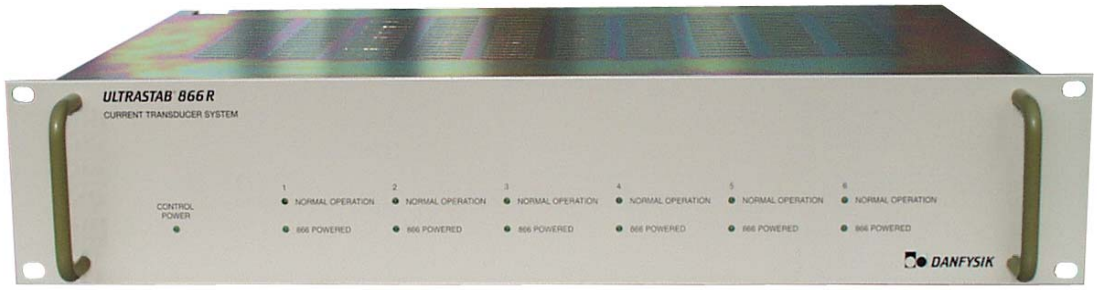
DANFYSIK

Ultrastab 866R
Six-Channel Current Transducer
User Manual



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24 April 2006

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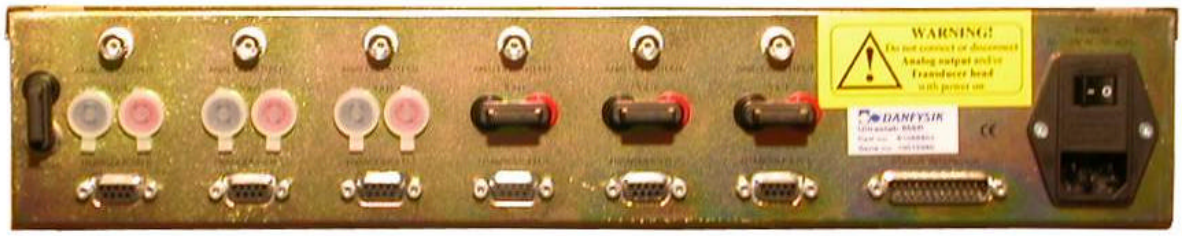
1.1 INTRODUCTION.

The ULTRASTAB 866R system is based on the very proven 866-600 precision current transducer technology. In this new configuration, named Model 866R, we have packaged the modules into a 3 to 6 channel system with a measuring capacity of up to 600A DC or 425A AC (RMS). The system can be used either as a stand-alone system or as a current range extender on high performance Power Analysers.

The system is delivered as a complete system, including auxiliary power supply, mounted in a 19" rack mount cabinet, transducer heads type 866-600 or 867-400 or a combinations of both types and connecting cables.
The basic version is equipped with 3 channels, but can be extended up to totally 6 channels.

The 866R system has a standard analog output of +/- 1V and an analog current output that is depending on the chosen type of transducer, and the selected maximum primary current, when the instrument was ordered, please refer to chapter 5.3.

Front view of the Ultrastab 866R with LED status information for the individual channels.



Rear view of the Ultrastab 866R with connectors for the individual Transducers/ channels and 25 pole female D-sub socket for interlock connections. The grounding option is located in the left side of the cabinet.

1.1.1 Working principle.

The DANFYSIK ULTRASTAB 866R Current Transducer system is a unique design, based on the zero-flux principle for galvanic isolated precision current measurement.

With the primary current conductor through the transducer head center hole and current flowing, the electronics will generate a current in the built-in compensation winding, counter-balancing the primary ampere-turns.

A very sensitive and extremely low noise detector circuit will detect when zero-flux is obtained, and an analog 0 – max. ±400mA or 0 - ±1V signal will be generated at the output terminals in direct proportion to the primary current.

The front panels of the modules are equipped with LED’s giving you the information:

- Power
- Normal operation
- Transducer connected

1.2 Warranty

DANFYSIK A/S warrants the equipment delivered from the company to be free from any defects in materials and workmanship for a period of:

12 Months from the date of installation or max. 18 months from the date of shipment. Whichever is shortest.

Within this warranty period DANFYSIK A/S will repair or replace any defective parts free of charge either on the customers site or at our factory at our choice.

DANFYSIK A/S will pay or reimburse the lowest two-way freight charges on any items returned to DANFYSIK A/S or our designated agent/representative provided DANFYSIK A/S has given prior written authorisation for such return.

This warranty shall not apply to any equipment which our inspection shows to our satisfaction, to have become defective or unworkable due to mishandling, improper maintenance, incorrect use, or any other circumstances, not generally acceptable for equipment of a similar type.

DANFYSIK A/S reserves the right on standard products to make changes in design without incurring any obligation to modify previously manufactured units.

The foregoing is the full extent of the warranty and no other warranty is expressed or implied. If no event Danfysik shall be liable for special damage arising from the delivery, late delivery, or use of the equipment.

If any fault develops the following steps should be taken:

Notify DANFYSIK A/S giving full details of the problems and include Model, Type, Serial number, and Order number.

On receipt of this information DANFYSIK A/S will send you either service information or instructions for shipping.

All shipments of DANFYSIK A/S equipment should be made according to our instructions and shipped in the original or a similar package.
For smaller parts a cardboard carton will be sufficient, providing the parts are wrapped in plastic or paper and surrounded with at least 10 centimetres of shock-absorbing material.

