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Werk für Industrie-elektronik
Nuklear-elektronik
Regelungs-technik

VME 5000 Series

User Manual

CONTENT

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1. Specification

1.1. General Information

VME/VXI-Crates V-5020/21/22/23 consist of power supply (UEP 5020/21), bin (UEV 4020/5021/5022/23) and fan tray (UEL 4020). All these components are pluggable and easily to exchange. Using external cooling the fan tray has to be replaced by VME-control and monitoring module.

The bins are available for different module formats (160, 220, 280, 340 as well as 400mm deep and 6 or 9, U high). Types with fan trays are additionally 2U higher (3U for 5022/23-Plenum bins).

The VME-Bus consists of a monolithic multilayer board. The backplanes are fully agree with VME-Spec.; the W-IE-NE-R VME backplanes do additionally have the CERN-approval. For different applications various types are installed (VMI J1/J2VXI, VME-430/ECL, other special types).

VME-fan trays are for cooling, controlling and monitoring the crates. The various fan trays are constructed according to the slot deepness, whereas both, front and bottom air supply, is possible. Fan rotation speed is shown and can be regulated; every fan (up to 6) is single controlled. Furthermore temperature of the air entry and in the power supply is shown. Optionally also above slot 1 or like requested.

All (up to 8) voltages of the power supply and the corresponding currents are shown and controlled. The threshold-limits (minimum / maximum voltages and currents) can be piloted by remote control and remain stored even after lack of voltage. In case of global trip off, the fault is to be shown in the diagnostic system.

VME-signals ACFAIL and SYSRESET are generated according to VME-Specs. SYSRESET can also be released manually.

Remote-control by network (CANbus, IEC-Bus, CAENET or Profibus) is optionally possible, if the intelligent version of fan tray or ZM controller is installed. All manual steps are also to be done through network. Furthermore, remote control and monitoring of several crates is possible through a PC's compatible program. (as well as via VME or CAMAC interfaces). Change of trip off limits (specially for currents) through menu is possible (Option). Piloting is separated from VME-potential galvanically, transferred through Optocoupler. Remote control as per CERN Spec. V422/V430 is given by use of the rear 15 pin Sub D connector.

The series 5000 models can work also with simplified fan tray UEL 4020 EC. These types have been connectet to the mains separately and to the power supply, too. No further facilities than mains switch and indicator are installed.

6U and 9U-VME/VXI-crates which are working without fan tray do have a 6U/4TE VME-controller module, put onto slot 21 of the VME crate. The module features the same control and monitoring facilities as the fan tray. External fans could be controlled at the same time.

The 5000 series -power supplies are constructed modular as a 3U high power pack, with a maximum output of 1000W (1500W), restricted by standard plug and fuse. An optionally installed auto ranging mains input features 94-132VAC or 186-264VAC. DC outputs are possible then with 1000W at >100VAC and 2000W at >200VAC.

For necassery higher power, a kompatible 6U high power pack with output power up to 3kW is available.

Power factor correction of the mains input is optionally possible by installing the PFCcon modul. This is to recommend if the user has been forced to prevent mains disturbances, caused by harmonic currents. The PFCcon works in accordance with IEC555 and EN 60555, a requierment for "CE" mark.

Power supplies and fantrays ar readily to replace.

A very special topic of the 4000/5000 VME/VXI series is the lack of any mains wiring inside bin and fan tray (not inside EC fan trays). The mains isolation inside the power supply is according to EN 60950 (CE), UL 1950, VDE 0805, CSA C22.2.950. Generally are considered: UL478, UL 1012, CSA 22-2-220/234.

1.2. VME-bin UEV 4020 / 5021 / 5022 / 5023 with backplane, 6/8U....9/11U

1.2.1 VME-bin UEV 4020

The bins are aoutfitted as a 8 respectively 11 units high VME/-bus bin incl. 2U fan tray space, which conforms to the VITA-VME specification (ANSI/IEEE STD1014-1987 IEC 821 and 297 as well as VIPA-VSO-VME 64). It is foreseen for mounting in a 19-inch rack and contains 21 slots for standard VME-bus system cards of 6 units height and 160 mm length and up to 9 U modules with a deep of 400mm. The rigid construction is based on solid side panels fixed by stable aluminium transversal bars. Series 5000 bins have an excellent shielding by low resistive screw connections and grounding of bin parts to the VME/VXI ground rail and through the power supply to mains earth.
The former UEV 4020 bins were equipped with a rear side ground bolt and a jumper to switch the VME ground to the mains earth or tokeep it unconnect. The new series have got a much shorter ground connection to the left side panel (view from rear side), what gives the best noise reduction.
If the application force to disconnect the VME ground from earth, the ground wire can put from the metalic ground bold to a neighbouring plastic one (isolated parking).
In VXI crates this ground connection is not foreseen to disconnect. All the wiring is covered by the shielding parts of backplane rear side.

The bins are available for 6U and 9U VME and VNX9 as well as VXI systems with various deepness (160mm / 220mm / 280mm / 340mm / 400 mm). For 9U bins divider sets can be installed which allows the use of small 6Ux160mm boards together with 9Ux400mm modules in the same bin. Also these bin desigens consider the actual VIPA VSO proposals.

The UEV 4020 is equipped with a printed multilayer monolith backplane carrying the J1 and J2 according to the IEEE1014 and IEC 821 standards. Either 21 or 15 slots are standardized, other on request. The backplane is characterised by a reflex- and cross-talk minimised design.

The VME-bus J1 and J2 data ways which comply with the VME-bus specification are passive terminated on both ends of the backpanel (on-board- termination). Additionally, the *BUS GRANT* lines (*BG0, BG1, BG2, BG3*) are equipped with optional individual terminations by jumper posts at both ends of the backplane (CERN V430 specification). The jumper posts for *BGIN / BGOUT* and *IACK DAISY-CHAIN* at every slot are available on both sides of the backplane.

All crates of the up to date production are equipped with automatic daisy chain backplanes ! Not any jumper posts are placed.

Free access is given to the back of the lower J2 dataway which is equipped with connectors for I/O cabling, and sub-system bus backplanes as for instance VSB-backplanes. After removing the power supply free access to the J1 connectors is possible, too.

All VME crates of the 5000 series can be delivered with W-IE-NE-R - ECL backplane according to the V430 CERN spec.

