DN 6000243

TECHNICAL MANUAL
MODEL 503V
• TIMECODE GENERATOR/TRANSLATOR •

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ACROAMATICS DOCUMENT HISTORY

The following table indicates major changes made to *Technical Manual - 503V Timecode Generator/Translator*, Acroamatics Document Number 6000243, released on June 5, 2000, and contains a record of all revisions made since that date.

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SECTION 1
INTRODUCTION

1.1 DESCRIPTION

The Model 503V Time Code Translator/Generator is a VME compatible, 6U card that converts amplitude modulated IRIG time code signals to a digital representation for downstream analysis. The Model 503V provides BCD time-of-year (days through microseconds) to both the VME Host computer and the Acroamatics 504V Distribution & Host Interface card. The 504V Distribution card merges time data with decommutated PCM data and analog-to-digital data for use with time-annotated data processing. Time messages are transmitted to the distribution at one second and one millisecond intervals. The time data is also available to the VME Host computer in four 16-bit registers. The time is captured upon reading the microseconds or milliseconds registers, and held frozen until the days are read. The reading of these registers has no effect on the generated time outputs or the data transmitted to the distribution card.

The VME Host computer configures the Model 503V Translator/Generator for several operating modes. In Generate mode, the system operates as a time source, generating timing from an on board crystal oscillator. The unit is capable of generating IRIG standard A, B and G time code formats at multiple rates of 4, 2, 1, 1/2, and 1/4 times real time. In addition, a slow code output is provided to time annotate strip chart recordings. The VME Host interface enables you to set the time for this mode.

In Translate mode the card operates as a time code reader, generating timing from an external source such as an analog tape recording. The translator's input section permits the reading of time code over a wide range of input amplitude and frequency. The system translates several IRIG standard time code formats (including A, B and G) at multiple rates of 4, 2, 1, 1/2, and 1/4 times real time.

The Timecode Translator has two selectable modes of operation. In Translate Carrier mode, the system utilizes the input carrier for the time base to translate the input time code signal. The input carrier rate determines the resolution of time. This feature permits the unit to translate time as the carrier rate varies during playback. In Translate Failsafe mode, the internal timing is phase-locked to the input carrier, and in the event of signal loss the translator continues to generate time without interruption. The translator must be programmed to some predetermined rate that is a multiple of 4, 2, 1, 1/2, or 1/4 times real time. The time is resolved to microseconds for all time code input formats. This feature makes it possible to generate a time code format of higher resolution to that being translated.

1.2 DOCUMENT CONVENTIONS

In this document register addresses and address offsets are hexadecimal numbers. Where it is necessary to refer to a hexadecimal number in the text, we use the C programming convention *0xNN* to refer to hexadecimal number *NN*. Bits in a register are numbered in decimal. The term *Device n* refers to an address destination on the TDP system A-Bus. The A-bus is the output data bus, and has eight possible destination devices. Although we do not use all eight, those destinations we do use are dedicated to specific functions in the TDP system. The term *DIT* refers to a data message in the TDP system. It stands for *Data, ID, and Time* , the three components of a TDP data message. We can label a DIT by the value of its ID tag, for example *DIT 0xFFF1* , the DIT that conveys the once per millisecond value of a time message. Frequently we use a functional label instead, for example, *the MILLISECOND DIT* .

SECTION 2
INSTALLATION

2.1 GENERAL

This section contains installation information for the Acroamatics Model 503V Timecode Generator˜Translator (TIME). The card part number is either 6011503 or 6011509.

2.2 UNPACKING

Using proper ESD-protection procedures, open the cardboard shipping container and remove the card from the anti-static bag. Retain the container, anti-static bag, and foam packaging material for use if you must return the card.

2.3 FACTORY RETURN

When you return a card to the factory for repair or modification, include as much information as possible describing the failure mode or the modification˜update you want.

Pack the card for shipment by wrapping it in the anti-static bag. Place the card into the shipping container, protecting it with the foam packing, and secure the container with reinforced tape. Provide the name and phone number of a technical contact we can talk to regarding the card.

Call Acroamatics at (805) 967-9909 to get a RMA number before returning any equipment to the factory, and include the RMA number in any correspondence or shipments to Acroamatics.

2.4 INSTALLING

The TIME card mounts in a standard VMEbus chassis. Mounting dimensions are shown in the assembly Drawing in Section 6 of this manual. Slide the card into one of your system VME chassis slots and seat the card firmly by pressing against the ears. Make the front panel cable connections appropriate to your system. Remove the board by pulling firmly on the outside of the ears. For connector locations see Figure 2-1.

2.5 CONNECTORS

The following pages contain tables of information on all the connections into and out of the TIME card.

TABLE 2-1. MATING CONNECTOR LIST FOR MODEL 503V

NOTE: ALL (%) REFER TO OPTIONS

CONN.	FUNCTION	MATING CONNECTOR
P01	VMEbus	603-2-IEC-C096
P02	VMEbus	603-2-IEC-C096
J01 (%)	ANALOG IN	137M-ND 937Z-ND
J02	SLOW CODE OUTPUT	SMB 903-285P-51S
J03	IRIG TIME OUTPUT	SMB 903-285P-51S
J04	IRIG TIME INPUT	SMB 903-285P-51S
J05	DISTRIBUTION INPUT BUS	3334-6660

TABLE 2-2. CONNECTOR LIST
MODEL 503V BACKPLANE CONNECTOR P01-ROW-A

NOTE: ALL ($) SIGNALS UNUSED ON THIS CARD

PIN	SIGNAL	FUNCTION
01	4VMED00	Data Bus 00
02	4VMED01	Data Bus 01
03	4VMED02	Data Bus 02
04	4VMED03	Data Bus 03
05	4VMED04	Data Bus 04
06	4VMED05	Data Bus 05
07	4VMED06	Data Bus 06
08	4VMED07	Data Bus 07
09	GND	Ground
10	SYSCLK ($)	System Clock
11	GND	Ground
12	9VMEDS1	Data Strobe 1
13	9VMEDS0	Data Strobe 0
14	9VMEWRT	Write
15	GND	Ground
16	9VMDACK	Data Transfer Acknowledge
17	GND	Ground
18	9VMASTB ($)	Address Strobe
19	GND	Ground
20	9VMIACK	Interrupt Acknowledge
21	9VMIAIN	Interrupt Acknowledge IN
22	9VMIAOT	Interrupt Acknowledge OUT
23	4VMAM04	Address Modifier 4
24	4VMEA07	Address Bus 07
25	4VMEA06	Address Bus 06
26	4VMEA05	Address Bus 05
27	4VMEA04	Address Bus 04
28	4VMEA03	Address Bus 03
29	4VMEA02	Address Bus 02
30	4VMEA01	Address Bus 01
31	-12 VDC ($)	-12 Volts DC
32	+5 VDC	+5 Volts DC

TABLE 2-3. CONNECTOR LIST
MODEL 503V BACKPLANE CONNECTOR P01-ROW-B

NOTE: ALL ($) SIGNALS UNUSED ON THIS CARD

PIN	SIGNAL	FUNCTION
01	9VMBSBY ($)	Bus Busy
02	9VMBCLR ($)	Bus Clear
03	ACFAIL ($)	AC Power Fail
04	9VMBGI0	Bus Grant 0 IN
05	9VMBGO0	Bus Grant 0 OUT
06	9VMBGI1	Bus Grant 1 IN
07	9VMBGO1	Bus Grant 1 OUT
08	9VMBGI2	Bus Grant 2 IN
09	9VMBGO2	Bus Grant 2 OUT
10	9VMBGI3	Bus Grant 3 IN
11	9VMBGO3	Bus Grant 3 OUT
12	9VMBRQ0 ($)	Bus Request 0
13	9VMBRQ1 ($)	Bus Request 1
14	9VMBRQ2 ($)	Bus Request 2
15	9VMBRQ3 ($)	Bus Request 3
16	4VMAM00	Address Modifier 0
17	4VMAM01	Address Modifier 1
18	4VMAM02	Address Modifier 2
19	4VMAM03	Address Modifier 3
20	GND	Ground
21	SERCLK ($)	Serial Clock
22	SERDAT ($)	Serial Data
23	GND	Ground
24	9VMIRQ7 ($)	Interrupt Request 7
25	9VMIRQ6 ($)	Interrupt Request 6
26	9VMIRQ5 ($)	Interrupt Request 5
27	9VMIRQ4 ($)	Interrupt Request 4
28	9VMIRQ3 ($)	Interrupt Request 3
29	9VMIRQ2 ($)	Interrupt Request 2
30	9VMIRQ1 ($)	Interrupt Request 1
31	+5 VSTDBY ($)	Stand-by +5 Volts DC
32	+5 VDC	+5 Volts DC

TABLE 2-4. CONNECTOR LIST
MODEL 503V BACKPLANE CONNECTOR P01-ROW-C

NOTE: ALL ($) SIGNALS UNUSED ON THIS CARD

PIN	SIGNAL	FUNCTION
01	4VMED08	Data Bus 08
02	4VMED09	Data Bus 09
03	4VMED10	Data Bus 10
04	4VMED11	Data Bus 11
05	4VMED12	Data Bus 12
06	4VMED13	Data Bus 13
07	4VMED14	Data Bus 14
08	4VMED15	Data Bus 15
09	GND	Ground
10	SYSFAIL ($)	System Failure
11	9VMBERR ($)	Bus Error
12	9VMPRST ($)	System Reset
13	9VMELWD	Long Word
14	4VMAM05	Address Modifier 5
15	4VMEA23 ($)	Address Bus 23
16	4VMEA22 ($)	Address Bus 22
17	4VMEA21 ($)	Address Bus 21
18	4VMEA20 ($)	Address Bus 20
19	4VMEA19 ($)	Address Bus 19
20	4VMEA18 ($)	Address Bus 18
21	4VMEA17 ($)	Address Bus 17
22	4VMEA16 ($)	Address Bus 16
23	4VMEA15	Address Bus 15
24	4VMEA14	Address Bus 14
25	4VMEA13	Address Bus 13
26	4VMEA12	Address Bus 12
27	4VMEA11	Address Bus 11
28	4VMEA10	Address Bus 10
29	4VMEA09	Address Bus 09
30	4VMEA08	Address Bus 08
31	+12 VDC ($)	+12 Volts DC
32	+5 VDC	+5 Volts DC

TABLE 2-5. CONNECTOR LIST
MODEL 503V BACKPLANE CONNECTOR P02-ROW-A

PIN	SIGNAL	FUNCTION
01	4FIFULL	ACRO Analog Data FIFO Full
02	4GRANT1	ACRO Analog Bus Grant In
03	4GRANT0	ACRO Analog Bus Grant Out
04	4ADCD08	ACRO Analog Data Bus Bit 08
05	4ADCD07	ACRO Analog Data Bus Bit 07
06	4ADCD09	ACRO Analog Data Bus Bit 09
07	4ADCD06	ACRO Analog Data Bus Bit 06
08	4ADCD10	ACRO Analog Data Bus Bit 10
09	4ADCD05	ACRO Analog Data Bus Bit 05
10	4ADCD11	ACRO Analog Data Bus Bit 11
11	4ADCD04	ACRO Analog Data Bus Bit 04
12	9CLK16M	ACRO 16 MHz Clock
13		Not Used
14	4ADCD00	ACRO Analog Data Bus Bit 00
15	4CHLID7	ACRO Analog Chan. ID Bit 07
16	4ADCD01	ACRO Analog Data Bus Bit 01
17	4CHLID6	ACRO Analog Chan. ID Bit 06
18	4ADCD02	ACRO Analog Data Bus Bit 02
19	4CHLID5	ACRO Analog Chan. ID Bit 05
20	4ADCD03	ACRO Analog Data Bus Bit 03
21	4CHLID4	ACRO Analog Chan. ID Bit 04
22		Not Used
23		Not Used
24		Not Used
25	4CHLID0	ACRO Analog Chan. ID Bit 00
26	9FIFWRT	ACRO Analog Data FIFO Write
27	4CHLID1	ACRO Analog Chan. ID Bit 01
28	9BUSBSY	ACRO Analog Input Bus Busy
29	4CHLID2	ACRO Analog Chan. ID Bit 02
30		Not Used
31	4CHLID3	ACRO Analog Chan. ID Bit 03
32		Not Used

