 3 BNC HOLES	MOD TO 218-300			1.00	EA	02
240-004-003	SCREW PH PN SS 4-40X3/8	SCREW PAN			1.00	EA	11
241-004-003	SCREW PH FH SS 4-40X3/8	BUY/USE 100 DEGREE ONLY			2.00	EA	04
251-004	NUT KEP SS 4-40	KEPNUT			3.00	EA	05
256-.375	LUG SOLDER BR 3/8 DIA	HH SMITH 1497			1.00	EA	07
269-004	WSHR FLAT NYL 4 1/16	1/4INCH OD			3.00	EA	06
271-004	WSHR SHLDR NYL 4	MOTOROLA B51547F019			1.00	EA	10
272-009	INSULATOR TO-220 SIL PAD	BERGQUIST 3223-07AC-55			1.00	EA	09
274-005	PLUG HOLE NYL 3/8 DIA	HH SMITH 3091/HEYCO 2617			2.00	EA	08
375-001	CONN BNC FM BULKHD RECP ^	KINGS KC-79-35			1.00	EA	03
57-5082-2800	DIODE	HP #5082-2800			1.00	EA	D3
86-392-0	ASSY FREQ 2.048MHZ(BASIC)	GENERIC-NO TTL OR SINE			1.00	EA	01
LA	LABOR ASSEMBLY COST HRS				0	EA	
LT	LABOR TEST COST HOURS				0	EA	
OSV86-392-1	OUTSIDE LABOR 86-392-1				1.00	EA	



TRUETIME 86-392 ASSY, REV

LTR	DESCRIPTION	DATE	APPROVED
A	CHANGE CONNECTION ON U6,12 SEE HISTORY FOR DETAIL.	10/03/91	
B	UPDATED PER ECO 611	1/15/92	<i>RR</i>
C	ROM CUG PER ECO 621	3.6.92	<i>RR</i>
D	PAL VERSION CHG PER ECO 658	5.15.92	<i>RR</i>

APPROVALS	DATE	TRUETIME
DRAWN BY: RICHARD CLERMONT	10/3/91	SANTA ROSA, CA
CHECKED: <i>KRK</i>	10-91	ASSY DRAWING
APPROVED: <i>KRK</i>	10-91	FREQUENCY SYNTHESIZER
		MKIII OPTION BOARD
		SIZE CODE IDENT NO. DRAWING NO.
		A 86-392-X
		SCALE SHEET 1 OF 2

UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES
 TOLERANCES ARE:
 FRACTIONS DECIMALS
 ALL DIMENSIONS TO BE CLAMPS PER ANSI Y14-4
 IN MATERIAL - BREAK EDGES PER MAX 1
 MATERIAL FINISH
 DO NOT SCALE DRAWING

