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Ordering Information



Acceptance of Order

The Order Acknowledgement is an acceptance of a Customer's offer to purchase goods or services from Eurotherm Recorders Inc. Software is licensed to Customer for use with the goods purchased only. Customer will, upon request, sign Eurotherm's applicable software license or secure the signature of the ultimate end user.

Cancellation Policy

Eurotherm Recorders may, at its sole discretion, agree to cancellation of an order. Any product purchased for and/or time and material used in the production of an order, including overhead expense, will be the responsibility of the Customer. An invoice will be sent for cancellation charges. Payment due in 30 days.

Return Policy

Because of the customized nature of the majority of our product line, most goods are not returnable. All other standard items, at the sole discretion of Eurotherm Recorders, may be authorized for return if they are:

- > Less than six months from date of original shipment
- > In the current product offering at the time of the return request
- > Unused and in the original packaging
- > Undamaged in any way

A restocking fee will be charged unless the return is caused by error of Eurothem Recorders. The restocking charge will be 25% of the List Price for total product valued in excess of \$100 or 50% for total product value of \$100 or less.

Invoicing and Payment

For Customers with approved credit, full payment for all invoiced items is due within 30 days of invoice date unless otherwise specified in the Order Acknowledgement. Eurotherm reserves the right at its discretion to withdraw credit terms and substitute terms of "Prepaid Order" or "Cash On Delivery".

ADD Applicable Taxes

The Customer is responsible for all applicable Sales and Use taxes that may be imposed by the statutes of the state to which the goods sold are delivered. A valid signed Resale/Exemption Certificate is to be furnished to Eurotherm Recorders prior to date of shipment to avoid tax being added to the invoice when sold on Net Terms or charged on a COD or Credit Card shipment.

Warranty

Eurotherm warrants its products to be free from defects in workmanship and materials for a period 12 months for recorder products and 36 months for indicators, from the original date of manufacture shipment. Eurotherm Recorders Inc will repair or replace, at its option, products which fail due to manufacturing defects within the warranty period. The customer is responsible for all shipping charges to the Recorder's designated repair site. Lesser warranty periods may cover parts and accessories that may be added to the sales offering from time to time. No other warranty periods apply unless agreed upon in writing by Eurotherm Recorders.

Eurotherm accepts no liability for defects caused by Customer's design or installation for goods or software; or if the goods or software have been modified or repaired other than as authorized in writing by Eurotherm; or if the goods have not been operated, stored or maintained as recommended. Nonpayment of invoice will void this warranty for the buyer, buyer's successor or ultimate end user.

See www.chessell.com for terms & conditions

Sales Representatives

The Control Magazine annual readership survey published in February 2000, cited Eurotherm Chessell USA as a company which provides exceptional service excellence related to recorders.

This sales and service support is available throughout North and South America and is provided by our team of motivated and professional Sales Representatives who are among the best in the industry. All our Sales Reps are factory-trained and can provide fast delivery on standard Eurotherm Chessell products. In addition, they can offer in-depth application assistance, engineering recommendations and on-site assistance.

To be connected with a sales representative in your area call

888.797.2475

or visit our website

www.chessell.com

To order chart paper, pens and software online visit

http://store.chessell.com

For additional literature call

800.801.5099



www.chessell.com/buy/index.html



About Eurotherm Chessell



Eurotherm was launched as a small engineering company in 1965, to develop temperature controllers. The founder's objectives were to provide excellent customer service, welldesigned quality products, using the latest technology and equal working conditions for all employees. By the end of 1975, Eurotherm International was formed as the holding company of the group's worldwide organization. From its inception, Eurotherm has con-

firmed itself as a market leader.

In 1999 Eurotherm became part of Invensys plc, a major international corporation, with revenues in excess of \$16-billion and over 100,000 employees worldwide. Invensys is a world leader in control systems, temperature and appliance controls, power controls and industrial equipment. The Invensys vision is to be the global leader in the automation and controls industry.



Eurotherm Chessell was established in 1972 and quickly made its name as a world manufacturer of chart recorders and data acquisition instruments. The product range includes paper, circular and video graphic recorders as well as data acquisitioin I/O, process indicators and data view software.



About Eurotherm Chessell

While continuing to provide traditional recording technology, we maintain our role as a standard-setter, with the introduction of advanced process visualization systems, and leading the use of Ethernet connectivity and web-browser enablement in plant instrumentation. Today, through technical innovation, Chessell continues to lead the industry in providing increased functionality and new products for their customers.

Unlike many manufacturers, the launch concept of Chessell was specifically to be a producer of recorders and data acquisition products for the process industry, and so it remains to this day. Not only is the design and build of our instrumentation optimized for an industrial environment, we have also built up 28 years of expertise in applications and support.



Worthing, UK, one of Eurotherm Chessell's manufacturing sites

Eurotherm Chessell data acquisition units and chart recorders are designed and manufactured at plants in San Diego, California (USA) and Worthing, Sussex (UK). US sales and service are based in Newtown, Pennsylvania.



Newtown, PA, Eurotherm Chessell's USA sales and service site



www.chessell.com/contact/index.html

888.797.2475

Product Selection Guide

			as 0.	<u> </u>			1100000000
	392/394	4101C/M	4102C/M	4103C/M	4181M	4250C/M	4000R
Continuous Pen	1 to 4	1 to 4	1 to 4	1 to 4		1 to 4	
Multipoint Printer	6 traces	6 traces	6 traces	6 traces	24 traces	45 traces	
Chart Width	10" (100mm)	3.94"	3.94"	3.94"	7.09"	9.84"	
	diameter	(100mm)	(100mm)	(100mm)	(180mm)	(250mm)	
Display Type	Digital	Analog	Digital	Digital	Digital	Digital	Digital
Chart Type	Circular	Z or Roll	Z or Roll	Z or Roll	Z Fold	Z or Roll	
Annotation							
Max No Inputs	4/6	4/6	4/6	4/6	48	96	96
Max No Contact Inputs	16 (392)	6	6	3/5	39	75	60
Max No Retransmission outputs	4			4	16	56 (not C)	48
Max No Relay Outputs	8/18	12	12	16	16	56	96
Front Panel Configuration							
Modbus Communications	▲ (394)						
Ethernet Communications							
Profibus Communications							
3.5" Floppy Disk Drive							
Memory Card (PC Card)	Type I (394)			Type I	Type I	Type I	Type I
Mathematics							
Timers, Counters, Totalizers							
PC Configuration	▲ (394)						
Panel cut out (see model section	13.58x13.39"	5.43x5.43"	5.43x5.43"	5.43x5.43"	11.06x11.06"	13.9x10.77"	17.09x10.35"
for depth behind panel)	(345x340mm)	(138x138mm)	(138x138mm)	(138x138mm)	(281x281mm)	(348x273.5mm)	(434x263mm)
IP Rating (door & Bezel)	54 or 65	54	54	54	54	54	54



Product Selection Guide











1100G

4100G	4181G	4250G	4250D	5100V	5180V	
						Continuous Pen
	24 traces	45 traces				Multipoint Dotter
	7.09"	9.84"				Chart Width
	(180mm)	(250mm)				
5.5" VGA	10.4" VGA	10.4" VGA	10.4" VGA	5.5" VGA	12.1" VGA	Display Type
	Z Fold	Z or Roll				Chart Type
						Annotation
12	48	96	512 (via network)	12	24	Max No Inputs
6	39	75	416 (via network)	6	24	Max No Contact Inputs
4	16	56	256 (via network)			Max No Retransmission outputs
16	16	56	256 (via network)	3	12	Max No Relay Outputs
Touch Screen	Touch Screen	Touch Screen	Touch Screen	Touch Screen	Touch Screen	Front Panel Configuration
						Modbus Communications
						Ethernet Communications
						Profibus Communications
						3.5" Floppy Disk Drive
Type I & III	Type I & III	Type I & III	Type I & III	Type 1& compact flash	Type 1& compact flash	Memory Card (PC Card)
						Mathematics
						Timers, Counters, Totalisers
						PC Configuration
5.43x5.43"	11.06x11.06"	13.7x10.77"	13.7x10.77"	5.43x5.43"	11.06x11.06"	Panel cut out
(138x138mm)	(281x281mm)	(348x273.5mm)	(348x273.5mm)	(138x138mm)	(281x281mm)	
	54	54 or 65	65	65	65	IP Rating (door & Bezel)

Some of the items shown on this table are options available at an additional cost.



Graphic Data Acquisition Recorders

5000 Series

The 5100V and 5180V Process Viewers, are the first recorders in a brand new range of data acquisition (DAQ) units. At the heart of the design is a leading edge technology Power PC, 32 bit RISC processor.

Ethernet Networking has become the recognized standard for high-speed data transmission within large plants ...and beyond. Series 5000 incorporates FTP (File Transfer Protocol) via its Ethernet communications, enabling the archiving of data into the plant-wide data network.

Data visualization needs to be presented in the most easily interpretable format to the operator. In addition to the standard displays of bar, chart and numeric formats, custom displays (plant mimics) can be created for the series 5000 recorders. The advanced software environment allows for display creating images that are both static, and have moving elements.

A Touch Sensitive Screen coupled with a 1/4 VGA or SVGA TFT color LCD

display provides excellent display capabilities. The Series 5000 features a simple to use Windows™ style system configurator, that is mirrored in the PC-based configuration program, allowing ease of transition between either method of set up.

Archiving is available on a choice of media, either 3.5" floppy diskette, or PC card, with up to 1 Gbyte of memory. Data is transferred from the instrument's non-volatile memory in hourly, daily or weekly files. Data can be archived at a rate which matches the units' high input scan rates – 8Hz. All data is stored in tamper-proof binary format that can be used for long term record processing.

OPC Server Capability (OLE for Process Control) defines the standard by which instrumentation can be integrated into modern automation/business systems. This enables Series 5000 recorders to be incorporated into the software system of your choice, without the need to assemble costly new drivers.

Use of the Eurotherm Custom Chip set ensures high quality I/O. One A/D converter per channel negates the need for relays or solid state switching, providing continuous measurement and parallel sampling for each input. High noise rejection and isolation (250 volts channel to channel and channel ground) ensures measurement integrity in the harshest of environments. This high accuracy data acquisition occurs at an input scan rate of 8Hz (all channels scanned every 125ms).

	ALC AT A	
System Range	5100V	5180V
No inputs	6-12	6-24
Display type	5.5" (139.7mm)(1/4 VGA) TFT color LCD	12.1" (307.34mm)(SVGA) TFT color LCD
User interface	Touch sensitive screen	Touch sensitive screen
Configurable		
Relay outputs	3	3-12
Communications	Ethernet	Ethernet
Datalogging		
Archive media	ATA & compact flash or 3.5" disk	ATA & compact flash or 3.5" disk
Totalizers, timers		•
and counters		

5100V

- 6 to 12 universal inputs, 3 relay outputs
- > 125ms input scan rate
- > High resolution 5.5" (139.7mm) touch screen display
- Data logging to 3.5" disk or PC card
- On-line help
- Custom screens
- Ethernet communic



www.chessell.com/products/graphicdaq/5100V.html 888.797.2475

5180V

- > 6 to 24 universal inputs, 3-12 relay outputs
- > 125ms input scan rate
- High resolution 12.1" (307.34mm) touch screen display
- Data logging to 3.5" disk or PC card
- On-line help
- Custom screens
- Ethernet communications



www.chessell.com/products/graphicdaq/5180V.html 888.797.2475

Graphic Recorders

System Range				
, 3	4100G	4181G	4250G	4250D
Max. No. Inputs	12	48	96	512
Max. Analog Outputs	4	24	32	256
Max. No. Relay Outputs	16	24	56	256
Max. No. Screen Trends	6	8	16	16
Max. No. of Maths Channels	24	24	96	
Max. No. of Timers	6	12	12	
Max. No. of Counters	6	12	12	
Max. No. of Totalizers	6	12	12	
Example Screen History	5.3 days	31.1 days	31.1 days	31.1 days
Screen Size	5.5"(139.7mm)	10.4"(264.16mm)	10.4"(264.16mm)	10.4"(264.16mm)
Integral Chart Printer (optio	nal)			
Chart Width		7.09"(180mm)	9.84"(250mm)	
Max. No. Chart Traces		24	45	
PC Memory Card Drive				
3.5" Floppy Drive				
Ethernet Communications				
MODBUS [®] Communications		A	A	A
Web Browser Support				
Graphics Networking				
Lab/Portability Case				
Panel Mount				
Wall Mount				
IP Rating (Door & Bezel)	NEMA 4 (IP65)	NEMA 3 (IP54)	NEMA 4 (IP65)	NEMA 4 (IP65)
Tamper Proof				

Display Formats

The recorders' display hierarchy allows operators to zoom in from an area display (graphic network only), to a plant summary view, to a group view, down to a channel view. The group view can be displayed in the following formats: chart emulation; bargraph; numeric. The 4181G, 4250G & 4250D also have a multi-group view. In this split-screen display up to four groups (or three groups plus the alarm summary) can be displayed simultaneously.