TABLE 2-6. CONNECTOR LIST
MODEL 503V BACKPLANE CONNECTOR P02-ROW-B

NOTE: ALL ($) SIGNALS UNUSED ON THIS CARD

PIN	SIGNAL	FUNCTION
01	+5 VDC	+5 Volts DC
02	GND	Ground
03	RESERVED ($)	
04	4VMEA24 ($)	Address Bus 24
05	4VMEA25 ($)	Address Bus 25
06	4VMEA26 ($)	Address Bus 26
07	4VMEA27 ($)	Address Bus 27
08	4VMEA28 ($)	Address Bus 28
09	4VMEA29 ($)	Address Bus 29
10	4VMEA30 ($)	Address Bus 30
11	4VMEA31 ($)	Address Bus 31
12	GND	Ground
13	+5 VDC	+5 Volts DC
14	4VMED16 ($)	Data Bus 16
15	4VMED17 ($)	Data Bus 17
16	4VMED18 ($)	Data Bus 18
17	4VMED19 ($)	Data Bus 19
18	4VMED20 ($)	Data Bus 20
19	4VMED21 ($)	Data Bus 21
20	4VMED22 ($)	Data Bus 22
21	4VMED23 ($)	Data Bus 23
22	GND ($)	Ground
23	4VMED24 ($)	Data Bus 24
24	4VMED25 ($)	Data Bus 25
25	4VMED26 ($)	Data Bus 26
26	4VMED27 ($)	Data Bus 27
27	4VMED28 ($)	Data Bus 28
28	4VMED29 ($)	Data Bus 29
29	4VMED30 ($)	Data Bus 30
30	4VMED31 ($)	Data Bus 31
31	GND	Ground
32	+5 VDC	+5 Volts DC

TABLE 2-7. CONNECTOR LIST
MODEL 503V BACKPLANE CONNECTOR P02-ROW-C

PIN	SIGNAL	FUNCTION
01		Not Used
02		↓
03		↓
04		↓
05		↓
06		↓
07		↓
08		↓
09		↓
10		↓
11		↓
12		↓
13		↓
14		↓
15		↓
16		↓
17		↓
18		↓
19		↓
20		↓
21		↓
22		↓
23		↓
24		↓
25		↓
26		↓
27		↓
28		↓
29		↓
30		↓
31		↓
32		Not Used

TABLE 2-8. CONNECTOR LIST
MODEL 503V FRONT PANEL CONNECTOR J01

PIN	SIGNAL	FUNCTION
19	INPA01	Differential - Input 01
37	INPB01	Differential + Input 01
18	INPA02	Differential - Input 02
36	INPB02	Differential + Input 02
16	INPA03	Differential - Input 03
35	INPB03	Differential + Input 03
15	INPA04	Differential - Input 04
34	INPB04	Differential + Input 04
14	INPA05	Differential - Input 05
33	INPB05	Differential + Input 05
13	INPA06	Differential - Input 06
32	INPB06	Differential + Input 06
12	INPA07	Differential - Input 07
30	INPB07	Differential + Input 07
11	INPA08	Differential - Input 08
29	INPB08	Differential + Input 08
10	INPA09	Differential - Input 09
28	INPB09	Differential + Input 09
09	INPA10	Differential - Input 10
27	INPB10	Differential + Input 10
07	INPA11	Differential - Input 11
26	INPB11	Differential + Input 11
06	INPA12	Differential - Input 12
25	INPB12	Differential + Input 12
05	INPA13	Differential - Input 13
24	INPB13	Differential + Input 13
04	INPA14	Differential - Input 14
23	INPB14	Differential + Input 14
03	INPA15	Differential - Input 15
21	INPB15	Differential + Input 15
02	INPA16	Differential - Input 16
20	INPB16	Differential + Input 16
08	GND	Ground
17	GND	Ground
22	GND	Ground
31	GND	Ground
01		Not Used

TABLE 2-9. CONNECTOR LIST
MODEL 503V FRONT PANEL CONNECTOR J02

PIN	SIGNAL	FUNCTION
01	4SLCODE	Slow Code Output
02	GND	Ground

TABLE 2-10. CONNECTOR LIST
MODEL 503V FRONT PANEL CONNECTOR J03

PIN	SIGNAL	FUNCTION
01	4TCTOUT	IRIG Time Output
02	GND	Ground

TABLE 2-11. CONNECTOR LIST
MODEL 503V FRONT PANEL CONNECTOR J04

PIN	SIGNAL	FUNCTION
01	4TCTINP	IRIG Time Input
02	GND	Ground

TABLE 2-12. CONNECTOR LIST
MODEL 503V FRONT PANEL CONNECTOR J05

PIN	SIGNAL	FUNCTION
01	4DFIB00	Distribution Input Bus 00
02	4DFIB01	Distribution Input Bus 01
03	4DFIB02	Distribution Input Bus 02
04	4DFIB03	Distribution Input Bus 03
05	4DFIB04	Distribution Input Bus 04
06	4DFIB05	Distribution Input Bus 05
07	4DFIB06	Distribution Input Bus 06
08	4DFIB07	Distribution Input Bus 07
09	4DFIB08	Distribution Input Bus 08
10	4DFIB09	Distribution Input Bus 09
11	4DFIB10	Distribution Input Bus 10
12	4DFIB11	Distribution Input Bus 11
13	4DFIB12	Distribution Input Bus 12
14	4DFIB13	Distribution Input Bus 13
15	4DFIB14	Distribution Input Bus 14
16	4DFIB15	Distribution Input Bus 15
17	4DFIB16	Distribution Input Bus 16
18	4DFIB17	Distribution Input Bus 17
19	4DFIB18	Distribution Input Bus 18
20	4DFIB19	Distribution Input Bus 19
21	4DFIB20	Distribution Input Bus 20
22	4DFIB21	Distribution Input Bus 21
23	4DFIB22	Distribution Input Bus 22
24	4DFIB23	Distribution Input Bus 23
25	4DFIB24	Distribution Input Bus 24
26	4DFIB25	Distribution Input Bus 25
27	4DFIB26	Distribution Input Bus 26
28	4DFIB27	Distribution Input Bus 27
29	4DFIB28	Distribution Input Bus 28
30	4DFIB29	Distribution Input Bus 29
31	4DFIB30	Distribution Input Bus 30
32	4DFIB31	Distribution Input Bus 31

TABLE 2-12. (continued) CONNECTOR LIST
MODEL 503V FRONT PANEL CONNECTOR J05

NOTE: ALL ($) SIGNALS UNUSED ON THIS CARD

PIN	SIGNAL	FUNCTION
33	4TIMRUN	Time Run
34	4DSTRUN	Distribution Run
35	GND	Ground
36	9FIACK1	Distribution Input Acknowledge 1
37	9DFIRQ1	Distribution Input Request 1
38	GND	Ground
39	9FIACK2($)	Distribution Input Acknowledge 2
40	9DFIRQ2($)	Distribution Input Request 2
41	9FIACK3($)	Distribution Input Acknowledge 3
42	9DFIRQ3($)	Distribution Input Request 3
43	4DFIRDY	Distribution Input FIFO Ready for Data
44	9FIACK4($)	Distribution Input Acknowledge 4
45	9DFIRQ4($)	Distribution Input Request 4
46	GND	Ground
47	9FIACK5($)	Distribution Input Acknowledge 5
48	9DFIRQ5($)	Distribution Input Request 5
49	9FIACK6($)	Distribution Input Acknowledge 6
50	9DFIRQ6($)	Distribution Input Request 6
51	GND	Ground
52	9FIACK7($)	Distribution Input Acknowledge 7
53	9DFIRQ7($)	Distribution Input Request 7
54	GND	Ground
55	9FIACK8($)	Distribution Input Acknowledge 8
56	9DFIRQ8($)	Distribution Input Request 8
57	9FIACK9	Distribution Input Acknowledge 9
58	9DFIRQ9	Distribution Input Request 9
59	9ACKENB	Distribution Input Common Acknowledge
60	9TIMACK	Fine Time Acknowledge

SECTION 3
OPERATION

3.1 INTRODUCTION

The VME Host processor interfaces to seven 16-bit registers on the 503V. These registers contain Time, Status, and Control information about the present state of 503V operations. The registers are memory-mapped in the A16 Utility Address Space on a switch selectable 64-byte boundary. You access the registers through nonprivileged or supervisory A16/D16 memory instructions. The allocation of the A16 Utility Space and a brief description of the registers follows.

A16 Utility Space		
Addr	**Function**	**Mode**
0	Signature & Soft Reset	Read/Write
2	Milliseconds Units & Microseconds Register	Read Only
4	Seconds & Milliseconds Register	Read/Write
6	Hours & Minutes Register	Read/Write
8	Time Valid Status & Days Register	Read/Write
A	Command Register	Read/Write
C	Control Register	Read/Write
E	Reserved	

3.1.1 Signature Register

The Signature Register identifies the installed card for system configuration purposes. Reading this register returns a value of 503 hexadecimal. Writing to this register generates a soft reset which reinitializes the on board microcomputer of the 503V.

Signature Register		
Addr	**Description**	**Mode**
0	0503	Read
0	Software Reset	Write

3.1.2 Time Registers

There are four time registers (byte addresses 2 through 8) that interface with the VME bus. These registers contain BCD time-of-year information. Reading the microseconds or milliseconds registers (byte addresses 2 and 4) captures the Time information and prevents the rest of the Time from being updated until the days are read. Writing to these registers permits the setting of Time in Generate mode. Time data is stored in the registers and passed onto the accumulator upon writing the seconds & millisecond register (byte address 4). The Time Valid status indicates that the time input verifies in translate mode.

Time Registers				
Addr	**Bits 15 - 12**	**Bits 11 - 8**	**Bits 7 - 4**	**Bits 3 - 0**
2	Units of msec	Hundreds of μsec	Tens of μsec	Units of μsec
4	Tens of seconds	Units of seconds	Hundreds of msec	Tens of msec
6	Tens of hours	Units of hours	Tens of minutes	Units of minutes
8	Time Valid (Bit 15)	Hundreds of days	Tens of days	Units of days

3.1.3 Time Command Register

The Time Command Register contains bits for enabling time to the 504V Distribution card, designating Leap Year, setting translate/generate mode and Failsafe or Carrier mode, setting Translate Timecode format, Generate Timecode format, and Slow Code format.

Time Command Register	
Bits	**Function**
15	Distribution Time Disable (H)
14	Leap Year Enable (H)
13-8	Reserved
7	Translate (H) / Generate (L) Mode
6	Carrier (H) / Failsafe (L) Mode
5-4	Translate Time Code Format
3-2	Generate Time Code Format
1-0	Slow Code Format

The following table gives the bit definitions for the Time Command Register.

Time Code Format		Slow Code Format	
Value	**Format**	**Value**	**Format**
00	IRIG B	00	1 Second Frame
01	IRIG A	01	10 Second Frame
10	IRIG G	10	1 Minute Frame
		11	10 Minute Frame

3.1.4 Time Control Register

The Time Control Register contains bits for inverting the time code input signal, the generate/translate rate multiplier, the AGC attack and decay rate, and the input filter cutoff frequency.

