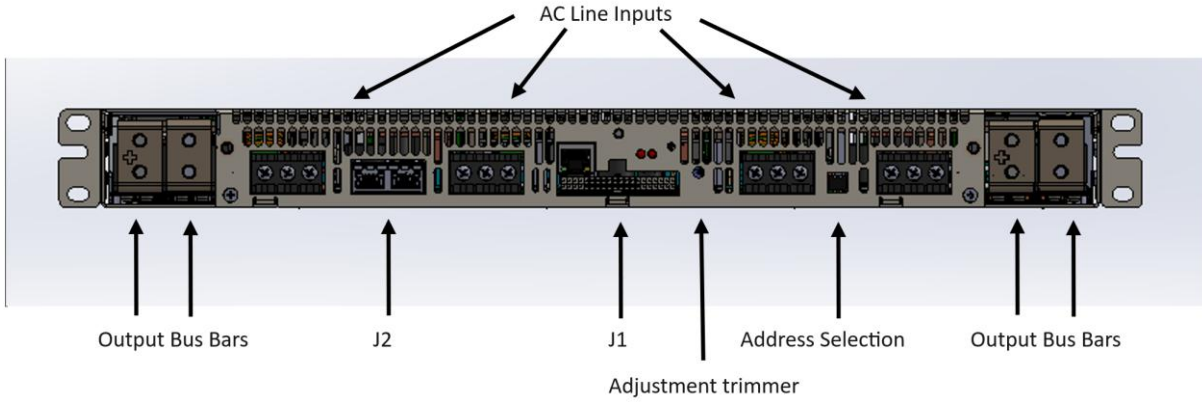
HFE3500-S1U/TB

HFE3500 Hot Swap Front End Industrial Power Supplies 1U Rack

APPLICATION NOTE

1 REAR PANEL CONNECTIONS AND CONTROLS

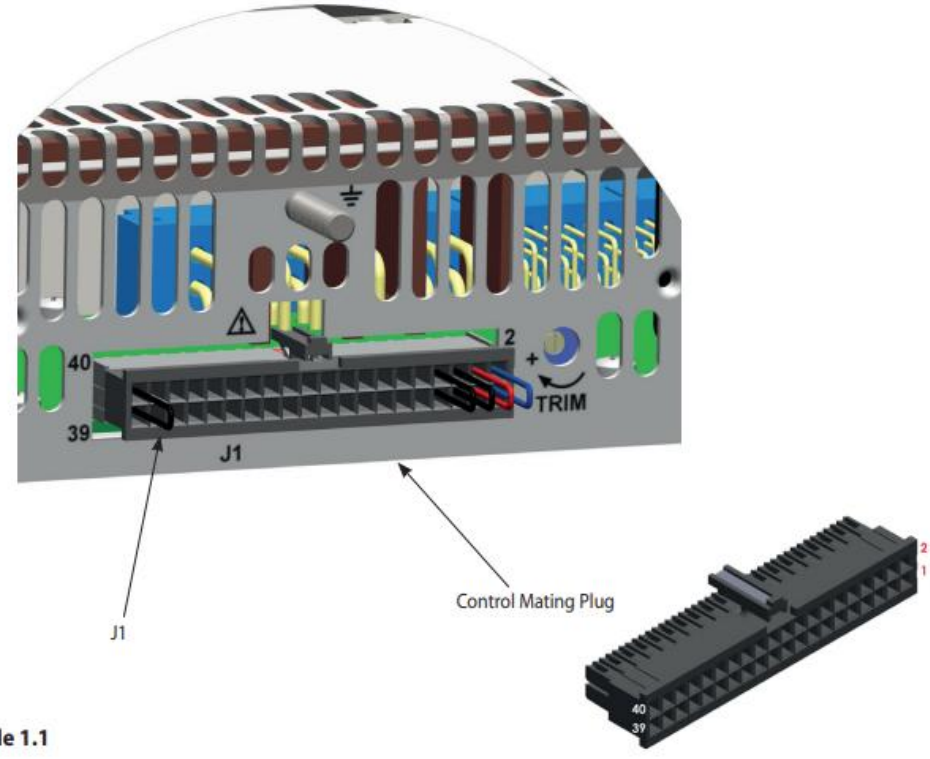
Fig 1.1 Rear View of HFE350-S1U/TB Series



Mating for J1 Control Plug (provided) or custom made plug/ cable should be inserted to J1 for proper operation of HFE3500 rack. Refer to Chapter 3 for connection diagrams.

PLEASE VERIFY J1
IS PROPERLY PLUGGED IN.

ENSURE THAT THERE IS NO
MECHANICAL STRESS
ON J1 CONNECTOR.



J1 Pin Allocation Chart see Table 1.1

J1 connector description: P/N: IPL1-120-01-S-D—RA-K (SAMTEC)
Mating Plug description: P/N: IPD1-20-D-K (SAMTEC)

