

# **Technical Information Manual**

Revision n. 8  
2 December 2020

**MOD. V6534**

*VME PROGRAMMABLE  
HV POWER SUPPLY*

**NPO:  
00114/07:V6534.MUTx/08**

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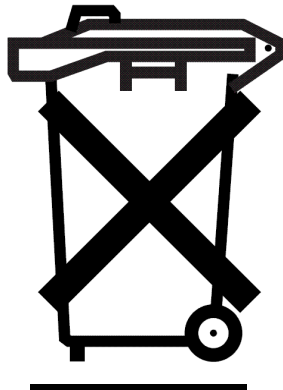
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# 1. General description

## 1.1. Overview



**Fig. 1.1: V6534 6 Channel VME Programmable HV Power Supply**

The V6534 is a 1-unit wide VME 6U module housing 6 High Voltage Power Supply Channels (6KV, 1mA). The board is available with either positive or negative output polarity; *mixed* version with 3 positive and 3 negative channels is also available. The channels share a common floating return, which allows on-detector grounding reducing the noise level. HV outputs are delivered through SHV connectors. The HV output RAMP-UP and RAMP-DOWN rates may be selected independently for each channel in the 1÷ 500 V/s range with 1 V/s steps. Safety features include:

- OVERVOLTAGE and UNDERVOLTAGE warning when the output voltage differs from the programmed value by more than 2% of set value (minimum 10V)
- Programmable via trimmer HVMAX and IMAX hardware protection limit
- OVERCURRENT detection: if a channel tries to draw a current larger than its programmed limit, it enters TRIP status, keeping the maximum allowed value for a programmable time (TRIP), before being switched off.
- Channels can be enabled or disabled through the Global Interlock logic
- Channels individually enabled via front panel jumpers (passive or active mode available).
- Optional A6580 DC Input Power Equalizer

The modules fit into both VME/VME64 standard and V430 crates. Imon ZOOM x10 allows to read current monitor either in full range with standard resolution (HIGH RANGE) or in lower 10% range with 10x resolution (LOW RANGE). It has not any effect on ISET resolution.

Functional parameters can be programmed and monitored via VMEbus; moreover, these units can be managed via CAEN HV Wrapper, a set of ANSI C functions bundled in a library, providing the software developer an unified software interface for the control of CAEN Power Supplies. This is a low level application in which the writing of the Control SW is assigned to the user. CAEN HV Wrapper is logically located between an higher level application, such as GECO2020, and the lower layer software libraries. It contains a generic software interface independent by the Power Supply models and by the communication path used to exchange data with them.

VMEbus allows to control the V65xx via OPC server, through a complete set of programmable/monitorable items; refer to the CAEN OPC Server User's Manual for detailed description. For more info please visit: [www.caen.it](http://www.caen.it) (products>firmware/software section).

**Table 1.1 – Available items**

<b>Code</b>	<b>Description</b>
WV6534MAAAAA	V6534M 6 Ch VME Programmable HV Power Supply (3ch -6kV 1mA, 3ch +6kV 1mA)
WV6534XAAAAA	V6534N 6 Ch VME Programmable HV Power Supply (-6kV 1mA)
WV6534XPAAAA	V6534P 6 Ch VME Programmable HV Power Supply (+6kV 1mA)
WA6580XAAAAA	A6580 - DC Power Input Equalizer for V65XX Family

## 2. Technical specifications

### 2.1. Packaging

The module is housed in a 6U-high, 1U-wide VME unit. The board is provided the VME P1, and P2 connectors and fits into both VME standard and V430 backplanes.

### 2.2. Power requirements

The power requirements of the modules are as follows:

**Table 2.1 – V6534 power requirements**

Power requirements					
# Ch. ON	Output	Without A6580		With A6580	
1		+5V	±12V	+5V	±12V
	Offset	0.2A	0.2A	1A	0.15A
	1kV/1mA	0.2A	0.4A	1.7A	0.25A
	3kV/1mA	0.2A	0.45A	2A	0.27A
6	6kV/1mA	0.2A	0.6A	2A	0.3A
	1kV/1mA	0.2A	1.45A	4.5A	0.8A
	3kV/1mA	0.2A	1.65A	5A	0.95A
	6kV/1mA	-	-	7.5A	1.3A
	Max	25W		48W	