2. RECEIVING AND UNPACKING.

2.1. RECEIVING THE GOODS

The shipping package and the ULTRASTAB should be thoroughly inspected for signs of obvious physical damage immediately upon receipt.
All materials in the package should be checked against the enclosed packing list and the list of standard delivery below. DANFYSIK A/S will not be responsible for any shortages unless notified immediately.

ULTRASTAB 866R. Standard Delivery:

- Electronics 19 inch crate
- Three Transducer heads type 866-600A or three type 867-400
- Three Connections cables 5m
- AC power cable
- Manual.

2.2. INSTRUCTIONS FOR UNPACKING

The ULTRASTAB is shipped in a cardboard carton.

If the equipment is damaged in any way, a claim should be filed with the shipping agent, and a full report of the damage should be forwarded to Danfysik A/S or our local agent/representative immediately upon arrival.
Upon receipt of this report, Danfysik will forward instructions concerning the repair, replacement or return shipment.
Please include the Type No., Serial No., and Order No. for the ULTRASTAB 866R on any communication with DANFYSIK or our representative.

3. INSTALLATION

1. Check that the specified AC voltage and current are available and that the ambient temperature is within the range specified in this manual.

2. Establish the Ground connection according to the local authority regulations and the requirements of the equipment via the AC power plug.

3. Connection cables:
   Mount the provided connection cables between the Electronics crate rear side sockets and the Transducer Heads. Use channel 1 to 3 as default.

4. Concerning Output terminals on the rear side of the cabinet:
   If the Voltage output shall used, the shorting clamp on the Current output must always be mounted. The value of the internal shunt is written on a label.
   If output current is used - i.e. for connecting an external shunt - the shortening clamp must be opened.
   The grounding clamp shall normally be mounted to obtain best noise performance.

5. Check that all cables terminated in plugs are pushed fully home.

6. Transducer head.
   The transducer head may be installed in any orientation, but be careful to keep it away from power transformers, and other units producing significant magnetic stray fields. Please refer to the “busbar free zone” in the technical specifications of the 866R

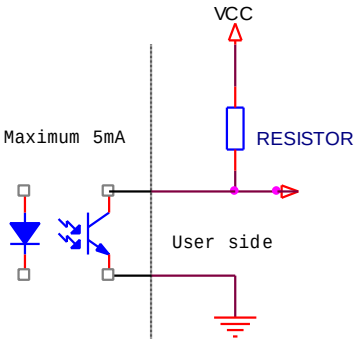
   If above checkpoints are fulfilled the system is ready for use.

3.2 INTERLOCK CIRCUIT

The interlock circuit is present at a 25 pole D-Sub socket at the rear side of the cabinet.
The output signal can be used in any general safety interlock set up circuit.
There is an Opto coupler output for each channel which are ON at NORMAL OPERATION.

Interlock plug:

Channel 1: pin 12 Collector & pin 11 Emitter
Channel 2: pin 10 Collector & pin 9 Emitter
Channel 3: pin 8 Collector & pin 7 Emitter
Channel 4: pin 6 Collector & pin 5 Emitter
Channel 5: pin 4 Collector & pin 3 Emitter
Channel 6: pin 2 Collector & pin 1 Emitter



One example of the interlock output

4. SWITCHING ON AND OPERATING INSTRUCTIONS

When the instructions for installation in pos. 3.1 have been completed, the ULTRASTAB 866R Electronics can be switched ON.

Please note:
If two voltage output is connected to the same instrument e.g. an oscilloscope, the output will not be valid, due to the internal shorting of the two channels GND.
Any instrument connected to the Voltage output MUST have a differential input to avoid a grounding loop via power ground.

1. Switch ON the AC power and the green LED – Control Power will be on.
   The Green LED - NORMAL OPERATION on the units connected will be "ON"

2 The total assembly is in NORMAL OPERATION, and an analogue current/voltage proportional to the measured current will be generated by the electronics circuitry and presented at the output terminals.
   NORMAL OPERATION means: Cable connected, measured current is within 115 % of programmed maximum current and internal aux. power supplies are working.

3. If the Green LED - NORMAL OPERATION is not "ON", please recheck that all connections are properly made and secured by the screws.

4. If any problem should occur during this operation, please contact our local representative or Danfysik direct.

5. All performance data refers to max. Current for the type 866-600 or 867-400 transducer head. In order to obtain maximum accuracy of the instrument, lower currents can be measured by applying more primary turns through the transducer head and divide the output signal with the number of turns or program to a lower maximum current. For high sensitivity measurements it is important to distribute the turns with even space all around on the transducer head.

6. In order to avoid excessive saturation of the iron core in the transducer head, this unit must be switched on before the actual primary current source is applied.

7. THEORY OF OPERATION.

5.1 GENERAL DESCRIPTION OF THE ELECTRONICS

The ULTRASTAB 866R electronic crate is equipped with a switch mode power supply delivering the +/-15V to the transducer heads. This power supply covers the following range of mains input voltages: 85 – 264Vac / 47-63Hz .
The build in interlock and Voltage Output module(VOM) receives the compensation current from the transducer heads and make it possible to measure the current or the voltage on the internal precision resistors.

5.2 ULTRASTAB 866-600 & 867-400 CURRENT TRANSDUCERS

The transducers have an arrow sticker on the side face. With the main current flowing in the direction of the arrow, a positive voltage will be developed across an internal or external Burden resistor.
The transducers can be mounted in any orientation, and the influence from external stray fields is very low.
Please note: The transducer contains fragile materials in the zero detector assembly, and care should be taken in handling.