Optionally bins can be equipped with a temperature sensor in top of slot 1 (or on requested position) for automatical fan speed control. If the sensor ambient temperature exceed 45°C (+/-) the fan speed increased to the full. Speed reduction becames not possible befor the sensor temperature is below 45°C again.

UEV 4020 bins has to be powerd either by the old 4020- (out of production) or the new and more powerful 5020- power supplies, which generates lower noise, too.

1.2.2 VME-bin UEV 5021

The UEV 5021 bins are made of the same mechanics than the UEV 4020 but the connectorfield for the power supply is different. Due to the multipin arrangement very much more and different outputs can be feed to the bin.
Divider sets 6U/9U can be mounted into 9U bins.
For 5021 bins only power supplies of the 5021 types can be used.

1.2.3 VME-bin UEV 5023 (VIPA-VSO-V64)

UEV 5022 bins are outfitted with a 3U fan tray space, but compatible to standard UEL4020LX fan tray. Between fan tray and modul bottom side a plenum chamber homogenize the air flow to every slot.
Below the fan tray a space exist for bearing a filter tray which may be replaced without effects for the crate function.
To achiev free access to the whole rear side of the backplane and also the fully VIPA-VSO-VME64 compatibility, the UEV 5021 power supply is located behind the 3U fan tray space. Due to that, UEV 5023 bins can bear 9U transition modules according to VIPA- VSO proposal as well as longer than 100mm ones, too. A module guiding system can be mount for 9, 6 or 3U transition modules. 5022 bins are equipped with multipin poer connector field, kompatible to 5021 power supplies. Divider sets 6U/9U can be mounted into 9U bins.

1.2.4 VME-bin UEV 5022

Outfitted with the same features as the 5023 bin but the power supply is situated at the top behind J1 level (and J2 level for 3kW- 6U power packs). The bin is compatible to the 5020 power supplies only. Transition module access to J2/J3 only.

1.2.5 VXI-bin UEV 5021- VXI, C and D size

Based on the UEV 5021 mechanics with a deepness of 340mm and a height of 8U for 6U x 340mm (C-size) as well as 11U for 9U x 340mm (D-size) modules the bins are equipped with a 13 slot automatic daisy chain monolithic backplane (9U with J1/J2/J3 resp. 6U with J1/J2).
B size as well as special deepness like 220mm or 280 mm on requst.
The fantray space is always considered with 2U height and the power connector field is similiar to that of the VME, but placed with the VXI spec. voltages. No damages can happen by a mix up of wrong power supplies. Each voltage has their own power pin on the power connector board. For 5021 VXI bins only power supplies of theVXI 5021 types can be used.

1.2.6 VME-bin UNX 4021/5021- VNX 9

The two available versions of VNX 9 differ in the position of the backplane only. In opposite to the 4021 bin with backplane in lower position bears the 5021 the backplane in the top position. The standard bin is equipped with W-IE-NE-R - ECL backplane according to the V430 CERN spec. and with the multipin power connector board. The mechanical construction is made extremly rugged with 5mm thick side panels.
Divider sets 6U/9U can be mounted into 9U bins.
The 5021 power packs are situated behind J1 level generally. If the crate has to be powered with more than 1.5kW, the 6U power pack becomes necassery and also the J2 rearside will be

covered. But the space between backplane and power pack is large enough to place piggi back boards on the J2 connectors (95mm space).
Customer specified backplanes may be placed to J3 level, wich is either on top in case of using 4021 bin (J3/J1/Jaux/J2) or at bottom side if 5021 (J1/Jaux/J2/J3) has been used. The power packs are situated accordingly.

Current limit for backplan connector pins is 1,5A. Abs. max. rating 2A for individually loaded pins.
For optimized cooling effects :
All free slots have to be covered by a frontpanel
All levels of the backplane have to be covered, either by 6U/9U backplane or by dummies.
Coresponding parts must be ordered!

1.3. VME-fan-tray and control unit UEL 4020 LX, UEL 4020 EC

Plugged into the bin from the front side, the UEL 4020 fan tray and control unit occupies two units of the crate below the VME-bus slots. In the standard version 3 axial d.c.-fans provide a sufficient air flow to dissipate the heat generated within the modules. In the case of 280mm or more deepness 6 fans are used.

The UEL 4020 fan-tray can operate in two different modes. In the standard mode the air is taken from the front and then pushed upwards to the modules. A bottom side air inlet for full cooling efficiency can be reached by removing the bottom plate of the fan-tray and mounting an optional front cover. The maximal air flow reached by the W-ie-Ne-R fan-tray in this mode is greater than 540 m^3/h (LX) and shows a good homogeneity. Thus, 1250 W may be dissipated by the air flow. Working with front air inlet only a reduced air flow of about 400 m^3/h (380 m^3/h EC) is available. Due to the lower homogeneity of the air distribution in this mode only the power dissipation of about 800 W can be cooled. The static pressure is equal to 10 mm (EC 8mm) water column.

The UEL 4020EC fan tray is the economic version and equipped with AC fans which gives some lower performance than the LX version. EC fan trays are outfitted with mains switch and indicator only. The mains power cord has to be plugged to the fan tray rear side and the cord tail of the EC fan tray to the power supply. In case of removing the fan tray the mains cords has to be disconnect before.

LX fan trays have all control elements placed at the front panel as showed in Fig. 1,

1.3.1 Monitoring and Control Commands (LX fantray only)

The rear side 15 pin Sub D connector provide

Status Contact	pin 1-2	Closed if all voltages within limits
Power inhibit	pin 3	Low signal set DC off
Fanfail Contact	pin 5-6	Closed if all fans work correct
Sys Reset	pin 7	Low signal generates SYS- Reset
Disable	pin 13	Low signal disabeled the Tripp off mode for troubel shooting. Display works as diagnostic system
0V Low level	pin 7	
Ground	pin 15	
	pin 8 - 12	Reseved for optional network (CANbus)

SWITCHES

POWER ON /Off	main switch for ventilation and power supply
SYS RES	protected located switch for *SYSRESET* circuit activation
MODE SELECT	selection switch to choose items and values for fan-tray and power supply monitoring and control
FAN SPEED	push button for step wise in- or decrease of fan speed
FAN AUTO OFF	switch to choose between local and remote warning or d.c. voltage cut-off after fan-failure

LED - INDICATORS

AC POWER	green large LED lights if *POWER* is on
STATUS	green LED lights if all voltages are within the limit
FAN FAIL	yellow LED lights if a fan failure is recognised
OVERHEAT	yellow LED lights if an overheat in the power supply occur
SYS FAIL	red LED lights if VME-bus system generates the *SYSFAIL* signal (system failure)

Every fan is single controlled by the micro-processor based fan failure and fan speed control unit. Thus a malfunction of anyone of the fans is detected. With the FAN SPEED switch the speed of the fans can be reduced or increase step wise. Further, it is possible to switch the fans complete off due if the crate temperature measurement option is installed (sensor at slot 1 position or as requested). In this case the bin temperature is automatically controlled. If the bin temperature reaches the threshold value of 40-45°C the fans are automatically switched to full speed. Speed reduction is possible again, when the sensor temperature gets below 40-45°C.