## 2.3. Front Panel

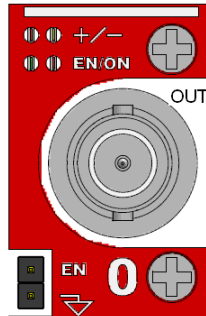


Fig. 2.1: V6534 front panel



## 2.4. Front panel connections

### 2.4.1. HV Channel Output



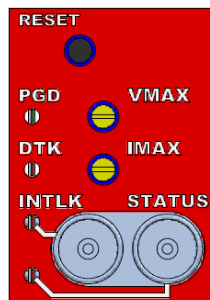
**Fig. 2.2: HV Channel panel and test point electrical scheme**

NAME:	TYPE:	FUNCTION:
EN	AMP 280370-2	Passive/active HV Enable (see below); -15V÷+20V max. ratings
OUT	RADIAL R317580 SHV	HV Channel Output connector
EN	Green LED	HV Channel enabled; turns off as HV Channel is ON
ON	Red LED	HV Channel ON
+/-	Red / Yellow LED	Polarity: Red = positive; Yellow = negative

The Board can be provided with either passive or active Channel HV Enable; therefore the HV output can be enabled in the following ways:

HV ENABLE:	DESCRIPTION:
Passive	Channel is enabled with a short circuit or TTL/CMOS <sup>1</sup> LOW level (200µA current) on EN pin. Channel is disabled with either open contact or TTL/CMOS HIGH level (200µA) on EN pin
Active	Channel is enabled with a TTL/CMOS HIGH level (200µA) on EN pin. Channel is disabled with open contact, short circuit or TTL/CMOS LOW level (200µA current) on EN pin.

### 2.4.2. HV Status control section



**Fig. 2.3: Status control panel**

NAME:	TYPE:	SIGNAL:	FUNCTION:
RESET	PUSH-BUTTON		Board Hardware Reset
PGD	GREEN LED		Board Power OK

<sup>1</sup> TTL/CMOS Levels: H=3.5V÷5V, L=0V÷0.5V; ~200µA

DTK	GREEN LED		DATA ACKNOWLEDGE; it lights up each time a VME access is performed
VMAX	TRIMMER		Hardware maximum voltage common to all the channels; can be read out via VME
IMAX	TRIMMER		Hardware maximum current common to all the channels; can be read out via VME
STATUS	RED LED/LEMO CONN. FISCHER D101A004-32, RED LED	NIM/TTL Out	Alarm status signalled (active LOW, see § 2.6 for internal settings)  The front panel LED is ON when the Alarm status is signalled
INTERLOCK	RED LED/LEMO CONN. FISCHER D101A004-32, RED LED	TTL/CMOS In <sup>2</sup>	See below for INTERLOCK configuration.  The front panel Interlock LED is ON when the INTERLOCK is enabled; as INTERLOCK is enabled, channels are turned off at the fastest available rate, regardless the RAMP DOWN setting.  INTERLOCK status can be readout via VMEbus

The Board INTERLOCK (remote board disable) can be configured in several ways, through internal SW6 and SW7 switches (see § 2.6), as explained below:

SW6:	SW7:	BOARD ENABLED:	BOARD DISABLED:	DESCRIPTION:
RIGHT	RIGHT	TTL/CMOS HIGH level (200µA) provided to the relevant connector or leaving the connector open.	500hm termination inserted into the relevant connector or with a TTL LOW level (200µA current) fed to the connector	cc-disable mode
LEFT	LEFT	500hm termination inserted into the relevant connector, leaving the connector open or with a TTL LOW level (200µA current) fed to the connector	TTL/CMOS HIGH level (200µA) provided to the relevant connector.	active-interlock mode
LEFT	RIGHT	TTL/CMOS HIGH level (200µA) provided to the relevant connector.	500hm termination inserted into the relevant connector, leaving the connector open or with a TTL/CMOS LOW level (200µA current) fed to the connector	passive-interlock mode
RIGHT	LEFT	500hm termination inserted into the relevant connector or with a TTL LOW level (200µA current) fed to the connector.	TTL/CMOS HIGH level (200µA) provided to the relevant connector or leaving the connector open.	cc-enable mode

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<sup>2</sup> TTL/CMOS Levels: H=3.5V÷5V, L=0V÷0.5V; ~200µA