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

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UOM LVL	REFERENCE DESCRIPTION
86-392-0	ASSY FREQ 2.048MHZ(BASIC)	GENERIC-NO TTL OR SINE				EA	
0000-PL	PARTS LIST REV LEVEL				1.00	EA	REV A (05-15-92)
0000-PRINT	REFERENCE PRINT				1.00	EA	SEE ASSY 86-392-X
0000-REV	PCB REV LEVEL HERE >>>>				1.00	EA	085-392 REV A
002-073	RES 1K OHM 1/4W 5%	R25J102			2.00	EA	R13,19
002-097	RES 10K OHM 1/4W 5%	R25J103			5.00	EA	R2,16,17,18,23
002-121	RES 100K OHM 1/4W 5%	R25J104			1.00	EA	R20
002-153	RES 2.2 MEG OHM 1/4W 5%	R25J225			1.00	EA	R15
002-157	RES 3.3 MEG OHM 1/4W 5%	R25J335			1.00	EA	R21
029-013	CAP MICA 15PF V R 5%	CORNELL CD155C150J0			1.00	EA	C20
029-016	CAP MICA 22PF V R 5%	CORNELL CD15ED220J03			1.00	EA	C18
029-041	CAP MICA 220PF V R 5%	CORNELL D155F221J0			1.00	EA	C19
033-020	CAP CER TRIM 4-20PF	STETTNER 300322-405			1.00	EA	C21
035-008	CAP VARICAP MV2108 R	MOTOROLA #MV2108			1.00	EA	B2
036-083	CAP MONO 0.01UF 100V R	MURATA RPE110X7R103K50V			1.00	EA	C7
036-095	CAP MONO 0.1UF 100V R 20%	MURATA RPE122Z5U104M50V			1.00	EA	C12
036-101	CAP MONO .1UF 50V	KEMET C410C104(1)5U5CA			10.00	EA	C2,101-104,112-116
037-033	CAP TANT 2.2UF 35V R	PANASONIC EDS-FIVE-225K			7.00	EA	C1,3,4,13,117A,117B,119
059-8192	XTAL 8.192 MHZ	CROVEN A187-263/HC43 CASE			1.00	EA	X2
085-392	PCB FREQ. SYNTHESIZER OPT	MKIII OPTION PCB			1.00	EA	PCB
176-33184P	MC33184P OP AMP LOW POWER	MOTOROLA MC33184P			1.00	EA	U17
176-78L05	LM78L05ACP +5V REGULATOR	LM78L05ACP			1.00	EA	U19
176-C82C54	82C54-2 INTRVL TMR(10MHZ)	INTEL 82C54-2			1.00	EA	U12
178-74HC4046	MC74HC4046 PLL	MC74HC4046			1.00	EA	U15
178-74HC574	74HC574 OCTAL D FLIP-FLOP	74HC574			1.00	EA	U3
178-74HC74	MC74HC74 DUAL D FLIP-FLOP	MOTOROLA MC74HC74AN			1.00	EA	U13
178-74HCT245	74HCT245 OCTAL XCEIVER	MOTOROLA MC74HCT245N			1.00	EA	U1
178-74HCT32	74HCT32	74HCT32			1.00	EA	U4
178-74HCU04	74HCU04 HEX INVERTER	MOTOROLA MC74HCU04N			1.00	EA	U14
181-009	PROGRAMMED DEVICE (16LB)	PALMUX0, CK SUM 2908			1.00	EA	U16
181-010	PROGRAMMED DEVICE (16LB)	SYNADDR0,V1.2,CK SUM 2688			1.00	EA	U2
273-014	TERM TEST POINT (BLACK)	COMP. CORP TP-104-01-00			1.00	EA	TP1
372-64P-001	CONN 64-P MALE RT AGL	^ ANSLEY #MC064-012-3			1.00	EA	P1
LA	LABOR ASSEMBLY COST HRS				0	EA	
LT	LABOR TEST COST HOURS				0	EA	
DSV86-392-0	OUTSIDE LABOR 86-392-0				1.00	EA	