For monitoring of fan speed, voltages, currents, temperatures, and **optional** network address the control and monitoring unit is equipped with a LED - alphanumeric display. In the case of illegal conditions or crate failures it serves as diagnostic system.

In case of using an EC fan tray, the integrated RS232 standard (2400 Baud) service interface may be used also for short distance monitoring and control (power supply item Nr. 048x.xxxx .

By use of an **optionally** possible interface inside LX fan trays all importand crate parameters can be monitored and each fan can be single controlled.

Optionally several interfaces are available as *CANbus CAENET*, *IEC (DESY-Spec.)*, and *PROFIBUS (COSY-spec.)*. Thus, remote control from a single point by an IBM-PC or a separated VME or CAMAC crate, equipped with available interfaces, is possible by use of

CANbus	for up to 32 Crates (extendable to 127)
IEC interface	for up to 15 crates
CAENET interface	for up to 99 crates
PROFIBUS interface	for up to 256 crates.

If the bin is not equipped with the fan tray and control unit a special monitoring controller with 1-slot width, type ZM for slot 21 position, features the same monitoring facilities as UEL 4020. ZM controller is available with IEC interface only.

1.4. VME power supply UEP 5020 / 5021, Mains inputs

The VME power supply of the 5000 series is a micro-processor controlled switching power supply designed in the high density W-ie-Ne-R - cavity technology, which provides a extremly lo noise output voltage.

The housing includes main filters, fuse , softstart-circuit, primary switching regulators and in-/output connectors. The AC input voltage is 180-264 V / 47-63 Hz whereby the input is protected by a slow-blow fuse 10A/250V (suffix D) as well. as 16A circuit braeker for 1,5kW (A, 2 x 16A for 3kW, E). The autoranging input (B) is fused with a 20A slow blow to allow enough current for powering from a 100VAC mains. This input has to be powered within either 94...136VAC or 186...264VAC input voltage range. For input voltages >140VAC the range changes to the higher one automatically,. swiching hysteresis is about 2VAC. Within the specified ranges the unit works stable.

If the power supply should work in the lower voltage range only, a locked range selector switch, located at the right side of the power box, allowes to fix the input either to the 115VAC range or to autoranging. The fix 115V-mode shall be selected, if the power supply has been driven by strongly disturbanced 115VAC power net.

Factory setting is always „auto“.

A solid state relay connects the power supply to a.c. mains after finishing the soft start routine.. DC on/off will made by the POWER ON/OFF switch mounted at the fan-tray front panel or for crates without fan tray at ZM-controller.

The EN 50 081 for generic emissions as well as the EN 50 082 for immunity standards, in particular EN 55 011 RFI rejection (incl. VDE 0871 class B) and EN 55 022 electromagnetic compatibility is accomplished. The insulation performs the EN 60 950, IISO 380, VDE 0805 (SELV)! Furthermore are considered UL 1950, UL 1012, UL 478, C 22.2.950, C 22.2.220/234.
Optionally a power factor correction modul (PFCcon) can be installed, which works according to EN 60 555-2/IEEE 555-2 (mains disturbances rejection, sinusoidal current flow)

Therefore the UEV 5020/5021 power supplies can fulfil the CE rules comprehensively and will CE marked for use at industrial power nets as well as for all power nets if the PFCcon is installed.

The power packs are readily replaceable. The maximum output power is 1500 W for 3U cabinets and 3kW for 6U power packs. Autoranging and sinusoidal inputs feature higher output power if mains voltage is ≥210VAC.

The following standard modules can be combined:

Voltage	Current	Module type
5V	100A	High power
-5,2V	100A	High power
-2V	50A (100A)	High power
+/-12V	6A	Dual Low-Power
+/-12V	10A	Dual Low-Power
+/-12V	40A	2 x High-Power
+/-15V	6A	Dual Low-Power
+/-15V	10A	Dual Low-Power
+/-15V	30A	2 x High-Power
+/-24V	6,5A	Dual Low-Power
+/-24V	20A	2 x High-Power

Other output voltages on request

The above rated currents are the nominal values. Limits are programmed at least to 110% (115%) of nom. currents. These limits can be set to lower values by the user as explained below in the following. to prevent damages in over powerd crates or during modul testing limit adjustment tide to the real used currents is to recommend.

For the power output to backplane connections special massive high current connectors are used in the case of the high current d.c. power outputs (+5V, -5.2V, -2V and GND). The low current outputs are connected via a 15-pin connector (DIN 41 612 - H15) refering to the UEP 5020 (4020) as well as via massive medium connectors in case of using UEP 5021. Sense, monitoring and control signal lines are connected via a 48-pin connector (DIN 41 612) and ribbon cable to backplane and fan Tray (LX wiring, not when EC wiring is installed). Each output can be adjusted by a multi-turn potentiometer which is placed at aux power module covered by the top plate, but free accessible. These trimmer will be scanned by the processor and digitally transmitted to the different modules to set the reference voltage. All other necassery adjustments are done by software and will stored in a non volatile memory. These contains also the parameters of the fan trays.

Turning on the power supply all voltages reach the nominal values nearly simultaneously within $50^{+}/_{-}$ 2.5 ms (start-end-time) whereby the voltage versus time curve shows a monotonic behavior. The start-off-time which corresponds to a value of 10% of the nominal voltages is reached after $2.5^{+}/_{-}2.5$ ms. The turn-on inrush current is limited by a softstart-circuit to a maximum value of 12 A. Dual outputs have a dual tracking function in addition

By the help of the remote sense lines an output voltage compensation of at least 0.5 V is possible. The turn-on inrush current is limited by a softstart-circuit

The UEP 5020/5021 shows an excellent long time stability. Under constant conditions the maximum voltage drift is lower than 10 mV or 0.1% within 24 hours or 50 mV or 1.0% within 6 months. The temperature coefficient of the output voltages is less than $2.0*10^{-4}$ /K.