## 2.5. Channel Characteristics Table

**Table 2.2 – Channel characteristics of the Mod. V6534 HV Board**

<b>Output channels:</b>	Positive or Negative Polarity
<b>Output ranges:</b>	0÷6 kV
<b>Max. Output Current:</b>	1mA, Max. 100 $\mu$ A with Imon x10 Zoom
<b>Max. Ch. Output Power:</b>	6 W
<b>Vset / Vmon Resolution:</b>	100 mV
<b>Iset / Imon Resolution:</b>	20 nA ; monitor resolution 2nA with Imon x10 Zoom
<b>VMAX software:</b>	0÷6 kV settable for each channel
<b>VMAX software resolution:</b>	100 mV
<b>VMAX hardware:</b>	0 ÷ 6100 V Absolute maximum HV level that the channel is allowed to reach, independently from the preset value Vset. Output voltage cannot exceed the preset value Vmax.
<b>Vmax hardware resolution:</b>	$\pm 1$ V
<b>VMAX hardware accuracy:</b>	2% of FSR
<b>IMAX hardware:</b>	0÷1 mA common to all board channels
<b>IMAX hardware accuracy:</b>	2% of FSR
<b>Interlock input:</b>	LOW: <1V; current~5mA; HIGH: 4÷6 V
<b>Ramp Up/Down:</b>	1÷500 Volt/s, 1 Volt/s step
<b>Trip:</b>	Max. time an "overcurrent" is allowed to last (seconds). A channel in "overcurrent" works as a current generator; output voltage varies in order to keep the output current lower than the programmed value. "Overcurrent" lasting more than set value (1 to 9999) causes the channel to "trip". Output voltage will drop to zero either at the Ramp-down rate or at the fastest available rate, depending on Power Down setting; in both cases the channel is put in the OFF state. If trip= INFINITE, "overcurrent" lasts indefinitely.
<b>Vmon vs. Vout Accuracy: <sup>3</sup></b>	typical: $\pm 0.05\% \pm 1$ V max: $\pm 0.05\% \pm 2$ V
<b>Vset vs. Vmon Accuracy: <sup>3</sup></b>	typical: $\pm 0.05\% \pm 1$ V max: $\pm 0.05\% \pm 2$ V
<b>Imon vs. Iout Accuracy: <sup>3</sup></b>	typical: $\pm 2\% \pm 40$ nA max: $\pm 2\% \pm 100$ nA
<b>Iset vs. Imon Accuracy: <sup>3</sup></b>	typical: $\pm 2\% \pm 40$ nA max: $\pm 2\% \pm 100$ nA
<b>Voltage Ripple:<sup>4</sup></b>	Typical: 15 mVpp Max: 25 mVpp
<b>Humidity range:</b>	0 ÷ 80%
<b>Operating temperature:</b>	0 ÷ 45°C
<b>Storage temperature:</b>	-10 ÷ 70°C
<b>Vout / Temperature coefficient:</b>	Typ: 50 ppm / °C Max: 100 ppm / °C
<b>Imon / Temperature coefficient:</b>	Max: 100 ppm/°C; Max: 500 ppm/°C with x10 Imon zoom
<b>Long term stability Vout vs. Vset:</b>	$\pm 0.02\%$ (after one week @ constant temperature)

<sup>3</sup> From 10% to 90% of Full Scale Range

<sup>4</sup> Measured with: 1m cable length; 2nF capacitance, 100MHz band width

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## 2.6. Internal components

**SW8, 9, 10, 11 “B. Ad. [31:16]”** Type: 4 rotary switches

Function: allow to set the VME base address of the module.

**SW3**

Type: Dip Switch

Function: allows to select whether the “Standard” (STD=down) or the “Back up” (BKP=up) firmware must be loaded at power on; (default position: STD)