4100G, 4181G and 4250G

- Fouch screens for simple use
- VGA wide view displays
- > 3 different size formats, from 2 to 96 inputs
- > High accuracy universal inputs
- Standard keyboard
- Area, group, loop and multi-group displays
- > Alarm summary
- > Data logging with remote file transfer
- > Math, timers, controllers and totalizers
- Modbus[®] and Ethernet enabled web browser communications

Benefits

- Non-Volatile Paperless Recording All trend data kept through power up/down of recorder
- Graphic Chart With full annotation including engineering units, channel descriptors, date, time and custom messages
- Trend History Enables operator to scroll through weeks of data on screen
- Universal Inputs Gives total product flexibility
- PC Configuration Single software package allows configuration, transfer and storage of instrument configurations
- Web Browser Enabled Allows real-time information to be monitored from an Internet-enabled PC via an Ethernet network
- Touch-Screen
 High resolution, full color, touch operated screen
- Numeric and Bar Graph Displays Includes alarm status of all channels displayed
- Alarm Summary Display Record of up to 256 alarm activities, can be filtered by group or point
- Data Storage Years of data can be electronically archived to PC card (up to 1Gb) or 3.5" floppy disk
- Review Software
 Stores process data on PC, for viewing and long term record keeping
- PC Chart and PC View Software Live view of process data on PC



4100G







4250G

4100G

- > 12-channel graphic recorder
- Large data archiving capability with integral PC card, floppy disk or hard disk drive
- Ethernet, MODBUS[®] or Profibus communications
- > Web-browser enabled
- E-mail alarm notification
- High quality color display
- > 3 Mb trend history
- Configuration/operation via touch screen or via local or remote PC
- Math functions, timers, counters and totalizers
- > Remote file transfer
- Relay outputs
- Analog retransmission outputs
- Nuclear certified models available through Wyle L a b s

The 4100G is a high specification graphic recorder capable of plotting up to 12 input signals, math (derived) channels, totalizer values etc. Enclosed in a sheet steel case designed to meet the requirements of an industrial environment, this recorder is ideal for continuous and batch processes as well as test and QA environments.

Display

The display consists of a 5.5" TFT color LCD originally designed for the harsh environment of automotive applications. This display is overlaid with a tough touch-screen membrane and the whole fascia can be sealed to IP65. The display can show process values



as if traced on a traditional chart, as bargraphs or in numeric format. Process alarms can also be viewed in a tabulated display and can be filtered by group or point.

Configuration

The recorder is fully configurable from the touch-screen using a simple menu system with text prompts. This allows access both to simple operator facilities and, via a password, to the input and instrument configuration.

The recorder can also be configured from a software package, allowing the user to set up the configuration off-site for later downloading to the recorder.



4100G

Ethernet & Web-Enabled DAQ

Chessell's tried and tested 100mm graphic recorder is now web-enabled. Improvements to the 4100G have led to a browserenabled unit, giving you the freedom to browse your process over the Internet.

This new feature allows real-time information to be monitored from an Internet-enabled PC, anywhere in the world. The 4100G connects to the world wide web via an Ethernet network. Use of an embedded TCP/IP server on the 4100G means that realtime process data can be browsed on a PC that has no specialized data acquisition software installed - only a standard Internet browser is required.

Data is displayed in the form of a chart, bar graphs and alarmsummary, incorporated into a single screen, displaying all pertinent process information concurrently. The data can be logged to the network via the client PC.

The web-enabled unit also features e-mail alarm notification. For user-selected alarms, a message is sent to a stored list of email addresses. Message content includes unit identification tag, channel tag, alarm number and the time at which the alarm went active.

Nuclear Certified Recorders

It is necessary to meet very stringent testing and qualifications standards to provide recorders and data acquisition units to the nuclear power industry. Recorders that are used in this sector typically have to meet the following qualifications:

- IEEE 344 specifications for use in Class 1E applications.
- EPRI Specification TR-102323 for EMI and RFI
- Software V&V Per IEEE Standard 7-4.3.2-1993 for software verification and validation.
- IOCFR50 Appendix B requirements and Part 21 for complete assurance and compliance for safety related applications.
- The software and the firmware are frozen for the recorders that are supplied by Wyle Laboratories. Chessell has committed to the long-term availability of these frozen versions.

Wyle Labs, an independent testing laboratory and sales organization, provides all the necessary documentation and support for the use of Chessell recorders in the nuclear power sector. Your regional Chessell representative will work with Wyle Labs towards the certification of recorders for your application.





www.chessell.com/products/graphic/4100G.html 888.797.2475

4100G Features and Options Guide

NUMBER OF INPUT CHANNELS

No Channels (for communications input)

- 2 channels
- 3 Channels
- 4 Channels
- 6 Channels
- 8 Channels
- 9 Channels
- 10 Channels
- 12 Channels

TREND HISTORY MEMORY

3Mb Memory

POWER SUPPLY

90-264V ac, 45-65Hz 24-48Vdc, ac 45-400Hz

ARCHIVE TYPE

1.44Mb floppy disk drive PC memory card (PCMCIA) drive

ARCHIVE LOCK

DIN archive access lock IP65 panel protection & archive lock Archive lock & dust protection Chassis lock Archive lock & chassis lock IP65 to panel, archive & chassis locks Dust protection, archive & chassis locks

APPROVALS

Seismic (IEEE344:1987-inc lock)

OPERATING LANGUAGE

English French German

MANUAL LANGUAGE

English French German

24V TRANSMITTER POWER SUPPLY

120V 3 channel TPS 240V 3 channel TPS 120V 6 channel TPS 240V 6 channel TPS

CERTIFICATION

CSA certification **PORTABLE KITS**

RELAYS CLOSED IN ALARM

4 normally closed relay o/p 8 normally closed relay o/p 12 normally closed relay o/p 16 normally closed relay o/p

RELAYS OPEN IN ALARM

4 normally open relay o/p 8 normally open relay o/p 2 normally open relay o/p 16 normally open relay o/p

FORM C RELAYS

3 form C relay o/p 6 form C relay o/p 9 form C relay o/p 12 form C relay o/p

ANALOG RETRANSMISSION

2 retransmission channels 4 retransmission channels

EVENT INPUTS

6 events inputs ARCHIVING FORMAT

ASCII logging Configuration save & restore Packed logging, incl. PC sw to unpack data

MEMORY CARD SIZE

340 Mb PC Card 520 Mb PC Card 4Mb Flash ATA Card 10.4Mb Flash ATA Card 20 Mb Flash ATA Card 1 GB Flash ATA Card

COMMUNICATIONS

RS 485 Modbus RTU RS 232 Modbus RTU RS 232 File Transfer Profibus (includes GSD editor) RS485 + File Transfer

MATHEMATICAL CAPABILITIES

Level 1 (basic functions), 24 derived variables Level 2 (advanced functions), 24 derived variables Level 3, level 2 plus exponential display

TOTALIZERS, TIMERS &

COUNTERS

2, 4 or 6 totalizers

6 timers & 6 counters 6 totalizers, 6 timers & 6 counters

CUSTOM LINEARIZATION TABLE 32 point curve

AC MONITOR KIT INPUTS

3 current inputs 1 voltage input 1 voltage & 1 current input 1 voltage & 3 current inputs 3 voltage inputs 3 voltage & 3 current inputs **AC MONITOR KIT VOLTAGE**

INPUT RANGE

0 - 300V ac, 45-65Hz 0 - 500V ac, 45-65Hz

AC MONITOR KIT CURRENT INPUT RANGE

0 - 25A ac, 45-65Hz 0 - 100A ac, 45-65Hz 0 - 1000A ac, switchable to 250A, 500A

& 1000A ac, 45-65Hz1000A ac, 45-65Hz

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 100:1 attenuator

4181G

- > 180mm graphic recorder
- > Up to 48 inputs
- Fouch-sensitive color LCD screen
- Optional integral six-color, multi-point printing
- Data storage to PCMCIA memory card
- RS232/485 MODBUS communications
- Over 500 points available using remote I/O racks (128 points displayable simultaneously)
- High speed scanning (all inputs in 1 sec)

The Eurotherm Chessell 4181G, high specification, 180mm graphic chart recorder combines proven technology with the reliability for which Chessell is renowned. Designed to meet the rigorous requirements of an industrial environment, this recorder is ideal for production and test purposes.

Display

The back-lit VGA liquid crystal display uses tough thin-film transistor (TFT) technology to give exceptionally vivid color and clarity unmatched by conventional CRT displays. The Model 4181G provides a menu of pre-configured display pages, arranged in a hierarchical system of plant areas, groups and inputs. The display can show process values in a choice of three formats: strip chart, bar graph and numerical as well as an alarm summary.





www.chessell.com/products/graphic/4181G.html 888.797.2475

4181G Features and Options Guide

No OF 8 CH UNIVERSAL INPUT BOARDS

1 Board (8 channels) 2 Boards (16 channels) 3 Boards (24 channels)

No OF 16 CHANNEL DC INPUT BOARDS

1 Board (16 channels) 2 Boards (32 channels) 3 Boards (48 channels)

SUPPLY VOLTAGE

90-132V ac (50/60Hz) 180-264V ac (50/60Hz)

4181G Chart type

No Writing System 22 meter Z Fold

No OF INPUT RELAY BOARDS

1 Board (8 Relays) 2 Boards (16 Relays) 3 Boards (24 Relays)

MOUNTING

Panel Mounting Bench/Portable

COMMUNICATIONS GRAPHICS

MODBUS® + (XIODL) Graphic Network

No OF 8 CH ANALOG RETRANSMISSION

1 Board (8 channels) 2 Boards (16 channels)

No OF 4 CH ANALOG RETRANSMISSION

1 Board (4 Channels) 2 Boards (8 Channels) 3 Boards (12 Channels)

MEMORY CARD

128K PC card 2 Mb PC card 6Mb PC card 4Mb ATA flash card 10.4Mb ATA flash card 520 Mb ATA hard card

MEMORY CARD SOFTWARE

Configuration Save/Restore ASCII Data Logging Packed Data Logging

MATHEMATICAL CAPABILITIES

Level 1 (basic functions), 24 derived variables

Level 2 (advanced functions), 24 derived variables

Level 3 (continuous emissions monitoring), Level 2, plus 12 each totalizers, timers and counters

REMOTE CJC

Remote CJC Socketed Remote CJC No Sockets

TCT (12 each totalizer, counter, timer)

TCT Supplied

PC CONFIGURATION

SOFTWARE Software Supplied

ADDITIONAL TREND MEMORY

Additional 10Mb memory (20Mb total)

MANUAL LANGUAGE

English French German

No OF CHART DIVISIONS

No Chart (writing system not fitted) 75 80 100 120

CERTIFICATES

CSA CE

BOARD OPTIONS

Conformal Coating (topicalization)

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator

4250G

- > 250mm graphic recorder
- > Up to 96 inputs
- Fouch-sensitive color LCD screen
- > Optional six-color, multi-point integral printer
- > Data storage to PC card
- RS 232/485 Modbus communications
- Over 500 points available using remote I/O racks
- High speed scanning (all inputs in 1 sec)

The Eurotherm Chessell 4250G, high specification, 250 mm graphic chart recorder combines proven technology with the reliability for which Chessell is renowned. Designed to meet the rigorous requirements of an industrial environment, the recorder is ideal for production and test purposes.