Time Control Register	
Bits	**Function**
15	Translator Input Polarity (H=Invert)
14-11	Reserved
10-8	Translator/Generator Rate Multiple
7-6	AGC Attack and Decay Rate
5-4	Input Filter Decade Cutoff Freq.
3-0	Input Filter Multiplier Cutoff Freq.

The following two tables give the bit definitions for the Time Control Register.

T/G Rate Multiple		AGC Attack/Decay		Filter Decade Cutoff	
Code	**Multiple**	**Code**	**Rate**	**Code**	**Frequency**
000	1/4	00	100 Carrier	00	1kHz
001	1/2	01	1k Carrier	01	10kHz
010	1	10	10k Carrier	10	100kHz
011	2	11	100k Carrier		
100	4				

Filter Multiplier Selection					
Code	**Value**	**Code**	**Value**	**Code**	**Value**
1110	0.25	1001	1.50	0100	3.00
1101	0.50	1000	1.75	0011	3.25
1100	0.75	0111	2.00	0010	3.50
1011	1.00	0110	2.30	0001	3.75
1010	1.25	0101	2.60	0000	4.00

3.2 DISTRIBUTION & HOST INTERFACE

The 504V Distribution & Host Interface card provides a method of inserting time data into a telemetry data stream for processing. Multiplexed Time data and an identifier are transmitted across this digital interface at one second and one millisecond intervals. The data is comprised of two 32-bit packed words representing BCD Time of Year resolved to one millisecond. The first word is the identifier, consisting of twelve bits of Fine-Time (typically microseconds), one bit of Status, and thirteen bits of an ID tag. The second word contains 32-bits of packed time-of-year data. Upon the output of the Time identifier the fine-time field is replaced with milliseconds, while microseconds are assumed to be zero. The format of the time words is shown below.

Distribution & Host Interface Time Words	
Identifier Word	
Bits	**Description**
31-20	Fine Time
19	Reserved
18	Time Valid Status (L)
17-16	Reserved
15-0	ID Tag Value of 1FFE hex for the One Second Word Value of 1FFF hex for the Millisecond Word
Data Word	
Bits	**Description**
31-24	Tens & Units Days
23-18	Tens & Units Hours
17-16	Hundreds of Days
15-8	Tens & Units Minutes
7-0	Tens & Units Seconds

3.3 SOFTWARE DESCRIPTION

The setup software for the Model 503V is similar to the existing Acroamatics setup compiler. The compiler is written in C programming language for portability. The setup language is compatible with that used in the Acroamatics 2110 series Telemetry Data Processors. The compiler processes the setup text for the 503V and builds a simple table of setup parameters. At the end of the input, the table is transmitted essentially intact to the hardware registers. The following sections discuss the setup syntax for the Model 503V.

You enter the Generator/Translator setup from the compiler with the **TGT** command. The general form of the setup is

```
TGT
  .
  .
commands
  .
  .
END
```

3.3.1 Setting the Time

To set the time enter the command

`TIME=[L]DDD:HHMM:SS[.SS]`

The optional parameter **L** specifies a leap year. The remaining fields are as follows

DDD	represents days (1 to 3 characters).
HH	is hours (must be two characters).
MM	is minutes (must be two characters).
SS.SS	seconds and fractions of seconds (1 to 5 characters).

Any field delimited by colons may be empty, in which case it is taken to be zero.

3.3.2 Setting Generate Mode

To initiate Generate mode you enter the command

`GEN` *[code] [rate multiplier]*

The optional parameter *code* specifies the output IRIG time code and must be G, A, or B. If *code* is not specified IRIG B is generated. The optional parameter *rate multiplier* determines the rate at which the time code is generated. Valid rates are X.25, X.5, X1, X2, and X4. When *rate multiplier* is not specified, X1 is used.

3.3.3 Setting Translate Mode

You initiate the Translate mode by entering the **XLAT** command shown below. The carrier frequency (code frequency times the rate multiplier) is the default filter cutoff frequency when a filter cutoff frequency is not entered.

`XLAT` *[code][Rate Multiplier][CAR][filter-cutoff-freq][INV][OUT=code]*

The translator normally operates in *FAILSAFE* mode. In the Failsafe mode, if the input time signal is lost, time is automatically generated at the programmed rate until the input signal is regained. The input frequency must be within 5% of the programmed rate in FAILSAFE mode. When the **CAR** mode is selected, the card translates at the rate corresponding to the carrier it detects. The low pass filter is normally set to the highest carrier frequency that is to be translated.

The optional parameters available when setting Translate mode are

code	*input code - A, B, or G*
rate multiplier	*X.25, X.5, X1, X2, or X4 - for Failsafe mode*
filter-cutoff-freq	*250Hz to 400kHz - overrides the default frequency*
INV	*inverts input polarity*
CAR	*(mode - translates at the carrier rate*
OUT=code	*generates amplitude modulated IRIG A, B, or G*

The parameters *code* and *rate multiplier*, which specify the input IRIG time code and the carrier frequency rate multiplier, are described above in the paragraph on the **GEN** command. The parameter *filter-cutoff-freq* sets the low-pass filter cutoff frequency. The cutoff filter frequency limits are 250Hz to 400kHz, which are specified as 250 to 400000. When it is not specified, the default value is the carrier frequency (1, 10, or 100kHz) times the rate multiplier. The *INV* parameter sets the translator for an inverted signal. The *OUT=code* option is used to specify the IRIG time code output and must be specified as G, A, or B. If it is not specified, the output code is the same as the translate code.

3.3.4 Specifying Slow Code

The Model 503V generates a Slow Code for strip chart time annotation. The command to set the Slow Code is a two character command. There are four Slow Code rate commands available: S1 for a 1 second frame; S2 for 10 seconds; S3 for 1 minute; and S4 for a 10 minute frame. S1 is the default selection when none is specified.

MODEL 503V TIME TRANSLATOR/GENERATOR SPECIFICATIONS

INPUT	CHARACTERISTICS
Amplitude	0.5 to 20 Vpp, Single-ended
Impedance	12K Ohms minimum
Input Codes	Translates IRIG G, A and B
Input Frequency	125 Hz to 400,000 Hz
Modulation Index	2:1 through 5:1.
Polarity	Program selectable, Invert or Normal Polarity
Leap Year	Selectable leap year enable resets days to 1 after 366.
Internal Time Base	20MHz crystal oscillator
OPERATION	
Generate Mode	Time is generated from the on board crystal oscillator and is presettable from VME Host. Generator may be programmed to generate time at multiples of 4, 2, 1, 1/2 and 1/4 real time.
Translate Mode	Time is read from an external source.
Translate Carrier Mode	The internal timing is based on the input carrier. This mode enables the system to translate time as the input carrier rate varies during playback of an analog recording.
Translate Failsafe Mode	The internal timing is phase-locked to the input carrier. In the event of time dropout, the translator continues generating time without interrupt. Time is resolved to microseconds for input code formats. Translator may be programmed to translate time at 4, 2, 1, 1/2 and 1/4 times real time.
Frame Bypass	Automatic frame bypass compares previous time frame with current one. Time accumulator is updated when they agree.
OUTPUT	
Parallel Time	BCD time-of-year, days through microseconds, is supplied to both the VME Host processor and the Acroamatics 504V Distribution & Host Interface card. Time and status information are captured and are supplied to the VME bus in four 16-bit words. Two 32-bit packed time messages are delivered to the Distribution & Host Interface at 1 second & 1 millisecond intervals.
Generator Output	Program selectable, generates IRIG time codes G, A and B. ±2.5 V Balanced Output, 10mA Drive I, Mod. Index 3:1.
Slow Code Output	Bi-Level, BCD encoded time-of-year format Four selectable frame rates: 1 sec, 5 sec, 10 sec and 1 min. Output levels are: baseline = 0.5 Volts, zero mark = 2.5 Volts, reference mark or one mark = 4.8 Volts
REQUIREMENTS	
Power	+5VDC at 1.5 Amperes
Temperature	Operating: 0 to +40°C, Non-operating: –40 to +86°C
Relative Humidity	Up to 90% Non-condensing
Air Flow	30 Linear FPM
Shock	Operating: 6G, non-operating: 50G
Vibration	Operating: 0.5G, 5 to 2000 Hz, Non-operating: 1.2G 5 to 500 Hz

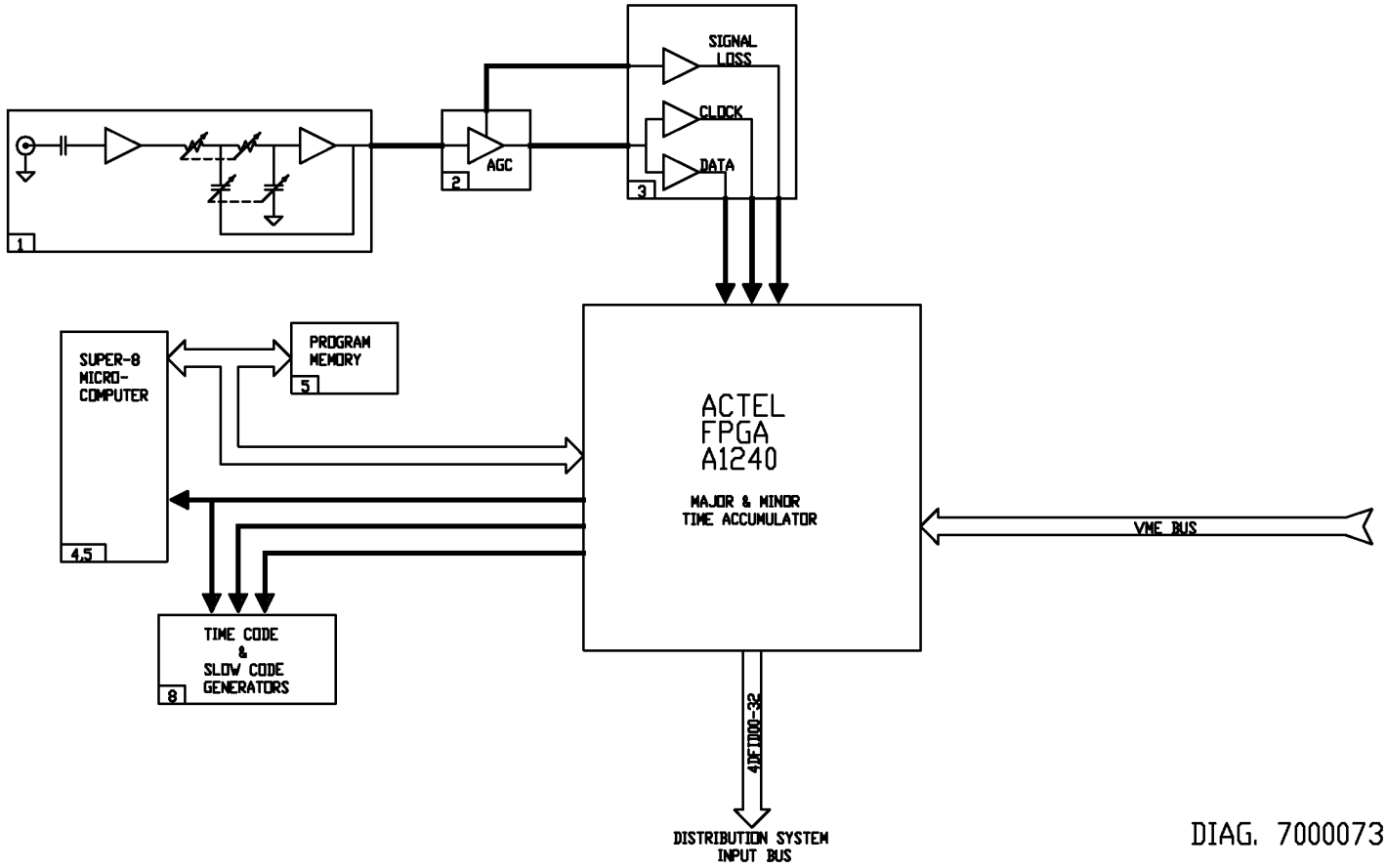
Specifications are subject to change without notice.