To dissipate the heat produced within the power packs fans are placed within the bottom of the power supply ,fixed to the moduls /except the 6A dual modules).

All monitoring and control operations are performed by a micro-processor based alarm and control circuit placed inside the UEL 4020**LX or EC** fan tryas. To protect both the power supply and the VME modules, a DC cut-off is started in the case of:

- overheat in the power modules (each module is equipped with temperature sensors);

- overload, i.e. 115% of nominal maximal current is exceeded (trip-off current set to 115% as standard value, can be changed)

- overvoltage, if voltage >125% (hardware) and if voltage >105% (software, can be changed)

- undervoltage, if voltage <97.5% (software, can be changed)

- fan failure.

All voltages and currents as well as the temperature inside the power supply (and fan speed, temperatures and optional net parameters, see 1.3) can be shown on the alphanumeric display of the fan-tray. The current information is given by a d.c. output reference voltage which corresponds to the current with a ratio of 1V/100A (+5V, -5.2V, -2V) or 1V/10A ($^{+}$/_12V, $^{+}$/_15V). The display ADC resolution is 10 bit. The accuracy of the voltage measurement is better than 0.5%. The accuracy of the current measurement depends on the corresponding voltage, i.e. for $^{+}$/_5V it is better than 2A in the range between 5A - 50A and for -2V it is better than 1A in the range between 1A - 20A. Above these current ranges the accuracy is at least 5% of the final value. In the case of $^{+}$/_12V and $^{+}$/_15V the accuracy is better than 0.2 in the whole current range.

Optionally several interfaces for the fan-tray are available as CANbus, IEEEbus, *CAENET*, and *PROFIBUS*. Thus, remote control and operation of the fan-tray and the power supply is possible from a single point (IBM-PC or a separated VME or CAMAC crate, see 1.3.).

1.5.1 VME 5020/5021 Power Supply,technical data summary

Mains input

A/D. Standard:		186...260VAC 47-63Hz, 400Hz on request
B. Auto range (Option):		94...136VAC/186...260VAC 47-63Hz, 400Hz on request
Inrush current:		limited by softstart-circuit, max 20A/30A
C. Sinusoidal (Option)**:**	**CE**	EN 60555, IEC 555 pow. fact. 0,95 (230VAC), 92...264VAC, 10/20A
Isolation Inp.-outp.	**CE**	EN 60950, ISO 380, VDE 0805, UL 1950, C22.2.950

Regulation static:	<25mV	(+/-100% load, +/-15% mains)	
12V,24V (10/6,5A):	<0,1%	(+/-100% load, +/-15% mains)	
dynamic :	<100mV	(+/-25% load)	
12V,24V (10/6,5A):	<0,7%	(+/-25% load)	
Recovery time +/-25% load:		within +-1%	within +-0,1%
		0,2ms	0,5ms,
12V,24V (10/6,5A):		0,0ms	1,0ms

Sense compens.range: min. 0,5V

Noise and ripple: < 15mVpp, typical <10mVpp (0-20MHz) 3mVrms (0-2MHz)

EMI

RFI-rejection(emission):	**CE**	EN 50081-1 VDE 0871 B, Mains inp. C or E, otherwise EN 50081-2
EMC (immunity):	**CE**	EN 50082-1 or 2

Operation temperature: 0....50° C without derating
Storage: -30° C up to 85° C
Temp.-coefficient: < 0,2% / 10K
Stability: 10mV or 0,1% within 24 hours
(conditions const.) 50mV or 1,0% within 6 month

Current limits: 115% of rated current-values, adjustable to any lower level (via fan tray switches or netware). Mains fuse can open in case of continuously overpowering!

Voltage rise characteristics: monotonic 50ms, processor controlled. Complementary outputs with dual tracking

Overvoltage crow bar protection: trip off adjusted to 125% of nominal voltage each output

DC Off (trip off): within 5ms if >2% deviation from adjusted nominal values, after overload, overheat, overvoltage, undervoltage (bad status) and fan fail
Output capacitors will be discharged by the crow bars
temperatur limits 110° C heat sink, 70° C ambient,
trip off points adjustable, processor controlled.

Efficiency: 75% 2V/ -83% 5V/ -85% 12V and 15V-modules

Mains Fuses

B. Auto range input: 20A fuse 1000W/1500W, **F**. 2x20A 2kW/3kW (≥100/200VAC)
C. Sinusoidal input: 10A fuse 900W/2000W, **E**. 2x10A 3kW
D. Standard input: 10A fuse 1000W, **A**. 15A circuit breaker 1500W **G**. 2x15A
M T B F, 40° C ambient temp.: >65 000 h (UEL 4020 EC fan tray >45 000h)

Available modules	+5,0V	100A	-5,2V	100A	each max.	200A (2+2 modules)
5021 Power supply					max.	500A (5+5 modules)
3U box, max. 5 modules (<1,5kW)	-2,0V	50 (100)A			max.	200A (2+2 modules)
5021 Power supply					max.	500A
6U box, max. 10 modules (>1,5kW)	+12V	6/10A	-12V	6/10A	each max.	10A (80A)
The 6 / 10A module is a one	+15V	6/10A	-15V	6/10A	each max.	10A (60A)

slot wide dual module

Standard power supplies with 10A-, 15A- or 20A input plugs. >15/20A terminals with 2m power cord
Item 0360.3xxxi / 0361.3xxxi / 046x.3xxxi for EC fan trays (5020).
Item 038x.3xxxi / 048x.3xxxi for EC fan trays (5021). i = A-, B-, C-, D-, E-, F or G- Input

Available output power depends on input voltage. The 20A input plug is UL/CSA approved only (250VAC)
Service connection: RS 232 Interface, bidirectional, 2400Baud

1.5.2 VXI 5021 Power Supply,technical data

Mains input

A./D Standard:		86...260VAC 47-63Hz, 400Hz on request
B. Auto range (Option):		94...136VAC/186...260VAC 47-63Hz, 400Hz on request
Inrush current:		limited by softstart-circuit, max 20A/30A
C. Sinusoidal (Option)**:**	**CE**	EN 60555, IEC 555 pow. fact. 0,95 (230VAC), 92...264VAC, 10/20A
Isolation Inp.-outp.	**CE**	EN 60950, ISO 380, VDE 0805, UL 1950, C22.2.950

Regulation static:	<25mV	(+/-100% load, +/-15% mains)
12V,24V (10/6,5A):	<0,1%	(+/-100% load, +/-15% mains)
dynamic :	<100mV	(+/-25% load)
12V,24V (10/6,5A):	<0,7%	(+/-25% load)
Recovery time +/-25% load:		within +-1% within +-0,1%
		0,2ms 0,5ms,
12V,24V (10/6,5A):		0,0ms 1,0ms

Sense compens.range: min. 0,5V

Noise and ripple: <5mVpp 0->300MHz, <1mVrms 0-2MHz typical, guaranteed VXI module inside!