4250G Features and Options Guide

No OF 3-WIRE UNIVERSAL INPUT BOARDS

Board (8 channels)
 Boards (16 channels)
 Boards (24 channels)
 Boards (32 channels)
 Boards (40 channels)
 Boards (48 channels)
 Boards (56 channels)
 No OF 2-WIRE DC INPUT BOARDS

Board (16 channels) Boards (32 channels) Boards (48 channels) Boards (64 channels) Boards (80 channels) Boards (96 channels)

No OF RELAY OUTPUT BOARDS

1 Board (8 Relays) 2 Boards (16 Relays) 3 Boards (24 Relays) 4 Boards (32 Relays) 5 Boards (40 Relays) 6 Boards (48 Relays) 7 Boards (56 Relays)

No OF 8 CHANNEL ANALOG RETRANSMISSIONBOARDS

1 Board (8 Channels) 2 Boards (16 Channels) 3 Boards (24 Channels) 4 Boards (32 Channels)

No OF 4 CHANNEL ANALOG RETRANSMISSION BOARDS

Board (4 Channels)
 Boards (8 Channels)
 Boards (12 Channels)
 Boards (16 Channels)
 Boards (20 Channels)
 Boards (24 Channels)
 Boards (28 Channels)

COMMUNICATIONS GRAPHICS

MODBUS[®] + (XIODL) Graphic Network **SUPPLY VOLTAGE** 90-132V ac (50/60Hz)

180-264V ac (50/60Hz) **MOUNTING**

Panel Mounting Bench/Portable

DOOR TYPE FOR GRAPHICS

NEMA 3 (IP 54) NEMA 4 (IP65) NEMA 4 (IP65) Tamper Proof

CHART TYPE (OPTIONAL)

No Writing System 22 meter Z Fold 32 meter Roll

No OF CHART DIVISIONS

100 120 140 150 **MEMORY CARD**

128K SRAM 2Mb SRAM 6Mb SRAM 4Mb ATA flash card 10.4Mb ATA flash card 520Mb ATA hard card

MEMORY CARD SOFTWARE

Configuration Save/Restore ASCII Data logging (includes config.) Packed Data logging (includes config. and ASCII)

MATHEMATICAL CAPABILITIES

Level 1 (basic functions) 32 derived variables

Level 2 (advanced functions) 32 derived variables

Continuous Emissions Monitoring, Level 2, 96 derived variables, 12 timers, 12 totalizers and 12 counters

Quality Monitoring, Level 2, 6 trace generators, and 12 timers

TOTALIZERS, COUNTERS, AND TIMERS

12 each totalizers, counters, timers

ROLLING MEMORY SOFTWARE Rolling Memory

ADDITIONAL TREND MEMORY

Additional 10Mb memory **REMOTE CJC BLOCK**

Remote CJC socketed Remote CJC No Sockets

PC CONFIGURATION SOFTWARE CERTIFICATES

CSA

CF

BOARD OPTIONS

Conformal Coating (tropicalization)

250 ohm shunt resistor

100 ohm shunt resistor 250:1 attenuator

I/O Rack & Display Units

4000R

- Data acquisition system
- > Up to 96 input channels
- High speed processing
- > Universal 8-channel input board
- > High density 16-channel input board
- Optional 80-character, 3-color vacuum fluorescent display
- > Data storage to PCMCIA SRAM memory card
- RS232/485 MODBUS[®] communications
- XIODL communications and networking software
- Panel or 19" rack mounting

The 4000R is designed for use as a stand-alone remote indicating/alarm unit, or for network use with the Chessell range of large frame video recorders. The unit is suitable for both panel and 19" (482.6mm) rack mounting.





www.chessell.com/products/iorack/4000R.html 888.797.2475

4250D

- Video graphic display unit
- Fouch-sensitive color LCD screen
- Data storage to PCMCIA ATA flash memory card
- RS232/485 MODBUS[®] communications
- Over 500 points available using remote I/O racks (256 points displayable simultaneously)
- ➢ IP65 (NEMA4) rated
- Surface or panel mounting
- Only 50 mm depth behind panel
- Fast, easy configuration
- High speed processing

The Eurotherm Chessell 4250D, high specification, graphic display unit combines the latest technology with the proven reliability for which Chessell is renowned. With an IP65 rating, the instrument meets the rigorous requirements of an industrial environment so the unit is ideal for production and test purposes.





www.chessell.com/products/iorack/4250D.html 888.797.2475

4000R Features and Options Guide

No OF 3 WIRE UNIVERSAL INPUT BOARDS

Board (8 channels)
 Boards (24 channels)
 Boards (32 channels)
 Boards (40 channels)
 Boards (32 channels)
 Boards (40 channels)
 Boards (48 channels)
 Boards (72 channels)
 Boards (80 channels)
 Boards (88 channels)
 Boards (96 channels)

No OF 2 WIRE DC INPUT BOARDS

1 Board (16 channels) 2 Boards (32 channels) 3 Boards (48 channels) 4 Boards (64 channels) 5 Boards (80 channels) 6 Boards (96 channels)

DISPLAY TYPE

Integral Display

Remote Panel Mounting Display Remote Wall Mounting Display

SUPPLY VOLTAGE

90-132V ac (50/60Hz) 180-264V ac (50/60Hz)

No OF RELAY OUTPUT BOARDS

1 Board (8 Relays) 2 Boards (16 Relays) 3 Boards (24 Relays) 4 Boards (32 Relays) 5 Boards (40 Relays) 6 Boards (48 Relays) 7 Boards (56 Relays) 8 Boards (64 Relays) 9 Boards (72 Relays)

MOUNTING

Panel Mounting Rack Mounting

COMMUNICATIONS

RS232/485 Modbus XIODL Graphic Network Modbus® and XIODL

8 CH ANALOG RETRANSMISSION

1 Board, 8 Ch 2 Boards, 16 Ch 3 Boards, 24 Ch 4 Boards, 32 Ch 5 Boards, 40 Ch

4 CH ANALOG RETRANSMISSION

1 Board, 4 Ch 2 Boards, 8 Ch 3 Boards, 12 Ch 4 Boards, 16 Ch 5 Boards, 20 Ch 6 Boards, 24 Ch 7 Boards, 28 Ch 8 Boards, 32 Ch 9 Boards, 36 Ch

MEMORY CARD DRIVE MEMORY CARD

128K PCMCIA SRAM memory card 2Mb PCMCIA SRAM memory card 6Mb PCMCIA SRAM memory card

MEMORY CARD SOFTWARE

ASCII Data Logging Packed Data Logging ASCII Logging to Graphic Network Packed Data to Graphic Network

MATH PACK OPTION

Level 1 (basic functions), 32 derived variables Level 2 (advanced functions), 32 derived variables Continuous Emissions Monitoring (level 2), 96 derived variables, 12 timers, 12 totalizers and 12 counters Quality Monitoring (level 2), 6 trace generators, and 12 timers

TCT (12 each totalizers, counters, timers) PC CONFIGURATION SOFTWARE MANUAL LANGUAGE

English

CERTIFICATES

CSA CF

BOARD OPTIONS

Conformal Coating (Tropicalization)

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator

4250D Features and Options Guide

MOUNTING METHOD

Panel Mounting Wall Mounting

DOOR TYPE

NEMA 4 (IP65) NEMA 4 (IP65) Tamper Proof

OP VOLTS 4250D

90-130V ac 220-240V ac

ADDITIONAL TREND MEMORY

10 Mb additional memory (20 Mb total)

MEMORY CARD

128K Memory Card 2 Mb Memory Card 6 Mb Memory Card 4Mb ATA Flash Card 10.4Mb ATA Flash Card 520Mb ATA Flash Card

Strip Chart Recorders

- > Wide choice of features and prices
- Clear data handling with high visibility diplays
- > Universal inputs
- Choice of paper and digital storage
- Real time annotation
- Plain English user interface
- PC configuration
- Sheet steel case

Eurotherm Chessell has an extensive family of strip chart recorders, ranging from one input, preconfigured units with an analog scale display, to recorders handling over ninety inputs with a range of advanced features including math capabilities and serial communications. The recorders are offered in three chart widths, 3.94" (100mm), 7.09" (180mm) and 9.84" (250mm), with both continuous pen and multipoint printer versions being available.



			-55 V.	54.0		2.1% 2		
	4101C	4101M	4102C	4102M	4103C	4103M	4181M	4250C/M
Continuous Pen								▲ (C)
Multipoint Dotter								▲ (M)
No. of Inputs	1 to 4	6	1 to 4	6	1 to 4	6	48	96
Digital Display								
Configurable								
Relay Outputs								
Chart Illumination								
Annotation								A
Retransmission Outputs								
Contact Inputs								
Communications								A
Data Logging+File Tran	ısfer						Type 1	Type 1
Mathematics								A
Counters, Totalizers								A
Timers								
PC Configuration								

4250C

- 250mm strip chart recorder
- > Up to 4 continuous writing pens
- High speed annotation of text, scales and logs
- > 80 character, 3 color vacuum flourescent display
- Data storage to PC card
- High speed (4Hz) scanning of all inputs
- Analog retransmission and relay outputs

The 4250C is a high specification, 250mm chart recorder with up to four continuous trace pens. The recorder also features a pen for chart annotation, including channel descriptors and scales, chart speed, messages and logs. The unit has a high speed scan rate of 4Hz for all inputs, with the option of storing data to the PC card drive. Math, totalizers, timers and counters make this a powerful answer to your continuous pen recorder requirements.





4250C Features and Ordering Guide

NUMBER OF PENS

1 Pen 2 Pens

- 3 Pens
- 4 Pens

No OF 8 CH DC INPUT BOARDS

1 Board (8 channels) 2 Boards (16 channels) 3 Boards (24 channels) 4 Boards (32 channels)

No OF 16 CH DC INPUT BOARDS

1 Board (16 channels) 2 Boards (32 channels) 3 Boards (48 channels)

SUPPLY VOLTAGE

90-132V ac (50/60Hz) 180-264V ac (50/60Hz)

CHART TYPE

22 meter Z Fold 32 meter Roll

No OF RELAY OUTPUT BOARDS

- 1 Board (8 Relays)
- 2 Boards (16 Relays) 3 Boards (24 Relays) 4 Boards (32 Relays) 5 Boards (40 Relays) 6 Boards (48 Relays) 7 Boards (56 Relays)

MOUNTING

Panel Mounting Bench/Portable

COMMUNICATIONS

RS232/485 Modbus ANNOTATION No OF 8 CH ANALOG RETRANSMISSION BOARDS

1 Board (8 Channels) 2 Boards (16 Channels) 3 Boards (24 Channels) 4 Boards (32 Channels)

No OF 4 CH ANALOG OUTPUT BOARDS

Board (4 Channels)
 Boards (8 Channels)
 Boards (12 Channels)
 Boards (16 Channels)
 Boards (20 Channels)
 Boards (24 Channels)
 Boards (28 Channels)
 MEMORY CARD DRIVE

MEMORY CARD DRIV

128K PCMCIA SRAM memory card 2Mb PCMCIA SRAM memory card 6Mb PCMCIA SRAM memory card

MEMORY CARD SOFTWARE

Configuration Save/Restore

ASCII Data Logging Packed Data Logging

MATHEMATICAL CAPABILITIES

Level 1 (basic functions), 32 derived variables Level 2 (advanced functions), 32 derived variables

REMOTE CJC

Remote CJC Socketed Remote CJC No Sockets

TOTALIZERS, COUNTERS AND TIMERS

6 each totalizers, counters, timers

PC CONFIGURATION SOFTWARE PEN OFFSET COMPENSATION No OF CHART DIVISIONS

100 120

140

150

CERTIFICATION

CSA

CE

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator

4250M

- > 250mm strip chart recorder
- > Up to 96 inputs
- > Unique 'secret-til-lit' full function keyboard
- Six color, multi-point printing
- > Up to 45 traces to chart
- > 80 character, 3 color vacuum fluorescent display
- > Data storage to PC card
- High speed scanning (all inputs in one second)
- MODBUS[®] serial communications
- Analog retransmission and relay outputs

The 4250M is Chessell's 250mm multipoint recorder. With up to 96 inputs all scanned in one second and a host of advanced features including math, totalizers, timers, counters, PC card drive and serial communications, this versatile recorder can be tailored to meet your exact process requirements. Fully configurable via the standard keypad or by PC, the 4250M also boasts a built-in 'secrettil-lit', full function alpha-numeric keyboard.