5.3 Programming the output Voltage

The output voltage is factory programmed to match the ordered number of channels and the maximum current to be measured.
If a need for more channels or other current values is desired, please contact Danfysik or our representative.
For information on how to field install new Voltage Output modules, please see appendix B.
The output voltage is always +/- 1V at maximum primary current, provided that the correct primary current has been selected when ordering. The value of the internal shunt is indicated on a label for each channel.
The configuration of your system is labelled on the lid of the 866R unit and shown in appendix B in this manual.

6.0 MAINTENANCE

The ULTRASTAB 866R assembly does not require any maintenance under normal operation.

Please note:
Faults within the calibrated components and the zero flux detector can only be repaired by returning the ULTRASTAB 866R assembly to Danfysik A/S direct or via our local representative.
Failing to follow this procedure will make the warranty null and void.

APPENDIX A. - SALES REPRESENTATIVE AND SERVICE.

DANFYSIK A/S,
Moellehaven 31,
DK-4040 Jyllinge
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Phone No.: +45 46 78 81 50
Fax No.: +45 46 73 15 51
E-mail: sales@danfysik.dk
WWW.danfysik.dk

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Telephone: +49 911 5971919
Fax: +49 911 5971920
Email: info@signaltec.com
Web: www.signaltec.com (www.signaltec.de)

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Redwood City
CA 94064
Phone No.: (650) 802-8292
Fax No.: (650) 802-8298
E-mail: sales@gmw.com
WWW.gmw.com

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5/1A, Grants Building
Arthur Bunder Road
Colaba
Mumbai - 400 005
Phone No.: (22) 285 5261
Fax No.: (22) 285 2326
E-mail: trans@vsnl.com

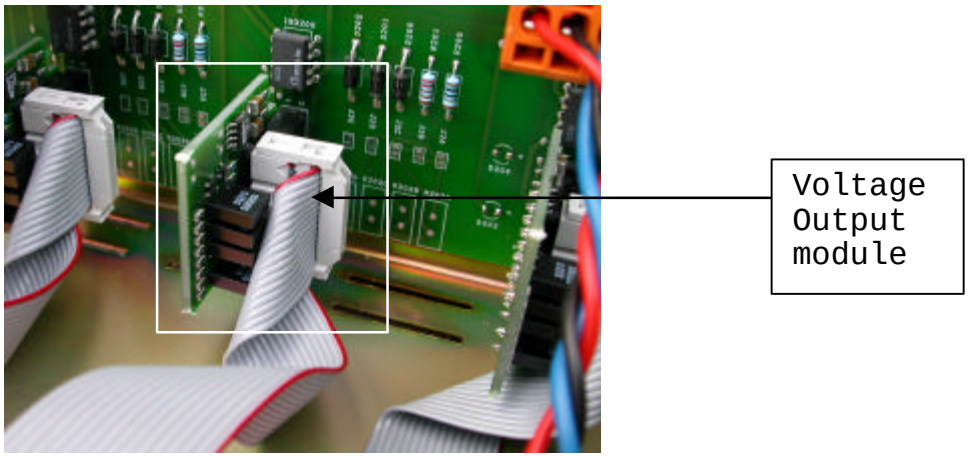
APPENDIX B: Installation of Voltage Output Modules (VOM):

If there is a need for adding more channels or changing the maximum current value of the Ultrastab 866R the following should be done:

Remove the mains power cable from the unit

The lid is removed by unscrewing the two screws on the side of the cabinet.

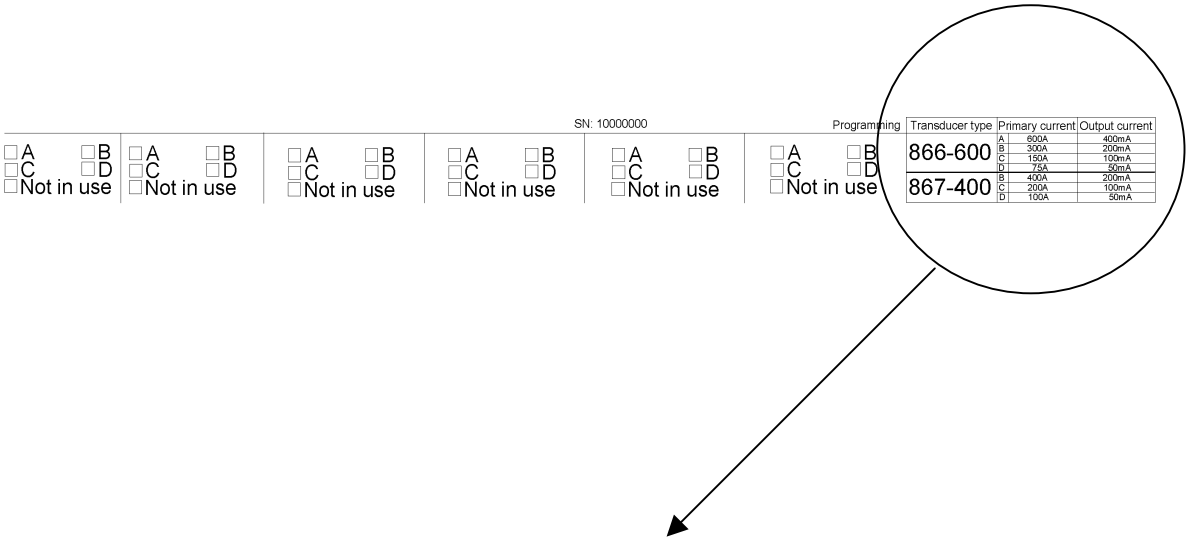
The new VOM module can now be installed between the ribbon cable and the main circuit board, please see photo.