Table 1.1 J1 Connector Pin Allocation Chart

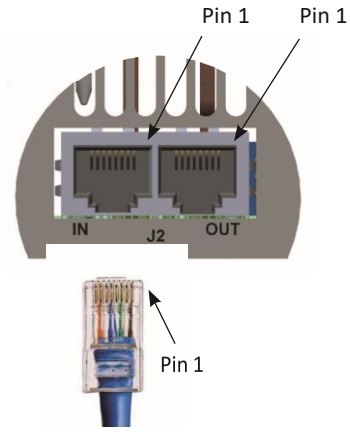
Pin #	Name	Description	Pos. #	Control plug J1	Referenced to
1,10	-SENSE	Negative sense Connected to –LS for local sensing, or –V on Load side.	All	Short	
2	-LS	Connected to Negative Output bus bar through 3 Ohm resistor.	All		
3	+SENSE	Positive sense Connected to +LS for local sensing, or +V on Load side.	All	Short	
4	+LS	Connected to Positive Output bus bar through 3 Ohm resistor.	All		
5	V_PROG	Input (0~5V) referenced to –S. Provides Vout programming by Voltage. Refer to Fig 3.6, 3.7.	All	Short	-SENSE
6	TRIM	Output of Rear Panel potentiometer, for manual adjustment of Output Voltage.	All		-SENSE
7	HICCUP_OCP_I_PROG	Input (0-5V) referenced to -S. Provides hiccup OCP current threshold programming by external voltage. Refer to Fig 3.6.1 and 3.7.1	All	Short	-SENSE
8,9	+5V/V_REF	5V fixed output for standard option unit. V_REF for Voltage programming when PMBus is being used.	All		-SENSE
11	TEMP_ALM_A	Output signal of PS in position A. "LOW" when the internal temperature is within safe limit, "HIGH" approximately 10°C below Thermal shut down. Open Collector (15V Max, sink Current 10mA max)	A		SIGNAL RETURN
12	TEMP_ALM_B	Output signal of PS in position B. Same as 11.	B		SIGNAL RETURN
13	TEMP_ALM_C	Output signal of PS in position C. Same as 11.	C		SIGNAL RETURN
14	TEMP_ALM_D	Output signal of PS in position D. Same as 11.	D		SIGNAL RETURN
15		NOT CONNECTED			
16	AC_FAIL_A	Output signal of PS in position A. "LOW" when the input voltage is 85Vac<Vin, "HIGH" when the input voltage is 85Vac>Vin. Open Collector (15V Max, sink Current 10mA max)	A		SIGNAL RETURN
17	AC_FAIL_B	Output signal of PS in position B. Same as 16.	B		SIGNAL RETURN
18	AC_FAIL_C	Output signal of PS in position C. Same as 16.	C		SIGNAL RETURN
19	AC_FAIL_D	Output signal of PS in position D. Same as 16.	D		SIGNAL RETURN
20		NOT CONNECTED			
21	DC_OK_A	Output signal of PS in position A. "LOW" when the output voltage is higher than 85~95% of Vout setting. Open Collector (15V Max, sink Current 10mA max)	A		SIGNAL RETURN
22	DC_OK_B	Output signal of PS in position B. Same as 21.	B		SIGNAL RETURN
23	DC_OK_C	Output signal of PS in position C. Same as 21.	C		SIGNAL RETURN
24	DC_OK_D	Output signal of PS in position D. Same as 21.	D		SIGNAL RETURN
25		NOT CONNECTED			
26 37 40	SIGNAL RETURN	Reference for: ENABLE, INHIBIT, TEMP ALARM, AC FAIL, DC OK, AUX, SCL, SDA, SMB ALERT. **The SIGNAL RETURN is isolated from the output.**	All		
27	INHIBIT_A	Input for PS in position A. Turns OFF the Main Output by electrical signal or dry contact. "SHORT" or 0~0.6V – Output OFF. "OPEN" or 2~15V – Output ON.	A		SIGNAL RETURN
28	INHIBIT_B	Input signal for PS in position B. Same as 27.	B		SIGNAL RETURN
29	INHIBIT_C	Input signal for PS in position C. Same as 27.	C		SIGNAL RETURN
30	INHIBIT_D	Input signal for PS in position D. Same as 27.	D		SIGNAL RETURN
31	NOT USED	NOT CONNECTED			
32	PS_EXIST_A	Output signal of PS in position A. SHORT to Signal Return when PS is inserted into the Rack.	A		SIGNAL RETURN
33	PS_EXIST_B	Output signal of PS in position B. Same as 32.	B		SIGNAL RETURN
34	PS_EXIST_C	Output signal of PS in position C. Same as 32.	C		SIGNAL RETURN
35	PS_EXIST_D	Output signal of PS in position D. Same as 32.	D		SIGNAL RETURN
36	NOT USED	NOT CONNECTED			
38	+AUX	Auxiliary Output. Voltage dependent on the standby option of the fitted power supplies. Not affected by any signal or fail state.			SIGNAL RETURN
39	ENABLE	Input for entire rack. Turns ON the Main Output by electrical signal or dry contact. "SHORT" or 0~0.6V – Output ON. "OPEN" or 2~15V – Output OFF.	All	Short	SIGNAL RETURN

1.2 J2 Pin Allocation Chart

J2 connector (RJ45 type) is used for connecting to the PMBus signals and the required connection of signals between parallel connected racks. Up to 3 racks can be connected in parallel (but only 2 if one wants each slot to have a unique PMBus address).

Table 1.2

IN		OUT	
Pin #	Name	Pin #	Name
1	CURRENT SHARE	1	CURRENT SHARE
2	HICCUP_OCP_I_PROG	2	HICCUP_OCP_I_PROG
3	V_PROG	3	V_PROG
4	-SENSE	4	-SENSE
5	SCL (PMBus)	5	SCL (PMBus)
6	SIGNAL_RETURN	6	SIGNAL_RETURN
7	SDA (PMBus)	7	SDA (PMBus)
8	SMB_ALERT	8	SMB_ALERT



1.3 Output Bus Bar Connections

The HFE3500-S1U/TB has two identical Output Bus Bar connections on both sides of Rear Panel.
They are connected in parallel in the Rack.
Each or both of them can be used for output connections.

ATTENTION: Maximum allowable current for each Output Bus Bar – 320A. Total Output Current: 640A

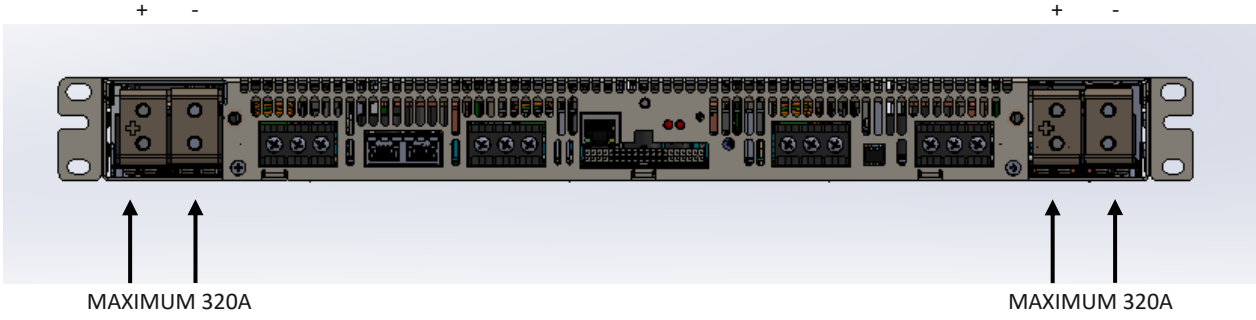


Fig 1.3a Output Bus-Bars.

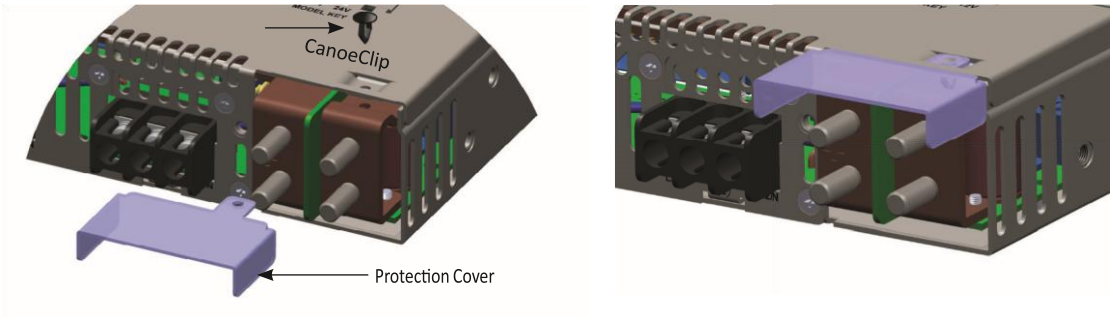


Fig 1.3b Installation of Output Bus-Bars Protection Cover.