4250M Ordering Guide

No OF 8 CH UNIVERSAL INPUT BOARDS

1 Board (8 channels) 2 Boards (16 channels) 3 Boards (24 channels) 4 Boards (32 channels) 5 Boards (40 channels) 6 Boards (48 channels) 7 Boards (56 channels)

No OF 16 CH UNIVERSAL INPUT BOARDS

1 Board (16 channels) 2 Boards (32 channels) 3 Boards (48 channels) 4 Board (64 channels) 5 Boards (80 channels) 6 Boards (96 channels)

'SECRET- TIL LIT' KEYBOARD SUPPLY VOLTAGE

90-132V ac (50/60Hz) 190-260V ac (50/60Hz)

CHART TYPE

22 meter Z Fold 32 meter Roll

No OF RELAY OUTPUT BOARDS

1 Board (8 Relays) 2 Boards (16 Relays) 3 Boards (24 Relays) 4 Boards (32 Relays) 5 Boards (40 Relays) 6 Boards (48 Relays) 7 Boards (56 Relays)

MOUNTING

Panel Mounting Bench/Portable

COMMUNICATIONS

MODBUS® Communications (XIODL) Graphic Network MODBUS® + (XIODL) Graphic Network

No OF 8 CH ANALOG RETRANSMISSION BOARDS

1 Board (8 Channels) 2 Boards (16 Channels) 3 Boards (24 Channels) 4 Boards (32 Channels)

No OF 4 CH ANALOG

RETRANSMISSION BOARDS 1 Board (4 Channels) 2 Boards (8 Channels) 3 Boards (12 Channels) 4 Boards (16 Channels) 5 Boards (20 Channels) 6 Boards (24 Channels)

7 Boards (28 Channels)

PC MEMORY CARD DRIVE MEMORY CARD

128K PCMCIA SRAM memory card 2Mb PCMCIA SRAM memory card 6Mb PCMCIA SRAM memory card

MEMORY CARD SOFTWARE

Configuration Save/Restore ASCII Data Logging Packed Data Logging ASCII Logging to Graphic Pkd Logging to Graphic

MATHEMATICAL CAPABILITIES

Level 1 (basic functions), 32 derived vari-

ables Level 2 (advanced function

Level 2 (advanced functions), 32 derived variables

Continuous Emissions Monitoring (level 2), 96 derived variables, plus 12 each totalizers, timers and counters *Quality Monitoring* (level 2) 32 derived variables, 6 trace generators and 12 timers

ROLLING MEMORY

REMOTE CJC

Remote CJC socketed Remote CJC No Sockets

TOTALIZERS, COUNTERS AND TIMERS

12 each totalizers, counters, timers **PC CONFIGURATION**

SOFTWARE

No OF CHART DIVISIONS

- 100
- 120
- 140

150

CERTIFICATION

CSA

CE

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator

4181M

- > 180mm strip chart recorder
- > Up to 48 inputs
- Six color multipoint printing
- > Up to 24 traces
- Full chart annotation
- 80 character vacuum flourescent display
- All inputs scanned in one second
- Data storage to PC card
- > Math, timers, counters and totalizers
- MODBUS[®] serial communications
- Analog retransmission and relay outputs



The Eurotherm Chessell 4181M is a high specification, 180mm chart recorder that supports up to 48 inputs, 24 of which can be printed to chart, with full 6 color annotation. The unit is fully configurable from its front panel via PC card download, or computer. A highly flexible unit, the 4181M has all the features normally associated with a 250mm unit, in a compact 180mm format. Designed to meet the requirements of an industrial environment, the recorder is ideal for production and test purposes.



4181M Features and Options Guide

No OF 8 CHANNEL UNIVERSAL INPUT BOARDS

1 Board (8 channels) 2 Boards (16 channels) 3 Boards (24 channels)

No OF 16 CHANNEL DC INPUT BOARDS

1 Board (16 channels) 2 Boards (32 channels) 3 Boards (48 channels)

WINDOW MATERIAL

Glass Polycarbonate

SUPPLY VOLTAGE

90-132V ac (50/60Hz) 180-264V ac (50/60Hz)

CHART TYPE

22 meter Z Fold No OF INPUT RELAY BOARDS

1 Board (8 Relays) 2 Boards (16 Relays) 3 Boards (24 Relays)

MOUNTING

Panel Mounting Bench/Portable

COMMUNICATIONS

MODBUS® Communications (XIODL) Graphic Network MODBUS® + (XIODL) Graphic Network

CHART ILLUMINATION No OF 8 CH ANALOG O/P

BOARDS 1 Board (8 Channels) 2 Boards (16 Channels)

No OF 4 CH ANALOG O/P BOARDS

1 Board (4 Channels) 2 Boards (8 Channels) 3 Boards (12 Channels)

MEMORY CARD DRIVE PC Memory Card Slot

MEMORY CARD

128K PCMCIA SRAM memory card 2Mb PCMCIA SRAM memory card 6Mb PCMCIA SRAM memory card

MEMORY CARD SOFTWARE

Config Save/Restore ASCII Data Logging Packed Data Logging ASCII Logging to Graphic Pkd Logging to Graphic

MATH PACK OPTION

Level 1 (basic functions), 24 derived vari-

ables

Level 2 (advanced functions), 24 derived variables

Continuous Emissions Monitoring, Level 2, plus 12 each totalizers, timers and counters

REMOTE CJC

Remote CJC Socketed Remote CJC No Sockets

TCT (12 each totalizers, counters, timers) PC CONFIGURATION SOFTWARE FACTORY CONFIGURATION No OF CHART DIVISIONS

100

120

CERTIFICATION CSA

CE

BOARD OPTIONS Conformal Coating (Tropicalization)

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator

4103C

- 1-4 continuous traces with annotation option
- > 4-color digital display with analog bar graphs
- Roll or z-fold chart
- > Front panel, local or remote PC configuration
- > Universal isolated inputs
- > Math, timers, counters and totalizers
- PC card reader
- MODBUS[®]/Profibus communications
- 9.3" total depth behind panel
- > Up to 16 relay outputs
- > Up to 4 analog outputs
- Content or event inputs
- > Remote file transfer

The 4103C is a 1 to 4 continuous pen instrument with an 8Hz sample rate. The unit has the option of a PC card drive for multiple configuration storage, transfer of process data to computer database or spread sheet packages. Extensive mathematic capabilities include totalizers, timers and counters as well as application specific equations. The 4103C's annotation allows scale and message printing and time tagged numerical values to be printed on the chart.





4103C Features and Options Guide

NUMBER OF CHANNELS

1 Channels 2 Channels 3 Channels 4 Channels

POWER SUPPLY

90-264V ac, 45-65Hz 24-48Vdc, ac 45-400Hz

CASSETTE TYPE

Roll Cassette (32m) Z-Fold Cassette (16m)

CHART DIVISIONS

40 Division 50 Division 60 Division 70 Division

ADDITIONAL APPROVALS Seismic (IEEE344:1987-inc lock)

OPERATING LANGUAGE

English French German

MANUAL LANGUAGE

English French German

CHART ILLUMINATION 24V TRANSMITTER POWER SUPPLY

120V 3 Channel TPS 240V 3 Channel TPS 120V 6 Channel TPS 240V 6 Channel TPS

ADDITIONAL OPTIONS

Portability Kit AC Monitor Option Conformal Coating (tropicalization) **RELAYS CLOSED IN ALARM**

4 NC Relay Outputs

8 NC Relay Outputs 12 NC Relay Outputs 16 NC Relay Outputs

RELAYS OPEN IN ALARM

4 NO Relay Outputs 8 NO Relay Outputs 12 NO Relay Outputs 16 NO Relay Outputs

RELAYS FORM C

3 Form C relay o/p 6 Form C relay o/p 9 Form C relay o/p 12 Form C relay o/p

ANALOG RETRANSMISSION

2 Ch Retrans 4 Ch Retrans

EVENTS INPUTS 6 Events Inputs

MEMORY CARD DRIVER

ASCII Logging Configuration Save/Restore Packed Logging (incl. PC s/w)

MEMORY CARD SIZE

128K Memory Card 2Mb Memory Card 6Mb Memory Card

COMMUNICATIONS

RS 485 Modbus RTU RS 232 Modbus RTU RS 232 File Transfer RS485 File Transfer Profibus

PEN OFFSET COMPENSATION CUSTOM MESSAGES

MATHEMATICAL CAPABILITIES

Level 1 (basic functions), 16 derived variables

Level 2 (advanced functions), 16 derived variables

Level 3, Level 2 plus exponential Display **TOTALIZERS, TIMERS &**

COUNTERS

2 Totalizers

- 4 Totalizers
- 6 Totalizers
- 6 Timers & 6 Counters
- 6 Totalizers, timers, counters

CUSTOM CURVE

ENVIRONMENTAL PROBES AC MEASUREMENT INPUTS

3 Current Input 1 Voltage Input

1 Voltage & 1 Current I/P

1 Volt & 3 Current I/Ps

3 Voltage Inputs

VOLTAGE INPUT RANGE

0-300V ac, 45-65Hz 0-500V ac, 45-65Hz

CURRENT INPUT RANGE

0-25A ac, 45-65Hz 0-100A ac, 45-65Hz 0-1000A ac (Switchable)

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator

4103M

- 6-color multipoint
- 4-color digital display with analog bar graphs
- Roll or Z-fold chart
- > Front panel, PC or remote configuration
- Universal isolated inputs
- Math, timers, counters and totalizers
- PC card drive
- MODBUS[®]/Profibus communications
- 9.3" total depth behind panel
- > Up to 16 relay outputs
- > Up to 4 analog retransmission
- 6 contact inputs
- Remote file transfer

The 4103M has the same features and architecture as the 4103C, but replaces 4 continuous pens with a 6 color, multipoint printhead.



4103M Features and Options Guide

No OF UNIVERSAL INPUT CHANNELS

Up to 6 Channels **POWER SUPPLY**

90-264V ac, 45-65Hz 24-48V dc, ac 45-400Hz

CHART TYPE

Roll Cassette (32m) Z-Fold Cassette (16m)

CHART DIVISIONS

40 Division 45 Division 50 Division 60 Division 70 Division 75 Division

OPERATING LANGUAGE

English French German

MANUAL LANGUAGE

English French German

24V TRANSMITTER POWER SUPPLY

120V 3 Channel TPS 240V 3 Channel TPS 120V 6 Channel TPS 240V 6 Channel TPS

ADDITIONAL OPTIONS

Portable case AC Monitor Kit **RELAYS CLOSED IN ALARM** 4 NC Relay o/p 8 NC Relay o/p 12 NC Relay o/p 16 NC Relay o/p

RELAYS OPEN IN ALARM

4 NO Relay o/p 8 NO Relay o/p 12 NO Relay o/p 16 NO Relay o/p

RELAYS FORM C

3 Form C relay o/p 6 Form C relay o/p 9 Form C relay o/p 12 Form C relay o/p

RETRANSMISSION

2 Ch Retrans 4 Ch Retrans

EVENTS INPUTS

6 Events Inputs **MEMORY CARD DRIVER** ASCII Logging

Configuration Save/Restore Packed Logging (incl. PC s/w)

MEMORY CARD SIZE

128K Memory Card 2Mb Memory Card 6Mb Memory Card

COMMUNICATIONS

RS 485 Modbus RTU RS 232 Modbus RTU RS 232 File Transfer RS485 File Transfer Profibus

CUSTOM MESSAGES MATHEMATICAL CAPABILITIES

Level 1 (basic functions) 16 derived variables

Level 2 (advanced functions) 16 derived variables

Level 3, level 2 plus exponential display **TOTALIZERS, TIMERS &**

COUNTERS

2 Totalizers

- 4 Totalizers
- 6 Totalizers

6 Timers & 6 Counters

6 Totalizers/Timers/Counters

AC MEASUREMENT INPUTS

3 Current Inputs 1 Voltage Inputs

VOLTAGE INPUT RANGE

0-300V ac, 45-65Hz 0-500V ac, 45-65Hz

CURRENT INPUT RANGE

0-25A ac, 45-65Hz 0-100A ac, 45-65Hz 0-1000A ac (Switchable)

BOARD OPTIONS

Conformal Coating (tropicalization)

INPUT SIGNAL CONDITIONING 250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator

www.chessell.com/products/strip/4103M.html 888.797.2475

4102C

- > 1-4 Pen continuous trace unit
- Roll or z-fold chart
- 3-color digital display
- User configurable universal, isolated inputs
- PC configuration
- Annotation
- Chart illumination
- > 9.29" (236mm) overall depth behind panel
- Front access to pen zero/span adjust
- > Up to 8 relay outputs
- Ready for immediate use

The 4102C is a low cost continuous pen recorder, capable of plotting up to four input signals. Enclosed in a sheet steel case designed to meet the requirements of an industrial environment, the recorder is ideal for production or test purposes.