SECTION 4
THEORY OF OPERATION

4.1 BLOCK DIAGRAM

This section contains a block diagram of the TIME card.

DN6000243



DIAG. 7000073 PG.1 REV. A

FIG 4-1

DRAWN BY H.PEARSALL	ACROAMATICS INC.		
DATE 10/93	TITLE BLOCK DIAGRAM TIMECODE GENRATOR/TRANSLATOR TIME		
CHECKED BY			
DATE	SIZE B	DRAWING # 2111503	REV F
APPRVD BY			
DATE	SCALE	SHEET 0 OF 13	

SECTION 5
TIME - ADJUSTABLE SWITCH & JUMPER SETTINGS

5.1 DESCRIPTION

The paragraphs below describe the selections available on the TIME card.

5.1.1 Address Select

The switches at U9 and U59 select the base of the 64 byte block of Time and A to D registers in the A16:D16 address space A6 through A15. Switch U9 positions 1-8 select the eight MSBs and Switch U59 positions one and two select the two LSBs.

5.1.2 Configuration Options

Switches three and four of U59 indicate the presence of options for system configuration. These two switches control the two LSBs of the high hex digit of the signature word (X503). Switch four is the LSB and is set to the OFF position to indicate the presence of the A to D option, changing the signature word to 1503 hex.

5.2 VME TIME CARD CIRCUIT DESCRIPTION

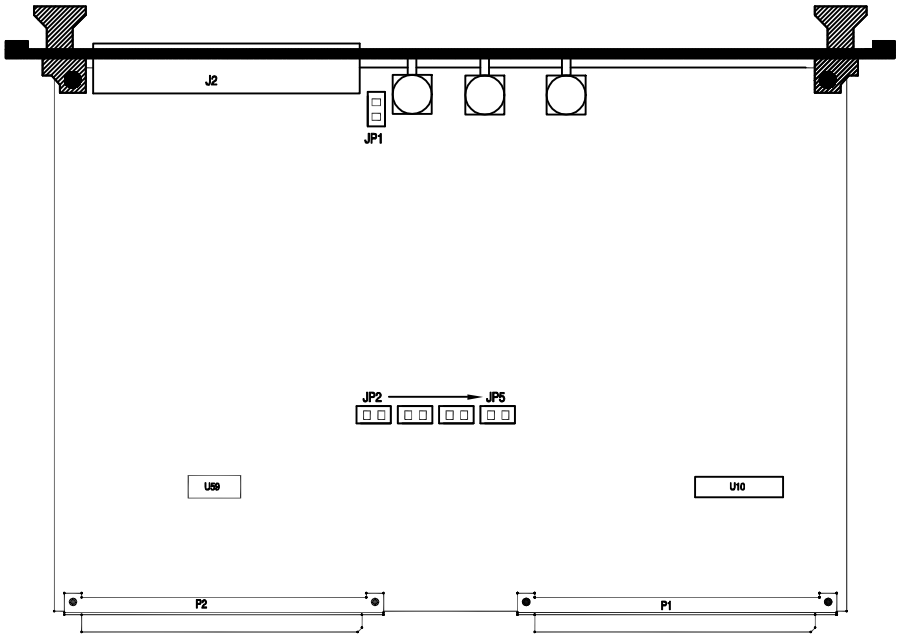
The Time Card input circuitry contains five sections: a Programmable Input Filter, an AGC amplifier, and three voltage comparators which produce TTL compatible, Clock, Data, and Loss signals. These are referred to as Clock-Detect comparator, a One-Detect comparator, and the Signal Loss Detector respectively.

The Input Filter consists of a fixed-frequency highpass filter at 100Hz to remove dc offsets, and a programmable lowpass filter to eliminate unwanted high-frequency noise. The upper cutoff frequency of the Lowpass filter may be programmed from 250Hz to 375kHz. While defaults filter settings are provided by the IRIG software, the operator may set the filter higher or lower if desired.

The carrier of the external time code generator is synchronously amplitude-modulated by the binary stream of time-code data such that the resulting waveform is a series of large and small cycles of a sine wave corresponding to *ones*& In real data, the carrier amplitude and the modulation index tend to drift over time, acquire wide-band noise, and even drop out occasionally; hence the input conditioning circuitry includes an automatic gain control amplifier to stabilize the input signal over a wide range of amplitudes. The AGC response time is set automatically based on the carrier rate.

The output from the AGC amplifier is sent to the three comparators. 1) The Clock-Detector produces a TTL signal that is synchronous to the carrier. 2) The One-Detect comparator threshold is set to detect large amplitude cycles corresponding to *ones* in the data stream. 3) To ensure data integrity, a third comparator (the Signal Loss detector) provides a indication to the processor that the input is gone or has dropped below a minimum threshold.

The Clock, Data, and Loss signals are fed into an ACTEL FPGA and processed by the Super-8 microcomputer to produce parallel time data. The Super-8 keeps track of time internally, and supplies its own time to the output if the external input is lost or in error.

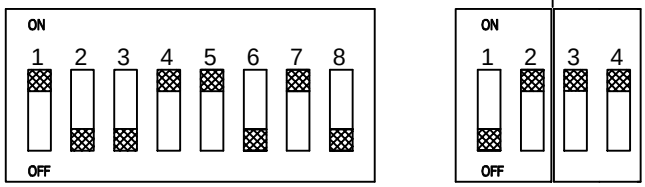


ADDRESS 658X SHOWN

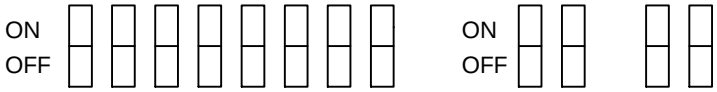
A15 ◄ A6 SEE PAGE 5-3

ON = 0

OFF = 1



U9 U59



SHIPPED ADDRESS _____

CARD 6011503 _____

SERIAL# / REV. _____

_____

CUSTOMER JOB#

_____

CONFIGURED BY DATE

_____

QC CHECK BY DATE

JUMPERS JP1 - JP5

JUMPER	INSTALLED
JP1	
JP2	
JP3	
JP4	
JP5	

FIGURE 5-1. TIMECODE GENERATOR/TRANSLATOR (TIME) FACTORY SETTINGS

U59
A TO D OPTION CONFIGURATION BITS

SW	FUNCTION
3	SIGNATURE REGISTER BITS FOR
4	A TO D IDENTIFICATION

JP1
ANALOG OPTION OUTPUT

JUMPER	STATE
IN	ANALOG OUTPUT ACTIVE
OUT	ANALOG OUTPUT INACTIVE

JP2 - JP5
A TO D ID BLOCK SELECT

JUMPER	ID BIT
JP2	A TO D ID BIT 7
JP3	A TO D ID BIT 6
JP4	A TO D ID BIT 5
JP5	A TO D ID BIT 4

NOTE: JUMPER IN SETS BITS TO 0

SEE APPENDIX A FOR DESCRIPTION
OF ID BLOCK SELECTION

CARD #6011503

FIGURE 5-2. TIMECODE GENERATOR/TRANSLATOR (TIME) FACTORY SETTINGS

5.3 TIME ADJUSTMENT PROCEDURE

The time card requires only two adjustments; one for the clock detect circuitry and one for the *ones detect* circuitry. The filter requires no adjustments. To adjust the Time input circuit, program the card for generate mode, and connect the generated time output to the time input SMB. The system continuously translates time code while generating time code, thus allowing the operator the ability to determine if all circuits are functional.

Monitor the output of the AGC amplifier at test point 13. The amplitude at the AGC output should be constant, approximately 1.2 Vpp signal with a 3V offset. For peak carrier amplitudes below 100mV, valid data may still be detected, but the Signal Loss Detector output should go high. The Signal Loss Detector's comparison threshold is fixed and needs no adjustment.

The Clock Detect threshold is set by a trim-pot VR3. Set the oscilloscope's dual inputs for 1 volt per division amplitude, and adjust the ground reference of each channel to the same level. While monitoring the AGC output at TP-13, connect the second channel to the comparator's threshold voltage on test point 15. Test point 7 may be used as the ground reference for the oscilloscope. Adjust the trim-pot, VR3, such that the voltage level at the comparator's input (TP-15) is about halfway between the positive and negative peaks of the small amplitude cycles. Verify that the TTL output of the Clock-Detect comparator is functional by monitoring test point 17. A 50% duty cycle, square-wave signal should be present.

The One-Detect comparator threshold is set by the trim-pot VR4. Set the threshold by viewing both inputs of the comparator, U61. While monitoring the AGC output at TP-13, connect the second channel to the comparator's threshold on test point 14. Adjust the trim-pot such that the voltage level at the comparator input (TP-14) is about halfway between the positive peak of the zeros cycle and the positive peak of the ones cycle. Verify that the One-Detector output asserts low during large, positive amplitude, half-cycles of the input, test point 22.

Finally, the system's overall performance, and whether the Super-8 microcomputer is properly reading the input time code, may be determined by monitoring U72 pin 43, Time Valid Status. The time valid status should assert low indicating the the input time code is continuous and valid.

5.3.1 Factory Settings

Figure 5-1 shows jumper and switch locations on the TIME PCB, and provides a record of the factory settings when the board was shipped. Figure 5-2 indicates the functions of all the possible switch and jumper selections.

SECTION 6
DRAWINGS

6.1 INTRODUCTION TO THE DRAWINGS

Section 6 contains a complete technical drawing package describing your VME card. the drawings in this section are keyed to your specific serial numbered card.

6.1.1 Drawing System

Acroamatics Drawing numbers are seven digit numbers which can also have a two digit dash number. The first four digits represent a drawing class, and wherever a drawing may be part of a standard drawing package, drawing numbers are issued so that all drawings which are part of the package share the same last three digits. In the following discussion "xxx" represents the number keyed to the the card part number (6011xxx). Individual parts are classified within the same drawing system, but are assigned serially without regard to other assemblies.

The PC Card Reference package includes the following drawings:

FOR CARD PART NUMBER 60115xx:

60115xx	Card Assembly Drawing
81115xx	Card List of Materials
21115xx	Card Schematic Drawing

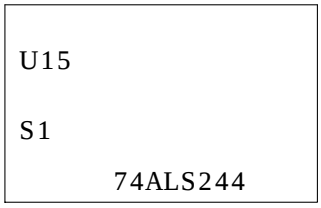
6.1.2 Drawing Package Organization

This section of the manual contains the physical drawings, called "Drawings", as opposed to the schematic drawings, called "Schematics", which are found in Section 7.

The Drawings section includes the card component assembly drawing 60115nn and the card List Of Materials (LOM). LOM's include sufficient information to facilitate ordering replacement parts either from Acroamatics or from the original component manufacturer. LOMs list parts by Acroamatics Part Number in the column headed **PART NO.** The component manufacturer is identified as **VENDOR.** Parts for which ACROAMATICS is listed as vendor are proprietary components available only from Acroamatics, Inc. Integrated Circuits which are industry standard are listed as GENERIC, and may be obtained from any reliable vendor. Other parts for which a specific source is listed may be available from other sources. When substituting parts from vendors other than those specifically listed, be certain that the components are truly interchangeable.