EMI

RFI-rejection(emission):	**CE**	EN 50081-1 VDE 0871 B, Mains inp. C or E, otherwise EN 50081-2
EMC (immunity):	**CE**	EN 50082-1 or 2

Operation temperature: 0....50° C without derating
Storage: -30° C up to 85° C
Temp.-coefficient: < 0,2% / 10K
Stability: 10mV or 0,1% within 24 hours
(conditions const.) 50mV or 1,0% within 6 month

Current limits: 115% of rated current-values, adjustable to any lower level (via fan tray switches or netware). Mains fuse can open in case of continuously overpowering!

Voltage rise characteristics: monotonic 50ms, processor controlled. Complementary outputs with dual tracking

Overvoltage crow bar protection: trip off adjusted to 125% of nominal voltage each output

DC Off (trip off): within 5ms if >2% deviation from adjusted nominal values, after overload, overheat, overvoltage, undervoltage (bad status) and fan fail
Output capacitors will be discharged by the crow bars
temperatur limits 110° C heat sink, 70° C ambient,
trip off points adjustable, processor controlled.

Efficiency: 75% 2V/ -83% 5V/ -85% 12V and 24V-modules

Mains Fuses

A. Standard input:	15A circuitbreaker 1500W,	**G.** 2x15A 3kW
B. Auto range input:	20A fuse 1000W/1500W	**F.** 2x20A 2kW/3kW

(≥100/200VAC)

C. Sinusoidal input:	10A fuse 900W/2000W	**E.** 2x10A 3kW
D. Standard input:	10A fuse 1000W	**E.** 2x10A 2kW

M T B F, 40° C ambient temperature: >65 000 h (UEL 4020 EC fan tray >45 000h)

Standard power supplies	equipped with **i** = A-, B-, C-, D-, E-, or F- Input
Item 0382.1120 i plug 10/15A	5V/100A, -5,2V/100A, -2V/100A +/-12V/10A
Item 0382.1126 i plug 10/15A	5V/100A, -5,2V/100A, -2V/100A +/-12V/10A, +/-24V/6,5A
Item 0382.1137 i plug 20A or terminals	5V/100A, -5,2V/100A, -2V/100A +/-12V/40A, +/-24V/20A
Item 0382.2137 i plug 20A or terminals	5V/200A, -5,2V/100A, -2V/100A +/-12V/40A, +/-24V/20A
Item 0382.1237 i plug 20A or terminals	5V/100A, -5,2V/200A, -2V/100A +/-12V/40A, +/-24V/20A
Item 0382.2237 i plug 20A or terminals	5V/200A, -5,2V/200A, -2V/100A +/-12V/40A, +/-24V/20A
Item 0482.xxxx i	for use with UEL 4020 EC fan trays

Available output power depends on input voltage. The 20A input plug is UL/CSA approved only (250VAC)

Service connection: RS 232 Interface, bidirectional, 2400Baud

1.5.3 FAN-Tray UEL 4020LX

Number of fans	3 or 6
Fan type	W-IE-NE-R - DC or SANYO DC
Fan live time	60.000 h (at 40 °C)
Maximum air flow	>540 /1000 m^3 /h (3 /6 fans, bottom air inlet) >400 m^3 /h (3 fans, front air inlet)
Max. static pressure	>8-10mm water column.
Control unit	micro-processor based with alphanumeric display (10 bit ADC) if no fan-tray is used the control unit is placed within the ***ZM controller*** in slot 21
Weight	3,3 Kg

1.5.4 FAN-Tray UEL 4020EC

Number of fans	3 or 6
Fan type	W-IE-NE-R - DC or SANYO DC
Fan live time	60.000 h (at 40 °C)
Maximum air flow	>540 /1000 m^3 /h (3 /6 fans, bottom air inlet) >400 m^3 /h (3 fans, front air inlet, optionally)
Max. static pressure	>8-10mm water column.
Control unit	micro-processor based. No further facilities, On/Off- switch only Compatible to LX types
Weight	3,3 Kg

2. Operation Manual Fan Tray

Following please read the description of operating and displays (Fig.1 and 2).

POWER ON/OFF push switch up: the crate is set "on"
push switch down: the crate is set "off"

POWER LED green LED lits up, if the crate is set "on"

STATUS LED green LED lits up, if all voltages are within the limits

FAN FAIL LED yellow LED lits up in case of fan failure

OVERHEAT LED yellow LED lits up if temperature too high

SYSFAIL LED red LED lits up if a VME-tray is generating the SYSFAIL signal

CURRENT DISP shows the current of the chosen channel

VOLTAGE DISP shows the voltage of the chosen channel

MODE DISPLAY shows the chosen measure range resp. multifunction display.

MODE SELECTION selection switch to chose the measuring range
push switch up: start to next mode
push switch down: return to last mode

Standard Measurement Ranges:

Available Modes and Display Examples			
Mode	Voltage	Current	Description
+5V	5.00	100	+5V channel
+12V	12.0	10.0	+12V channel
+15V	15.0	6.0	+15V channel VME
+24V	24.00	20,0	+24V channel VXI
STBY	5.00	----	stand-by channel
-5V	5.20	100	-5.2V channel
-12V	12.0	10,0	-12V channel
-15V	15.0	6,0	-15V channel VME
-24V	24.0	20,0	-24V channel VXI
-2V	2.00	50	-2V channel
FANS	3000	RPM	fan rotation speed
TEMP	25	°C	fan air inlet temp.
PTMP	55	°C	power supply temp.
BTMP*	35	°C	bin slot 1 temp. Opt.*
CAEN*	ADDR	12	CEANnet address*
CANbus*	ADDR	12	CEANnet address*
PROF*	ADDR	12	Profibus address*
IEC*	ADDR	12	IECbus address*

* only Fan Trays with network interface.