List of available VOM's:

Product	Description	Part No.
866-VOM75	Voltage Output Module with ± 10V analog output for ± 75A	81088903
866-VOM150	Voltage Output Module with ± 10V analog output for ± 150A	81088904
866-VOM300	Voltage Output Module with ± 10V analog output for ± 300A	81088905
866-VOM600	Voltage Output Module with ± 10V analog output for ± 600A	81088906

Programming label for *ULTRASTAB 866R*



Transducer type	Primary current		Output Current
866-600	A	600A (425A RMS)	400mA
	B	300A (210A RMS)	200mA
	C	150A (105a RMS)	100mA
	D	75A (52A RMS)	50mA
867-400	A	Not used	Not used
	B	400A (280A RMS)	200mA
	C	200A (140A RMS)	100mA
	D	100A (70A RMS)	50mA

DANFYSIK

ULTRASTAB 866R
3 – 6 Channel Current Transducer System

BASIC SPECIFICATION FOR A SINGLE CHANNEL	
Primary current I (max.)	600ADC / 425A RMS
Polarity	Bipolar
Output at max. primary current: - Current output (screw terminals) - Voltage output (BNC)	 ± 400mA *) ± 1V
Load capacity: - Normal load - Overload (basic function maintained) - Overload (fault)	 0 – 100% 0 – 110% 500% (0.1 s)
Transfer ratio accuracy: - Current I(max) / 400mA - Voltage I(max)/1V	 < 2 ppm < 0,01%
Linearity: - Current mode - Voltage mode	 < 1 ppm < 25 ppm
Measuring / ratio stability: Current mode: - v.s. temperature - v.s. time Voltage mode: - v.s. temperature - v.s. time	 <0,3 ppm/°C 1 ppm/month <3 ppm/°C 10 ppm/month
Offset: - Initial - Drift v.s. temperature - Drift v.s. time	 < 25 ppm < 0,3 ppm/°C < 2 ppm/month
Noise feedback to main conductor DC – 50 kHz (RMS) (Measured on the primary current cable – one turn)	 < 10µV
Output noise (RMS): DC – 10 Hz DC – 10 kHz DC – 50 kHz	 < 1 ppm < 10 ppm < 30 ppm
Slew rate (10-90%)	≥ 10kA / ms

BASIC SPECIFICATION FOR A SINGLE CHANNEL	
Channel separation at max nominal current, and slew rate at 40kA/ms	0.05% / ÷66dB
Bandwidth (small signal 0.5%) 3 dB	DC to 100 kHz
Busbar free zone to be within linearity specification: Cylinder shape (diameter x length)	 ø 150 x 150 mm
Test voltage transducer head	5 kV AC (RMS)
Cable length electronics measuring head	5 m
Operating temperature	10 – 50°C
Storage temperature	0 – 60°C
Input power requirement	85 - 260V, AC, 50/60Hz max. 100V A
Emission complying standard Immunity complying standard	EN 50081-2 EN 50082-2-1995
Operating humidity	20 – 80%
Mechanical dimensions: A. Electronics Weight B. Transducer (dwg. 88312) Hole for conductor Weight (each transducer)	 483 x 88 x 250 mm Approx. 4 kg 122 x 98 x 65 mm ø 26 mm 1 kg

All ppm figures refer to max. output.
Specifications are subject to change without notice.

*) Optional output data:
The 866R can be delivered factory programmed for:
± 200mA / ± 1V at 300A primary current - or
± 100mA / ± 1V at 150A primary current - or
± 50mA / ± 1V at 75A primary current

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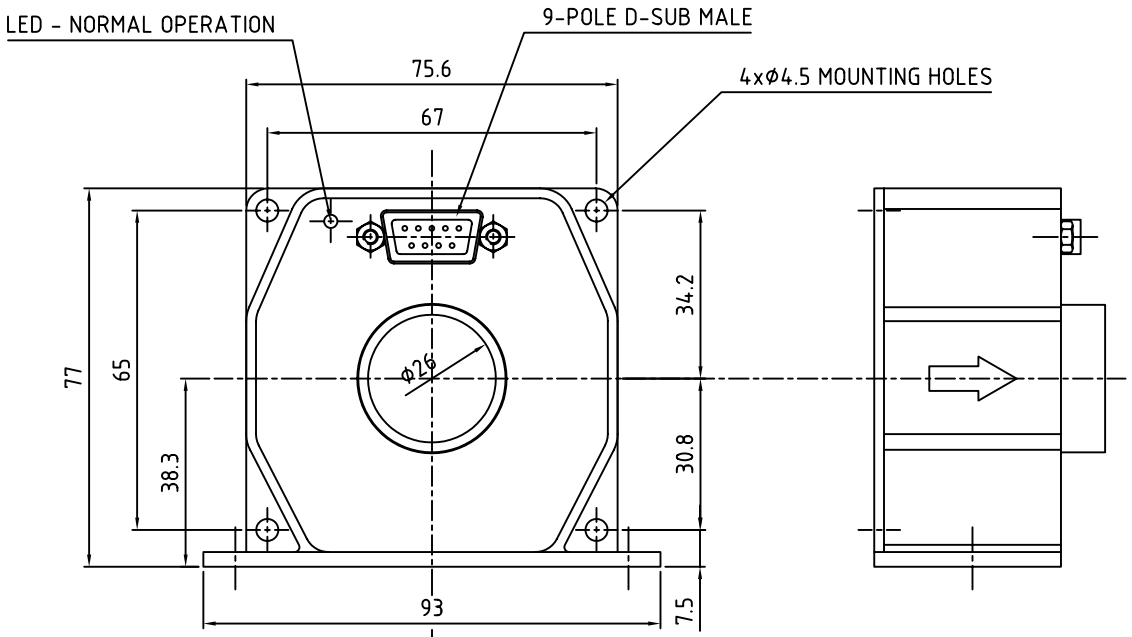
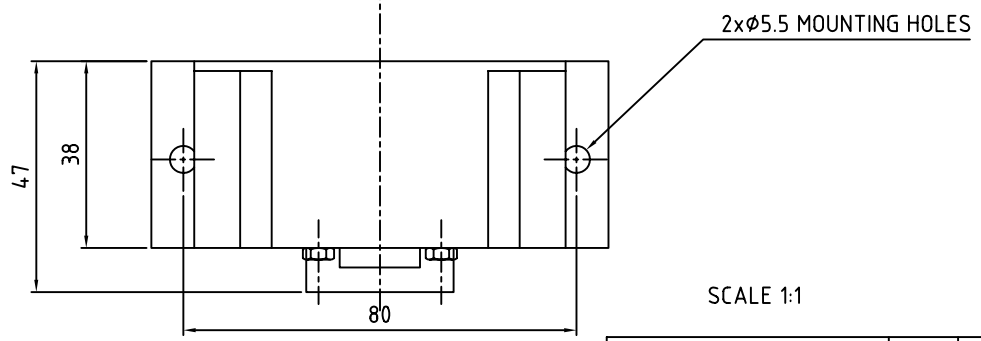
Web: **www.danfysik.dk** – e-mail: sales@danfysik.dk





