

# Fan Tray Unit UEL03M

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## User Manual

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## 1. Specification UEL 03M

The W-Ie-Ne-R UEL 03M is a modular fan tray unit for use in NIM or CAMAC crates which conform the CERN standard. Three built-in DC-fans with variable fan speed produce an air flow which is enough to dissipate the heat produced by the plugged in NIM or CAMAC modules.

The micro-processor based fan tray unit is equipped with an alphanumeric display to inform about voltages, currents, temperatures and fan speed. In case of fail functions this display can be used as a diagnostic system for trouble shooting. If used together with the PS 336 W-Ie-Ne-R high power CAMAC power supply software controlled current limits can be defined by the help of the front panel display and switches. Additionally the unit can be prepared with an interface for crate remote control (IEC, HS CAENET, Profibus or CANbus).

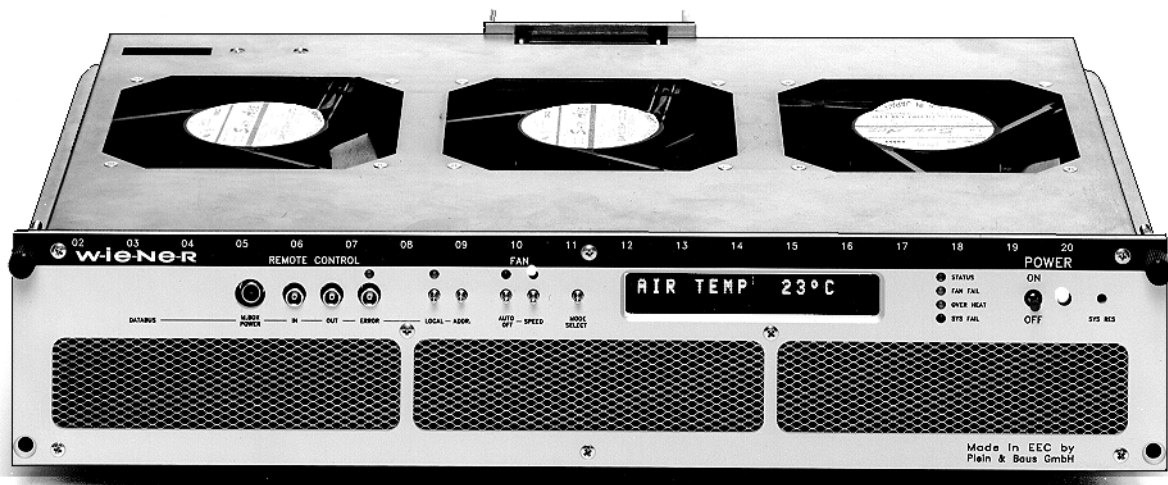


Fig. 1 UEL 03M

Plugged into a NIM or CAMAC crate which is designed according to the CERN standard (CAMAC note 64-04 or NIM 8120/8053) from the front the UEL 03M fan tray and control unit occupies the two units of the crate below the CAMAC or NIM slots.

Three axial dc.-fans provide a sufficient air flow to dissipate the heat generated in the modules. The UEL 03M fan-tray can be operated in two different air inlet 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  $540 \text{ m}^3/\text{h}$  and shows a good homogeneity. Thus, up to  $1600 \text{ W}$  may be dissipated by the air flow. As depicted in fig. 2 the maximum air flow as well as the static pressure depends on the air resistance given by the plugged in modules. Note, that this maximum value may be diminished by empty, not covered slots. Working with front air inlet only a reduced air flow of about  $400 \text{ m}^3/\text{h}$  is available. Due to the lower homogeneity of the air distribution in this mode only the power dissipation of about  $800 \text{ W}$  can be cooled. The maximum static pressure is equal to  $8 \text{ mm}$  water column.

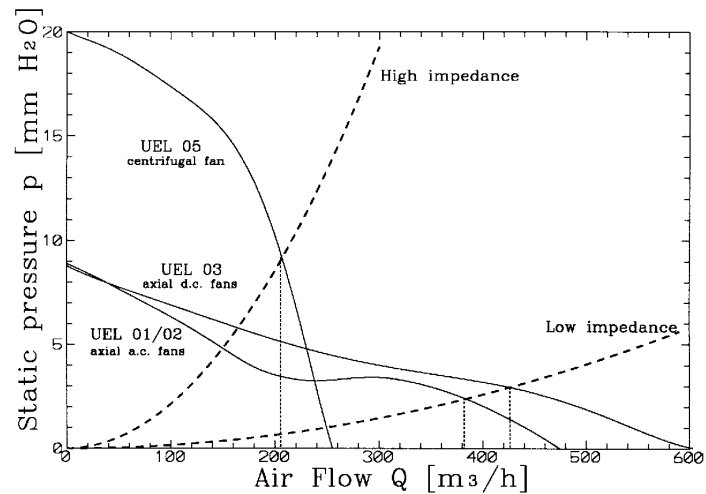


Fig. 2 static pressure and air flow diagram.