1.4 Output Voltage adjustment Trimmer

Output Voltage may be adjusted manually by the Rear Panel Trimmer.

Model	HFE3500-24	HFE3500-48
Output voltage range (V)	24.0~27.6	48.0~55.2

The trimmer needs to be connected to the V_PROG pin to allow it to adjust the output voltage. Instructions for how to wire J1 to create such a setup are given later in this document.

1.5 PMBus address

Each slot in the Rack (see fig-2.2) has its own address for PMBus communication. In case parallel connection of two racks is used, SW1 located at the rear panel is used to differentiate between addresses for the same slots. see Table 1.5.

Position In Rack	SW1-1	SW1-2	Address (Bin)
A	ON	ON	0010000
B			0010010
C			0010100
D			0010110
A	OFF	OFF	0010001
B			0010011
C			0010101
D			0010111

2 RACK MECHANICAL FEATURES

2.1 Insertion and extraction of the PS

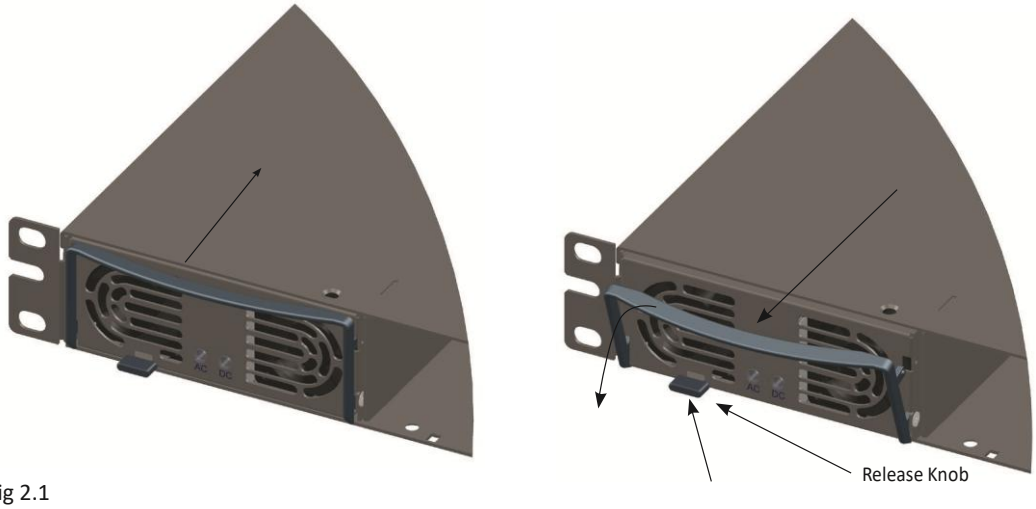


Fig 2.1

To insert the power supply, push unit into The rack with the extraction handle closed.

To extract power supply, elevate the Release knob and pull the extraction handle Simultaneously.

CAUTION

When inserting a power supply into the rack, do not use unnecessary force; slamming the power supply into the rack can damage the connectors on the rear of the supply and inside the rack.

2.2 Definition of Power Supplies Position

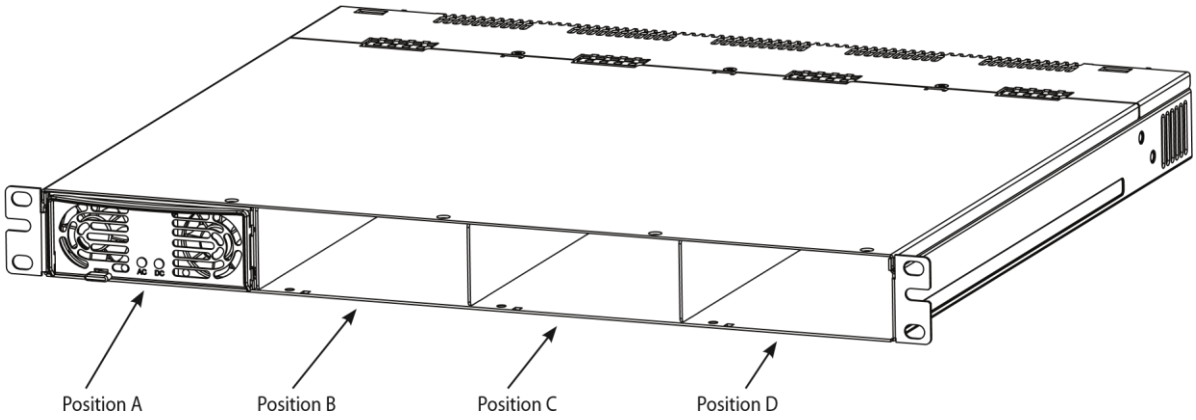


Fig 2.2 Power supply positions

2.3 Keying Option to define the Rack's Voltages

Keying Option can be installed to ensure that only the correct Power Supply can be inserted into the Rack.
The Key Option consists of two parts: Power Supply Key (one per unit Fig 2.3a) and Rack Keys (5 per Rack Fig 2.3b).
Power Supply Key and Rack Keys should be fixed in position corresponding to the Main Output Voltage and Standby option, with Phillips head M3x6 countersunk screws. Pictures show 24V 12V model (second to right on model key).

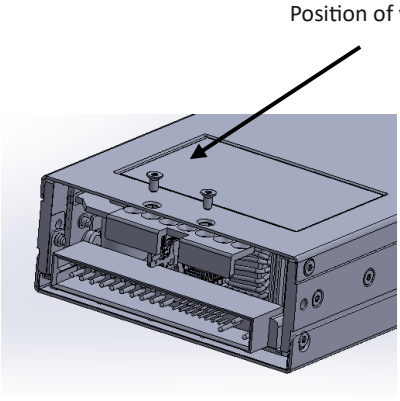


Fig2.3a
Assembly of Rack Key (Rack Top View)

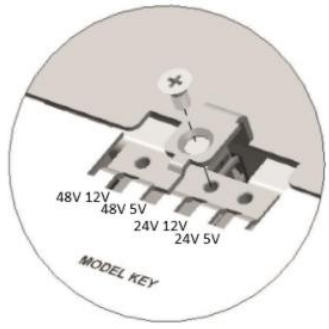


Fig 2.3b
Assembly of Rack Key (Rack Top View)

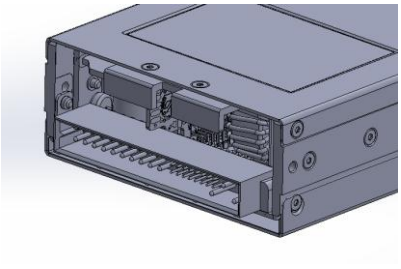


Fig 2.3c
Example Model with 24V 12V Model with assembled Key.