SCALE 1:1

WEIGHT APP. 450g

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e-mail: danfysik@danfysik.dk
Phone: +45 4679 0000 Fax: +45 4679 0001

Projection:	Dimensions without tolerance indication: EN 22768-mK	Scale: 1:1	Customer	Size: A3	
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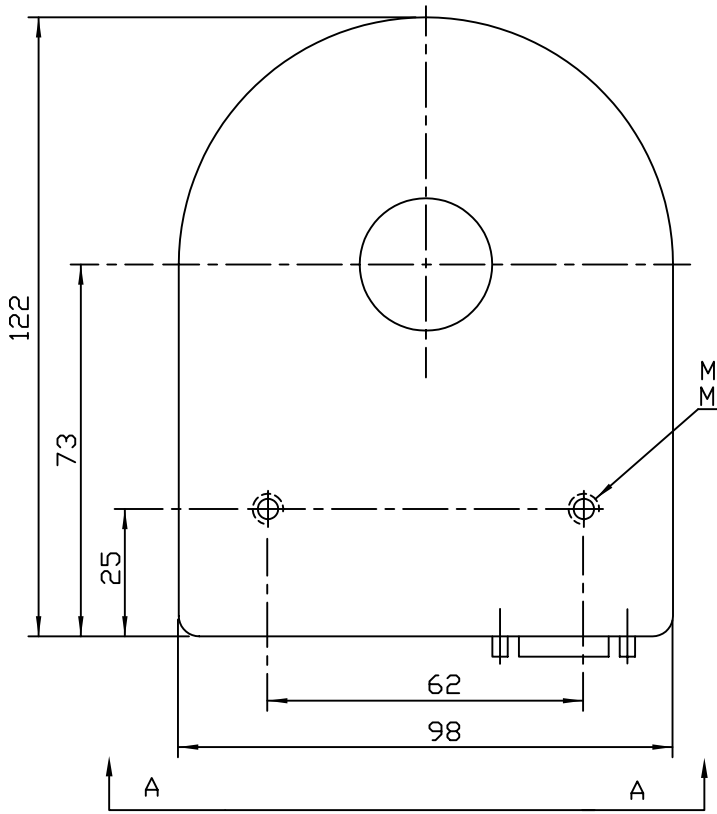