**SW5**

Type: Dip Switch

Function: allows to select NIM(right)/TTL(left) Level for the STATUS output

**SW6, 7**

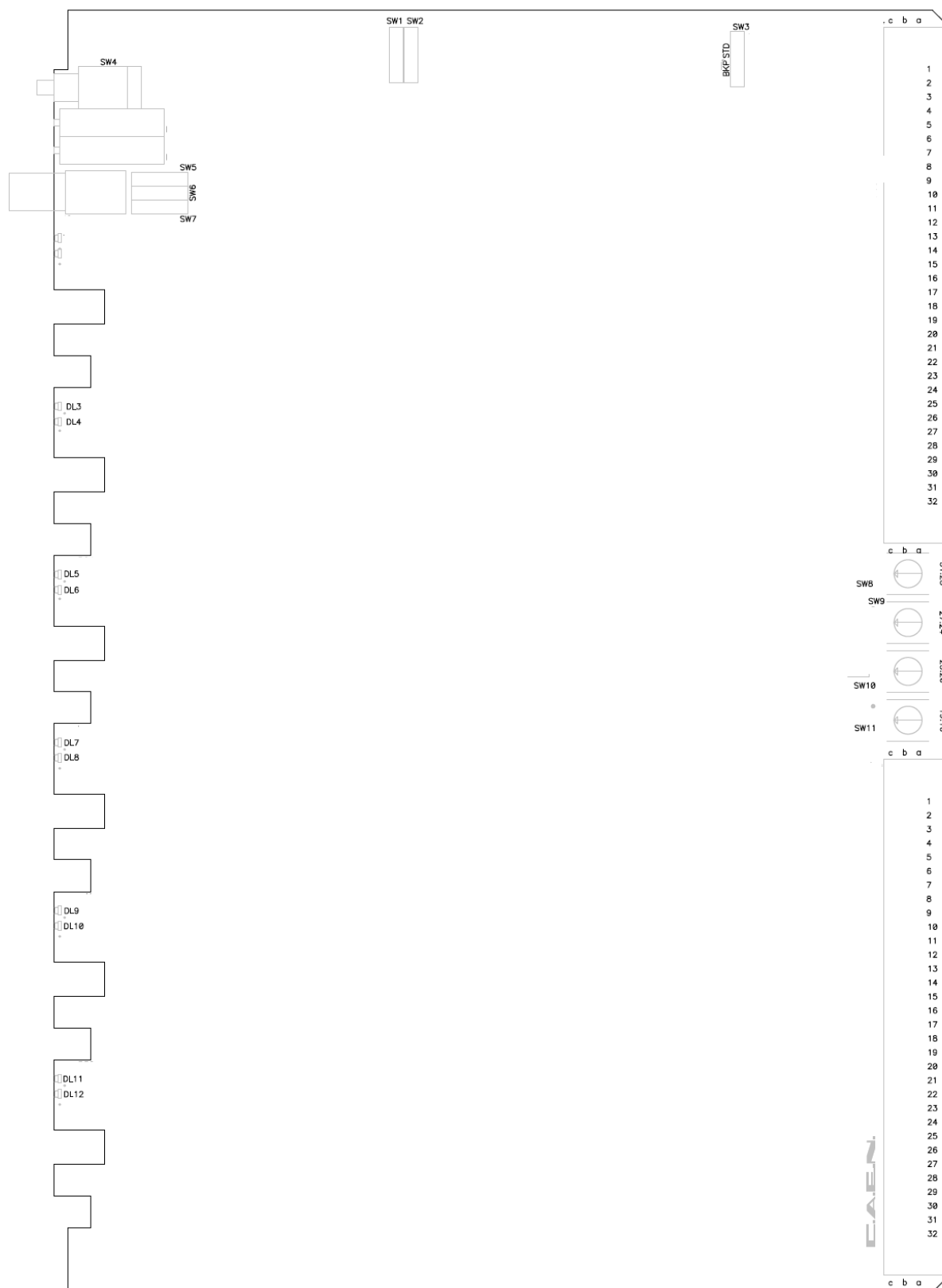
Type: Dip Switch

Function: allow to select INTERLOCK signal operation (see § 2.4.2)

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## 2.7. Imon Zoom

Imon Zoom allows to monitor the channel current with an increased resolution (10x) in the 0 – 100  $\mu$ A range; by selecting Imon Range = LOW (see § 3.2.2.1), the output current is monitored with 2nA resolution (instead of 20 nA), in the 0 – 100  $\mu$ A range. It is important to notice that, if Imon Range = LOW is selected, and the channel draws a current larger than 100  $\mu$ A, then Overcurrent is signalled.



**Fig. 2.4: Rotary and dip switches location**

## 3. VME Interface

### 3.1. Register address map

The Address map for the Model V6534 is listed in Table 3.1. All register addresses are referred to the Base Address of the board, i.e. the addresses reported in the Tables are the offsets to be added to the board Base Address.



N.B.: registers that are not described in the map are reserved and must not be over written by the User.