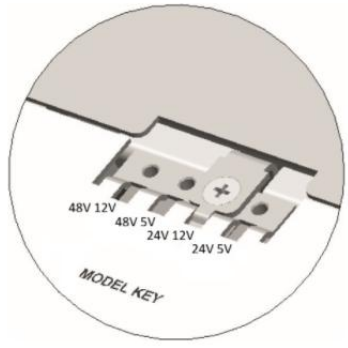


Fig 2.3d
Example Rack Key assembled
for 24V 12V model

2.4 Blank Panel

In case all positions of the Rack are not filled with supplies, a Blank Panel should be used to ensure proper Air Flow.
It is recommended to interleave supplies and Blank Panels wherever possible.

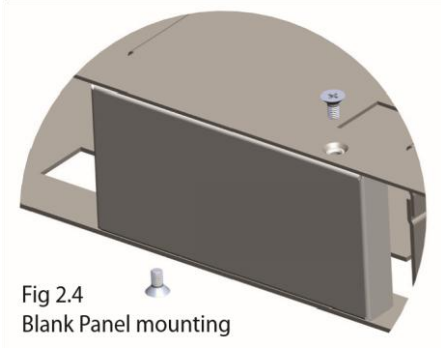


Fig 2.4
Blank Panel mounting

2.5 Rack mounting options

Rack can be mounted into 19” Rack Cabinet which suits both USA and European Standards: and screws are included.

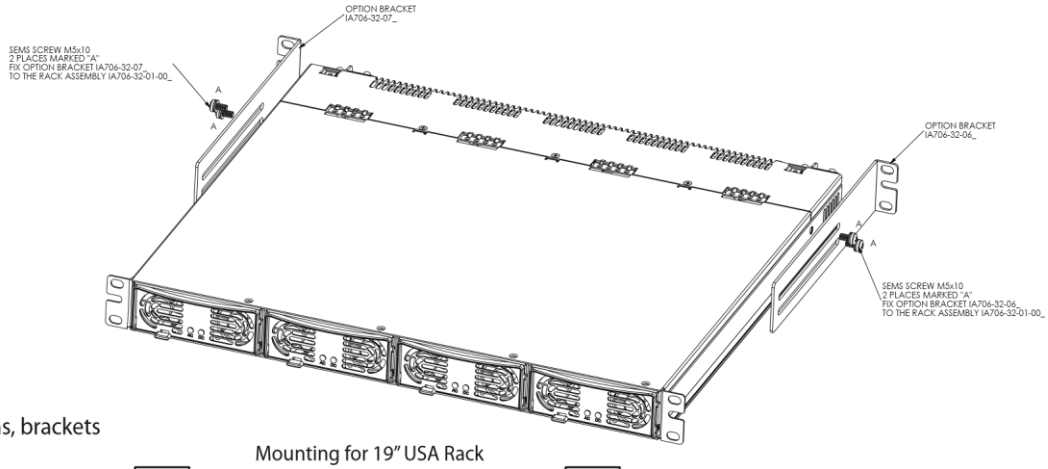
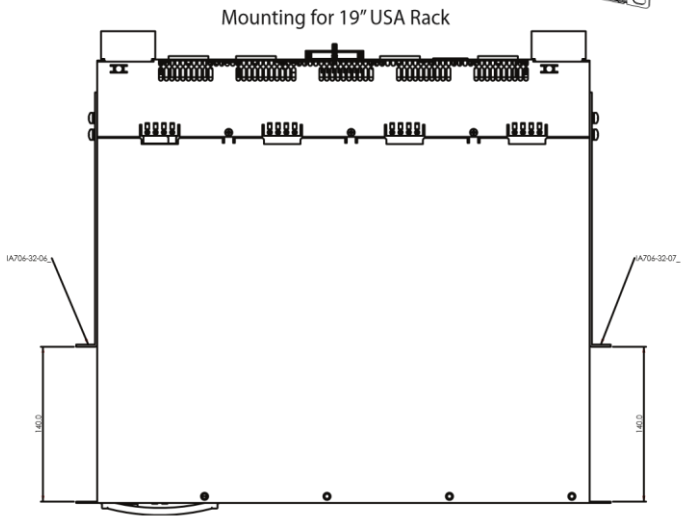
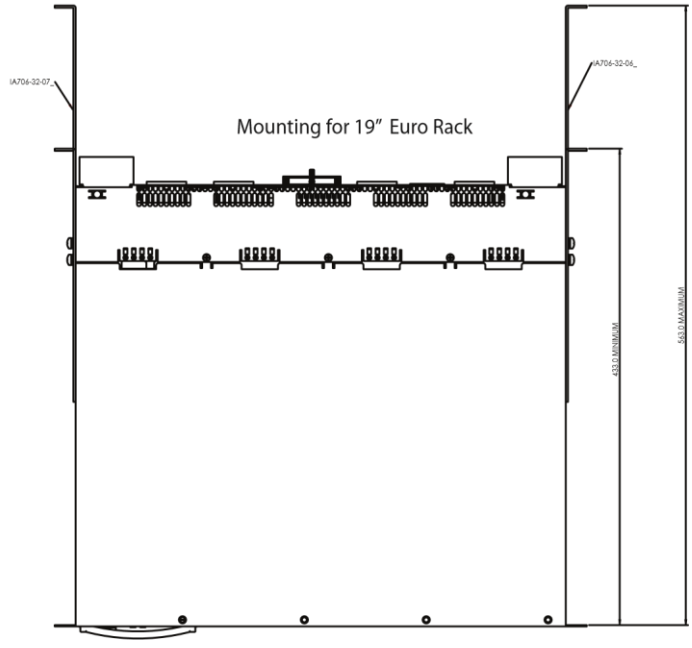


Fig 2.5 Mounting options, brackets





3 Typical applications

3.1 Basic connection

For basic connection, the supplied Control Plug should be inserted to J1.

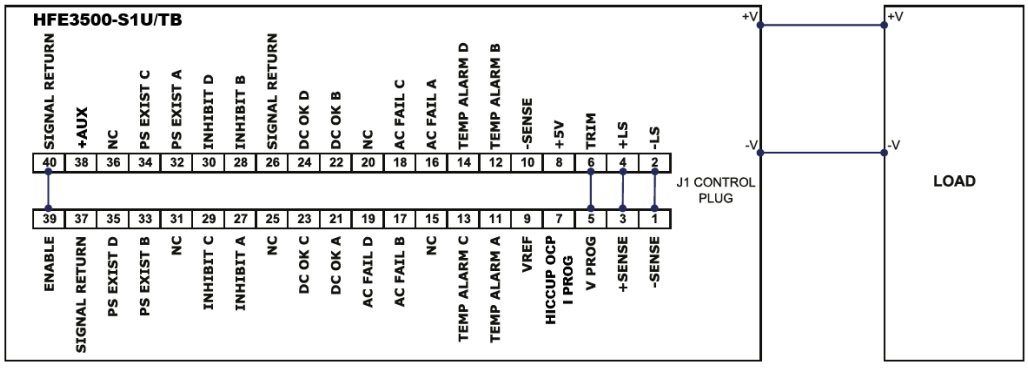


Fig 3.1 Basic connection diagram

3.2 Remote sensing ATTENTION:

1. Maximum voltage drop on load wires: HFE3500-24: 0.5V/wire, 48: 1V/wire.
2. Twisted wires should be used for Remote Sense connection.
3. If Remote Sensing is used, do not break Main Output connection.