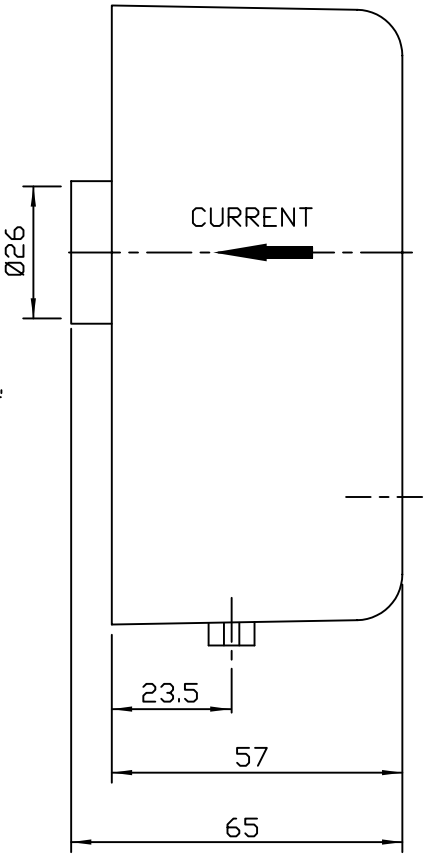

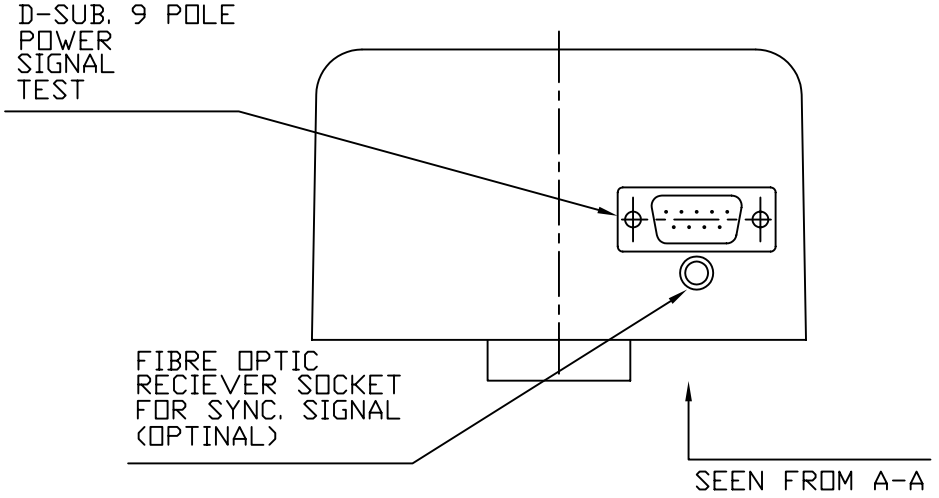

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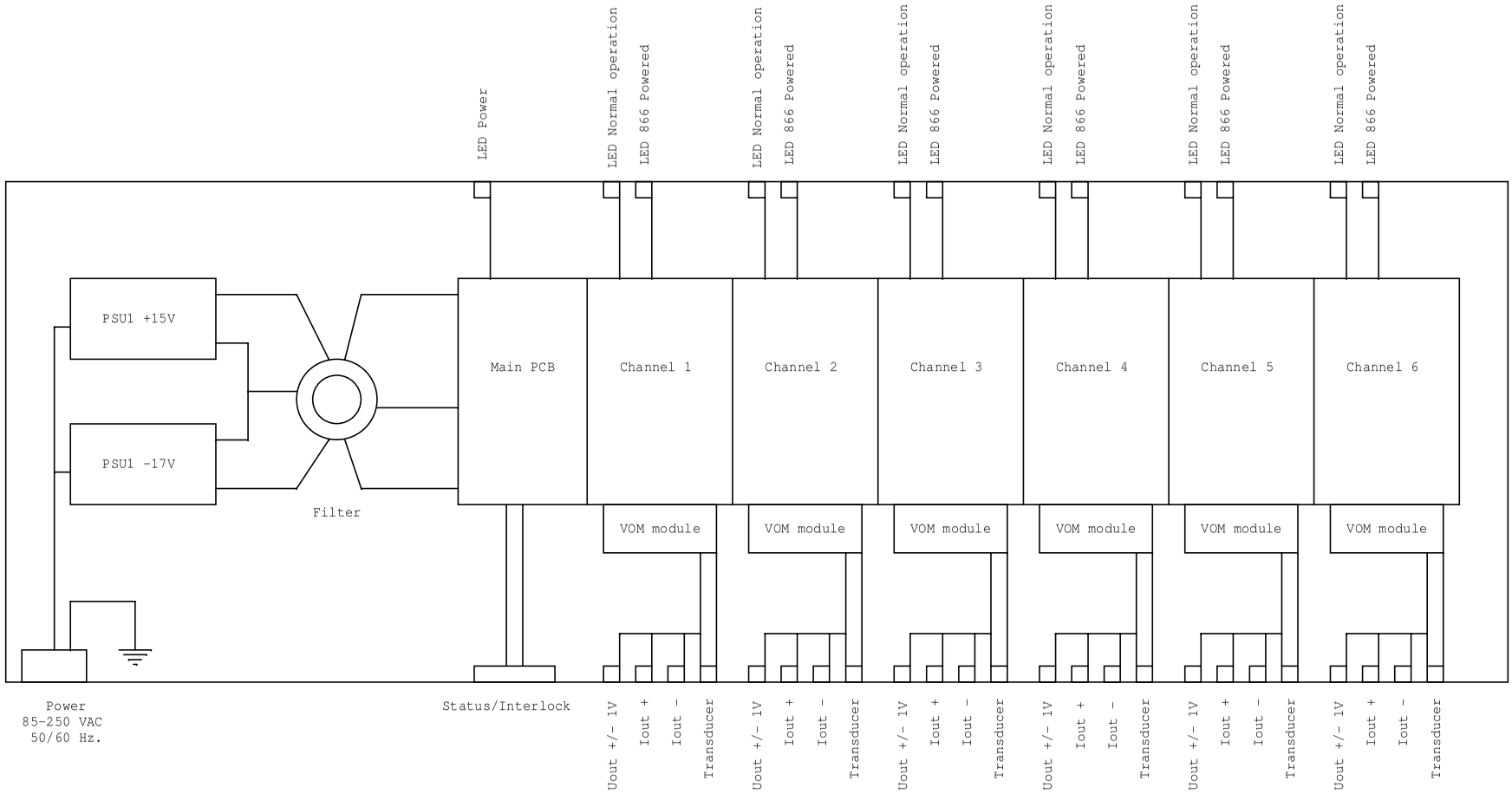
CURRENT TRANSDUCER 150/600A ULTRASTAB 866		DWG.NO.: 88201G
DANFYSIK	CUSTOMER: . PROJECT NO. .	REVISION: G SHEET 1 OF 1
	FILE: .	DATE: MK 20.03.01 SIZE: A3

