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SBS Technologies, Inc.

4487 P/V

Telemetry Receiver



Technical Manual

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Table of Contents

Chapter 1: Introduction 1-1
1.1 General 1-1
1.2 Specifications 1-2

Chapter 2: Installation 2-1
2.1 General 2-1
2.2 Addressing 2-1
2.3 Pinouts 2-5

Chapter 3: Programming 3-1
3.1 General 3-1
3.2 Specifications 3-1
3.3 Signature 3-2
3.4 Programming 3-2
3.5 Status 3-6

Chapter 4: Block Diagram 4-1

List of Tables

Table 1-1, Specifications 1-2
Table 3-1, Write Registers 3-1
Table 3-2, Read Registers 3-2
Table 3-3, Serial PROM Map 3-3
Table 3-4, IF Bandwidth Settings 3-5
Table 3-5, AGC Time Constant Settings 3-5

List of Figures

Figure 3-1: PROM Reading Function.....3-4
Figure 4-1: Block Diagram.....4-1

Chapter 1: Introduction

1.1 General

The 4487 is a small, remotely programmable AM and wideband FM receiver intended for telemetry applications. The receiver is available in different form factors for popular computer busses. The 4487-P form factor is for ISA (PC-compatible) systems. The 4487-V is for VME systems.

These receivers tune a distinct telemetry band, identified by the second letter of the model number. These are:

- "S" receivers: 2200-2400MHz.
- "L" receivers: 1435-1540 MHz.
- "U" receivers: 350-450 MHz.

This document provides a brief specification, including pinout information and the necessary setup and operating procedures to ensure ease of use.

Chapter 2: Installation

2.1 General

2.1.1 4487-P

The 4487-P must be installed in a full-length ISA slot. Use care when installing to avoid damage to the components on the back side of the board.

2.1.2 4487-V

The 4487-V occupies one standard 6U VME slot. The receiver has no VME P2 Connector.

2.2 Addressing

2.2.1 4487-P

The 4487 occupies 8 bytes of address space. The base address is set by an 8-pole switch S1 near the front end of the board. A one in the port address is signified by turning its switch section off (away from the arrow.)