The 4102C has a high resolution, 3-color vacuum fluorescent display with 15 mm high blue digits for process value and a single 8mm green character for channel number. The display shows the process value for each of the input channels in turn, with indication of alarm status.

Use of the very latest in Application Specific Integrated Circuit (ASIC) and Surface Mount technologies, gives the 4102 input circuitry, high accuracy and stability. Inputs are fully universal accepting any mix of thermocouple, resistance thermometer, potentiometer, mV or mA inputs.





34 www.chessell.com/products/strip/4102C.html 888.797.2475

4102M

- 6-pen multipoint
- Roll or Z-fold chart
- 3-Color digital display
- User configurable, universal, isolated inputs
- Local or PC configuration
- Annotation
- Chart illumination
- 9.3" (236.22mm) overall depth behind panel
- Front access to pen zero/span adjust
- > Up to 12 relay outputs
- Ready for immediate use

The 4102M is a low cost multipoint recorder, capable of plotting up to six input signals. Enclosed in a sheet steel case designed to meet the requirements of an industrial environment, the recorder is ideal for production or test purposes.

The 4102M has a high resolution, 3-color vacuum fluorescent display with 15 mm high blue digits for process value and a single 8mm green character for channel number. The display shows the process value for each of the input channels in turn, with indication of alarm status.

Use of the very latest in Application Specific Integrated Circuit (ASIC) and Surface Mount technologies, gives the 4102 input circuitry, high accuracy and stability. Inputs are fully universal accepting any mix of thermocouple, resistance thermometer, potentiometer, mV or mA inputs.





www.chessell.com/products/strip/4102M.html 888.797.2475

4102C Features and Options Guide

NUMBER OF UNIVERSAL INPUT CHANNELS

- 1 Channels 2 Channels 3 Channels
- 4 Channels

POWER SUPPLY

90-264V ac, 45-65Hz 24-48V ac, 45-400Hz

CHART TYPE

Roll Cassette (32m) Z-Fold Cassette (16m)

CHART DIVISIONS

40 Division 45 Division 50 Division 60 Division 70 Division 75 Division

ANNOTATION

American Date Format European Date Format

MANUAL LANGUAGE

English French German

CHART ILLUMINATION RELAYS FORM C

3 Form C Relay o/p 6 Form C Relay o/p 9 Form C Relay o/p

24V TRANSMITTER POWER SUPPLY

120V 3 Channel TPS 240V 3 Channel TPS 120V 6 Channel TPS 240V 6 Channel TPS

ADDITIONAL OPTIONS

Portable Case

Remote Chart Control Event Input Event Pen

Conformal Coating (tropicalization)

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator

4102M Features and Options Guide

NUMBER OF CHANNELS

6 Channels **POWER SUPPLY**

90-264V ac, 45-65Hz 24-48V ac, 45-400Hz

CASSETTE TYPE

Roll Cassette (32m) Z-Fold Cassette (16m)

CHART DIVISIONS

40 Division 45 Division 50 Division 60 Division 70 Division 75 Division

ANNOTATION

American Date Format European Date Format

MANUAL LANGUAGE

English French German

RELAYS FORM C

3 Form C Relay o/p 6 Form C Relay o/p 9 Form C Relay o/p 24V TRANSMITTER POWER SUPPLY

120V 3 Channel TPS 240V 3 Channel TPS 120V 6 Channel TPS 240V 6 Channel TPS CERTIFICATION

CSA CE

ADDITIONAL OPTIONS

Portable Case Remote Chart Control Event Input Event Pen Conformal Coating (tropicalization) **INPUT SIGNAL CONDITIONING** 250 ohm shunt resistor

100 ohm shunt resistor 250:1 attenuator
4101C

- 4-Pen continuous trace
- Roll or Z-fold chart
- Analog display with high trace visibility
- Pre-configured, universal, isolated inputs
- PC configuration
- Annotation
- 9.29" (236mm) overall depth behind panel
- Front access to pen zero/span adjust
- > Up to 9 relay outputs
- Factory Configured ready for immediate use

The 4101C is a low cost, 1 to 4, continuous pen instrument with a 4Hz sample rate. Access to pen zero and span, alarm thresholds, chart speeds, time and date is from the front of the recorder. The use of pre-configured inputs allows direct connection of a variety of transducers. Text annotation can print the time, chart speed and channel scales onto the chart.





4101M

- 6-Pen multipoint
- Roll or Z-fold chart
- Analog display with high trace visibility
- Pre-configured, universal, isolated inputs
- PC configuration
- Annotation
- 9.29" (236mm) overall depth behind panel
- Front access to pen zero/span adjust
- Up to 12 relay outputs
- Factory configured ready for immediate use

The 4101M is a low specification multipoint recorder, capable of plotting up to six input signals. Enclosed in a sheet steel case designed to meet the requirements of an industrial environment, the recorder is ideal for production or test purposes.

The 4101M has an analog scale, with the current process value being indicated by a pointer on the printhead carriage. This, together with the unimpeded view given by the special door design gives high visibility to the traces and their current values.

Use of the very latest in Application Specific Integrated Circuit (ASIC) and Surface Mount technologies, gives the 4101 input circuitry high accuracy and stability. Inputs are fully universal accepting inputs from thermocouples, resistance thermometers and potentiometers.





4101C Features and Options Guide

NUMBER OF CHANNELS

1 Channel 2 Channels 3 Channels 4 Channels

POWER SUPPLY

90-264V ac, 45-65Hz 24-48V ac, 45-400Hz

CASSETTE TYPE

Roll Cassette (32m) Z-Fold Cassette (16m)

CHART DIVISIONS

40 Division 45 Division 50 Division 60 Division 70 Division 75 Division

ANNOTATION

American Date Format European Date Format

SCALE TYPE

Custom Scale Special Custom Scale Linear Default (0-100)

MANUAL LANGUAGE

English French German **RELAY FORM C**

3 Form C Relays o/p 6 Form C Relays o/p 9 Form C Relays o/p

24V TRANSMITTER POWER SUPPLY

120V 3 Channel TPS 240V 3 Channel TPS 120V 6 Channel TPS 240V 6 Channel TPS

CERTIFICATION

CSA CE

ADDITIONAL OPTIONS

Portable Case Remote Chart Control Event Input Event Pen Conformal Coating (tropicalization)

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator Conformal Coating (tropicalization)

4101M Features and Options Guide

NUMBER OF CHANNELS

6 Channels

POWER SUPPLY

90-264V ac, 45-65Hz 24-48V ac, 45-400Hz

CASSETTE TYPE

Roll Cassette (32m) Z-Fold Cassette (16m)

CHART SPEED RANGE

Off, 5, 20, 60, 120mm/hr Off, 10, 20, 60, 120mm/hr Off, 10, 30, 60, 120mm/hr Off, 20, 30, 60, 120mm/hr

CHART DIVISIONS

40 Division 45 Division 50 Division 60 Division 70 Division 75 Division

ANNOTATION

American Date Format European Date Format SCALE TYPE Custom Scale Special

Custom Scale Linear Default (0-100)

MANUAL LANGUAGE

English French German

RELAY FORM C

3 Form C Relays o/p 6 Form C Relays o/p 9 Form C Relays o/p 12 Form C Relays o/p

24V TRANSMITTER POWER SUPPLY

120V 3 Channel TPS 240V 3 Channel TPS 120V 6 Channel TPS 240V 6 Channel TPS

CERTIFICATION

CSA CE

ADDITIONAL OPTIONS

Remote Chart Control Event Input Conformal Coating (tropicalization)

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 100 ohm shunt resistor 250:1 attenuator Conformal Coating (tropicalization)

4100 Series Power Monitor Kits

- Current monitoring using clamps
- Voltage measurement up to 300V RMS (sinusoidal) or 300V ac average (non-sinusoidal)
- Portable unit
- Padded carrying case

This package combines the Eurotherm Chessell 4100 series of 100mm recorders with average ac voltage and average ac current transducers to provide a simple solution to process power monitoring problems.

The package, which can be supplied with the 4100 series recorders, can be specified for various combinations of voltage and current inputs, up to a maximum of three current and three voltage inputs, allowing simultaneous monitoring of three phase power.

The instrument is enclosed within a rugged portable case with all sensor connections made at the rear panel of the unit. In addition, the kit comes complete with a fabric, padded carrying case that provides storage for the recorder and for the current clamps, leads, memory cards, charts, pens and other accessories.

With the model 4103 recorders, the kit provides traces of the inputs on the chart. With annotating recorders, scales, times and dates can also be recorded on the chart. In addition, recorders fitted with math capabilities can perform VA calculations and the results traced on the chart, or if a suitable archiving option is fitted,



the results can be logged to memory card, for subsequent manipulation on a PC.

The model 4100G recorder carries out the same functions as the model 4103, but the chart is replaced by a video display, with data stored on either PC card or 3.5" diskette.

Please see individual model order guides for order details.

Electrical connector details







Circular Chart Recorders

394 and 392

- Choice of continuous or multipoint printing
- > Up to four color printing
- Clear circular charts
- Configuration via front panel or PC
- > Up to IP65 (Nema 4X) environmental protection
- > Optional controllers
- > Optional PC card in the 394
- Relay and analog output controllers
- Mathematical capabilities
- > Timers, counters & totalizers
- Wall, panel or pipe mounting
- Alarm indication

The 394 and 392 recorders provide the most advanced options for circular recorders available. The multipoint (394) brings features not previously available on circular recorders, such as: scale printing; time/date stamps; printed logs. Continuous trace pens (392) are suitable for fast changing signals and provide 'like for like' replacement of any existing recorders. Both instruments are fully configurable, and can be quickly and easily set up to meet your requirements. The option to have built-in controllers, together with the mathematical functions and IP65 rating, make the 394 and the 392 ideal for small machine applications.



394

- > Up to 6 universal inputs
- Annotation as standard
- I or 2 independent case-mounted PID controllers
- Front panel or PC configuration
- Data logging to PC Card
- Mathematical capabilities
- Fotalizers, counters and timers
- MODBUS[®] communications
- > Up to 18 relay outputs
- > Up to 4 analog retransmission outputs

The 394 is a step forward in circular chart recording. Using printhead technology successful in other Chessell products, the 394 can trace up to six inputs in four colors with full chart annotation. Advanced math capabilities, case-mounted PID controllers are among the features that make the 394 one of the most versatile and powerful circular chart recorders on the market.