**Table 3.1 – Address Map for the Mod. V6534**

BOARD PARAMETERS				
VME Offset	Register Name	VME Access	Mode	Function
0x0000÷0x004C	Reserved, do not over write!			
0x0050	VMAX	A32/D16	R	Board Maximum Voltage
0x0054	IMAX	A32/D16	R	Board Maximum Current
0x0058	STATUS	A32/D16	R	Board Status flags
0x005C	FWREL	A32/D16	R	Readout of microcontroller Firmware Rel.
0x0060-0x007C	Reserved, do not over write!			
CHANNEL 0 PARAMETERS				
VME Offset	Register Name	VME Access	Mode	Function
0x0080	VSET	A32/D16	RW	Set channel voltage
0x0084	ISET	A32/D16	RW	Set channel current
0x0088	VMON	A32/D16	R	Channel voltage monitor
0x008C	ImonH	A32/D16	R	Channel current monitor (high range)
0x0090	PW	A32/D16	RW	Power
0x0094	CHSTATUS	A32/D16	R	Channel Status flags
0x0098	TRIP_TIME	A32/D16	RW	Trip Time
0x009C	SVMAX	A32/D16	RW	Software VMAX
0x00A0	RAMP DOWN	A32/D16	RW	Ramp Down Rate
0x00A4	RAMP UP	A32/D16	RW	Ramp Up Rate
0x00A8	PWDOWN	A32/D16	RW	Power Down Mode
0x00AC	POLARITY	A32/D16	R	Channel Polarity
0x00B0	TEMPERATURE	A32/D16	R	Channel Temperature
0x00B4	IMON RANGE	A32/D16	RW	Imon Range control register
0x00B8	ImonL	A32/D16	R	Channel current monitor (low range)
0x00BC÷0x00FC	Reserved, do not over write!			
CHANNEL 1 PARAMETERS				
VME Offset	Register Name	VME Access	Mode	Function
0x0100	VSET	A32/D16	RW	Set channel voltage
0x0104	ISET	A32/D16	RW	Set channel current
0x0108	VMON	A32/D16	R	Channel voltage monitor
0x010C	ImonH	A32/D16	R	Channel current monitor (high range)
0x0110	PW	A32/D16	RW	Power
0x0114	CHSTATUS	A32/D16	R	Channel Status flags
0x0118	TRIP_TIME	A32/D16	RW	Trip Time
0x011C	SVMAX	A32/D16	RW	Software VMAX

0x0120	RAMP DOWN	A32/D16	RW	Ramp Down Rate
0x0124	RAMP UP	A32/D16	RW	Ramp Up Rate
0x0128	PWDOWN	A32/D16	RW	Power Down Mode
0x012C	POLARITY	A32/D16	R	Channel Polarity
0x0130	TEMPERATURE	A32/D16	R	Channel Temperature
0x0134	IMON RANGE	A32/D16	RW	Imon Range control register
0x0138	ImonL	A32/D16	R	Channel current monitor (low range)
0x013C÷0x017C	Reserved, do not over write!			
CHANNEL 2 PARAMETERS				
<i>VME Offset</i>	<i>Register Name</i>	<i>VME Access</i>	<i>Mode</i>	<i>Function</i>
0x0180	VSET	A32/D16	RW	Set channel voltage
0x0184	ISSET	A32/D16	RW	Set channel current
0x0188	VMON	A32/D16	R	Channel voltage monitor
0x018C	ImonH	A32/D16	R	Channel current monitor (high range)
0x0190	PW	A32/D16	RW	Power
0x0194	CHSTATUS	A32/D16	R	Channel Status flags
0x0198	TRIP_TIME	A32/D16	RW	Trip Time
0x019C	SVMAX	A32/D16	RW	Software VMAX
0x01A0	RAMP DOWN	A32/D16	RW	Ramp Down Rate
0x01A4	RAMP UP	A32/D16	RW	Ramp Up Rate
0x01A8	PWDOWN	A32/D16	RW	Power Down Mode
0x01AC	POLARITY	A32/D16	R	Channel Polarity
0x01B0	TEMPERATURE	A32/D16	R	Channel Temperature
0x01B4	IMON RANGE	A32/D16	RW	Imon Range control register
0x01B8	ImonL	A32/D16	R	Channel current monitor (low range)
0x01BC÷0x01FC	Reserved, do not over write!			
CHANNEL 3 PARAMETERS				
<i>VME Offset</i>	<i>Register Name</i>	<i>VME Access</i>	<i>Mode</i>	<i>Function</i>
0x0200	VSET	A32/D16	RW	Set channel voltage
0x0204	ISSET	A32/D16	RW	Set channel current
0x0208	VMON	A32/D16	R	Channel voltage monitor
0x020C	ImonH	A32/D16	R	Channel current monitor (high range)
0x0210	PW	A32/D16	RW	Power
0x0214	CHSTATUS	A32/D16	R	Channel Status flags
0x0218	TRIP_TIME	A32/D16	RW	Trip Time
0x021C	SVMAX	A32/D16	RW	Software VMAX
0x0220	RAMP DOWN	A32/D16	RW	Ramp Down Rate
0x0224	RAMP UP	A32/D16	RW	Ramp Up Rate
0x0228	PWDOWN	A32/D16	RW	Power Down Mode
0x022C	POLARITY	A32/D16	R	Channel Polarity
0x0230	TEMPERATURE	A32/D16	R	Channel Temperature
0x0234	IMON RANGE	A32/D16	RW	Imon Range control register
0x0238	ImonL	A32/D16	R	Channel current monitor (low range)
0x023C÷0x027C	Reserved, do not over write!			
CHANNEL 4 PARAMETERS				
<i>VME Offset</i>	<i>Register Name</i>	<i>VME Access</i>	<i>Mode</i>	<i>Function</i>
0x0280	VSET	A32/D16	RW	Set channel voltage