Figure 2-2, 4487-V Board

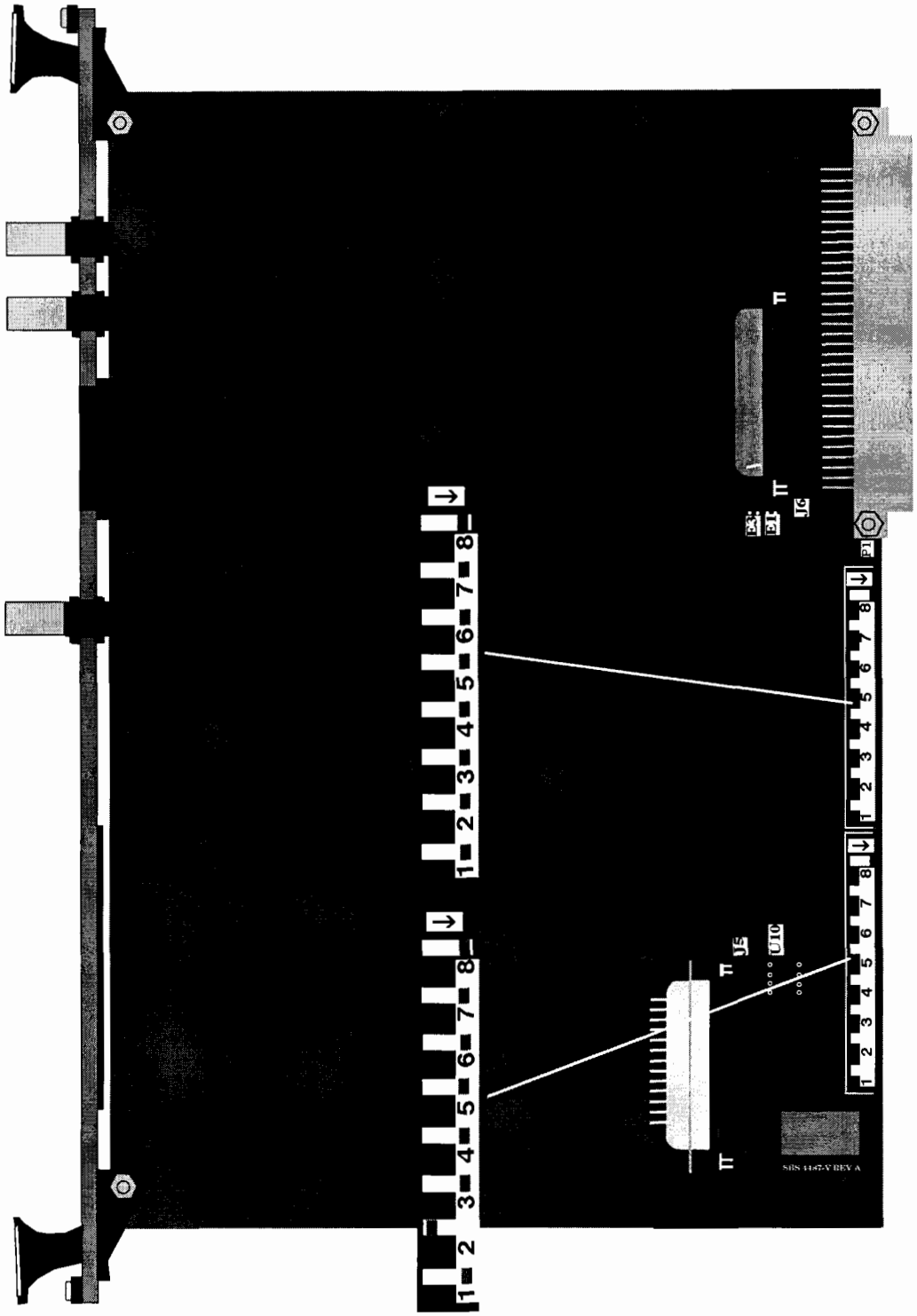


Table 2.4: 4487-V Address Switch Settings

Section	Bit	Section	Bit
S1-1	A23	S2-1	A15
S1-2	A22	S2-2	A14
S1-3	A21	S2-3	A13
S1-4	A20	S2-4	A12
S1-5	A19	S2-5	A11
S1-6	A18	S2-6	A10
S1-7	A17	S2-7	A9
S1-8	A16	S2-8	A8

2.3 Pinouts

The table below indicates the external inputs and outputs.