86-392-X

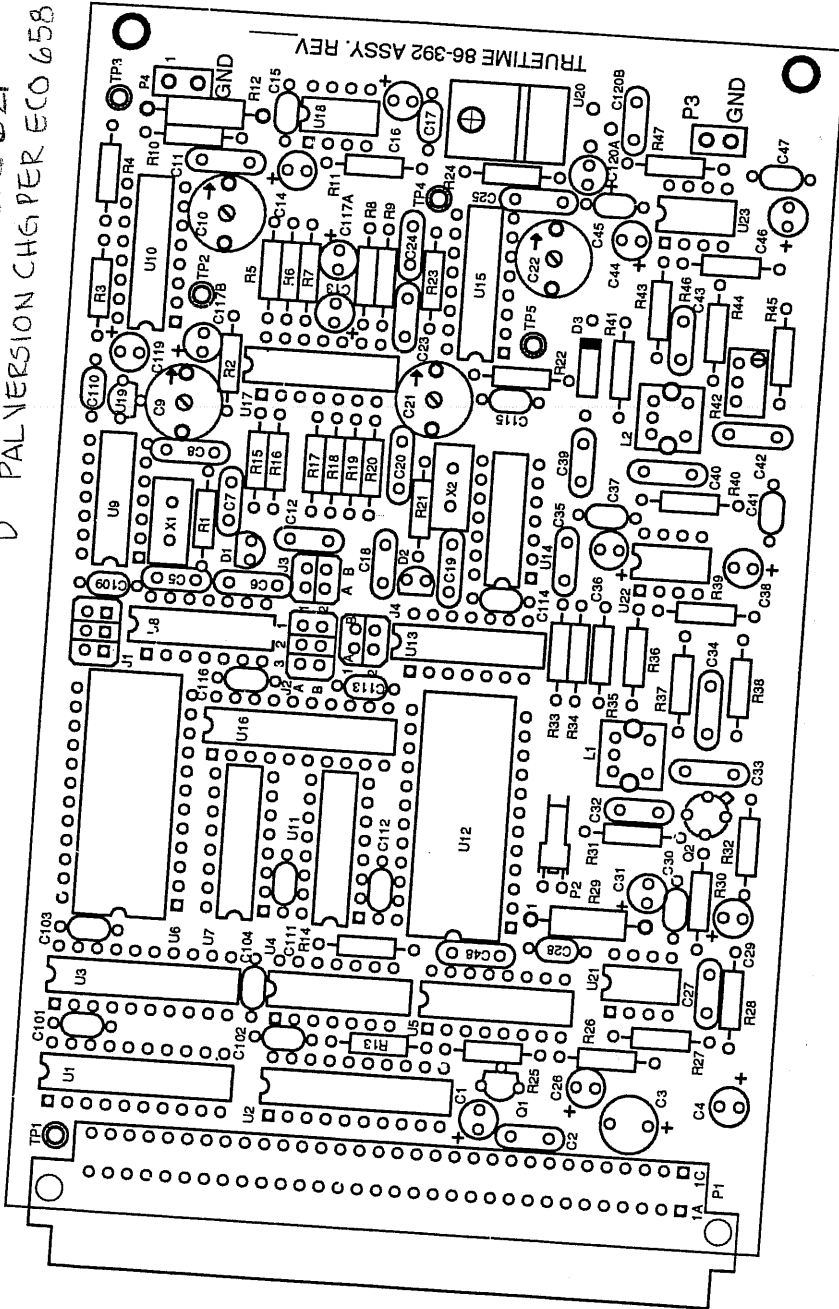
A

B

C

D

LTR	DESCRIPTION	DATE	APPROVED
A	CHANGE CONNECTION ON U6,12 SEE HISTORY FOR DETAIL	10/03/91	
B	UPDATED PER ECO 611	1/15/92	SPR
C	BOM CHG PER ECO 621	3-6-92	
D	PAL VERSION CHG PER ECO 658	5-15-92	DR



UNLESS OTHERWISE SPECIFIED		TRUETIME	
DIMENSIONS ARE IN INCHES		SANTA ROSA, CA	
FRACTIONS - DECIMALS		ASSY DRAWING	
ALL THROUGHS TO BE CLASS 2 PER ANSI Y14.4		FREQUENCY SYNTHESIZER	
BURN IN - BREAK EDGES AND MARK R		MKIII OPTION BOARD	
MATERIAL		SIZE	CODE IDENT NO.
FINISH		A	86-392-X
DO NOT SCALE DRAWING		SCALE	
			SHEET 002 OF 2
APPROVALS		DATE	REV.
DRAWN BY: RICHARD CLERMONT		10/3/91	D
CHECKED: KRX		10-91	
APPROVED: KRX		10-91	

A

B

C

D

1

2

3

4

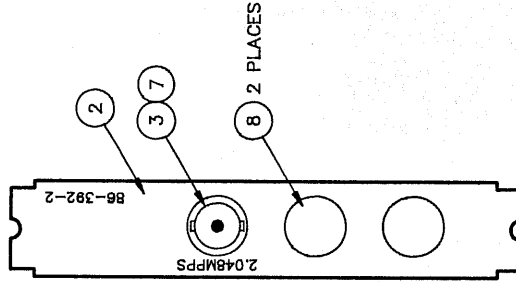
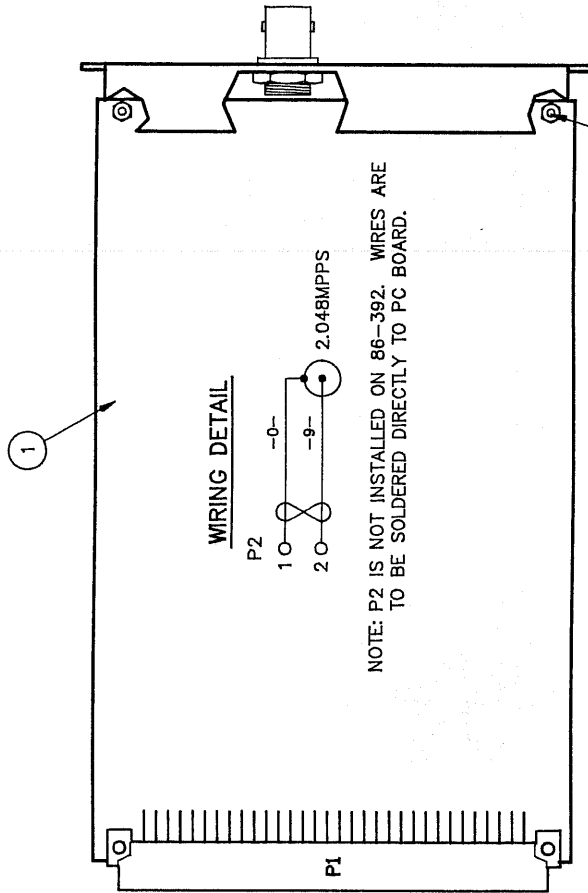
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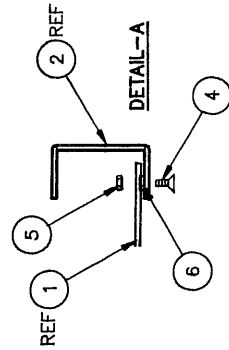
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REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
	C	PRINT CREATED	06-10-93	KPK