DK-4040 JYLLINGE DENMARK. TELEPHONE: +45 46 78 81 50. TELEFAX: +45 46 73 15 51. E-MAIL: DANFYSIK@DANFYSIK.DK

FIRST ANGLE PROJECTION



Ultrastab 866R main blockdiagram

SCHEMATIC

DRAWN BY. JB
DESIGN APP.
PROD APP.
PROJ. ENGR.
DWG.NO.: (820) 89111

FILE. T:\PROJEKTER-IGANG\PC STYRET TEST SYSTEM\TEST BOX\866R MAIN SCHEMATIC.DSN

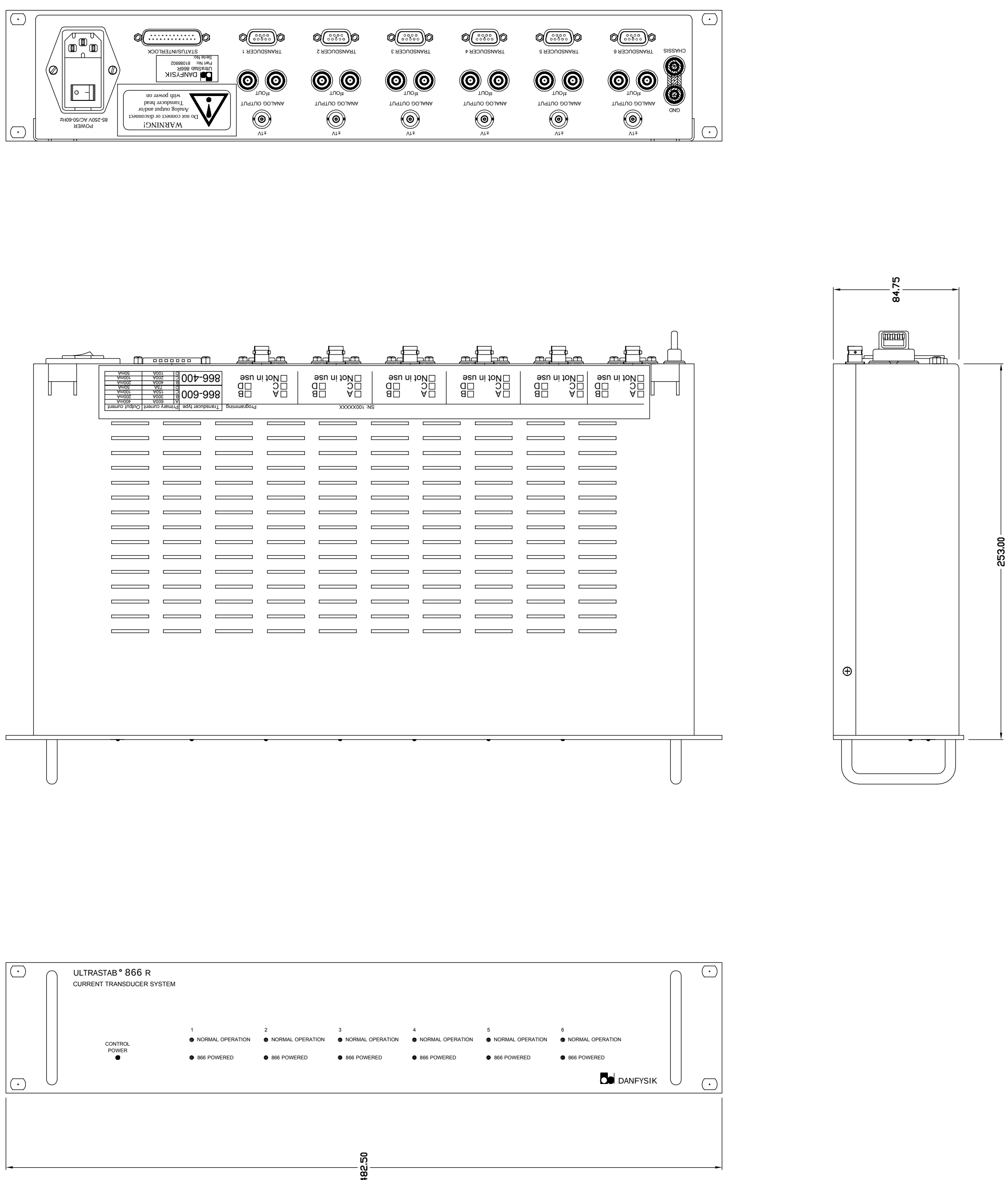
DANFYSIK | CUSTM. -------- | ORDER NO. -------- | REV. 1 | SHEET. 1 OF 1

Modified. Friday, September 26, 2003 09:22:39 | Created. Wednesday, September 24, 2003 10:17:53 | SIZE A4

MØLLEHAVEN 31 DK-4040 JYLLINGE DENMARK TELEPHONE: +45 46 79 00 00 TELEFAX: +45 46 79 00 01 E-MAIL: DANFYSIK@DANFYSIK.DK

Danfysik 866R Outline Drawing

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		16 Jun 04	M. Duffy



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN M. Duffy	DATE 16 Jun 04	
CHECK M. Duffy	DATE 16 Jun 04	
ENGINEERING M. Duffy	DATE 16 Jun 04	
NEXT ASSY	SYSTEM	
SOFTWARE AUTOCAD 2000		

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE Danfysik 866R Outline Drawing