394 Features and Options Guide

NUMBER OF CHANNELS

1 Channel 2 Channels 3 Channels 4 Channels 6 Channels

OPERATING VOLTAGE

90-264 Vac (50/60Hz)

FORM C RELAYS

2 form C Relay 4 form C Relay 6 form C Relay 8 form C Relay 10 form C Relay 12 form C Relay 14 form C Relay 16 form C Relay 18 form C Relay

CONTROLLER ONE

Relay Triac mA Relay/Relay Relay/Triac Triac/Relay mA/Relay mA/Triac

CONTROLLER TWO

Relay Triac mA Relay/Relay Relay/Triac Triac/Relay mA/Relay mA/Triac

CASE STYLE

NEMA 3 (IP54) panel mounting NEMA 3 (IP54) pipe mounting NEMA 4 (IP65) panel mounting NEMA 4x (IP65) pipe mounting NEMA 4x (IP65) panel mount + stainless steel NEMA 4 (IP65) pipe mount + stainless steel **DOOR LOCK TRANSDUCER POWER SUPPLY**

120 V, 3 channel TPS 240 V, 3 channel TPS 120 V, 6 channel TPS 240 V, 6 channel TPS **TOTALIZERS, TIMERS & COUNTERS**

2 totalizers
4 totalizers
6 totalizers
6 timers & 6 counters
6 totalizers, timers & counters

TOTALIZER COUNTER OUTPUTS CUSTOM CURVE

MATHEMATICAL CAPABILITIES

Level 1, basic functions, 16 derived variables

Level 2, advanced functions, 16 derived variables

Level 3, Level 2 plus exponential display ANALOG RETRANSMISSION

2 ch retransmission

4 ch retransmission Modbus 422 communications

DOOR MATERIAL

Glass Acrylic

CERTIFICATIONS

CE CSA

PC CARD DRIVER

ASCII Logging Config. Save and Restore Packed Data Logging **MEMORY CARD**

512K PC Card 2Mb PC Card

CUSTOM MESSAGE CHARTS SUPPLIED WITH INSTRUMENT

Chart 7 Day, 50 Divisions Chart 7 Day, 60 Divisions Chart 7 Day, 70 Divisions Chart 7 Day, 80 Divisions Chart 7 Day, 90 Divisions Chart 7 Day, 100 Divisions Chart 24 hours, 50 Divisions Chart 24 hours, 60 Divisions Chart 24 hours, 70 Divisions Chart 24 hours, 80 Divisions Chart 24 hours, 90 Divisions Chart 24 hours, 100 Divisions

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 5V TO 100Vdc attenuator

392

- > Up to 4 universal input channels
- 40-character vacuum-fluorescent digital display
- Simple on-site configuration using control panel
- Mathematical capabilities
- > 4 totalizers with 9-digit readout
- > 4 alarms per channel
- Thermocouple, RTD, x^{3/2}, x^{5/2}, linear, square root, log₁₀ linearizations, mVdc, Vdc, mAdc

The Eurotherm Chessell model 392's quality construction and easeof-use, provide reliable, trouble free operation. Precise attention to design, manufacturing and quality control ensures that model 392 recorders work 'first time'.

The design and solid construction of the model 392 makes maintenance, field upgrade and the addition of features, fast, easy and affordable. The 392 is available in an IP65 rating to withstand harsh environments.

Easy Set-up

The recorder functions can be configured quickly and easily, using the six front panel keys to follow the plain English prompts which appear on the display.

The configuration menu is separated from the operator functional items by password protection.



Advanced Features

Custom linearization for non-linear inputs such as pH and conductivity sensors, permits the use of standard charts, eliminating the need for expensive non-linear or overprinted charts. Microprocessor power provides calculation, display and recording of derived variables such as mass flow, relative humidity and BTU, as well as non-standard user-entered calculations.



392 Features and Options Guide

NUMBER OF CHANNELS

- 1 channel 2 channels 3 channels
- 4 channels

O/P VOLTS 392 RECORDER

110/120V ac (50/60Hz) 220/240V ac (50/60Hz) 24V dc

OUTPUT RELAYS

2 relays 4 relays 6 relays 8 relays

CONTROL LOOP 1

Duration adjust, relay (DAT)

Current adjust 4-20mA dc (CAT) Duration adjust, relay (DAT) Duplex CAT Duplex DAT

SETPOINT GENERATOR

CASE STYLE

NEMA 3 (IP54) panel mounting NEMA 3 (IP54) pipe mounting NEMA 4 (IP65) panel mounting NEMA 4 (IP65) pipe mounting NEMA 4X (IP65) panel mount + stainless steel NEMA 4X (IP65) pipe mount + stainless steel

DOOR LOCK

TRANSDUCER POWER SUPPLY

Up To 4 channels

TOTALIZERS (INTEGRATORS)

- 1 totalizer
- 2 totalizers
- 3 totalizers
- 4 totalizers

TOTALIZER COUNTER OUTPUTS

- 1 totalizer output
- 2 totalizer outputs
- 3 totalizer outputs
- 4 totalizer outputs

CUSTOM CURVE

MATHEMATICAL CAPABILITIES

Level 1, Basic functions, 9 derived variables Level 2, Advanced functions, 9 derived variables

ANALOG RETRANSMISSION

- 1 Retransmitted channel
- 2 Retransmitted channels
- 3 Retransmitted channels
- 4 Retransmitted channels

EVENT (CONTACT) INPUTS

8 event inputs (1 board) 16 event inputs (2 boards)

MODBUS® COMMUNICATIONS CASE HEATER WINDOW MATERIAL

Glass Acrylic

EVENT PEN OPTION

CERTIFICATION

CSA CE

CE & CSA Hazard Certification

CHARTS SUPPLIED WITH INSTRUMENT

12 hours, 50 Divisions 12 hours, 100 Divisions 24 hours, 50 Divisions 24 hours, 100 Divisions 7 days, 50 Divisions 7 days, 100 Divisions

INPUT SIGNAL CONDITIONING

250 ohm shunt resistor 5V to 100Vdc attenuator

www.chessell.com/products/circular/392.html 888.797.2475

Remote I/O & Control System

IOS 2500

- Modular distributed I/O system
- Integral PID control or use as controller independent I/O
- 4, 8 or 16 I/O modules per base
- > 2 single or cascade PID blocks per base
- Network up to 16 bases
- > 9Hz I/O and PID sample rate
- 2 alarms per input plus, 4 per PID loop
- > 4 user defined alarms per base
- Comprehensive math and boolean function library

New from Eurotherm Chessell, the IOS 2500 is a modular, remote I/O system, incorporating dual PID control with self tuning, cascade and gain scheduling, together with mathematical capabilities and combinational logic.

Each chassis base accepts a wide choice of four, eight or sixteen plug-in I/O modules. Up to 16 base units may be daisy-chained using standard RJ45 cables to provide multi-loop solutions, up to 32 loops. The system is designed to be used with any device running a Modbus RTU or Profibus DP master communications interface or operating as an OPC client.

DIN rail mounting allows the 2500 to be mounted where the control action is required, minimizing the cost of wiring, since only twisted pair communications cable is taken to the user interface. The 2500 may also be mounted directly onto the machine, saving the cost of control cubicles.



IOS 2500 uses iTOOLS, a Windows-based software tool. This package is used to set up the PID blocks and I/O, in addition to the "user wiring" set up and the connection of the I/O points to the PID blocks or to internal variables. This allows local mathematical calculations and combinational logic, e.g., a relay output can be made to change state if any one of four digital inputs is on, and if a given analog input is in its alarm state. In addition to use for set-up, iTOOLS also includes a trending display, and data logging function. The iTools open edition includes an OPC data access version 2 compliant server for real-time, bi-directional, access to all of the 2500's I/O values and parameters.



IOS 2500 Features and Options Guide

Chassis - Base Units

4 I/O module base 8 I/O module base 1 6 I/O module base

Processor Modules

Data acquisition only, Modbus Data acquisition only, Profibus DAQ, control & user wiring, Modbus with 2 loops PID DAQ, control & user wiring Modbus with 4 loops PID DAQ, control & user wiring Modbus with 8 loops PID DAQ, control & user wiring Profibus with 2 loops PID DAQ, control & user wiring Profibus with 4 loops PID DAQ, control & user wiring Profibus with 4 loops PID DAQ, control & user wiring Profibus with 8 loops PID

Processor Terminal Units

Modbus Profibus RJ45 Profibus DB9

Analog Inputs

2-channel Universal Isolated Input module 3-channel 4-20mA input

Universal Input Terminal Units

Thermocouple with CJC Vdc/Pt100/potentiometer mA 3-channel Current Input module with 24V Excitation

Current Input Terminal Units

Without disconnects With disconnects

Analog Outputs

2-channel Universal Isolated Output Module

Universal output terminal units

Without disconnects With disconnects Digital Inputs

8-channel Logic Input Module 8-channel Contact Input Module

Logic/Contact Digital Input Terminal Units

Without disconnects With disconnects 4-channel 24V input Module

24V Digital Input Terminal Units

Without disconnects With disconnects

Digital Outputs

4-channel logic output module 10mA (24V required)4-channel 24V output module, 100mA (24V required)

Digital Output Terminal Units

Without disconnects With disconnects

Relay Outputs

4-channel 2A relay Module (3 SPST, 1

SPDT)

Relay Output Terminal Units

Without disconnects With Disconnects

Power Supplies

24V 25A supply 24V 5A supply 24V 10A supply

Software and Accessories

iTools configuration software - demonstration edition

iTools configuration software - standard edition

iTools configuration software - open edition

2500C configuration cable (DB9 to RJ11) 3m base interconnection cable (RJ45 to RJ45)

0.5m base interconnection cable (RJ45 to RJ45)

Termination load (for last base in link) Modbus

Termination load (for last base in link) Profibus

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Indicators and Alarm Units

2000*i* Series

- > Innovative design
- Bright, clear LED displays
- > Universal inputs
- Calibration set for life
- > Alarm outputs
- Front panel configuration
- Custom linearization
- > Wide-range power supply
- Plug-in from front
- Three year warranty

High accuracy measurement and display of temperature and other process variables, versatile alarm handling and advanced communication facilities are the hallmarks of the 2000*i* family of indicators and alarm units.



	24080	2 108	-2132	5 1 16
System Range	2408i	2108 <i>i</i>	2132 <i>i</i>	2116i
Panel size	1/8 DIN	1/8 DIN	1/32 DIN	1/16 DIN
Display Color	Red or green	Red or green	Green	Green
No. characters	5	4	4	4
Character height	16mm	16mm	9mm	9mm
Panel sealing	NEMA 3(IP54)	NEMA 3(IP54)	NEMA 4 (IP65)	NEMA 3(IP54)
No. inputs	2	1	1	1
Input type	3-wire universal	3-wire universal	2-wire universal	2-wire universa
Internal alarms	4	3	3	3
Relay outputs	4	2	2	2
Remote acknowledge	A	A		A
Analog retransmission	A			
Modbus communications	A			
Profibus commuications				
Strain-guage/transmitter power	supply			

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2408*i*

- Red or green 5 digit display
- > Universal analog input
- Second universal input for max, min or difference measurement
- Four alarm setpoints
- Relay and logic alarm outputs
- Front panel configuration
- IP54 panel sealing
- 85-264 Vac universal power supply or 20-29 Vac/dc
- Serial communications
- > Analog retransmission
- > Standard 1/8 DIN panel size

The 2408*i* is a sophisticated, modular 1/8 DIN process indicator providing a large, accurate display of temperature and other process variables. Standard features include large display, 4 alarm setpoints, change-over relay outputs, and alarm acknowledge inputs.

The 2408*i* universal temperature and process indicator has an extensive range of options, a modular hardware build accommodates a range of plug-in modules allowing up to four alarm outputs, two process value inputs, analog retransmission, remote setpoint input and digital communications.

Other options include MODBUS® or Profibus communications, 24V dc transmitter power supply and strain gauge bridge supply.



Use of the very latest in Application Specific Integrated Circuit (ASIC) and surface mount technology gives the input circuit high accuracy and stability. The universal analog input allows selection between nine internally stored thermocouple types, Pt100 resistance thermometer and linear voltage measurements. Linear inputs can be scaled to the desired display range.