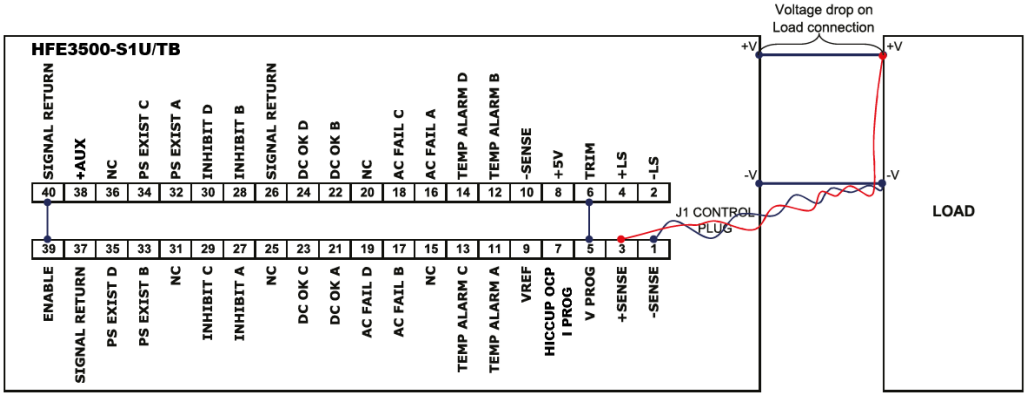


Fig 3.2 Remote Sensing connection diagram

3.3 On/Off control for the entire Rack

Switch closed: Output ON

Switch open: Output OFF

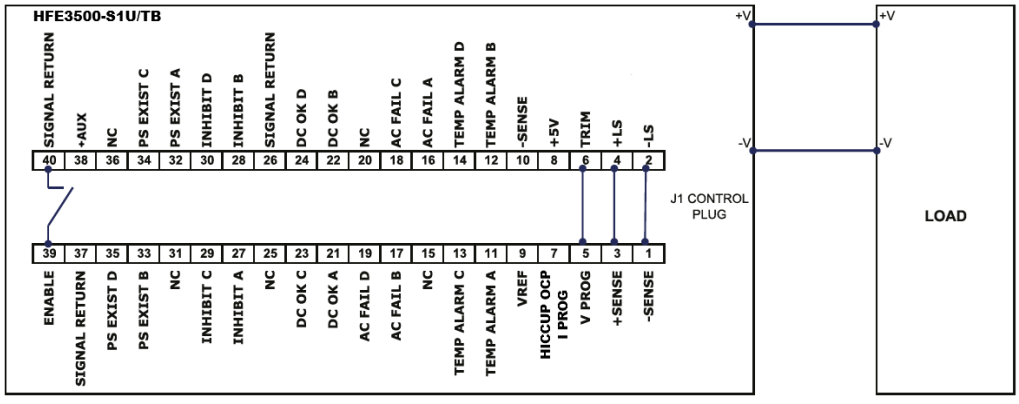


Fig 3.3 Entire rack On/Off control diagram

3.4 Individual On/Off control for each PS

Switch closed: Output OFF

Switch open: Output ON

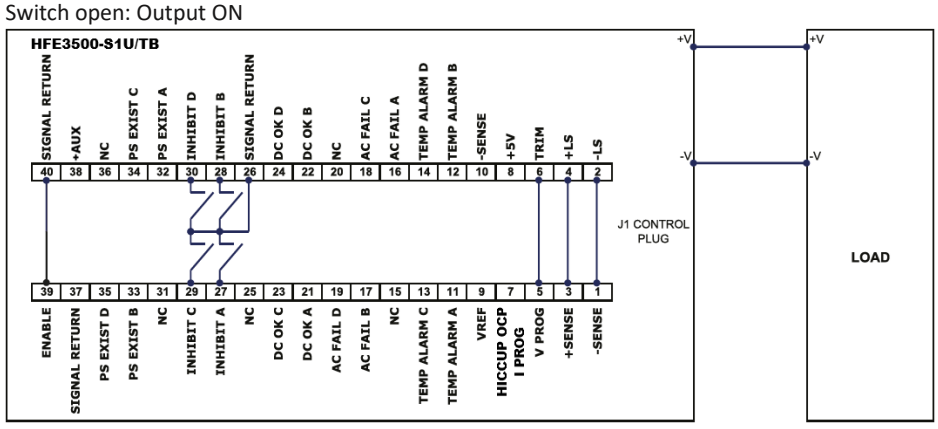


Fig 3.4 Individual units On/Off diagram

3.5 Supervisory signals

Following signals are accessible from each power supply at J1:

DC OK

AC FAIL

PS EXIST

TEMP ALARM

These signals are Open Collector type (Max 15V, 10mA), isolated from Output and referenced to SIGNAL RETURN.

Fig 3.5 presents example of the typical connection for DC OK signal of power supply in position A.