SIZE A0 | DRAWING NO. 21908-0001-0 | REV A
SCALE 1:1 | WT kg | SHEET 1 OF 1

REVISIONS				
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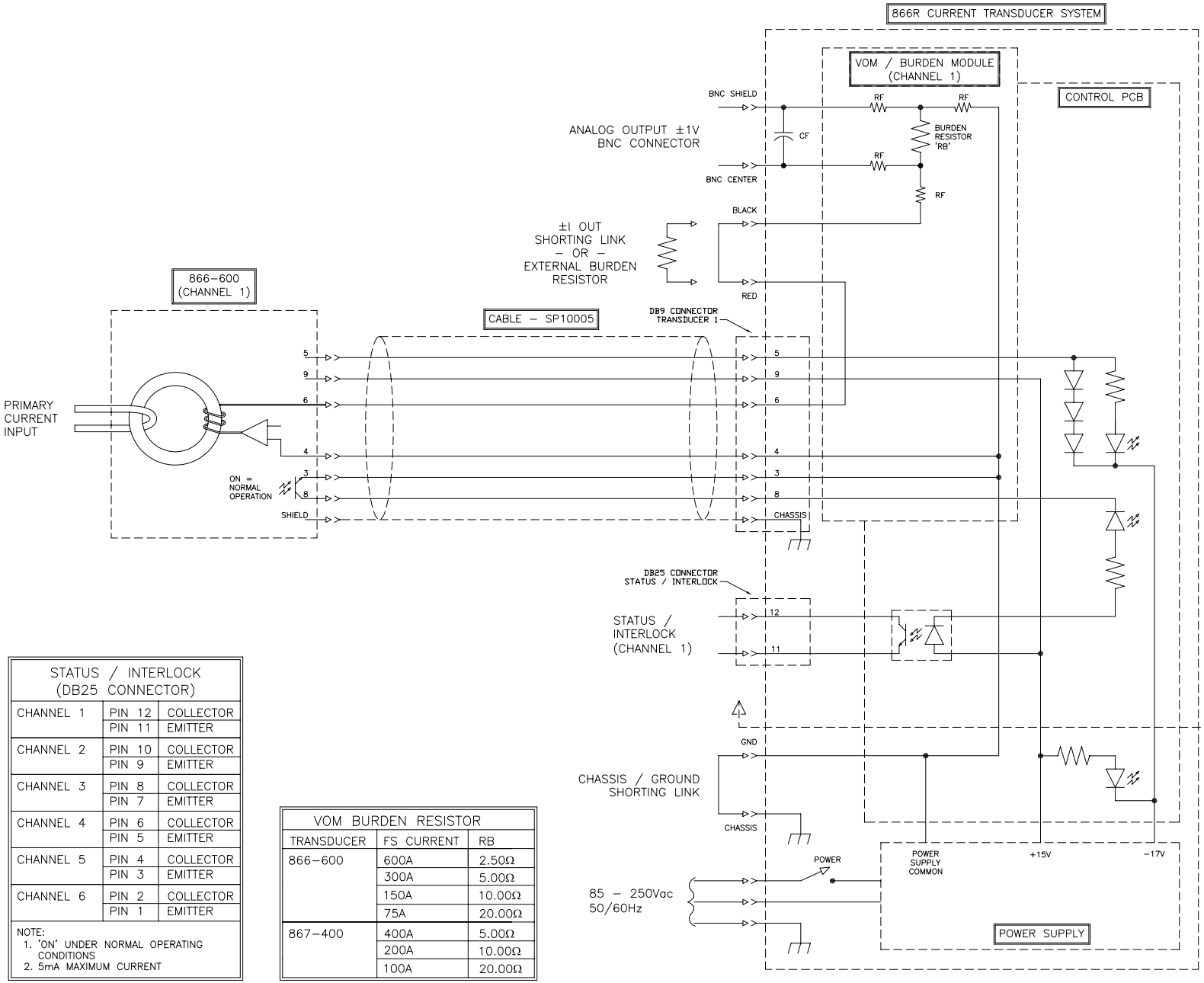

STATUS / INTERLOCK (DB25 CONNECTOR)		
CHANNEL 1	PIN 12	COLLECTOR
	PIN 11	EMITTER
CHANNEL 2	PIN 10	COLLECTOR
	PIN 9	EMITTER
CHANNEL 3	PIN 8	COLLECTOR
	PIN 7	EMITTER
CHANNEL 4	PIN 6	COLLECTOR
	PIN 5	EMITTER
CHANNEL 5	PIN 4	COLLECTOR
	PIN 3	EMITTER
CHANNEL 6	PIN 2	COLLECTOR
	PIN 1	EMITTER

NOTE:
1. 'ON' UNDER NORMAL OPERATING CONDITIONS
2. 5mA MAXIMUM CURRENT

VOM BURDEN RESISTOR		
TRANSDUCER	FS CURRENT	RB
866–600	600A	2.50Ω
	300A	5.00Ω
	150A	10.00Ω
	75A	20.00Ω
867–400	400A	5.00Ω
	200A	10.00Ω
	100A	20.00Ω

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN M. Duffy 14 Jul 04
CHECK M. Duffy 14 Jul 04
ENGINEERING M. Duffy 14 Jul 04
NEXT ASSY | SYSTEM
SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

	LINEAR	INCHES	mm
	X.XXX	±.005	±0.03
	X.XX	±.02	±0.1
	X.X	±.03	±0.3
	X	±.06	±1
	DEG	±.5	±0.5
	FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802–8292. Fax: (650)802–8298.

TITLE
DANFYSIK 866R SYSTEM SCHEMATIC

SIZE A0 | DRAWING NO. 13908–0000–0 | REV A
SCALE NTS | WT kg | SHEET 1 OF 1