SEE DETAIL-A (2 PLACES)



TrueTime
SANTA ROSA, CA

**ASSY FREQUENCY
2.048MHZ TTL**

APPROVALS	DATE
DRAWN BY D. EDILLOR	06-93
CHECKED BY	
APPROVED BY <i>KPK</i>	6-10-93

FILENAME: \86\392-2	DATE: 06-08-93		
SIZE	CODE IDENT NO.	DRAWING NO.	REV.
B		86-392-2	C
SCALE: NONE		SHEET 1 OF 1	

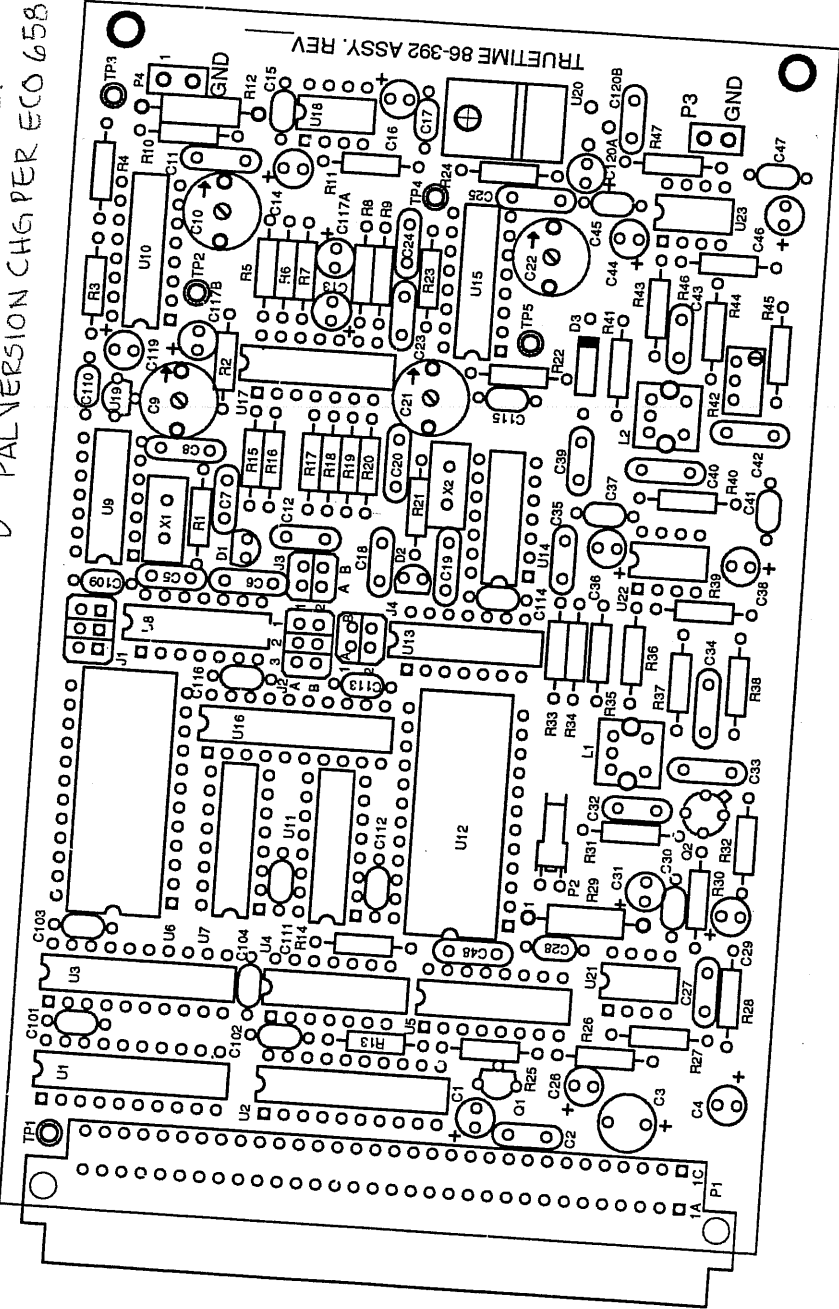
MAX * BILL OF MATERIALS * SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	UOM	REV LVL	REFERENCE DESCRIPTION
86-392-2	ASSY FREQ 2.048MHZ TTL	OPTION BOARD MKIII					EA	
0000-APPROVAL	PARTS LIST APPROVAL				1.00		EA	<i>KRK 6-9-93</i>
0000-PL	PARTS LIST REV LEVEL				1.00		EA	REV C (06-09-93)
0000-PRINT	REFERENCE PRINT				1.00		EA	86-392-2 REV C
0001-PRINT	REFERENCE PRINT				1.00		EA	SCHEM SEE 86-392-X
002-049	RES 100 OHM 1/4W 5%	R25J201			1.00		EA	R27
003-20R-0.5	RES 20 OHM 1/2W	ALLEN-BRADLEY EB-200-5			1.00		EA	R29
036-101	CAP MONO .1UF 50V	KEMET C410C104(1)5U5CA			2.00		EA	C28,30
037-033	CAP TANT 2.2UF 35V R	NEMCO TB2.2/35 K1			2.00		EA	C26,31
176-LM6321	LM6321 HI SPEED BUFFER	NATIONAL #LM6321N			1.00		EA	U21
218-337	REAR PNL PLT, 3 BNC HOLES	MOD TO 218-300			1.00		EA	02
241-004-003	SCREW PH FH SS 4-40X3/8	BUY/USE 100 DEGREE ONLY			2.00		EA	04
251-004	NUT KEP SS 4-40	KEPNUT			2.00		EA	05