Table 2.5: J2 Pinout

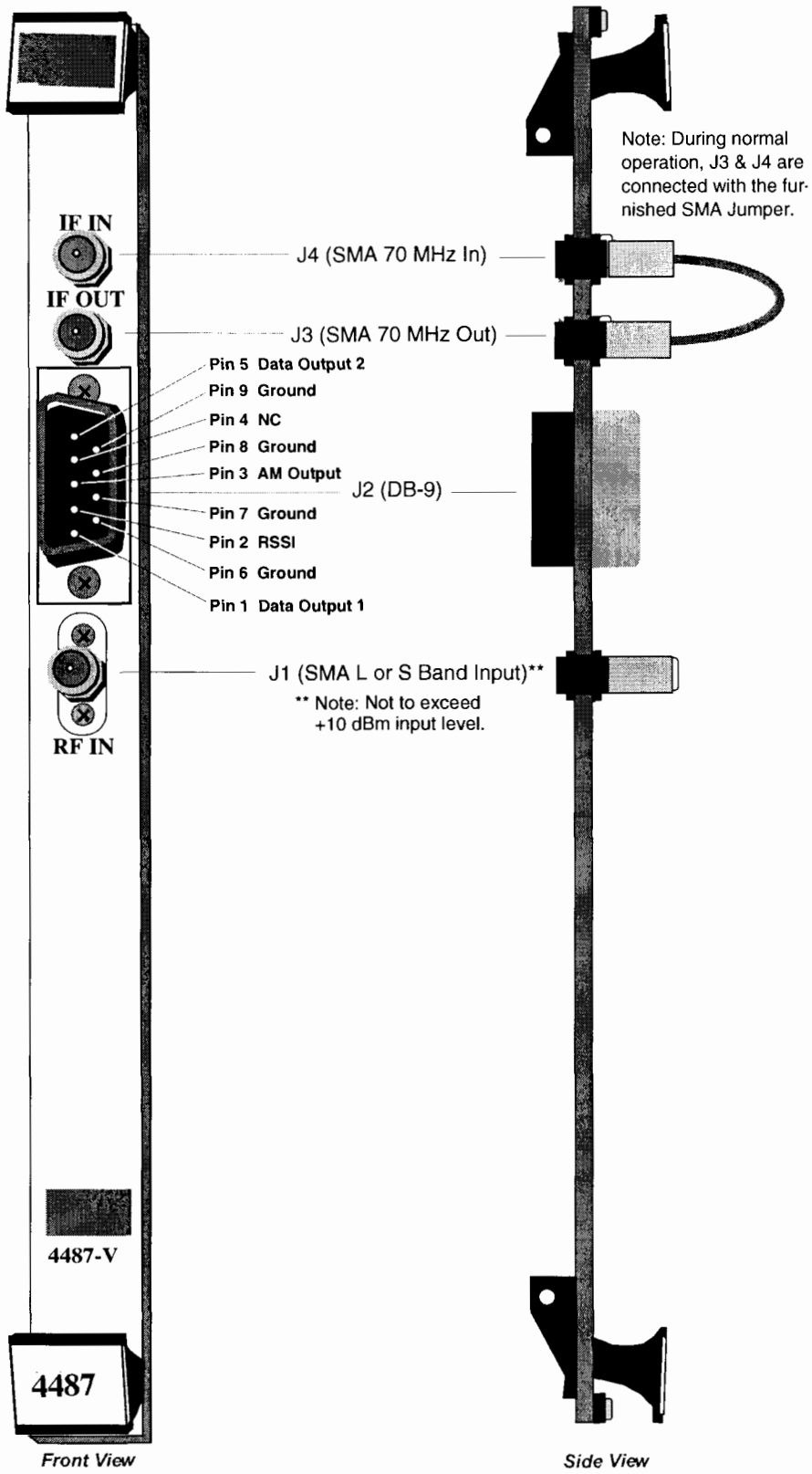
Pin	Signal
1	DATA OUTPUT 1
2	RSSI
3	AM OUTPUT
4	NC
5	DATA OUTPUT 2
6	GROUND
7	GROUND
8	GROUND
9	GROUND

Table 2.6: SMA Connections

Connector	Type	Function
J1	SMA FEMALE	RF INPUT
J2	DB9 MALE	SIGNAL OUTPUT
J3	SMA FEMALE	70 MHz INPUT
J4	SMA FEMALE	70 MHz OUTPUT

NOTE: For normal operation, J3 and J4 must be connected using the (furnished) SMA jumper.

Figure 2-5, 4487-V Front Panel Diagram



Chapter 3: Programming

3.1 General

The 4487 Receiver occupies eight bytes of I/O space. These are referred to as eight numbered "registers." For the 4487-P, each is at a physical I/O port obtained by adding the register number to the address switch setting. For the 4487-V, multiply the register number by 2 and add the VME base address +1. Write-only registers 0 through 5 and read-only registers 0 through 2 are implemented. These are mapped into bitfields as shown in Tables 3–1 and 3–2. Certain hexadecimal constants are used here, flagged in C-language fashion by a leading "0x."

3.2 Specifications

Table 3-1, Write Registers

Register	#	Bit							
		07	06	05	04	03	02	01	00
Control 1	0	-	-	-	-	DI	CK	0	ADC
Coarse Tune Low	1	Coarse Tune Bits 7-0							
Coarse Tune High	2	IFBW		-	Coarse Tune Bits 12-8				
Fine Tune	3	CS	Fine Tune						
Control 2	4	AGC Control				PDF Control			
Control Voltage	5	DAC Value (Not Used)							
Not Implemented	6	-	-	-	-	-	-	-	-
Not Implemented	7	-	-	-	-	-	-	-	-

Table 3-3, Serial PROM Map

Location	Assignment	L-Band Default	S-Band Default
00	0x4487 if PROM present	0x4487	0x4487
01	Fc Low frequency (MHz)	1435	2200
02	Fc High frequency (MHz)	1540	2400
03	First IF frequency (MHz)	468	289
04	First IF step size (KHz)	500	500
05	First IF offset (usually zero)	0	0
06	Second IF step size (KHz)	50	50
07	Second IF Offset	0x18	0x1C
08	Narrowest IF Bandwidth (KHz)	1000	1000
09	Narrow IF Bandwidth (KHz)	2000	2000
10	Wide IF Bandwidth (KHz)	5000	5000
11	Widest IF Bandwidth (KHz)	10000	10000
12	Lowest Lowpass Cutoff (KHz)	500	500
13	Low Lowpass Cutoff (KHz)	1000	1000
14	High Lowpass Cutoff (KHz)	2500	2500
15	Highest Lowpass Cutoff (KHz)	5000	5000
16	Zero for standard receiver	0	0
17..63	Unassigned		