The 2408*i* also has logic inputs that can be used, among other functions, for external alarm acknowledgment and to disable all front panel keys to prevent operator access. Sensor break detection can be configured to detect open circuit inputs.



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2108*i*

- Red or green, 4 digit display
- > 15.9 mm character height
- > Universal input
- > Three alarm set points
- > Up to two alarm outputs
- Front panel configuration
- > IP54 panel sealing
- 85-264 Vac universal power supply
- Standard 1/8 DIN panel size
- Front button push for alarm acknowledgment



The 2108*i* provides accurate measurement and display of temperature and other process variables in a standard 1/8 DIN panel format. Four internal alarm setpoints can operate two relay outputs. A front panel button is provided for alarm acknowledgment and resetting.

The 2108*i* display utilizes large (15.9mm), high visibility LED characters in either red or green. Alarm indication is also clearly visible.

Use of the very latest in Application Specific Integrated Circuit (ASIC) and surface mount technology gives the input circuit high accuracy and stability. The universal input circuit allows selection from nine internally stored thermocouple types, Pt100 resistance thermometer or linear voltage measurements. Linear 4-20mA inputs can be scaled to the desired display range.

The 2108*i* also has logic inputs that can be used for external alarm acknowledgment and to disable all front panel keys to prevent operator access. Sensor break detection can be configured to detect open circuit inputs.

The units are factory configured prior to dispatch. This configuration may be modified at any time via the front panel keys by following menu driven prompts. Configuration data is stored in nonvolatile EEPROM memory, protecting user entered data during power loss. Access to configuration mode is via password to ensure security.



2132*i* and 2116*i*

- Green 4 digit display
- 9mm character height
- Universal input >
- Three alarm set points \geq
- Up to two relay outputs \triangleright
- ≻ Front panel configuration
- IP 65 and (NEMA 4X) sealing
- 85-246V ac or 20-29V dc/ac power supply >
- Standard 1/32 and 1/16 DIN panel sizes

Available in compact 24 x 48mm and 48 x 48mm panel sizes, the 2132i and 2116i allow selection of nine internally stored thermocouple types. The temperature can be displayed in °F, °C or Kelvin. Other input linearizations can be factory downloaded. Linear process inputs are scalable to the desired display range. Three internal alarm setpoints can operate one internal relay output and a second external relay output module.



2132i





2132*i* dimensions



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2408*i* Features and Options Guide

BASE UNIT

Indicator/Alarm Unit
DISPLAY COLOR

Green Display Red Display

SUPPLY VOLTAGE

85-264V ac 20-29V ac/dc

MODULE 1

Alarm Relay Output DC Retransmission Strain Gauge - 5V Transducer Supply Strain Gauge - 10V Transducer Supply 20mA Transmitter Supply Dual Relay Setpoint Retrans 0-20mA Setpoint Retrans 4-20mA Setpoint Retrans 0-5V dc Setpoint Retrans 1-5V dc Setpoint Retrans 0-10V dc Triple Cont I/P - Unconfigured Triple Log I/P - Unconfigured Triple Log O/P - Unconfigured Process Value Retrans 0-20mA Process Value Retrans 4-20mA Process Value Retrans 0-5V dc Process Value Retrans 1-5V dc Process Value Retrans 0-10V dc Error Retrans 0-20mA Error Retrans 4-20mA Error Retrans 0-5V dc Error Retrans 1-5V dc Error Retrans 0-10V dc

Alarm Relay Output DC Retransmission Strain Gauge - 5V Transduecr Supply Strain Gauge - 10V Transducer Supply 20mA Transmitter Supply Dual Relay Setpoint Retrans 0-20mA Setpoint Retrans 4-20mA Setpoint Retrans 0-5V dc Setpoint Retrans 1-5V dc Setpoint Retrans 0-10V dc Triple Cont I/P - Unconfigured Triple Log I/P - Unconfigured Triple Log O/P - Unconfigured Process Value Retrans 0-20mA Process Value Retrans 4-20mA Process Value Retrans 0-5V dc Process Value Retrans 1-5V dc Process Value Retrans 0-10V dc Pot Input - Tracking SP Input Pot Input - Unconfigured Error Retrans 0-20mA Error Retrans 4-20mA Error Retrans 0-5V dc Error Retrans 1-5V dc Error Retrans 0-10V dc

MODULE 3

Alarm Relay Output DC Retrans 20mA Transmitter Supply 20mA Transmitter Supply Dual Relay Setpoint Retrans 0-20mA

Setpoint Retrans 4-20mA Setpoint Retrans 0-5V dc Setpoint Retrans 1-5V dc Setpoint Retrans 0-10V dc Triple Cont I/P - Unconfigured Triple Log I/P - Unconfigured Triple Log O/P - Unconfigured Process Value Retrans 0-20mA Process Value Retrans 4-20mA Process Value Retrans 0-5V dc Process Value Retrans 1-5V dc Process Value Retrans 0-10V dc Pot Input - Tracking SP Input Pot Input - Unconfigured Error Retrans 0-20mA Error Retrans 4-20mA Error Retrans 0-5V dc Error Retrans 1-5V dc Error Retrans 0-10V dc

RELAY OUTPUT 1

Relay Alarm Output New Alarm

COMMUNICATIONS

RS232 - El Bisynch Protocol RS232 - MODBUS® Protocol RS422 - El Bisynch Protocol RS422 - Modbus Protocol RS485 - El Bisynch Protocol RS485 - MODBUS® Protocol

PDSIO MODULE

Tracking Setpoint Input

MODULE 2

2108*i* Features and Options Guide

BASE UNIT

Indicator/Alarm Unit DISPLAY COLOR Green Display Red Display SUPPLY VOLTAGE

85-264V ac

RELAY OUTPUT 1 (Form C) Alarm Output New Alarm RELAY OUTPUT 2 (Form C) Alarm Output MANUAL OPTIONS

English Others - consult factory INPUT ADAPTOR 0-20mA - Resistor: 2.49 ohm, 0.1% 0-10V input adaptor

2132*i* /2116*i* Features and Options Guide

BASE UNIT

Indicator/Alarm Unit **SUPPLY VOLTAGE** 85-264V ac 20-29V ac or dc

LOGIC INPUT/OUTPUT

Logic I/P Alarm Ack/Reset Logic I/P Keylock Alarm Output RELAY OUTPUT Alarm Output New Alarm EXTERNAL RELAY MODULE

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Software

Unit Configuration & Process View PC Software

From remote configuration of the simplest chart recorder, to self-engineering SCADA packages, Eurotherm Chessell has produced PC software to enhance and extend the use of its chart recorders, data acquisition units and systems.

	Configuration	Editor	Review	PC Char	t PC View
Configuration					Configure alarm set-points
Offline View					A
Real-time View					A
Database					A
File Add					A
Chart Display					A
Chart Print					A
Indicator Display					A
Point Display					A
Alarm Display					

Configuration Editor Software

- Remote PC configuration
- All configuration fields on one screen for each channel
- Configure factory-set units
- Upload and download of configuration files through unit's configuration port

The fastest way to configure your recorder! Configuration Editor gives you 'at-a-glance' access to all set-up parameters. All data entry fields for each individual channel, totalizer, counter etc., are shown on a single screen. Type free form entries in using the computer keyboard, and use the pull down menus for the fixed entry fields.

Configuration Editor runs in Windows 3.X, 95, 98 and NT, within an MSDOS shell, and is available for use with the following units:

394	4101M	4103M	4250D
4000R	4102C	4181G	4250G
4100G	4102M	4181M	4250M
4101C	4103C	4250C	



Configuration Editor enables the field set-up of 'factory-set' chart recorders, such as 4101C and 4101M. PC produced configurations can be transferred to the recorder via PC card or floppy diskette, for those instruments fitted with an internal data drive. All units have front of panel configuration ports, that can be cabled to your PC for configuration upload and download.

The 5000 series of DAQ recorders have integral configuration software which can be downloaded to PC.

Unit Configuration & Process View PC Software

Review Software

- > View historical data on PC
- Modify and compress displayed data
- Combine data from multiple recorders
- > Secure source data
- Output data to printer or standard spreadsheet packages

Display Data

Review software is a powerful tool for the analysis, display, databasing and export of archived process data. Review provides an easy way to review stored data by point, time, plant-unit and batch number. Designed to view and print historical data produced by Chessell's intelligent chart recorders and data acquisition units, all channels retain their original trace colors, identifiers and scales, ensuring easy comparison of data with that on the recorder unit.

Source Data Remains Secure

Source data is retained in a database in the binary format used by Chessell's recorders and data acquisition equipment. This binary format provides data security – once written, process values in the data cannot be tampered with.

Data Export

Once within the PC environment, process data is stored on hard disk for easy and instant access. The data is easily copied to the Windows clipboard for integration into other reporting packages such as spreadsheets, or word processing packages. Displayed data can also be exported as ASCII comma delimited files.

Printer Output

Any windows supported printer will produce attractive hard copy outputs in black and white, or color. Process data is printed with scales, channel identifiers and time markers.

Remote File Transfer

Review has a facility for the remote transfer of data and configurations. Files stored on the recorder's local archive drive are transferred between the unit and a PC, over the instruments serial communications. Available on the: 41003C, 4103M and the 4100G, this features:

- Automatic (timed) or operator requested transfer of archived data files from recorder to PC
- > Save recorder configuration to archive drive
- Restore configuration from archive drive to recorder
- > Delete files on archive drive



This feature is ideal for large plants and remote sites where data files need to be gathered on a daily or weekly basis, for quality record purposes.

Two modes of operation for file transfer are available:

1. Direct Connection to PC



2. Modem Connection to PC



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Unit Configuration & Process View PC Software

PC Chart and PC View Software

- Live PC view of process data
- Chart, bar graph, numeric and multi group displays
- Alarm summary
- Combine and view data from multiple recorders
- Auto set-up, no display, database or file engineering required
- > Uses standard MODBUS® RTU interface
- Secure binary data format
- Data open to network
- Supports multiple PC communications ports for fast data transfer speed

PC Chart & PC View are pre-engineered software packages that provide all the benefits of live PC data logging and trending, without the need for the system set-ups and configuration normally associated with this type of package. The software can interface with multiple Eurotherm Chessell chart recorders and data acquisition systems, displaying both live and historical process data.

Displays

PC Chart displays process data in the form of a chart. PC View builds on this, with multi group charts, panel indicator, alarm summary and point displays. The panel indicator display incorporates digital indication and bar graphs and the point displays. The latter shows full configuration parameters of an input, including alarm set-points, which can be adjusted on the PC display.

In addition to a comprehensive alarm summary page, all display formats in PC View include a continuous banner view of active alarms. Multiple displays can be viewed simultaneously.

In both packages, displays can be customized in terms of trend color, chart background color, scales and the number of divisions and zones in the chart display. The group content may also be edited, including mixing inputs from different chart recorders and data acquisition units in a single group.



Chart Display (PC Chart & PC View)



Group Trend Display (PC View)



Panel Indicator Display (PC View)

Unit Configuration & Process View PC Software

Source Data Remains Secure

Process data is communicated to the PC via standard MODBUS® RTU link, and is stored in a binary format, giving a secure file. Data can be exported in a CSV format giving complete system access to process information, while retaining secure source data.

Because PC Chart and PC View store data in the same binary format that Chessell instruments use in local archiving, should the communications link fail, it is possible to add data files from an instrument's integral drive, into the PC database, ensuring continuous and complete data archive files.

Automatic Set-Up

Written round standard SCADA software, PC Chart and View give all the benefits normally associated with this type of package without the engineering and system configuration normally required, cutting both set-up time and cost. Both software packages up-load the configuration files of the interfacing chart recorders and data acquisition units and use this set-up data to self-engineer an I/O database including all ranging, scaling and tag information. The software uses global tagging for the inputs creating an open system project database.

Serial Communications Link

Both PC Chart and View use standard MODBUS® RTU serial communications and support the use of multiple PC communications ports. This allows system expansion without a loss of transfer speed. These packages can be used with all current Eurotherm Chessell data acquisitions units and chart recorders that support MODBUS® RTU serial communications:

4000R	4181M	4250G	5180V
4100G	4250C	4250M	394
4181G	4250D	5100V	

PC Chart and PC View are available for Windows 95, 98 and NT.