256-.375	LUG SOLDER BR 3/8 DIA	HH SMITH 1497			1.00		EA	07
269-004	WSHR FLAT NYL 4 1/16	1/4INCH OD			2.00		EA	06
274-005	PLUG HOLE NYL 3/8 DIA	HH SMITH 3091/HEYCO 2617			2.00		EA	08
375-001	CONN BNC FM BULKHD RECP ^	KINGS KC-79-35			1.00		EA	03
86-392-0	ASSY FREQ 2.048MHZ(BASIC)	GENERIC-NO TTL OR SINE			1.00		EA	01
LA	LABOR ASSEMBLY COST HRS				0		EA	
LT	LABOR TEST COST HOURS				0		EA	
DSV86-392-2	OUTSIDE LABOR 86-392-2				1.00		EA	

86-392-X

D		DATE		APPROVED	
A		10/09/91			
B		1/15/92		[Signature]	
C		3.6.92		[Signature]	
D		5.15.92		[Signature]	

LTR	DESCRIPTION
A	CHANGE CONNECTION ON U6, 12 SEE HISTORY FOR DETAIL.
B	UPDATED PER ECO 611
C	BOM CHG PER ECO 621
D	PAL VERSION CHG PER ECO 658



UNLESS OTHERWISE SPECIFIED		APPROVALS		DATE		TRUETIME	
DIMENSIONS ARE IN INCHES		DRAWN BY: RICHARD CLEMONT		10/3/91		SANFORD, CA	
TOLERANCES ARE AS FOLLOWS		CHECKED: [Signature]		10-91		ASSY DRAWING	
FRACTIONS: DECIMALS		APPROVED: [Signature]		10-91		FREQUENCY SYNTHESIZER	
.XX = .001"		DO NOT SCALE DRAWING				MKIII OPTION BOARD	
ALL THREADS TO BE CLASS 8 PER ANSI 11.4		SCALE		A		DRAWING NO.	
SH. MATL. - BREAK EDGES .500 MAX R		C		A		86-392-X	
MATERIAL		B		A		REV.	
FINISH		A		A		D	
		D		D		SHEET 1 OF 2	