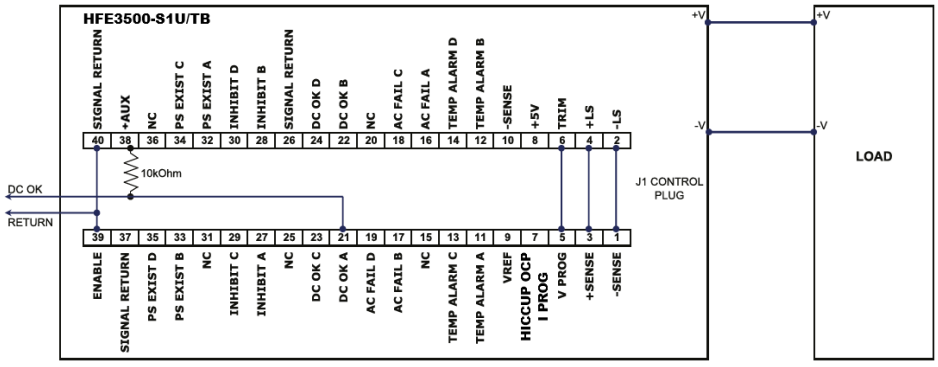


Fig 3.5 “DC OK” signal connection diagram for Power Supply in Position A

3.6 Output Voltage programming by External Voltage.

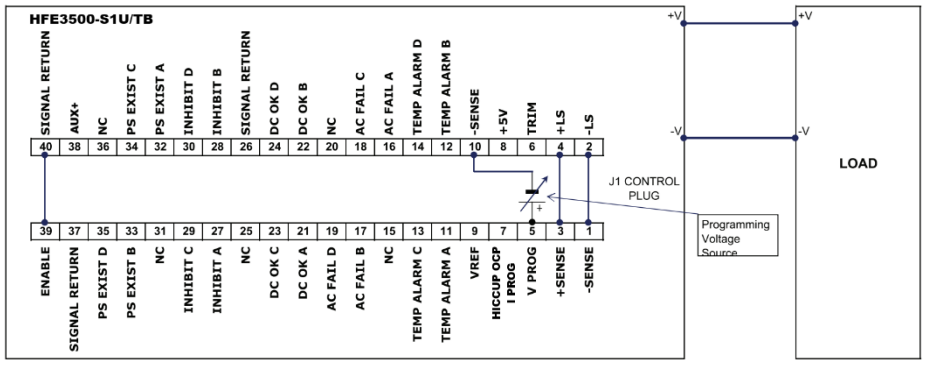
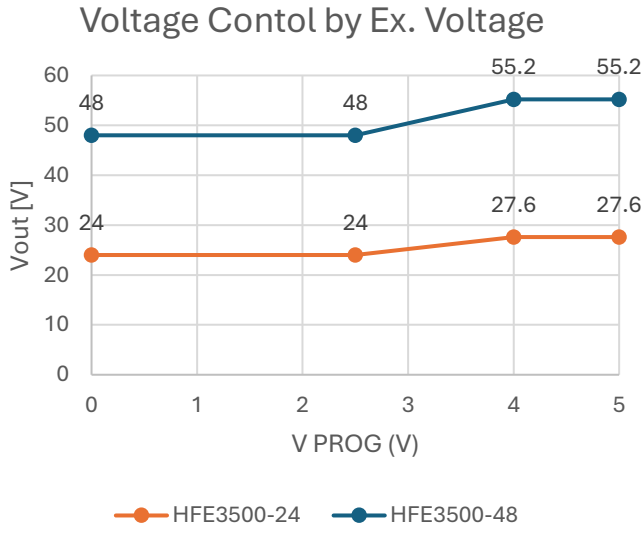


Fig 3.6 Output Voltage Programming by External Voltage



3.7 Hiccup OCP Current Threshold Programming by External Voltage

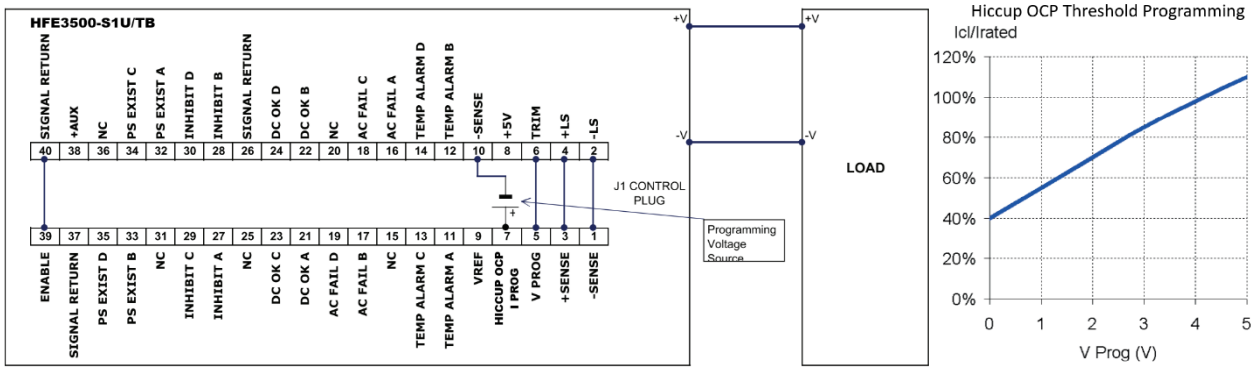


Fig 3.7 Hiccup OCP Current Threshold Programming by External Voltage

3.8 Output Voltage Programming by PMBus

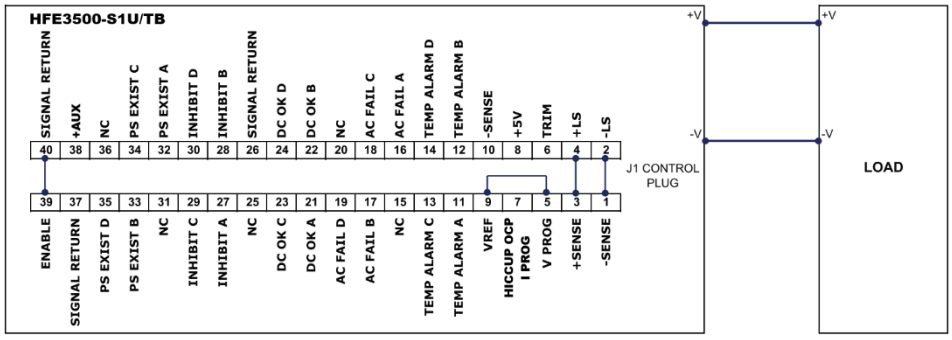


Fig. 3.8 Output Voltage Programming by PMBus

3.9 PMBus Host connection

To connect the rack to the Host computer, connect communication cable (refer to table 3.9 for cable connection) between J2 and computer:

Table 3.9 PMBus Cable.

Signal Name	From pin	Wire (AWG)	To Host	Note
SCL	5	22~24	-	Twisted pair
SIGNAL_RETURN	6	22~24	-	
SDA	7	22~24	-	Twisted pair
SMB_ALERT	8	22~24	-	

RJ45 Shielded Male Connector should be used.

Cable must be shielded; only connector shield is connected to cable shield.

3.10 Parallel connection of two Racks

To connect two Racks in parallel for higher Output Current:

- Connect Main Output (Bus-Bars) in parallel. Make the connections as short as possible and with equal length.
- Connect Sense (twisted pairs) to Load point.
- Connect J2 connector of both Racks by Cable (for cable construction see Table 3.10).
- Slave - Disconnect connection between VPROG and TRIM (J1.5 and J1.6).
- Slave - Switch SW1 to “OFF” position to give racks different PMBus addresses. For addressing refer to Table 1.5.
- Output Voltage can be adjusted by the trimmer on Master Rack.

Table 3.10 Rack Interconnection Cable.