FAN SPEED SEL.	push switch up:	fan speed will increase (3120 rpm maximum)
	push switch down:	fan speed will decrease.
	If another range was set before pushing the switch the display shows the speed automatically. It returns after 5 sec. to original range.	
	Display shows the nom. speed of the blowers and twinkles if it differs from the given reference speed.	
AUTO OFF CONT.	push switch up:	display shows "AUTO OFF EN.". In case of fan fail the crate will be set "OFF".
	push switch down:	display shows "AUTO OFF EN." In case of fan failing the crate will ***not*** be set "OFF". The failure is only shown on LED.
SYSRES	call VME-SYSRES, after pushing the switch the display shows "SYSRES".	

2.1 Adjustment of Controlling Limits, AC fail behavior

The controlling limits of the UEP4020-power supplies (minimum output voltage, maximum output voltage and maximum current) can be modified with the operation switches of the Fan tray.

Equipment: Fan tray UEL4020LX, Software Release 2.02 or higher.
Operation:

1. Switch on fan tray, select channel (e.g.+12V) with the mode-switch.
2. Switch up power and mode switch both together for about 5 seconds.
   Controlling mode menu is shown.
   The display shows channel, value and corresponding value
   (e.g. +12V, IOFF 2.500).
3. Select controlling measurement with the mode-switch. You may change between trip-off current, minimum voltage (UMIN) and maximum voltage (UMAX).
4. Switch up the power switch
   The value flashes and may be changed with the mode-switch
   mode-switch up: value will increase
   mode-switch down: value will decrease
5. Power switch down
   Release to controlling mode menu.
   next step 2. (chose other value) or 6. (End).
6. Power switch down End of programming

Programming of behaivior after AC-fail :

Automatical restarting with previous state after Power Fail: Select the mode POWER range (display) and push now the POWER- ON- and the MODE- switch upright at the same time.

Remaining in OFF State after Power Fail: Select the mode POWER range (display) and push now the POWER- ON- switch upright and the MODE switch down at the same time

Caution: The controlling programm is stored within the power supply, not within the Fan tray. During programming all remote-control-signals will be ignored.

The following installations are only for Fan Trays with network Interface:

ADDRES SEL. push switch up: crate address will increase
push switch down: crate address will decrease
In case another measurement range was selected before pushing the switch display changes automatically to the actual address. It returns to original range after 5sec. Crate address is stored within the fan tray through EEPROM.

RTL-SWITCH Return To Local. This switch enables lock off of local keys if they were disabled through remote control. This function can be locked out through remote control and the display shows "LOCK OUT".

LOCAL LED green LED lits if the keys are enabled (local mode).

CANbus PLUGS 1 (opt. 2)Sub D 9pin plug for connection with CAN-BUS).
IEC-BUS PLUGS 2 parallel set plugs for connection with IEC-BUS (IEEE).
Profibus PLUGS 1 (opt. 2)Sub D 9pin plug for connection with PROFI-BUS
CAN- or Profobus may also connected to the bin rear side 15pin Sub D monitor plug

The following installations are only for Fan Trays with CAENET-Interface:

ADDRESS SEL. push switch up: crate address will increase
push switch down: crate address will decrease
In case another measurement range was selected before pushing the switch, display changes automatically to the actual address. It returns to original range after 5sec. Crate address is stored within the Fan Tray by EEPROM.

ERROR LED If CAENET recognises a failure the LED lits up and

ERROR PLUG there is a closed pot free contact at the ERROR PLUG

CAENET IN/OUT 2 parallel set connectors for CAENET in/out (daisy chain)

MANUAL BOX P. 5V supply for CAENET-hand controller.

2.2 Dust Filter

All fan trays which take the air from the bottom may be outfitted with a dust filter mat inside. This filter consist of a special foam , washable. It is easy to withdrawel after opening the bottom sheet of the fan tray. The filter mat is clamped to the bottom sheet by 2 (>220mm depth 3x) formed spring wires.

In case of using bin types 5022 or 5023 a separat filter tray can be inserted below the fans. The 3U cooling space is divided into 2U for the fan tray and a halve U each for the plenum and for the filter tray. Filter material as well as the mechanics are similiar to the integrated version.
With a new filter foam the efficiency is reduced by 10% only refer to non filtered fans. The dirty grade depends on the quantity of ambient dust and has to be watched. A good indication is given by the use of the temp. sensor in top of the crate. Increasing temperature of outcoming air is one indication (below other) for necessary cle[VME500A.DO] aning of the filter foam.
Dust filters and temperature sensors are optionally available. They have to be ordered separatly.

VME500A.DO

3. Operation ZM-Control- and Monitoring Module

Following please read description of operating and display (drawing 3.1):

SYSRES push VME-SYSRES and the display shows "SYS RES"

POWER LED green LED lights if the crate is set "ON"

POWER ON/OFF push switch up: the crate is on
push switch down: the crate is off

STATUS LED green LED lights if all voltages are within the limits

FAN FAIL LED yellow LED lights if a failure on fan is recognised

OVERHEAT LED yellow LED lights if power temperature is too high

SYSFAIL LED red LED lights if VME-crate generates the "SYSFAIL" signal

MODE DISPLAY shows chosen measuring range

U/I DISPLAY shows voltage/current of chosen measuring range resp. LED

MODE SELECTION selection switch. Chosen range of measurements shown in the MODE-display.

push switch up: start to next mode
push switch down: return to last mode

U/I SELECTION select current/voltage display

ADDRESS SEL. push switch up: crate address increased
push switch down: crate address decreased
In case another measuring range was selected before the display changes automatically showing the actual address. After 5 sec. it will return to original range. Power address is stored in the Fan Tray through EEPROM.

GTL SWITCH Go to local. This switch is to unlock local switches if they were disabled through remote control. This function can be locked through remote control. The display shows "LOCK OUT".

LOCAL LED green LED lits if keys are enabled.

IEC-BUS PLUG plug to connect with IEC-BUS

APPENDIX

APPENDIX A. - Reckognize Failures Reports

Basically there are two different kinds of failures:

1. Annoying failures are reckognized by the diagnostic system of fan tray resp. the control and monitoring module. "ERR. XXXX" and a detailed information is shown. Fatal failures could be avoided by "SYSRES". Correct working of crate, especially controlling, are not guaranteed in this case!