The last column (Reference) of the List of Materials lists the assembly location or locations. An assembly location can contain a socket as well as the component plugged into the socket.

For example



This example shows that location U15 contains socket S1 and an IC of type 74ALS244. Resistors, capacitors, and other components are shown in a similar fashion, and are referenced using common industry abbreviations.

6.1.3 Programmed Parts

The VME card can include programmed parts such as PROMs, EPROMs, EEPROMs, PALs, GALs, FPGAs, etc. If these are a permanent part of the hardware, they are documented on the List Of Materials for the PC card on which they are installed. Programmed parts are listed on the LOM twice; once as the unprogrammed part, with the Manufacturers Part Number, and also under the Acroamatics program number (606xxxx) with which they must be programmed to become the correct programmed part.

Programs for PROMs have part numbers in the series 6061xxx
Programs for EPROMs and EEPROMs have part numbers in the series 6062xxx
Programs for PALws and GALs have part numbers in the series 6064xxx
Programs for FPGAs have part numbers in the series 6067xxx

REV	REASON	MANDATORY	INITIATED BY	APPRV	DATE
A	RELEASED SEE ECR #4167		JW		12/96
B	SEE ECR #3974	X		JW	12/96
C	SEE ECR #3992	X		JW	12/96
D	SEE ECR #4010	X		JW	12/96
E	SEE ECR #4010	X		JW	12/96
F	SEE ECR #4042	X		JW	12/96
G	SEE ECR #4172	X			
H	SEE ECR #4288	X		BL	9/97
I	SEE ECR #4300	X		BL	11/97
J	SEE ECR #4307	X		BL	11/97
K	SEE ECR #4315	X		BL	12/97
L	SEE ECR #4330	X		BL	1/98
M	SEE ECR #4361	X		BL	3/98
N	SEE ECR #4399	X		BL	3/98
O	SEE ECR #4674	X		BL	3/98
P	SEE ECR #4699	X		RT	1/01
NC	SEE ECR #4959	X		HC	4/04

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X											

LIST OF MATERIALS 8111503-10

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
-7																									

PC CARD 1290164

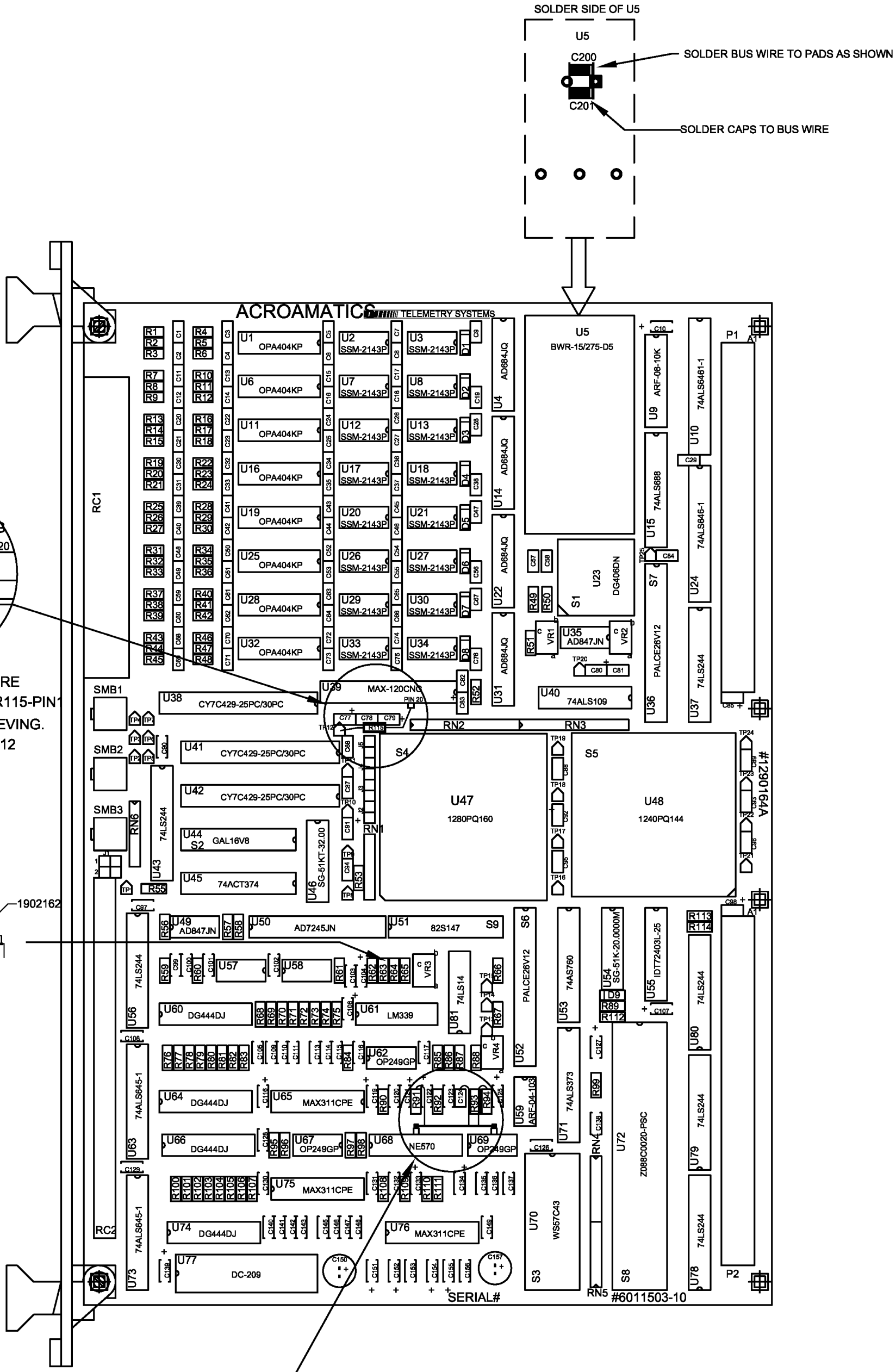
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
X	X	X	X	X	X	X	X	X	X																

SCHEMATICS 2111503-10

MANUFACTURING:

VERIFY REVISION LEVELS OF WIRELIST AND L.O.M. BEFORE BUILDING CARD.

DR D MACDONALD	4/04	ACROAMATICS TELEMETRY SYSTEMS GOLETA, CAL. 93117
CHK		
APPD		ASSEMBLY, CIRCUIT CARD
		VME TIME W/ A-D CONVERTER
NEXT ASSY	USED ON	SIZE B / SCALE NTS / DWG NO. 6011503-10
APPLICATION		SHEET 1 OF 2 / REV P



DR D MACDONALD	4/04	ACROAMATICS TELEMETRY SYSTEMS GOLETA, CAL. 93117
CHK		
APPD		ASSEMBLY, CIRCUIT CARD
		VME TIME W/ A-D CONVERTER
NEXT ASSY	USED ON	SIZE B / SCALE NTS / DWG NO. 6011503-10
APPLICATION		SHEET 2 OF 2 / REV P

LIST OF MATERIALS 8111503-10 PAGE 1 OF 3
VME TIME w/ A-D CONVERTER

ASSEMBLY PN 6011503-10 DRAWN BY WOLF Apr 6 12:34

REVISION O ENGINEERING APPROVAL _____ DATE _____

MANUFACTURING APPROVAL _____ DATE _____

NO.	PART NO	QNTY	DESCRIPTION	MANUFACTURERS PN	VENDOR	REFERENCE
1	1290164	1	PCB VME TIME W/ ATOD CONV	1290164	ACROAMATICS	Rev. A
2	2796063	1	CONN PC 37P D-SUB SDR RTA	DMRST37RB05CG	VIKING	RC1
3	2796057	3	CONN PC SMB RTANGLE 1P	903-373J-51A	AMPHENOL	BNC1-3
4	2796059	1	CONN PC 60P SDR RTANGL	2560-5002UB	3M	RC2
5	2796061	2	CONN PC 96P SDR RTANGL	7296-50C2TH	3M	P1,P2
6						
7	8542069	1	SOCKET 28P CHIP CARRIER	PLCC-28-P-T	MCKENZIE	S1
8	8542072	2	SOCKET 20-PIN LOPRO .3w	115-93-320-41-003	PRECI-DIP	S2,S9
8			Acceptable substitute is:	DIP-050-320-160-B	MCKENZIE	
9	8542089	1	SOCKET 24 PIN LOPRO .6w	115-93-624-41-003	PRECI-DIP	S3
10	8542080	1	SOCKET 144-PIN QFP BASE	822114-3	AMP	S5
11	8542081	1	SOCKET 144-PIN QFP TOP	822115-3	AMP	
12	8542083	2	SOCKET 28-PIN DIP LOPRO .3W	115-93-328-41-0003	PRECI-DIP	S6,S7
13	8542076	3	SOCKET 20-PIN SIP	SIP-1x20-185-B	MCKENZIE	S8 (48 USED)
13			Acceptable substitute is:	315-93-120-41-003	PRECI-DIP	
14	8542084	1	SOCKET 160-PIN QFP BASE	822114-4	AMP	S4
15	8542085	1	SOCKET 160-PIN QFP TOP	822115-4	AMP	
16	1902162	1	CAP CERM 10pF 50V	CN15C100J	CENTRALAB	C158
17	1871057	2	CAP SILV MICA 5pF 50V	CD5CC050D03	CD	C124,C135
18	1922027	2	CAP TA 68uF 20% 6V	P2018	DIGI-KEY	C151,C154
19	1902170	73	CAP CERM .1uF 50V .1" LS	C320C104M5U5CA	KEMET	C5-C9,C15-C19,C24-C29,C34-C38
19						C43-C47,C52-58,C63-67,C72-76,C78,
19						C81,C82,C84,C86-90,C101,C103,C105
19						C93-97,C102,C108,C128-C130,C137
19						C138,C140,C123,C116,C117,C148-149
20	1902161	32	CAP CERM 100pF 50V	CN15C101J	CENTRALAB	C1-4,C11-14,C20-23,C30-33,C39-42,
20						C48-51,C59-62,C68-71
21	1922114	2	CAP TA 220uF 10% 10V	T350L227K010AS	KEMET	C150,C157
22	1922613	19	CAP TA EPXY 10uF 10% 25V	T362B106KO25AS	KEMET	C10,C79,C80,C83,C85,C91,C92,
22						C98,C104,C106,C107,C127,C118,
22						C119,C125,C134,C139,C152,C155
23	1922650	2	CAP TA 47uF 10% 6V SMT	T491C476K006AS	KEMET	C200,C201
23			Acceptable substitute is:	267E6301476K-720	MATSUO	
24	1922621	2	CAP TA EPXY 2.2uF 10% 35V	T368B225KO35AS	KEMET	C121,C133
25	1922640	1	CAP TA EPXY 22uF 10V	T362B226K010AS	KEMET	C77
26	1903003	6	CAP TMP STBL (X7R) 1.0uF	C330C105K5R5CA	KEMET	C120,C122,C126,C131,C132,C136
27						
28	1903016	3	CAP TMP STBL (X7R) .82uF	DR30BBM824K	METUCHEN/GENERIC	C100,C153,C156
29	1903030	4	CAP TMP STBL (X7R) .047uF	DR30BBM473K	METUCHEN/GENERIC	C111,C115,C141,C145
29			Acceptable substitute is:	C322C473J1R5CA	KEMET	
30	1903041	4	CAP TMP STBL (X7R) 4700pF	DR20BBM472K	METUCHEN/GENERIC	C110,C114,C142,C146
31	1904031	4	CAP NPO 180pF	C322C181J2G5CA	KEMET	C109,C113,C143,C147
31			Acceptable substitute is:	C317C181J1G5CA	KEMET	
32	1904018	1	CAP NPO 39pF	5018E050RD390J	KYOCERA	C99
33	3572004	9	DIODE SILICON	1N4148	GENERIC	D1-9