Signal Name	From pin	Wire (AWG)	To Pin	Note
CURRENT SHARE	1	22~24	1	Twisted pair
V_PROG	3	22~24	3	Twisted pair
-SENSE	4	22~24	4	
SCL	5	22~24	5	Twisted pair
SIGNAL_RETURN	6	22~24	6	
SDA	7	22~24	7	Twisted pair
SMB_ALERT	8	22~24	8	

RJ45 Shielded Male Connectors should be used.

Cable must be shielded; only connector shields are connected to cable shield.

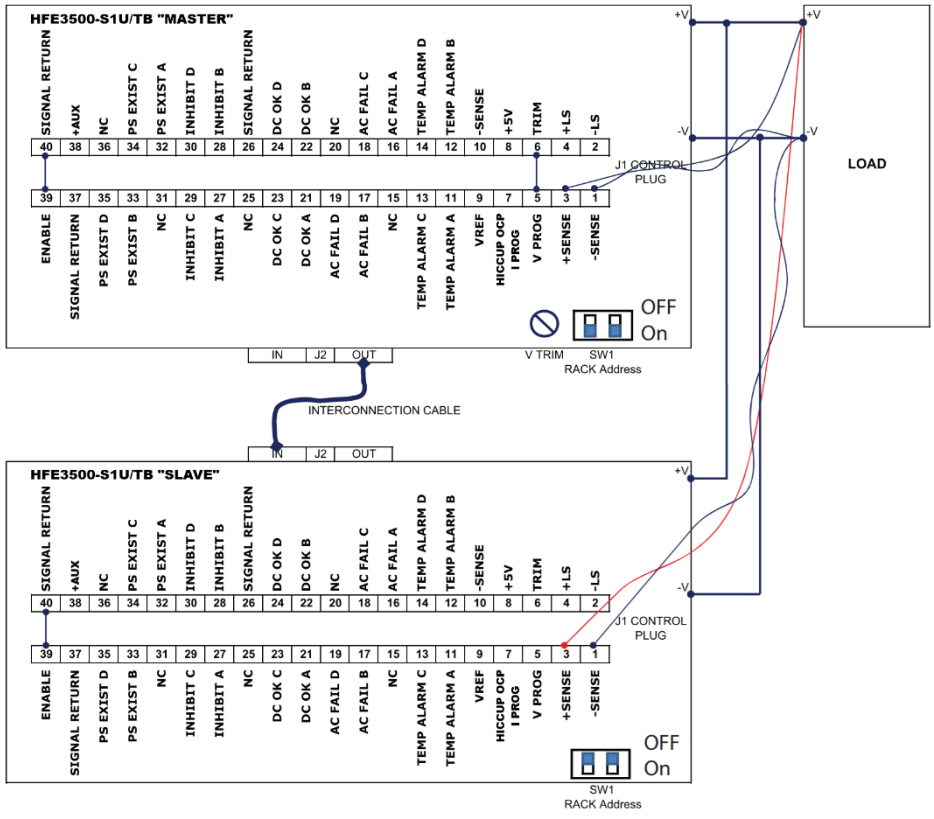


Fig 3.10 Racks parallel connection diagram.

*Note: For PMBUS control of output voltage, rewire the master rack by:

1. Disconnecting Pin 5&6
2. Connecting Pin 5&9

3.11 Series Rack connection

Up to 2 racks with the same number of power supplies and rating (voltage and current) can be used to increase the output voltage. To connect two Racks in series:

- Connect Main Output (bus bars) in series;
- Connect Sense (twisted) to Load point (as shown in fig-3.11), or use Local Sensing using supplied Control Plugs.
- In case PMBus is used, Connect J2 connector of both Racks by Interconnect Cable for Serial connection (for cable construction see Table 3.11);

CAUTION

Do not use Cable as of Table 3.10.

- On one Rack put Switch SW1 to OFF position (only for PMBus). For Addressing see Table 1.5;
- Output Voltage can be adjusted by potentiometers on both Racks.

Table 3.11 Rack Interconnection Cable for Serial connection.

Signal Name	From pin	Wire (AWG)	To Pin	Note
CURRENT SHARE	1	Open	1	**Do not connect!**
V_PROG	3	Open	3	**Do not connect!**
-SENSE	4	Open	4	
SCL	5	22~24	5	Twisted pair
SIGNAL_RETURN	6	22~24	6	
SDA	7	22~24	7	Twisted pair
SMB_ALERT	8	22~24	8	

RJ45 Shielded Male Connectors should be used. Cable must be shielded; only connector shields are connected to cable shield. Diodes should be connected in parallel with each unit output to prevent reverse voltage. Each diode should be rated to at least the power supply rated output voltage and output current.

WARNING

Do not connect -SENSE and any signals referenced to -SENSE between two Racks. Only signals referenced to SIGNAL RETURN can be connected between Racks.