0x0284	ISET	A32/D16	RW	Set channel current
0x0288	VMON	A32/D16	R	Channel voltage monitor
0x028C	ImonH	A32/D16	R	Channel current monitor (high range)
0x0290	PW	A32/D16	RW	Power
0x0294	CHSTATUS	A32/D16	R	Channel Status flags
0x0298	TRIP_TIME	A32/D16	RW	Trip Time
0x029C	SVMAX	A32/D16	RW	Software VMAX
0x02A0	RAMP DOWN	A32/D16	RW	Ramp Down Rate
0x02A4	RAMP UP	A32/D16	RW	Ramp Up Rate
0x02A8	PWDOWN	A32/D16	RW	Power Down Mode
0x02AC	POLARITY	A32/D16	R	Channel Polarity
0x02B0	TEMPERATURE	A32/D16	R	Channel Temperature
0x02B4	IMON RANGE	A32/D16	RW	Imon Range control register
0x02B8	ImonL	A32/D16	R	Channel current monitor (low range)
0x02BC÷0x02FC	Reserved, do not over write!			
CHANNEL 5 PARAMETERS				
VME Offset	Register Name	VME Access	Mode	Function
0x0300	VSET	A32/D16	RW	Set channel voltage
0x0304	ISET	A32/D16	RW	Set channel current
0x0308	VMON	A32/D16	R	Channel voltage monitor
0x030C	ImonH	A32/D16	R	Channel current monitor (high range)
0x0310	PW	A32/D16	RW	Power
0x0314	CHSTATUS	A32/D16	R	Channel Status flags
0x0318	TRIP_TIME	A32/D16	RW	Trip Time
0x031C	SVMAX	A32/D16	RW	Software VMAX
0x0320	RAMP DOWN	A32/D16	RW	Ramp Down Rate
0x0324	RAMP UP	A32/D16	RW	Ramp Up Rate
0x0328	PWDOWN	A32/D16	RW	Power Down Mode
0x032C	POLARITY	A32/D16	R	Channel Polarity
0x0330	TEMPERATURE	A32/D16	R	Channel Temperature
0x0334	IMON RANGE	A32/D16	RW	Imon Range control register
0x0338	ImonL	A32/D16	R	Channel current monitor (low range)
0x033C÷0x037C	Reserved, do not over write!			
BOARD CONFIGURATION				
VME Offset	Register Name	VME Access	Mode	Function
0x8100	CHNUM	A32/D16	R	Number of channels
0x8102÷0x8114	DESCR	D16	R	Board description
0x8116÷0x811C	MODEL	D16	R	'V6534 m, n, p'
0x811E	SERNUM	D16	R	Board Serial Number
0x8120	VME_FWREL	D16	R	VME FPGA Firmware Release



## 3.2. Register Description

The following sections describe in detail all registers. The parameters value can be calculated, if not otherwise indicated, by multiplying register value \* parameter resolution. For example, if the read value of VSET parameter is 30000, then this corresponds to a voltage level of  $30000 * 0.1 = 3000$  V.

### 3.2.1. BOARD PARAMETERS

#### 3.2.1.1. VMAX

VME Offset	0x0050
Range	0 – 6100 (decimal)
Resolution	1 V
Description	This register can be used to read channel maximum allowed voltage. VMAX is a hardware limit, set by the corresponding board front panel trimmer

#### 3.2.1.2. IMAX

VME Offset	0x0054
Range	0 - 1050 (decimal)
Resolution	1 $\mu$ A
Description	This register can be used to read channel maximum allowed current IMAX is a hardware limit, set by the corresponding board front panel trimmer.

#### 3.2.1.3. STATUS

VME Offset	0x0058	
Description	STATUS bit	Meaning
	0	Channel 0 ALARM
	1	Channel 1 ALARM
	2	Channel 2 ALARM
	3	Channel 3 ALARM
	4	Channel 4 ALARM
	5	Channel 5 ALARM
	6	Reserved
	7	Reserved
	8	Board POWER FAIL
	9	Board OVER POWER
	10	Board MAXV UNCALIBRATED
	11	Board MAXI UNCALIBRATED
	12..15	Reserved

#### 3.2.1.4. FWREL

VME Offset	0x005C	
Description	Readout of microcontroller Firmware Release	
	Bit	Meaning
	[7:0]	Minor Release Number
	[15:8]	Major Release Number

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### 3.2.2. CHANNEL PARAMETERS

#### 3.2.2.1. VSET

VME Offset	$(0x80 * \text{Channel}) + 0x80$ (channel can be in 0..5 range)
Range	0 – 60000 (6000V/Resolution)
Resolution	0.1 V
Description	This register can be used to set channel voltage. The register value must be set to expected voltage divided by resolution. So a 3000V corresponds to setting VSET to $3000/0.1 = 30000$ .