ASSEMBLY PN 6011503-10 DRAWN BY WOLF Apr 6 12:34

REVISION O

NO.	PART NO	QNTY	DESCRIPTION	MANUFACTURERS PN	VENDOR	REFERENCE
34	7700016	3	RES SIP 1K 5R 6-PIN	4306R-101-1K	BOURNS	RN1,RN4,RN5
35	7700023	2	RES SIP 1K 9R 10-PIN	L101C-102	BECKMAN	RN2,RN3
36	7700050	1	RES SIP 1.5K/3.3K OHM 6P	CSC06A-05-152/332J	DALE	RN6
37	7093031	2	MINI TRIM POT 10-TURN 2K	RJ26FW202	BOURNS	VR3,VR4
38	7093034	1	MINI TRIM POT 5K 10-TURN	RJ26FW502	BOURNS	VR2
39	7093035	1	MINI TRIM POT 200 OHM 10-TURN	RJ26FW201	BOURNS	VR1
40						
41	7672001	2	RES 10 OHM 1/4W 5% CARBON	GENERIC	GENERIC	R52,R61
42	7682121	4	RESISTOR 300K OHM 1/8W 5%	RCO5GF	A-B	R63,R86,R90,R108
43	7680224	1	RESISTOR 3.01K 1/10W 1%	RN55C3011F	TRW	R72
44	7680294	2	RESISTOR 8.06K 1/10W 1%	RN55C8061F	TRW	R93,R94
45	7682032	1	RESISTOR 51 OHM 1/8W 5%	RC05GF510	A-B	R50
46	7685002	8	RESISTOR 1K 1/8W 1%	5063JD1K00F	PHILIPS	R66,R67,R71,R92,R96,R109,R113,
46						R114
47	7685003	14	RESISTOR 2K 1/8W 1%	5063JD2K00F	PHILIPS	R57,R58,R60,R68,R69,R70,R97
47						R55,R56,R62,R74,R85,R88,R99
48	7685009	4	RESISTOR 14K 1/8W 1%	5063JD14K0F	PHILIPS	R76,R80,R100,R104
49	7685041	1	RESISTOR 100 OHM 1/8W 1%	5063JD100R0F	PHILIPS	R115
50	7685068	5	RESISTOR 1.33K 1/8W 1%	5063JD1K330F	PHILIPS	R65,R79,R83,R103,R107
51	7685076	4	RESISTOR 3.32K 1/8W 1%	5063JD3K320F	PHILIPS	R78,R82,R102,R106
52	7685083	4	RESISTOR 6.81K 1/8W 1%	5063JD6K810F	PHILIPS	R77,R81,R101,R105
53	7685087	41	RESISTOR 10K 1/8W 1%	5063JD10K0F	PHILIPS	R1,R3,R4,R6,R7,R9,R10,R12,R13,
53						R15,R16,R18,R19,R21,R22,R24,R25,
53						R27,R28,R30,R31,R33,R34,R36,R37,
53						R39,R40,R42,R43,R45,R46,R48,R53,
53						R59,R64,R73,R84,R87,R110-R112
54	7685094	2	RESISTOR 20K 1/8W 1%	5063JD20K0F	PHILIPS	R49,R51
55	7685071	1	RESISTOR 1.82K 1/8W 1%	5063JD1K820F	PHILIPS	R98
56	7685100	2	RESISTOR 39.2K 1/8W 1%	5063JD39K20F	PHILIPS	R89,R91
57	7685110	17	RESISTOR 100K 1/8W 1%	5063JD100K0F	PHILIPS	R2,R5,R8,R11,R14,R17,R20,R23,R26,
57						R29,R32,R35,R38,R41,R44,R47,75
58	7685074	1	RESISTOR 2.67K 1/8W 1%	5063JD2K670F	PHILIPS	R95
59	7130067	1	PWR SUP DC/DC +-15v/275ma	BWR-15/275-D5	DATEL	U5
60	7130068	1	PWR SUP DC/DC +-15v/50ma	215D5FS	CDI	U77
60			Acceptable substitute is:	DC-209	INTRONICS	
61	5300014-18	1	IC HEX SCHMITT INVERTERS	74LS14	GENERIC	U81
62	5300109-30	1	IC DUAL J-K F/F W/SET&CLR	74ALS109	GENERIC	U40
63	5300244-18	6	IC OCTAL BUFFER NI TS	74LS244	GENERIC	U37,U43,U56,U78,U79,U80
64	5300373-30	1	IC OCT D-LATCH TRANSP TS	74ALS373	GENERIC	U71
65	5300374-62	1	IC OCT D-F/F EDGE-TRIG TS	74ACT374	GENERIC	U45
66	5300645-31	2	IC OCTAL BUS TRANSCEIVERS	74ALS645-1	GENERIC	U63,U73
67	5300646-31	2	IC OCTAL BUS XCVR W/REGS TS	74ALS646-1	GENERIC	U10,U24
67			Acceptable substitute is:	CALS646A-1NT	TI	
68	5300688-30	1	IC 8-BIT MAG COMP	74ALS688	GENERIC	U15
69	5300760-36	1	IC OCTAL BUFFER OC NI	74AS760	TI	U53
70	5301143	16	IC OP AMP INSTRUMENTATION	SSM-2143P	ANALOG-DEVICES	U2,U3,U7,U8,U12,U13,
70						U17,U18,U20,U21,U26,

VME TIME w/ A-D CONVERTER

ASSEMBLY PN 6011503-10 DRAWN BY WOLF Apr 6 12:34

REVISION O

NO.	PART NO	QNTY	DESCRIPTION	MANUFACTURERS PN	VENDOR	REFERENCE
70						U27,U29,U30,U33,U34
71	5301249	4	IC OP AMP DUAL PRCSION 22v/us	OP249GP	PMI	U57,U62,U67,U69
72	5305311	3	IC RF/VIDEO MUX 4-to-1 DIFF	MAX311CPE	MAXIM	U65,U75,U76
73	5301339	1	IC QUAD COMPARATOR	LM339	NATIONAL	U61
74	5301404	8	IC OP AMP QUAD FET	OPA404KP	BURR-BROWN	U1,U6,U11,U16,U19,U25,U28,U32
75	5301406	1	IC ANALOG MUX 16 CHNL	DG406DN	MAXIM	U23
76	5301419	1	IC CMOS ANALOG SWITCH	DG419DJ	SILICONIX	U58
77	5301444	4	IC ANALOG SWITCH QUAD	DG444DJ	SILICONIX	U60,U64,U66,U74
78	5301570	1	IC DUAL AUDIO COMPANDOR/AGC	NE570	SIGNETICS	U68
79	5301684	4	IC ANALOG SAMPLE & HOLD QUAD	AD684JQ	ANALOG-DEVICES	U4,U14,U22,U31
80	5301847	2	IC OP AMP HIGH SPEED/LOW PWR	AD847JN	ANALOG-DEVICES	U35,U49
81	5308413-35	1	IC 64x4 FIFO CASC. 35MHz W/OE	IDT72403L-35	IDT	U55
82	5308429-30	3	IC 2K x 9 BIT FIFO	CY7C429-25PC/30PC	CYPRESS	U38,U41,U42
83	5352147-25	1	IC 512x8 PROM 25ns	N82S147BN	SIGNETICS	UNPROGRAMMED PROM
84	5352732-04	1	IC 4Kx8 CMOS EPROM	WS57C43C-25D	WAFERSCALE	UNPROGRAMMED PROM
85	5353016	1	IC GAL 16V8 7ns	GAL16V8B-7LP	LATTICE	UNPROGRAMMED PAL
86	5353025	2	IC GAL 26CV12 15ns	PALCE26V12H-15PC/4	AMD	UNPROGRAMMED PAL
87	5354010	1	FPGA 4000 GATE QFP	A1240XL-PQ144C	ACTEL	UNPROGRAMMED FPGA
88	5354009	1	FPGA 8000 GATE QFP	A1280XL-PQ160C	ACTEL	UNPROGRAMMED FPGA
89	5400016	1	IC 12-BIT DAC PAR-LOAD IN-V/O	AD7245JN	ANALOG_DEVICES	U50
90	6128800-20	1	IC SPR-8 MCU w/8K XROM 20MHz C	MOS Z088C0020-PSC	ZILOG	U72
91	6350026	1	OSCILLATOR XTAL 20.0MHz DIP	SG-51K/P-20.0000M	EPSON	U54
92	6350035	1	OSCILLATOR XTAL 32MHz DIP	SG-51KT-32.00	EPSON	U46
92			Acceptable substitute is:	SG-51PTJ-32.00	EPSON	
92			Acceptable substitute is:	SG-51PH-32.00	EPSON	
93	9070011	1	DIP SWITCH 8-POS W/10K RES PU	ARF-08-10K	ALCO	U9
94	9070012	1	DIP SWITCH 4-POS W/10K RES PU	ARF-04-10K	ALCO	U59
94			Acceptable substitute is:	ARF-04-3.3K	ALCO	
95	2840019	1	A/D CONV 12BIT 2us Trk/Hld	MAX-120CNG	MAXIM	U39
96	6062135	1	VME TGT SINE WAVE	6011503	ACROAMATICS	PART 84 PROGRAMMED,U51
97	6062131	1	VME TGT SUPER-8 SFTWRE	5352732-04-REV.G	ACROAMATICS	PART 85 PROGRAMMED,U70
98	6064279	1	VME TGT VME BUS CNTRL	5353025-REV.B	ACROAMATICS	PART 87 PROGRAMMED,U36
99	6064280	1	VME TGT TIME CODE GEN	5353025-REV.A	ACROAMATICS	PART 87 PROGRAMMED,U52
100	6064282	1	VME TGT DIST BUS CNTRL	5353016-REV.B	ACROAMATICS	PART 86 PROGRAMMED,U44
101	6067016	1	VME TGT TIME CODE XLT/GEN	5354010-REV.E	ACROAMATICS	PART 88 TIME, U48
102	6067051	1	VME TGT ANALOG RATE CNTRL	5354009-REV.A	ACROAMATICS	PART 89 TGTARC, U47
103						
104	5470001	6	JUMPER 2 POS	MSB2360-G-C-STP	MACKENZIE	J1,J2,J3,J4,J5
105	2794021	1	CONN D-SUB STAND-OFF SHORT	3341-1S	3M	
106	5600012	1	LABEL,VME PNL, ACRO	5600012	ACROAMATICS	
107	5600016	1	LABEL,VME PNL, TIME	5600016	ACROAMATICS	
108	6730092	1	FR PNL-VME BLANK	6U4EF0000	TRIPLE-E	SCRN #8071141, MOD #5951088
109	5470011	1	JUMPER PINS SINGLE ROW 50POS	MTSW-150-07-G-S-24	SAMTEC	36 USED

REV	REASON	MANDATORY	INITIATED BY	APPRV	DATE
A	RELEASED SEE ECR #4167		JW		12/96
B	SEE ECR #3974	X		JW	12/96
C	SEE ECR #3992	X		JW	12/96
D	SEE ECR #4010	X		JW	12/96
E	SEE ECR #4010	X		JW	12/96
F	SEE ECR #4042	X		JW	12/96
G	SEE ECR #4165	X			
H	SEE ECR #4288	X		BL	9/97
I	SEE ECR #4300	X		BL	11/97
J	SEE ECR #4307	X		BL	11/97
K	SEE ECR #4315	X		BL	12/97
L	SEE ECR #4330	X		BL	1/98
M	SEE ECR #4361	X			
NC	SEE ECR #4959	X		HC	4/04