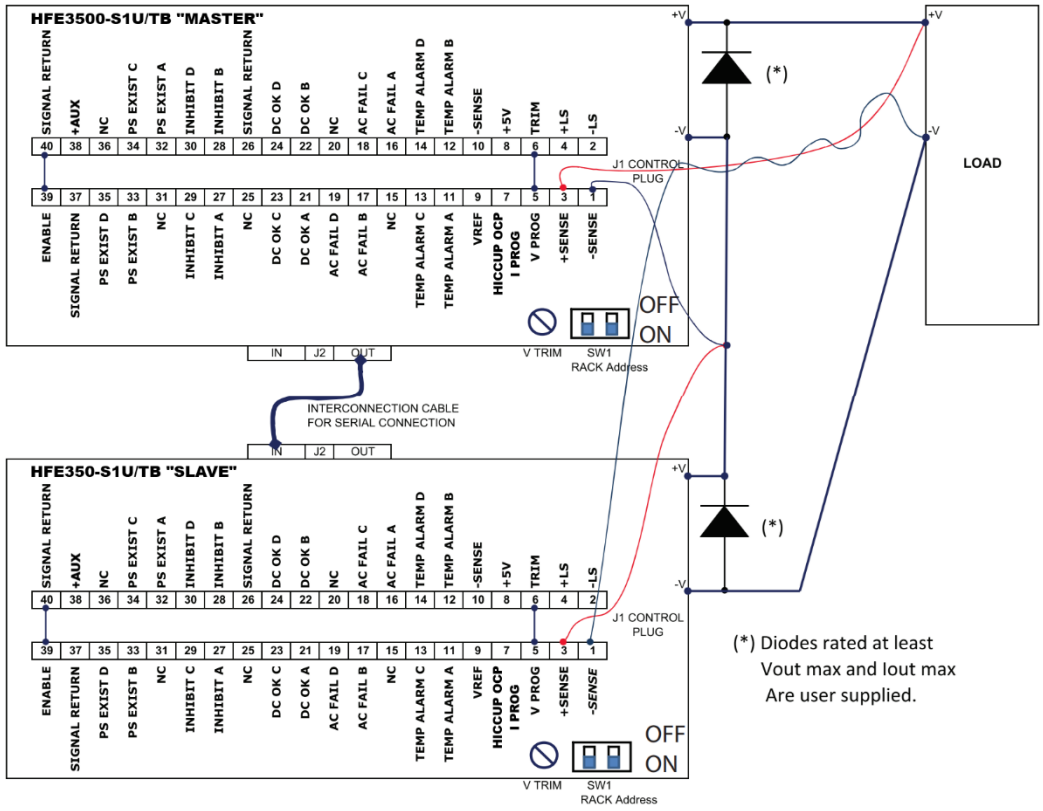
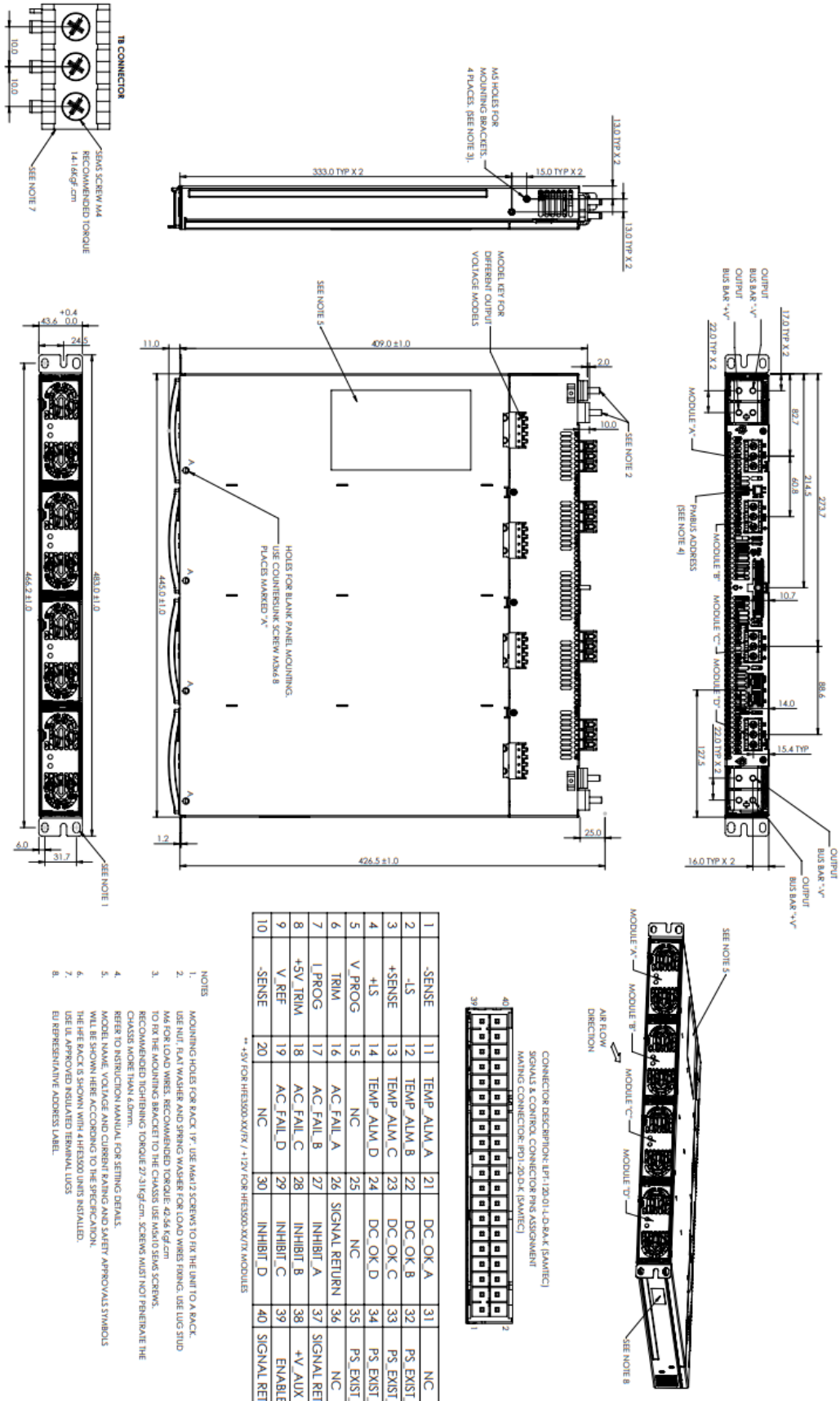


Fig 3.11 Serial Connection Diagram (remote sense)

HFE3500-S1U/TB Outline Drawing



1	-SENSE	11	TEMP_ALM_A	21	DC_OK_A	31	NC
2	-LS	12	TEMP_ALM_B	22	DC_OK_B	32	PS_EXIST_A
3	+SENSE	13	TEMP_ALM_C	23	DC_OK_C	33	PS_EXIST_B
4	+LS	14	TEMP_ALM_D	24	DC_OK_D	34	PS_EXIST_C
5	V_PROG	15	NC	25	NC	35	PS_EXIST_D
6	TRIM	16	AC_FAIL_A	26	SIGNAL RETURN	36	NC
7	I_PROG	17	AC_FAIL_B	27	INHIBIT_A	37	SIGNAL RETURN
8	+5V_TRIM	18	AC_FAIL_C	28	INHIBIT_B	38	+V_AUX **
9	V_REF	19	AC_FAIL_D	29	INHIBIT_C	39	ENABLE
10	-SENSE	20	NC	30	INHIBIT_D	40	SIGNAL RETURN

** +5V FOR HFE3500-XX/FX / +12V FOR HFE3500-XX/TX MODULES

NOTES

1. MOUNTING HOLES FOR RACK 19": USE M6x12 SCREWS TO FIX THE UNIT TO A RACK.
2. USE NUT, FLAT WASHER AND SPRING WASHER FOR LOAD WIRES FIXING. USE LUG STUD M6 FOR LOAD WIRES. RECOMMENDED TORQUE: 42.56 Kgf.cm
3. TO FIX THE MOUNTING BRACKET TO THE CHASSIS USE M5x10 SEMS SCREWS. RECOMMENDED TIGHTENING TORQUE 27.31Kgf.cm. SCREWS MUST NOT PENETRATE THE CHASSIS MORE THAN 6.0mm.
4. REFER TO INSTRUCTION MANUAL FOR SETTING DETAILS.
5. MODEL NAME, VOLTAGE AND CURRENT RATING AND SAFETY APPROVALS SYMBOLS WILL BE SHOWN HERE ACCORDING TO THE SPECIFICATION.
6. THE HFE BACK IS SHOWN WITH 4 HFE3500 UNITS INSTALLED.
7. USE UL APPROVED INSULATED TERMINAL LUGS
8. EU REPRESENTATIVE ADDRESS LABEL