#### 3.2.2.2. ISET

VME Offset	$(0x80 * \text{Channel}) + 0x84$ (channel can be in 0..5 range)
Range	0 - 52500 (1050 $\mu$ A/Resolution)
Resolution	0.02 $\mu$ A
Description	This register can be used to set channel current. The register must be set to expected current divided by resolution. So a 100uA correspond to setting ISET to $100/0.02 = 5000$ .

#### 3.2.2.3. VMON

VME Offset	$(0x80 * \text{Channel}) + 0x88$ (channel can be in 0..5 range)
Range	0 - 60000 (6000V/Resolution)
Resolution	0.1 V
Description	This register can be used to monitor channel voltage. The register value must be multiplied by resolution to get voltage in Volts. For instance, a value of 30000 corresponds to a voltage value of 3000 V.

#### 3.2.2.4. ImonH

VME Offset	$(0x80 * \text{Channel}) + 0x8C$ (channel can be in 0..5 range)
Range	0 - 50000 (1000 $\mu$ A/Resolution)
Resolution	0.02 $\mu$ A
Description	This register can be read to get channel current value. The register value has a lower resolution and it is updated when IMON RANGE is set to HIGH. The register value must be multiplied by resolution to get current in $\mu$ A. For instance, a value of 5000 corresponds to a current value of $5000 * 0.02 = 100 \mu$ A

### 3.2.2.5. PW

VME Offset	(0x80 * Channel) + 0x90 (channel can be in 0..5 range)
Range	0 - 1
Description	This is channel ON/OFF control register. Possible register values and meaning are: 0: OFF 1: ON

### 3.2.2.6. CHSTATUS

VME Offset	(0x80 * Channel) + 0x94 (channel can be in 0..5 range)	
Description	STATUS bit	Meaning
	0	Channel ON
	1	Channel RAMP UP
	2	Channel RAMP DOWN
	3	Channel OVER CURRENT
	4	Channel OVER VOLTAGE
	5	Channel UNDER VOLTAGE
	6	Channel MAXV
	7	Channel MAXI
	8	Channel TRIP
	9	Channel OVER POWER
	10	Channel OVER TEMPERATURE
	11	Channel DISABLED
	12	Channel INTERLOCK
	13	Channel UNCALIBRATED
	14..15	Reserved

### 3.2.2.7. TRIP\_TIME

VME Offset	(0x80 * Channel) + 0x98 (channel can be in 0..5 range)
Range	0 - 10000 (1000S/Resolution)
Resolution	0.1 s
Description	This register can set TRIP time. TRIP range: 0 ÷ 999.9 s; 1000 s = Infinite.

### 3.2.2.8. SVMAX

VME Offset	(0x80 * Channel) + 0x9C (channel can be in 0..5 range)
Range	0 - 60000 (6000V/Resolution)
Resolution	0.1 V
Description	This register can be used to set a software VMAX. The register value must be set to expected voltage divided by resolution. So a 3000V corresponds to setting SVMAX to 3000/0.1 = 30000. Parameter VSET cannot exceed SVMAX in any case. Board will automatically make VSET = SVMAX, if SVMAX is lower then VSET

### 3.2.2.9. RAMP DOWN

VME Offset	(0x80 * Channel) + 0xA0 (channel can be in 0..5 range)
Range	0 - 500 (decimal)
Resolution	1 V/s
Description	This register can be used to set RAMP DOWN rate.

### 3.2.2.10. RAMP UP

VME Offset	(0x80 * Channel) + 0xA4 (channel can be in 0..5 range)
Range	0 - 500 (decimal)
Resolution	1 V/s
Description	This register can be used to set RAMP UP rate.

### 3.2.2.11. PWDOWN

VME Offset	(0x80 * Channel) + 0xA8 (channel can be in 0..5 range)
Range	0 - 1
Description	This is channel Power Down Mode control register. Possible register values and meaning are: 0: KILL 1:RAMP

### 3.2.2.12. POLARITY

VME Offset	(0x80 * Channel) + 0xAC (channel can be in 0..5 range)
Range	0 - 1
Description	This register reads channel POLARITY. Possible values are: 0: NEGATIVE 1: POSITIVE

### 3.2.2.13. TEMPERATURE

VME Offset	(0x80 * Channel) + 0xB0 (channel can be in 0..5 range)
Range	-40 .... +125 (2's complement)
Resolution	1 °C
Description	Get current channel temperature.