To read from the PROM, you need to set and clear the CS, DI, and CK bits in the right order, and read and serialize the data from the DO bit. Rather than a wordy explanation, the algorithm is expressed in pseudocode as the `RdProm()` function in Figure 3-1. This function takes an address and returns the value read from the PROM. c programmers will be able to adapt this code almost directly; workers in other languages will have to translate. For the 4487V the `WrReg()` and `RdReg()` functions will have to be rewritten to perform VMEbus accesses to the registers, of course.

If `RdProm(0)` does not return hexadecimal 4487, you should assume the PROM is not present

3.4.2 4487 Receiver Setup Procedure

To set up the 4487, select an Input Frequency, Intermediate Frequency (IF) bandwidth, and Automatic Gain Control (AGC) time constant. As a result of these selections, the values written to Registers 1 through 4 are selected and calculated. Values not defined result in improper operation.

Select an IF bandwidth appropriate to the expected peak signal deviation of the transmitting device. The IF bandwidth should be twice the data rate of the transmitting device. Peak-to-peak deviation of the transmitting device should correspond to 0.7 times the symbol rate. Four settings are available. Choose values for constants K1 and K2 from Table 3-4, "IF Bandwidth Settings," on page 3-5.

Table 3-4, IF Bandwidth Settings

WIDTH	K1	K2
NARROWEST	0	0x0E
NARROW	0x40	0x0D
WIDE	0x80	0x0B
WIDEST	0xC0	0x07

Four AGC settings are available. Choose constant K3 from Table 3-5, "AGC Time Constant Settings," on page 3-5.

Table 3-5, AGC Time Constant Settings

Time Constant	K3
0.1ms	0x10
1ms	0x20
10ms	0x40
100ms	0x80

To use the numbers read from the PROM more directly, we developed a new generalized algorithm to set up the 4487. This algorithm uses the values read from the PROM and scales at strategic places so integer arithmetic can be used. Herein, a number in [brackets] refers directly to the contents of a PROM location. Remainders from integer divides can be ignored except where noted.