All elements of the control unit are placed at the front panel of the fan-tray,

POWER ON /Off	main switch for ventilation and power supply
SYS RES	not used
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 dc. voltage cut-off after fan-failure

### **LED - INDICATORS**

AC POWER	green large LED lights if <i>POWER</i> 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 bus system generates system failure signal
FAN SPEED	red control LED for reduced fan speed (below 3000RPM)
FAN AUTO OFF	red control LED for 'only warning after fan failure' mode (dc. off after fan failure disabled)

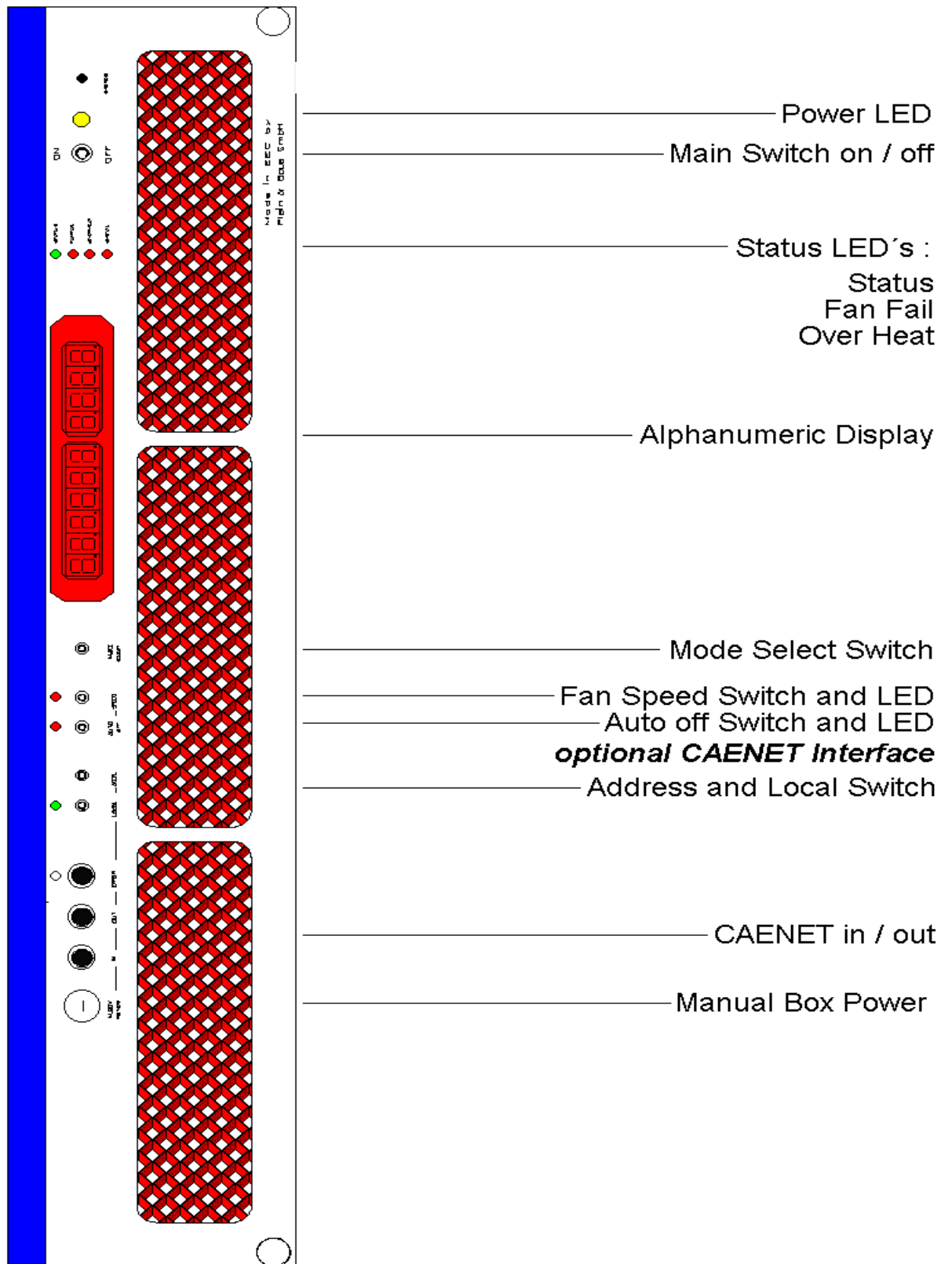


Fig. 3 UEL 03M Front panel with optional HS CAENET Interface

Every fan is single controlled by the micro-processor based fan failure and fan speed control unit. Thus a malfunction of any one of the fans is detected. With the FAN SPEED switch the speed of the fans can be step wise reduce or increase . For monitoring of fan speed, voltages, currents, temperatures, and 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.