#### 3.2.2.1. IMON\_RANGE

VME Offset	(0x80 * Channel) + 0xB4 (channel can be in 0..5 range)
Range	0 - 1
Description	This is channel Imon Range control register. Possible register values and meaning are: 0: Range High 1: Range Low

#### 3.2.2.2. ImonL

VME Offset	(0x80 * Channel) + 0xB8 (channel can be in 0..5 range)
Range	0 - 50000 (decimal)
Resolution	0.002 µA
Description	This register can be read to get channel current value <i>when IMON_RANGE is set "LOW"</i> The register range 0-50000 corresponds to 0-100 µA.

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## 3.2.3. BOARD CONFIGURATION

### 3.2.3.1. CHNUM

VME Offset	0x8100
Description	It contains the number of channels. Number of Channel is 6 in case of V6534 board.

### 3.2.3.2. DESCR

VME Offset	0x8102 ÷ 0x8114															
Description	The DESCR registers reports a description of the board with ASCII codes: V6534 has the following description: '6 Ch 6KV/1mA'															
BIT	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x8102	' '								'6'							
0x8104	'h'								'C'							
0x8106	'6'								' '							
0x8108	'v'								'k'							
0x810A	'1'								'/'							
0x810C	'A'								'm'							
0x810E	\0								\0							
0x8110	\0								\0							
0x8112	\0								\0							
0x8114	\0								\0							

### 3.2.3.3. MODEL

VME Offset	0x8116 ÷ 0x811C															
Description	The MODEL registers reports the board name using ASCII codes															
BIT	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x8116	'6'								'V'							
0x8118	'3'								'5'							
0x811A	'm, n, p'								'4'							
0x811C	\0								\0							

### 3.2.3.4. SERNUM

VME Offset	0x811E															
Description	This register reports the Board Serial Number.															

### 3.2.3.5. VME\_FWREL

VME Offset	0x8120															
Description	This register reports the FW Release Number															
BIT	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0x8120	Major_release								Minor_release							

## 4. Installation

- The Mod. V6534 fits into all 6U VME crates.
- Use only crates with forced cooling air flow
- Turn the crate OFF before board insertion/removal
- Remove all cables connected to the front panel before board insertion/removal



### CAUTION

**USE ONLY CRATES WITH FORCED COOLING AIR FLOW SINCE OVERHEAT MAY DAMAGE THE MODULE!**

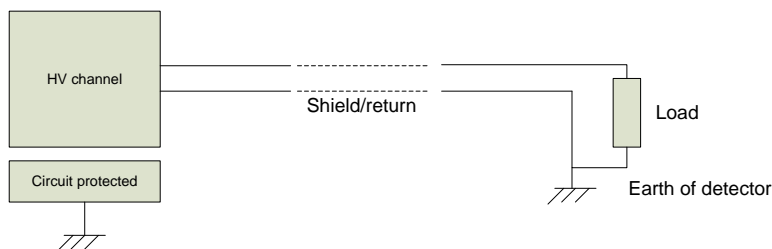


### CAUTION

**ALL CABLES MUST BE REMOVED FROM THE FRONT PANEL  
BEFORE EXTRACTING THE BOARD FROM THE CRATE!**

### 4.1. Safety Earth connection

The connection of shield/return to Earth is fundamental for User safety. The connection must always be at the level of detector. Shield/return connections even if not present or performed incorrectly, due to protection circuits implemented on the V65xx are bound to Earth; in this case the voltage difference between shield/return and Earth is limited to approximately 50V. Please note that this is a status of emergency-protection, not a working one. The best configuration must be determined by the user upon application, the optimal connection depends on many characteristics of the related experiment. The following diagrams show one example of configuration.



**Fig. 4.1: Shield/return to Earth connection**

### 4.2. Power ON sequence

To power ON the board follow this procedure:

1. insert the V6534 board into the crate

2. power up the crate

At power ON all registers are set to their default configuration

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### 4.3. Firmware upgrade

It is possible to upgrade the board firmware via VME, by writing the Flash: for this purpose, download the software package and the CAENUpgrader tool, available at [www.caen.it](http://www.caen.it)

The instructions are explained by the Quick User's Guide included.



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## 5. Change Document Record

Date	Revision	Changes
11 October 2019	7	Updated IMon Zoom description throughout document
2 December 2020	8	Updated Channel Characteristics Table