1. The Fc value is expressed in units of 10KHz, e. g., 2215.5 MHz is expressed as 221550L.

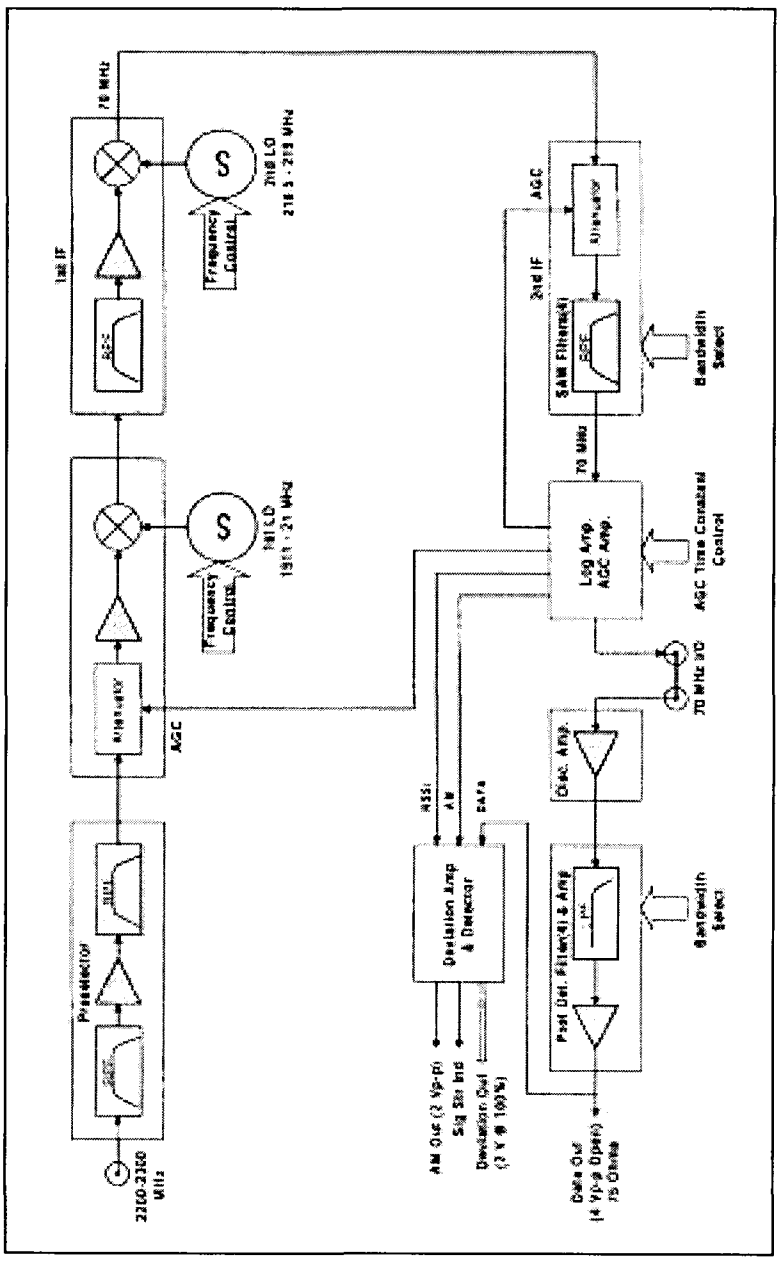
2. The minimum Fc is `[1] * 100`. The maximum is `(([2] * 100) - ([6] / 10))`. Fc is clamped in that range.

3. The First Local Oscillator setting is calculated. This is `(Fc - ([3] * 100) ) / ([4] / 10)`, saving both the quotient *q* and remainder *r*.

4. Calculate *q* + `[5]`. Write the 8 LSB's of the result to register 1. Shift the result 8 bits to the right, add the selected IF filter value (k1,

Chapter 4: Block Diagram

Figure 4-1: Block Diagram



Index

Symbols

"L" receivers: 1435-1540 MHz 1-1
"S" receivers: 2200-2400MHz 1-1
"U" receivers: 350-450 MHz 1-1

Numerics

16 mode 2-4
4487 1-1
4487-P 1-1
4487-P Front Panel Bracket 2-6
4487-P installation 2-1
4487-V 1-1, 3-1
4487-V Front Panel Diagram 2-7
4487-V installation 2-1
6U VME slot 2-1

A

ADC Value Register 3-6
AGC Time Constant Settings 3-5
algorithm 3-5
AM receiver 1-1
ASCII string 3-2
Automatic Gain Control (AGC) 3-5

B

base address 2-1, 2-4
Block Diagram 4-1

C

configuration data 3-2

D

DB-9 Mating Connector for 4487-P/V 2-6

E

external inputs and outputs 2-5

F

FM receiver 1-1
Front Panel Bracket, 4487-P 2-6

I

I/O space 3-1
IF Bandwidth Settings 3-5
Input Frequency 3-5
Installation 2-1
Intermediate Frequency (IF) bandwidth 3-5
Introduction 1-1
ISA (PC-compatible) systems 1-1
ISA carrier 3-2
ISA slot 2-1

J

J4 2-5
jumper settings 2-4

P

peak deviation status 3-6
port address 2-1
programmable 1-1
Programming 3-1
Programming, PROM 3-2
PROM ..... -2
PROM Reading Function 3-4
PROM, earlier boards 3-2

R

Read Registers 3-2
Receiver 3-1
Receiver Setup Procedure 3-5
registers 3-1
RF requirements 3-2

S

Serial PROM Map 3-3
signal strength 3-6
Signature 3-2
sinusoidal signals 3-6
SMA jumper 2-5
Specifications 1-2
Specifications, programming 3-1
Standard Address Space 2-4
switch settings 2-4

T

T/MATE I 3-2
telemetry applications 1-1

V

VME A16 mode 2-4
VME A24 mode 2-4
VME base address 3-1
VME carrier 3-2
VME systems 1-1

W

wideband 1-1
wideband FM 1-1
Write Registers 3-1

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