Description of failures:

MESSAGE	ERROR	TROUBLE SHOOTING / HELP
Network Bus	no reaction of -Bus adaptor	check connection fan tray - power supply
CPU CONN	fan tray EEPROM damaged	repair of CPU modul
CPU CHKS	control sum of CPU-EEPROM incorrect	new programming EEPROM
POW CONN	failure of connexion between fan tray and power supply	checking of connexion fan tray - power supply
POW CHKS	control sum of power EEPROM incorrect	new programming of EEPROM
IIC PROG	during programming an EEPROM a failure is shown	repeat programming, if failure is shown again, change EEPROM
CAEN NETW	CAENET adaptor does not react	repair of CAENET adaptor
MEM CHKS	failure of test sum	repair of fan tray resp. control and monitoring module.

2. Fails are possible by wrong output voltages, damaged fans, missing power and too high temperature. The crate is switched off and the error is shown until next switch-on.
To find the details about errors a test modus can be set which prevents the crate's cut off. But note:
Some errors may lead to great damages within the crate or the modules, e.g. overvoltage, when global trip off function is disabled. The following additional protections stay still active:
overvoltage protection through crowbar, power supply will not be cut off when crowbar is ignited longtime damage of crowbar by overtemperature can happen !!.

test mode "ON" push up power ON/OFF-switch while setting SYSRES
display showing the software no. and "TEST MODE"

test mode "OFF" push down power ON/OFF-switch while setting SYSRES. D
Display showing "NORM MODE"

Errors:

MESSAGE	ERROR	TROUBLE SHHOTING / HELP
FAN OFF	failure of fan	repair of fan tray
TEMP OFF	temperature of power supply too high	control of fan
AC FAIL	failure of power (line)control of	power supply/fuse less voltage (control runs up to 140V)
+/-??V OV +/-??V UV +/-??V OC	overvoltage of channel +/-??V undervoltage of channel +/-??V overcurrent of channel +/-??V	control of voltages, possibility of short curcuit, undervoltage of all channels may be caused by permanent switch on/off (cooling of input current)

Appendix B. - Technical details of fan tray

The micro processor controlled W-IE-NE-R VME crate fan trays are modularly constructed. These uints can be optionally equiped with interfaces for remote control.

The fan-tray electronic bases on the following elements:

CPU

The CPU-modul is the control center of the fan tray and by that of the whole crate. It has the following functions:
- measuring of analog ranges (4 pos./4 neg. voltages, 8 current proportional voltages, temperature of power supply, outside temperature)
- control of max. 6 DC fans
- generation of ACFAIL, SYSRES, (VME-Bus)
- computation of SYSFAIL (VME-Bus)
- power fail control
- control of other fan tray moduls

I/O

The I/O modul operates for communication with the server.
Possible inputs:
- 1 key (Reset)
- 6 switches (ON/OFF, measuring range, rotation of speed fan, fan failure, net work address, autopilot ON/OFF).

Possible outputs:
- 5 LED`s (power on, status, fan fail, over heat, SYSFAIL)
- 8 character alphanumerical displays (measuring range, voltage, current).

Optionally interfaces for remote control could be connected to the CPU-modul. The following interfaces are available :

Crate side	Control side	Software design
- CANbus interface	PC, VME	W-IE-NE-R
- IEC-Bus interface	PC, VME	W-IE-NE-R , Desy
- CAENET interface	PC, VME, CAMAC	W-IE-NE-R , CAEN
- PROFIBUS interface	PC, VME	W-IE-NE-R , KFA Jülich

The fan tray electronic is connected with the bin by a 50-pin connector located at the CPU-module. Signals are coordinated with W-IE-NE-R VME-crates. To coordinate with other crates (e.g. NIM/CAMAC) use an input module.

B.1 CPU-module

1. General

The CPU-module contains a +5V voltage control, a fan control and a micro processor basing on PCB80C552 (Intel).

2. Technical Details

Power requirements:

Electronic: 6,0V - 7.5V DC, 1A (UCPU+, UCPU-)
Fan: 26V - 30V DC, 750mA (3 fans) resp. 1,5A (6 fans)
Aux.voltage: 4,75V - 5,25VDC (UAUX1+, UAUX1-)
The aux. voltage supplies the inferfaces isolated. Current depends on modules.

Analog Inputs:

Input	Voltage
U0:	0V ... +7V
U1:	0V ... +16,5V
U2:	0V ... +28,5V
U3:	0V ... +28,5V
U4:	0V ... -7V
U5:	0V ... -16,5V
U6:	0V ... -28,5V
U7:	0V ... -2,5V
I0-I7:	0V ... +2,4V
TEMP:	0V ... +5V*

*considered for temperature sensor TSP102 (Texas Instruments).

Digital In/Output:

Name	Type	Level	State
POWERFAIL	input	TTL	activ LOW
SYSFAIL	input	TTL	activ LOW
ACFAIL	output	TTL	OC, 48mA
SYSRES	output	TTL	OC, 48mA
DISAB2	output	TTL	24mA
POWDOWN	output	TTL	24mA
STBYON	output,	TTL	24mA
SCL/SDA	IIC-Bus		

Interface-plug:

Pin	Assignments	Comment
1	5V	supply +5V
2	GND	ground
3	RD0,RD1,RD2	Read-Signal (TTL HC)
4	WR0,WR1,WR2	Write-signal (TTL HC)
5	A0,A1,A2	Address lines (TTL HC)
6	PWM1	direct line to PCB80C552
7	P4.3,P4.4,P4.5,P4.6,P4.7,IN T1	
8	D0 - D7	PCB80C552 Data Bus (buffered)

Dimension: 80mm * 30mm * 160mm (whd, without plug)

3. Plug Connector Assignments

Plug X 1 (CPU <-> Interface, DIN 41612 R/2, 48 pins)

Pin	Row A	Row B	Row C
1	+5V	+5V	+5V
2	WR0	not connected	RD0
3	WR1	STATUSR	RD1
4	WR2	reserve 3	RD2
5	D0	FANF	D4
6	D1	DISABLE	D5
7	D2	FANFR	D6
8	D3	reserve 5	D7
9	A0	reserve 4	A1
10	A2	RETURN	INT1
11	PWM1	INHIBIT	P4.3
12	P4.4	reserve 2	P4.5
13	P4.6	reserve 1	P4.7
14	GND	GND	GND
15	UAUX2-	MSYSRES	UAUX2+
16	UAUX1-	STATUS	UAUX1+

Plug X 2 (CPU <-> BIN, D-Sub, 50-pol.)