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
X	X	X	X	X	X	X	X	X	X	X	X	X													

LIST OF MATERIALS 8111503-11

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
6																									

PC CARD 1290164

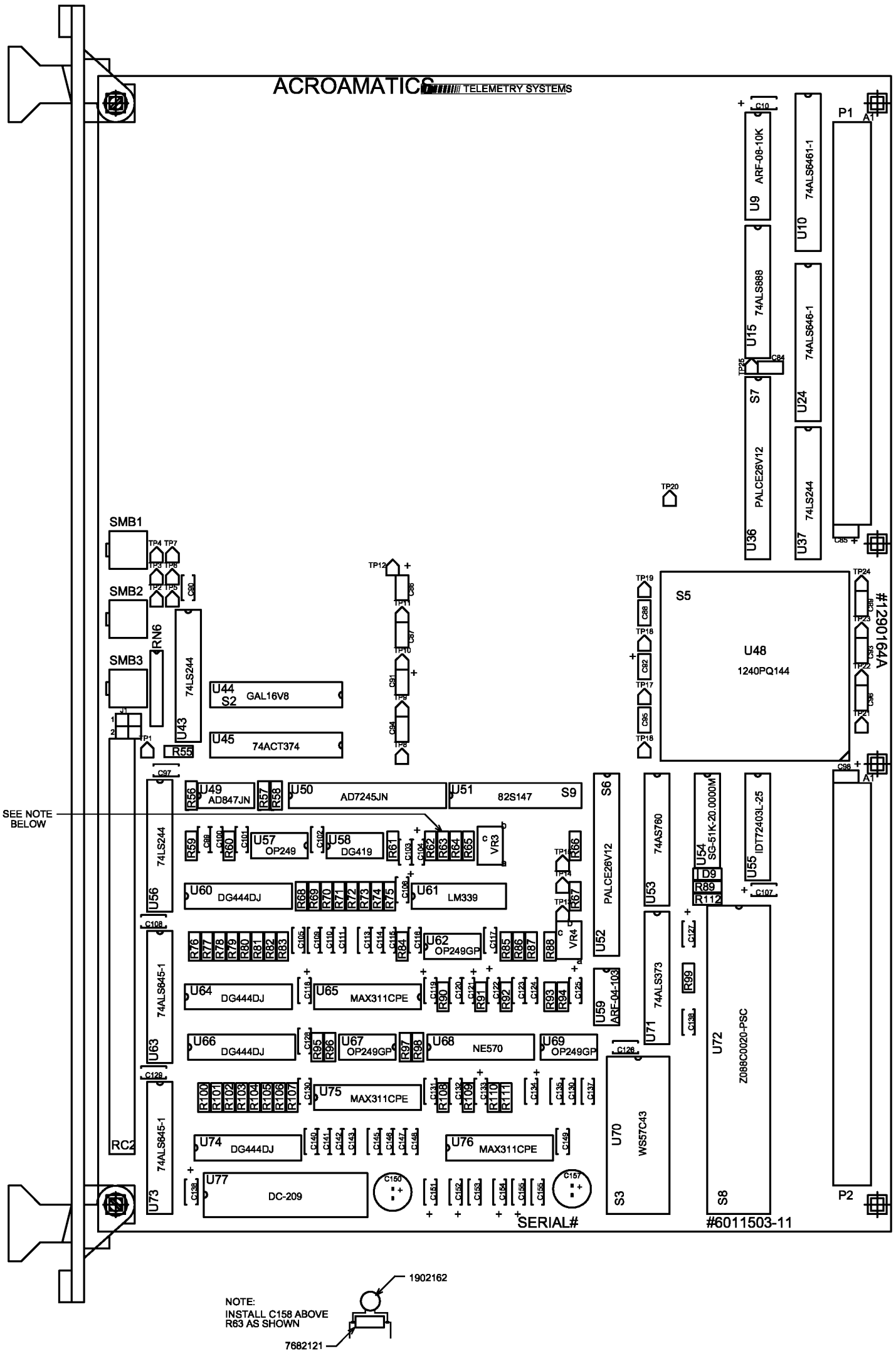
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
X	X	X	X	X	X	X	X																		

SCHEMATICS 2111503-11

MANUFACTURING:

VERIFY REVISION LEVELS OF WIRELIST AND L.O.M. BEFORE BUILDING CARD.

DR D MACDONALD	4/04	ACROAMATICS TELEMETRY SYSTEMS GOLETA, CAL. 93117
CHK		
APPD		ASSEMBLY, CIRCUIT CARD
		VME TIME W/OUT A-D CONVERTER
NEXT ASSY / USED ON		SIZE B / SCALE NTS / DWG NO. 6011503-11
APPLICATION		SHEET 1 OF 2 / REV M



NOTE:
INSTALL C158 ABOVE
R63 AS SHOWN

DR D MACDONALD	4/04	ACROAMATICS TELEMETRY SYSTEMS GOLETA, CAL. 93117	
CHK			
APPD		ASSEMBLY, CIRCUIT CARD	
		VME TIME W/OUT A-D CONVERTOR	
NEXT ASSY	USED ON	SIZE B	SCALE NTS
APPLICATION		SHEET 2 OF 2	REV M

VME TIME w/o A-to-D CONVERT

ASSEMBLY PN 6011503-11 DRAWN BY WOLF Apr 6 12:35

REVISION M ENGINEERING APPROVAL _____ DATE _____

MANUFACTURING APPROVAL _____ DATE _____

NO.	PART NO	QNTY	DESCRIPTION	MANUFACTURERS PN	VENDOR	REFERENCE
1	1290164	1	PCB VME TIME W/ ATOD CONV	1290164	ACROAMATICS	Rev. A
2						
3	2796057	3	CONN PC SMB RTANGLE 1P	903-373J-51A	AMPHENOL	BNC1-3
4	2796059	1	CONN PC 60P SDR RTANGL	2560-5002UB	3M	RC2
5	2796061	2	CONN PC 96P SDR RTANGL	7296-50C2TH	3M	P1,P2
6						
7						
8	8542072	2	SOCKET 20-PIN LOPRO .3w	115-93-320-41-003	PRECI-DIP	S2,S9
8			Acceptable substitute is:	DIP-050-320-160-B	MCKENZIE	
9	8542089	1	SOCKET 24 PIN LOPRO .6w	115-93-624-41-003	PRECI-DIP	S3
10	8542080	1	SOCKET 144-PIN QFP BASE	822114-3	AMP	S5
11	8542081	1	SOCKET 144-PIN QFP TOP	822115-3	AMP	
12	8542083	2	SOCKET 28-PIN DIP LOPRO .3W	115-93-328-41-0003	PRECI-DIP	S6,S7
13	8542076	3	SOCKET 20-PIN SIP	SIP-1x20-185-B	MCKENZIE	S8
13			Acceptable substitute is:	315-93-120-41-003	PRECI-DIP	
14						
15						
16	1902162	1	CAP CERM 10pF 50V	CN15C100J	CENTRALAB	C158
17	1871057	2	CAP SILV MICA 5pF 50V	CD5CC050D03	CD	C124,C135
18	1922027	2	CAP TA 68uF 20% 6V	P2018	DIGI-KEY	C151,C154
19	1902170	26	CAP CERM .1uF 50V .1" LS	C320C104M5U5CA	KEMET	C84,C86-90,C101,C103,C105
19						C93-97,C102,C108,C128-C130,C137
19						C138,C140,C123,C116,C117,C148-149
20						
21	1922114	2	CAP TA 220uF 10% 10V	T350L227K010AS	KEMET	C150,C157
22	1922613	16	CAP TA EPXY 10uF 10% 25V	T362B106KO25AS	KEMET	C10,C85,C91,C92,
22						C98,C104,C106,C107,C127,C118,
22						C119,C125,C134,C139,C152,C155
23						
24	1922621	2	CAP TA EPXY 2.2uF 10% 35V	T368B225KO35AS	KEMET	C121,C133
25						
26	1903003	6	CAP TMP STBL (X7R) 1.0uF	C330C105K5R5CA	KEMET	C120,C122,C126,C131,C132,C136
27						
28	1903016	3	CAP TMP STBL (X7R) .82uF	DR30BBM824K	METUCHEN/GENERIC	C100,C153,C156
29	1903030	4	CAP TMP STBL (X7R) .047uF	DR30BBM473K	METUCHEN/GENERIC	C111,C115,C141,C145
29			Acceptable substitute is:	C322C473J1R5CA	KEMET	
30	1903041	4	CAP TMP STBL (X7R) 4700pF	DR20BBM472K	METUCHEN/GENERIC	C110,C114,C142,C146
31	1904031	4	CAP NPO 180pF	C322C181J2G5CA	KEMET	C109,C113,C143,C147
31			Acceptable substitute is:	C317C181J1G5CA	KEMET	
32	1904018	1	CAP NPO 39pF	5018E050RD390J	KYOCERA	C99
33	3572004	1	DIODE SILICON	1N4148	GENERIC	D9
34						
35						
36	7700050	1	RES SIP 1.5K/3.3K OHM 6P	CSC06A-05-152/332J	DALE	RN6
37	7093031	2	MINI TRIM POT 10-TURN 2K	RJ26FW202	BOURNS	VR3,VR4