The UEL 03M confirms the CERN CAMAC 64-04 specification for alarm and monitoring facilities:

- **status:** good if all voltages are within tolerance levels
- **rearming input**
- **power - fail signal**
- **alarms:** for overload and over temperature
- **monitor outputs:** for voltages and currents.

These functions are only available if the power supply generates the signal outputs defined by the CERN 64-04 note ( linear regulated powers supplies : "M" types, switched : all PS 336 types).

By use of an **optional** possible interface all fan parameters can be monitored and each fan can be single controlled. If using all W-IE-NE-R power supply, fan-tray and bin, a lot of control functions concerning the power supply are possible too.

**Optionally** several interfaces are available as H.S. *CAENET*, *IEC*, and *CAN-bus*. Thus, remote control from a single point by an IBM-PC or a separated VME or CAMAC crate is possible by use of

<i>IEC</i> interface	for up to 15 crates
<i>H.S.CAENET</i> interface	for up to 99 crates
<i>CAN</i> bus interface	for up to 126 crates

For user of crate remote control interfaces the interface description and the detailed control command description can be delivered on request. The CAN-bus interface operation is described within chapter 3.4.

## **2. Technical data summary**

### ***FAN-Tray UEL 03M***

Number of fans	3
Fan type	SANYO DC San Ace 109P1224H102
Fan live time	60.000 h (at 40 °C)
Maximum air flow	>540 m <sup>3</sup> /h (bottom air inlet) >400 m <sup>3</sup> /h (front air inlet)
Max. static pressure	>8mm water column.
Control unit	micro-processor based with alphanumeric display (10 bit ADC)
Weight	4.5 Kg



All present voltage and current values of the several voltage output lines as well as the temperature inside the power supply can be shown on the alphanumeric display of the fan-tray. To select between the display modes push the *MODE SELECT* switch as given in 2.2.

Using W-Ie-Ne-R switched power supply PS 336 it is also possible to adjust the current limits of the power supply. These values which cause a cut-off when exceeding can be changed according to the following instructions,

1. Switch on fan-tray and select channel (e.g.+12V) with *MODE SELECT* switch.
2. Switch up both *POWER* and *MODE SELECT* switches together for about 5 sec. Then the controlling mode menu including selected channel, limit IOFF, and the corresponding value will be shown on the display.
3. Switch up *POWER* until the value twinkles.
4. Change the value by pushing the *MODE SELECT* switch down (value will decrease) or up (value will increase).
5. To accept the new value switch down *POWER*. The power supply control unit is programmed indicated by flashing *PROG*. To change the other limits repeat step 3 - 6.
7. Switch *POWER* down to end programming.

Note that all control limits are stored within the power supply control unit which is located inside the power supply. During programming all remote control signals will be ignored.

In case of using the linear regulated power supplies (UEP series) it is possible to define the current resolution for each voltage. These values which are stored within the fan-tray unit can be programmed by the following switch algorithm,

1. Switch on fan-tray and select channel (e.g.+12V) with *MODE SELECT* switch.
2. Switch up both *POWER* and *MODE SELECT* switches together for about 5 sec. Then the controlling mode menu including selected channel, and the current resolution will be shown on the display.
3. Change the value by pushing the *MODE SELECT* switch down (value will decrease) or up (value will increase).
4. To accept the new value switch down *POWER*. The power supply control unit is programmed indicated by flashing *PROG*. To change the other limits repeat step 1 - 4.
5. Switch *POWER* down to end programming.

The following table represents possible values for the current resolution and the standard settings

Resolution	Full scale current	Default for channel
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5mV/A	80A	+/-6V
10mV/A	40A	
25mV/A	16A	+/-12V, +/-24V
50mV/A	8A	

Further, it is possible to define the crate behaviour after AC on or AC failure. It is possible to select either a general crate is off after connecting to AC or an automatic power on to allow the crates to switch automatically on after AC fail.