Pin	Name	Pin	Name	Pin	Name
1	U0	18	U2	34	U1
2	U3	19	U5	35	U4
3	U6	20	GND	36	U7
4	SYSRES	21	SYASFAIL	37	ACFAIL
5	I0	22	I2	38	I1
6	I3	23	I5	39	I4
7	I6	24	SDA	40	I7
8	SCL	25	DISAB2	41	NET
9	POWON	26	STBON	42	UFAN+
10	UFAN-	27	UCPU+	43	UCPU+
11	UCPU-	28	UAUX1+	44	UCPU-
12	UAUX1-	29	UAUX2-	45	UAUX2+
13	TEMP	30	reserve1	46	STATUS
14	STATUSR	31	INHIBIT	47	reserve2
15	reserve3	32	reserve 4	48	RETURN
16	FANF	33	FANFR	49	DISABLE
17	reserve5			50	MSYSRES

Plug X 3 (EPROM-choice, 3-pol.)

Pin	Name
1	+5V
2	EPROM Pin 1
3	A15

Plug X3 not connected, you see plug 1 connected with plug 2 on the plug board.

Plug C 4 (fan 6, 3-pol.)

Pin	Name	Description
1	U+	fan supply (0 - 28V)
2	CTRL	fan control (input, TTL-OC)
3	GND	ground

Plug X 5 (fan 5, 3-pol.)

Pin	Name	Description
1	U+	fan supply (0 - 28V)
2	CTRL	fan control (input, TTL-OC)
3	GND	ground

Plug X 6 (fan 4, 3-pol.)

Pin	Name	Description
1	U+	fan supply (0 - 28V)
2	CTRL	fan control (input, TTL-OC)
3	GND	ground

Plug X 7 (fan 3, 3-pol.)

Pin	Name	Description
1	U+	fan supply (0 - 28V)
2	CTRL	fan control (input, TTL-OC)
3	GND	ground

Plug X 8 (fan 2, 3-pol.)

Pin	Name	Description
1	U+	fan supply (0 - 28V)
2	CTRL	fan control (input, TTL-OC)
3	GND	ground

Plug X 9 (fan 1, 3-pol.)

Pin	Name	Description
1	U+	fan supply (0 - 28V)
2	CTRL	fan control (input, TTL-OC)
3	GND	ground

Plug X 11 (CPU <-> I/O-Modul, 10-pol.)

Pin	Name	Description
1	GND	ground
2	+5V	supply (+5V)
3	CLOCK	(output, TTL)
4	ODAT	load signal respl. display (output TTL)
5	IDAT	switches (input, TTL)
6	SEL0	display select 0 (output, TTL)
7	SEL1	display select 1 (output, TTL)
8	SEL2	display select 2 (output, TTL)
9	GND	ground
10	VLED	LED-supply (UCPU+)

B.2 I/O-Modul

1. General

The I/O-modul shows measuring range, voltage, current and different states and is for programming by switches resp. keys.

2. Technical Details

Power requirements:
Electronic: 4.75 - 5.25 V DC, 10 mA
LEDs: 4.75 - 8 V DC, max. 1A

Signals:

GND	ground
VCC	supply (+5'V)
VLED	LED-supply (+5V)
CLOCK	clock (input, TTL)
LOAD/ODAT	load signal, display dates (input, TTL)
IDAT	position of switches (output, TTL)
SEL0	display select 0 (input, TTL)
SEL1	display select 1 (input, TTL)
SEL 2	display select 2 (input, TTL)

Dimension: 375mm x 32.5mm x 15mm (whd without plug).

3. Plug Connector Assignments

Plug X 1 (I/O <-> CPU, 10-pol.)

Pin	Name	Pin	Name
1	GND	2	VCC
3	CLOCK	4	LOAD/ODAT
5	IDAT	6	SEL1
7	SEL1	8	SEL2
9	GND	10	VLED

Appendix C. - Technical details of VME-Control and Monitoring Module

The control- and monitoring modul is a 4TE/6HE VME-bus compatible processor card, controlling and monitoring the power supply.

Features:

- measuring of analog sizes (4 pos. voltages, 4 neg. volgtages, 8 voltages as corresponding to the currents, temperature of the module inside, control of external fans and temperature.
- generating the signals (ACFAIL, SYSRES (VME-Bus)
- utilization of SYSFAIL (VME-Bus)signal
- power fail controlling
- power supply control
- inputs
- 1 switch (reset)
- 5 switches (on/off, measuring range, voltage/current, network address, self- control, on/off)
- outputs
- 6 LED`s (net on, status, fan fail, over heat, SYSFAIL, local)
- 2 * 4 alphanumerical displays (measuring range, voltage, current)
- monitoring through IEC-bus

Operating can be done manually or through IEC-net.
Connection with IEC-Bus only through processor controlled IEC-Bus-Controller µPD7210. All Functions of IEEE-standard 488-1978 are to be implemented. All IEC-Bus lines are separated galvanically. Interface communicates with CPU-modul through optocoupler supplied with voltage UAUX1. Connection of additional signals through lines a and c of plug X2 (VME Bus J2).

Analog Inputs:	U0	0V ... +7 V
	U1	0V ... +16.5 V
	U2	0V ... + 28.5V
	U3	0V ... + 28.5V
	U4	0V ... - 7V
	U5	0V ... - 16.5V
	U6:	0V ... - 28.5V
	U7	0V ... - 2.5V
	I0 - I7	0V ... + 2.4V
TEMP	0V - 5V, prepared to connect with TSP 102 (Texas Instruments)	

Pin Assignment rear side 15-pin Sub-D Monitoring Plug

Pin	Name	Pin	Name
1	STATUS	9	CAN-GND
2	STATUS-R	10	CAN-L
3	Power-INHIBIT	11	CAN-H
4	GND	12	
5	FANFAIL	13	Global Trip Off DISABLE
6	FANFAIL-R	14	n.c.
7	Manual SYSRES	15	n.c.

8	n.c.	-	-

Status:	zero impedance (contact closure) = power supply working correctly.
FANFAIL:	high impedance (contact opening) fan failure.
Manual SYSRES:	short circuit to GND
Global Trip Off Disable:	short circuit to ground inhibits trip off for trouble shooting
Poewr Inhibit:	short circuit or TTL low disables the input power relay (remote on/off)