VME TIME w/o A-to-D CONVERT

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NO.	PART NO	QNTY	DESCRIPTION	MANUFACTURERS PN	VENDOR	REFERENCE
38						
39						
40						
41	7672001	1	RES 10 OHM 1/4W 5% CARBON	GENERIC	GENERIC	R61
42	7682121	4	RESISTOR 300K OHM 1/8W 5%	RCO5GF	A-B	R63,R86,R90,R108
43	7680224	1	RESISTOR 3.01K 1/10W 1%	RN55C3011F	TRW	R72
44	7680294	2	RESISTOR 8.06K 1/10W 1%	RN55C8061F	TRW	R93,R94
45						
46	7685002	6	RESISTOR 1K 1/8W 1%	5063JD1K00F	PHILIPS	R66,R67,R71,R92,R96,R109
47	7685003	14	RESISTOR 2K 1/8W 1%	5063JD2K00F	PHILIPS	R57,R58,R60,R68,R69,R70,R97
47						R55-R56,R62,R74,R85,R88,R99
48	7685009	4	RESISTOR 14K 1/8W 1%	5063JD14K0F	PHILIPS	R76,R80,R100,R104
49	7685068	5	RESISTOR 1.33K 1/8W 1%	5063JD1K330F	PHILIPS	R65,R79,R83,R103,R107
50	7685076	4	RESISTOR 3.32K 1/8W 1%	5063JD3K320F	PHILIPS	R78,R82,R102,R106
51	7685083	4	RESISTOR 6.81K 1/8W 1%	5063JD6K810F	PHILIPS	R77,R81,R101,R105
52	7685087	8	RESISTOR 10K 1/8W 1%	5063JD10K0F	PHILIPS	R59,R64,R73,R84,R87,R110,R111,R112
53						
54	7685071	1	RESISTOR 1.82K 1/8W 1%	5063JD1K820F	PHILIPS	R98
55	7685100	2	RESISTOR 39.2K 1/8W 1%	5063JD39K20F	PHILIPS	R89,R91
56	7685110	1	RESISTOR 100K 1/8W 1%	5063JD100K0F	PHILIPS	R75
57	7685074	1	RESISTOR 2.67K 1/8W 1%	5063JD2K670F	PHILIPS	R95
58						
59	7130068	1	PWR SUP DC/DC +-15v/50ma	215D5FS	CDI	U77
59			Acceptable substitute is:	DC-209	INTRONICS	
60						
61	5300244-18	3	IC OCTAL BUFFER NI TS	74LS244	GENERIC	U37,U43,U56
62	5300373-30	1	IC OCT D-LATCH TRANSP TS	74ALS373	GENERIC	U71
63	5300374-62	1	IC OCT D-F/F EDGE-TRIG TS	74ACT374	GENERIC	U45
64	5300645-31	2	IC OCTAL BUS TRANSCEIVERS	74ALS645-1	GENERIC	U63,U73
65	5300646-31	2	IC OCTAL BUS XCVR W/REGS TS	74ALS646-1	GENERIC	U10,U24
65			Acceptable substitute is:	CALS646A-1NT	TI	
66	5300688-30	1	IC 8-BIT MAG COMP	74ALS688	GENERIC	U15
67	5300760-36	1	IC OCTAL BUFFER OC NI	74AS760	TI	U53
68						
69	5301249	4	IC OP AMP DUAL PRCSION 22v/us	OP249GP	PMI	U57,U62,U67,U69
70	5305311	3	IC RF/VIDEO MUX 4-to-1 DIFF	MAX311CPE	MAXIM	U65,U75,U76
71	5301339	1	IC QUAD COMPARATOR	LM339	NATIONAL	U61
72						
73						
74	5301419	1	IC CMOS ANALOG SWITCH	DG419DJ	SILICONIX	U58
75	5301444	4	IC ANALOG SWITCH QUAD	DG444DJ	SILICONIX	U60,U64,U66,U74
76	5301570	1	IC DUAL AUDIO COMPANDOR/AGC	NE570	SIGNETICS	U68
77						
78	5301847	1	IC OP AMP HIGH SPEED/LOW PWR	AD847JN	ANALOG-DEVICES	U49
79	5308413-35	1	IC 64x4 FIFO CASC. 35MHz W/OE	IDT72403L-35	IDT	U55
80						
81	5352147-25	1	IC 512x8 PROM 25ns	N82S147BN	SIGNETICS	UNPROGRAMMED PROM

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NO.	PART NO	QNTY	DESCRIPTION	MANUFACTURERS PN	VENDOR	REFERENCE
82	5352732-04	1	IC 4Kx8 CMOS EPROM	WS57C43C-25D	WAFERSCALE	UNPROGRAMMED PROM
83	5353016	1	IC GAL 16V8 7ns	GAL16V8B-7LP	LATTICE	UNPROGRAMMED PAL
84	5353025	2	IC GAL 26CV12 15ns	PALCE26V12H-15PC/4	AMD	UNPROGRAMMED PAL
85	5354010	1	FPGA 4000 GATE QFP	A1240XL-PQ144C	ACTEL	UNPROGRAMMED FPGA
86	5400016	1	IC 12-BIT DAC PAR-LOAD IN-V/O	AD7245JN	ANALOG_DEVICES	U50
87	6128800-20	1	IC SPR-8 MCU w/8K XROM 20MHz C	MOS Z088C0020-PSC	ZILOG	U72
88	6350026	1	OSCILLATOR XTAL 20.0MHz DIP	SG-51K/P-20.0000M	EPSON	U54
89						
90	9070011	1	DIP SWITCH 8-POS W/10K RES PU	ARF-08-10K	ALCO	U9
91	9070012	1	DIP SWITCH 4-POS W/10K RES PU	ARF-04-10K	ALCO	U59
91			Acceptable substitute is:	ARF-04-3.3K	ALCO	
92						
93						
94	6062135	1	VME TGT SINE WAVE	6011503	ACROAMATICS	PART 83 PROGRAMMED,U51
95	6062131	1	VME TGT SUPER-8 SFTWRE	5352732-04-REV.G	ACROAMATICS	PART 84 PROGRAMMED,U70
96	6064279	1	VME TGT VME BUS CNTRL	5353025-REV.B	ACROAMATICS	PART 86 PROGRAMMED,U36
97	6064280	1	VME TGT TIME CODE GEN	5353025-REV.A	ACROAMATICS	PART 86 PROGRAMMED,U52
98	6064282	1	VME TGT DIST BUS CNTRL	5353016-REV.B	ACROAMATICS	PART 85 PROGRAMMED,U44
99	6067016	1	VME TGT TIME CODE XLT/GEN	5354010-REV.E	ACROAMATICS	U48,TIME,PART #87
100						
101						
102						
103						
104	5600012	1	LABEL,VME PNL, ACRO	5600012	ACROAMATICS	
105	5600016	1	LABEL,VME PNL, TIME	5600016	ACROAMATICS	
106	6730092	1	FR PNL-VME BLANK	6U4EF0000	TRIPLE-E	SCRN #8071168, MOD #5951094
107	5470011	1	JUMPER PINS SINGLE ROW 50POS	MTSW-150-07-G-S-24	SAMTEC	28 USED

APPENDIX A
ANALOG TO DIGITAL CONVERTER

APPENDIX A
ANALOG TO DIGITAL CONVERTER

A-1. Introduction

The Analog to Digital Converter option consists of additional circuitry installed on the TIME card. The two LSBs of the high nibble of the TIME card signature register are used to indicate the presence of the A to D option by changing the TIME signature to 1503 hex. The analog option provides sixteen differential inputs. Each input has a differential-to-single-ended amplifier with integral sample and hold circuitry. The inputs are multiplexed to a 12 bit A to D converter with a maximum composite conversion rate of 500,000 samples per second. Programmable sampling intervals from 16 to 500,000 samples per second are available for each input. The sampling rates are entered via sixteen registers which are an extension of the TIME card registers in A16/D16 utility space. These registers are shown below.

A to D A16 Utility Space		
Addr	**Function**	**Mode**
2E ↓ 10	Channel 15 Rate Set ↓ Channel 0 Rate Set	Read/Write ↓ Read/Write

The channel rate is set by writing a 16 bit word of the following format: bits 6-0 contain a divider (from 1 to 128) that is set by entering 0 through 127; bits 7 and 11 are reserved; and bits 10-8 contain a prescalar whose values are shown in the table below.

Rate Setup Word Prescale	
Value	**Clock Rate**
7	16 MHz
6	4 MHz
5	1 MHz
4	250 kHz
3	50 kHz
2	10 kHz
1	2 kHz
0	Channel Disable

Bits 10, 9, and 8 in all channels default to zero at reset, disabling the channels. Bits 15-12 at address 10 (Channel 0 rate set) are reserved to set the data format in bits 13-12. The data format defaults to zero at reset. These bits are detailed in the table below.

Value	Data Format
3	Twos complement, Right justified
2	Twos complement, Left justified
1	Offset binary, Right justified
0	Offset binary, Left justified

A-2. Analog Adjustable Switches & Jumper Settings

JP1 installed enables the analog output to Distribution.

Jumpers JP2 through JP5 allow you to set bits 7-4 of the base ID for analog channels 0-15. The TDP compiler assumes the base ID is set for 1FC0, so if you use the TDP compiler's analog port setup, you should stay with the factory setting of 1FC0. The jumpers allow you to offset analog IDs in 16 channel increments; for analog expansion boards you place the blocks of 16 channels as you want within the ID space 1F00-1FF0.

A-3. Programming Analog Sampling

The setup language for the analog channels is compatible with that used in the Acroamatics 2110 series Telemetry Data Processors. The following section discusses the setup syntax.

Standard TDP syntax is used to specify the data processing. The ID field (in this case, the ID is the channel number) must include a specification of the analog sampling rate. The schematic representation is

ANA
ID(rate): alg_1
⋮
END alg_n

rate is the sampling rate expressed in samples per second, and should lie between 16 and 500,000. The sum of all the sampling rates per channel should not exceed 500,000. If you exceed this rate, the data is sampled as rapidly as possible, with the total number of channels sampled at about 500,000 samples per second. This adjustment is made by the hardware by reducing the sampling rate on the higher speed channels as necessary. A rate of zero disables the channel.

The ID values for the analog channels are assigned using the programmed channel numbers relative to the base of 1FC0 hex (8128); therefore, channel 0 has output ID 8128, channel 1, output ID 8129, and channel 15, output ID 8143. You may list more than one ID on a line if the processing of the data is the same.

An example of Analog Port programming is

```
ANA
OBN       |data format is offset binary
2(10000):                FL1 2%
1(2000):  3:     PAS
4(5000): 5: 6: 7:        FL1 1%
END
```

Note the unexpressed sampling rate for channels 5, 6, and 7, which are sampled at the same rate (5000) as channel 4.

You can program the analog sampling rates and the data format with the command

RATE *[format] rate* ch_1 ... ch_n

rate is the sampling rate in samples per second, 16 to 500000. A rate of zero disables the channel. A list of channels ch_1 ... ch_n follows the rate, and all specified channels (0-15) are set to the specified rate. To use the RATE command to set the Data Format, use the options listed below. You set one format for all of the channels. If the format is not specified in the RATE command, it is not changed from its previous setting. At power up and reset, the format is offset binary, left justified.

Format Specifier	Data Format
RJA	Twos complement, Right justified
LJA	Twos complement, Left justified
RJL	Offset binary, Right justified
LJL	Offset binary, Left justified

ANALOG TO DIGITAL CONVERTER SPECIFICATIONS

INPUT	CHARACTERISTICS
Differential	Sixteen inputs with individual sample and hold circuits
Impedance	100k Ohms minimum
Input Amplitude	±10 Volts full scale
OPERATION	
Sampling Rate	16 to 500,000 samples per second
Resolution	12 bits
Data Format	Offset binary or twos complement, right or left justified
Nonlinearity	±1 LSB
Accuracy	±0.05% of full scale
REQUIREMENTS	
Power	+5VDC at 1.5 Amperes
Temperature	Operating: 0 to +40°C, Non-operating: –40 to +86°C
Relative Humidity	Up to 90% non-condensing
Air Flow	30 Linear FPM
Shock	Operating: 6G, Non-operating: 50G
Vibration	Operating: 0.5G, 5 to 2000 Hz, Non-operating: 1.2G 5 to 500 Hz

Specifications are subject to change without notice.

A-4. Analog Adjustment Procedure

Two potentiometers, VR1 and VR2, provide adjustments for gain and offset of the analog inputs as a group. These are factory adjusted and normally need no further adjustment.

To set up for these adjustments, run channel 0 at 10KHz. Bend about one inch of #18 bus wire into a U shape (a paper clip will work). Insert the two ends into connector RC1 pins 19 and 37 (top two pins of 37 pin D-SUB closest to the outside corner of the board). Use a queball jumper to connect this shorting loop to ground (TP-7).

Observe the single channel display for the ID of channel 0 (usually 1FC0). The twos complement, left justified data should be at midscale with values of FFFFFFF0 and 00000000 occurring somewhat equally. If not, adjust VR2 to obtain midscale.

Next cut in half the loop at RC1 removing the short between pins 19 and 37. Leaving the ground on one pin of RC1, connect the other pin to U39 pin 5 (–5.000V) with another queball jumper. This will put channel 0 at half scale, either positive or negative depending on connections at RC1. Adjust VR1 for a reading of FFFFC000 or 00004000. Connections at RC1 may be swapped to see if the readings are symmetrical. When pin 19 is ground and pin 37 is –5.000V, the single channel display will show 00004000, 00003FF0, 00004010 etc., and with connections swapped, the display will show FFFFC000, FFFFC010, FFFFBFF0, etc.