1. Switch on fan-tray and select channel POWER with *MODE SELECT* switch.
2. Switch up both *POWER* and *MODE SELECT* switches together for about 5 sec. Then the controlling mode menu including „auto power on“ or „no auto power on“ be shown on the display.
3. Change the value by pushing the *MODE SELECT* switch down or up
4. To accept the new value switch down *POWER*.

### 3.4. CAN-bus interface operation

If equipped with the optional CAN-bus interface the front panel is equipped with additional elements for network operation:

#### SWITCHES

ADDR	CAN - bus crate address
LOCAL	not used

#### LED - INDICATORS

LOCAL	green large LED lights if CAN Net OK
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The 9-pin Sub-D connector for CAN-bus interfacing is prepared according to CiA DS 102-1:

Pin	Line	Comment
1	-	reserved by CiA
2	CAN_L	CAN_L bus line (dominant low)
3	GND	Ground
4	-	reserved by CiA
5	-	reserved by CiA
6	-	
7	CAN_H	CAN_H bus line (dominant high)
8	-	reserved by CiA (failure signal)
9	-	

To change the CAN-bus address the ADDR switch has to be pressed. The address can be selected within the range 1 ... 127. The chosen net address is displayed on the fan tray display. If the

display has been showing another parameter (voltage, fan speed, ...9 before changing the net address it will return to the previous display. To shut the crate for remote control the position „CANBUS DISABLED“ has to be chosen.

Within the W-IE-NE-R CAN-bus protocol a broadcast call to all connected crates is possible (see CAN-BUS Interface report) . The address for this general call is factory prepared 127 however it can be changed by the following procedure:

1. Select display channel „GENERAL CALL“ with *MODE SELECT* switch.
2. Switch up or down the ADDR switch to change the value.

If the crate has to be disabled for general call the position „GENERAL CALL OFF“ has to be selected.

According to the CAN bus specification the data transfer speed is depending on the net length as given within the following table:

Max. Distance	Bit Rate	Type
10 m	1.6 Mbit/s	high- speed
40 m	1.0 Mbit/s	
130 m	500 kbit/s	
270 m	250 kit/s	
530 m	125 kbit/s	
620 m	100 kbit/s	low-speed
1300 m	50 kbit/s	
3300 m	20 kbit/s	
6700 m	10 kbit/s	
10.000 m	5kbit/s	

To adjust the net speed for a given net length select the bit rate according to this table and set on the crates:

1. Select display channel „SPEED“ with *MODE SELECT* switch.
2. Switch up or down the ADDR switch to select the required rate.

### 3.5. Error message list

Both, W-IE-NE-R power supplies and fan-trays are equipped with micro-processor based monitoring and control units. Thus, any fan or power module failure will be detected and on the alphanumeric display an error message is shown. This is a useful information for trouble shooting.

#### 3.5.1 Error messages during self test after switching on

##### Fan-Tray failures

<b>CHKS CONF</b>	Configuration check sum error
<b>CHKS UCAL</b>	Check sum error of calibration voltage

<b>CHKS ICAL</b>	Check sum error of calibration current
<b>PROM CONN</b>	internal CPU error
<b>CHKS ADDR</b>	Check sum error of netware address
<b>CHKS STAT</b>	Check sum error of previous mains on/off status
<b>CHKS FAN</b>	Fan-tray check sum error

### **Power supply failures**

<b>PS PROM CHKS</b>	Power supply check sum error
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Pushing *SYSRES* the first three error messages will be ignored, but keep in mind the defective conditions especially, for the voltage and current monitoring. The other errors, instead of the CPU error are automatically corrected so that the error message serves only as information for the user.

### **3.5.2 Run time error messages**

<b>FAN OFF</b>	Fan failure
<b>TEMP OFF</b>	Temperature of power supply too high
<b>AC FAIL</b>	Failure of ac power (line)
<b>+/_??V OV</b>	Overvoltage of channel +/_??V
<b>+/_??V UV</b>	Undervoltage of channel +/_??V
<b>+/_??V OC</b>	Overcurrent of channel +/_??V

### **3.6. Change of air flow direction**

The UEL 425 fan-tray can operate in two different modes. The standard fan takes the air from the front and pushes it upwards to the modules. To reach full cooling efficiency through a bottom side air inlet remove the bottom plate and change the front cover plate according to the following instructions:

1. Release all screws of the fan-tray bottom plate and remove it.
2. Release the screws fixing the front plate of the fan-tray and remove front grid placed behind the front plate
3. Insert front cover plate (optional) and fix all screws.