Point Display (PC View)



Alarm Summary (PC View)

Supplies & Service

Charts and Pens

Eurotherm Chessell can provide you with top quality pens, cartridges and charts for their strip, circular and video graphic recorders. For each unit the paper and pens are designed to work not only with each other, but also with the writing system of the recorder itself. Using Chessell consumables on a Chessell recorder will give optimum results.

Using pens and paper not specifically designed to be used together, or on your recorder can lead to: ink bleeds, smudged charts, faint trends, trace too heavy, short cartridge/pen life, no trace laid down or paper ripped on fast moving transients

Even if it has a Chessell part number, if it's not from us or one of our sales representatives, then it's not a genuine Chessell consumable.



Service

Chessell has a dedicated service department at its Newtown, Pennsylvania facility. The department can fulfill all your service and repair requirements, but many service and upgrade procedures can be easily carried out in the field by the customer. Many field kits are available, including those that add features to your recorder such as relays or math capabilities, and include step-by-step installation instructions and all the parts you need. These field kits allow you to service and upgrade a unit at your convenience.

A wide range of information and assistance is also available online. Get information on all Chessell products, download manuals and applications notes, browse frequently asked questions and retrofit instructions. Support or Service: 215.968.0660 Monday-Friday 8:00am-5:00pm Eastern Time Fax: 215.968.0662 www.chessell/support/index.com Sales Department: sales@chessell.com Literature Requests: literature@chessell.com Technical Support: support@chessell.com Repairs or Spares: repairs@chessell.com

Appendix

Alarms

Chessell units have between two and four soft (internal) alarms per channel, dependent on the unit. On the basic recorders (4101 and 4102), these absolute high and low alarms can be linked to output relays.

The intelligent chart recorders and data acquisition units each have four alarms per channel (both input and derived channels). Each alarm can be configured for a certain trigger and alarm type.

Alarms can be used to trigger a wide range of jobs including the operating of output relays.

Trigger Type

- Trigger Once active, the alarm stays active until the alarm source returns to a non-alarm state. Any continuous jobs (e.g. change print mode) remain active for the duration of the alarm state. Trigger alarms are not annunciated in anyway and do not appear in alarm history lists.
- Latching Once active, the alarm stays active until it is both acknowledged AND the alarm source has returned to a non-alarm state. Continuous jobs (e.g. change chart speed) remain active only until the source returns to a non-alarm state (whether or not the alarm has been acknowledged).
- Non-latching Once active, the alarm stays active until the alarm source returns to a non-alarm state. Any continuous jobs (e.g. change print mode) will remain active for the duration of the alarm state.

Alarm Types



Absolute Alarm definitions

An **absolute high** alarm becomes active when its setpoint value is exceeded, and it remains active until the measured value falls below the value (setpoint - hysteresis).

An **absolute low** alarm becomes active when its setpoint value is exceeded (in the negative sense), and it remains active until the measured value rises above the value (setpoint + hysteresis).

Alarms

Alarm Types (cont.)



Deviation alarm definitions



Rate-of-change alarm definitions

Hysteresis is available on absolute and deviation alarms, allowing deadband areas to be entered to stop 'twitching' if the channel value is hovering around the setpoint.

Dwell, available on all alarms, allows initiation of alarm actions to be delayed for up to 2048 seconds after the alarm is detected. If the channel goes out of alarm parameters within the dwell period, the alarm is not activated.

Jobs

Jobs

A 'job' is defined as an action that can be initiated by an alarm, a timer, a counter, etc. Jobs can be configured to be active continuously while the initiating source is active or inactive (e.g. Select chart speed B), or to carry out a particular task (e.g. Increment counter no. 3), as the result of a single trigger going active or inactive. Up to four jobs can be initiated by each alarm, timer, etc. The job types and actions are shown below, against possible trigger sources:

Job triggers, types and actions



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Totalizers, Counters and Timers (TCT) Options

Totalizers

Each TCT option supplies a number of eight-digit totalizer functions, dependent on the unit model (see model pages for totalizer count). Each totalizer is used to integrate the output of a given input or derived channel, providing that it is above a low cut-off point, below a high cut-off point and within the channel's range.

A setpoint value can be entered, and when the totalizer value exceeds this threshold, up to four actions (job list) can be triggered. The jobs remain active until the totalizer is reset or disabled. Totalizer values are non-volatile and are stored in battery-backed RAM.

The function equation for the totalized value is:

$$tot_{t} = tot_{t-1} + \frac{ma_{1}}{PSF \times USF}$$

Where tot t	=	totalizer value at time t
tot t-1	=	totalizer value last time
ma t	=	input value of source channel (Ca) at time t
PSF	=	Period scaling factor
USF	=	Units scaling factor (negative for decrement; positive or un-signed for increment)

Counters

Each TCT option supplies a number of eight-digit counter functions, dependent on the unit model (see model pages for number of counters available on each unit). Each counter is controlled from other recorder functions through job lists. As shown in the previous section, counter jobs are:

- a. Increment specified counter
- b. Decrement specified counter
- c. Preset specified counter or group of counters
- d. Disable specified counter or group of counters

Each counter is configured with a threshold to allow it to trigger up to four jobs itself. A limit setpoint allows these jobs to be initiated either when the count value exceeds the threshold (Limit high) or when it falls below the threshold (Limit low). Counters values are non-volatile, and are stored in battery-backed RAM.

Timers

Each TCT option supplies a number of timer functions, dependent on the unit model (see model pages for number of counters available on each unit). Each timer can be configured to start at a specific time and date (according to the real-time clock in the recorder) or can be triggered by a job. The timer will then run for the configured time period (duration). Once initiated, the timer will re-start every repeat period until it is disabled.

Each timer can have up to four jobs allocated to it, that will initiate at the setpoint of the timer. Timer values are non-volatile, and are stored in battery-backed RAM.

For examples on the use of totalizers, timers and counters, see the Application Notes section of this handbook, pages 70-82.

The following math functions are available in the math options on the configurable models of the recorders in the Chessell range (see individual product pages for availability). Although the numbers of derived variables differ between models, all units with math capabilities support two levels of functions, level 1 being basic functions and level 2 incorporating more advanced functions and equations, as well as those featured in level 1.

One function/equation is used to produce a single derived variable, and derived variables can be linked together to produce more complex equations. Many units feature additional math options which can include totalizers, timers and counters for continuous emissions monitoring or trace generators for quality monitoring.

MATH PACK LEVEL 1 - Basic Functions

Constant	Enables entry of a constant value
Сору	Enables any input, derived channel, totalizer or counter value to be incorporated
Add	Sum of two channels
Subtract	Subtracts one channel from another
Multiply	Multiplies two channels together
Divide	Divides one channel by another
Modulus	Takes the value of the input without the sign

MATH PACK LEVEL 2 - Advanced Functions

All level 1 functions plus:	
Square root	Takes the square root of a channel
Channel average	Takes the average of the value of a channel. The time over which the average is taken, and the frequency with which it is updated can be configured
Group average	Takes the average of a named group of channels
Rolling average	Takes the average value of a specified channel over a specified time period
Exponent	Provides the value of e raised to the power of a specified channel
Log _e	Takes the 'natural' log of a specified channel's value
10 ^x	Output is 10 raised to the power of a specified channel
Log ₁₀	Take log 10 of a specified channel's value
Rate of change	Determines the change in value of the source over a specifiable time period
Sample and hold	Allows the value of a channel to be held as a result of a trigger input
Channel minimum	Holds the minimum value reached by a specified channel since the function was started
Latching minimum	Holds the minimum value reached, since the function was initiated, out of all the channels in a specified group
Continuous minimum	The current minimum value out of all the channels in a specified group
Channel maximum	Holds the maximum value reached by the source channel since the function was started
Latching maximum	Holds the maximum value reached, since the function was initiated, out of all the channels in a specified group
Continuous maximum	The current maximum value out of all the channels in a specified group
Polynomial	Third order polynomial curve fit $A_{_0}$ + $A_{_1}X$ + $A_{_2}X$ 2 + $A_{_3}X$ 3 , where X is the value of the source channel and $A_{_0}$ to $A_{_3}$ are constants
Fvalue	Calculates F_O/F_H from temperature and z-value inputs
Relative humidity	Calculates relative humidity from wet and dry temperature inputs, atmospheric pressure input and psychrometric constant input
Linear mass flow	Calculates mass flow from linear type transducer output
Square root mass flow	Calculates mass flow from square root type transducer output
Zirconia probe	Solves the Nernst oxygen equation
Switch	Output copies either of two channels trigger selected as input sources
High select	Output is the higher of two source channels' values
Low select	Output is the lower of two source channels' values
Trace generator	If the Quality Monitoring option is fitted, selects one of six trace table profiles for generating a PV
Stopwatch	Increments once per second while enabled
Time Stamp	Holds current time and date value when triggered by a job

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EQUATIONS

Channel Average

To provide the arithmetic mean of a channel over a specified time period.

$$A_t' = \frac{\sum_{t=1}^{t=Tx60} ma_t}{Tx60}$$

Where,	A,	=	Channel average at time t
	ma	=	Value of channel to be averaged at interval sample time t
	Т	=	Time interval in minutes

Group Average

To provide the average value of all the channels in a group.

$$A_t = \frac{(ma_t + \dots + mn_t + \dots + mx_t)}{R}$$

Where,	A,	=	Mean value of the specified group of channels at time t
	maț	=	Value of first channel in the group at time t
	mn	=	Value of nth channel in the group at time t
	mx,	=	Value of final channel in the group at time t
	R	=	Number of channels in the group

Rolling Average

To calculate the arithmetic mean of consecutive readings of a source channel, sampled at a specified time interval. The user configures the number or readings to be averaged, and the time between samples.

$$A_t = \frac{\sum_{s=1}^{s=PT} ma_{(t-s)}}{P}$$

WhereA,=Rolling average of specified channel at time tma=Value of specified channel at time t - sP=Number of valid samples takenT=Sample interval in seconds

At reset, the time period is restarted and P set to zero.

Rate of Change

To calculate the rate of change (d/dt) of the value of a specified channel.

$$A_t = \frac{(ma_t - ma_{(t-Ta)})xR}{P}$$

Where,	A,	=	Rate of change value
	ma	=	Current value of source channel
	ma _{t-Ta}	=	Value of source channel last time
	R	=	Rate multiplier in seconds to give rate per minute, per hour etc., from sample rates of minutes, seconds etc.
	Р	=	Sample period in seconds (time between successive calculations)

Relative Humidity

To determine the percentage relative humidity using wet and dry temperature, and atmospheric pressure inputs.

NOTE: The psychrometric constant used in the calculation (to be entered by the user) is generally 6.66 x 10⁻⁴.

$$\% RH = \frac{VP_{Air}}{VP_{Sat}}$$

Where VP_{air} is the water vapor pressure in the atmosphere being measured, and VP_{sat} is the saturated water vapor pressure at the measured dry bulb temperature.

VP_{oir} CALCULATION

 VP_{air} is calculated as follows:

$$VP_{Air} = VP_{Wetsat} - \left\{ 6.66 \, x 10^{-4} \, xmc_t x(ma_t - mb_t) \right\}$$

where, ma_t

= value of the channel measuring dry bulb temperature (C)

 $mb_t = value of the channel measuring wet bulb temperature (C)$

mc, = value of the channel measuring the atmospheric pressure (bar)

 VP_{wetsat} = the saturated water vapor pressure at the measured wet bulb temperature, calculated as follows:

$$VP_{Wetsat} = A_0 = (A_1 x m b_t^2) + (A_2 x m b_t^2) + (A_3 x m b_t^3) + (A_4 x m b_t^4) + (A_5 x m b_t^5)$$

where,

=	6.17204663 x 10 ⁻³
=	4.28096024 x 10 ⁻⁴
=	1.53342964 x 10 ⁻⁵
=	2.40833685 x 10 ⁻⁷
=	3.04249240 x 10 ⁻⁹
=	2.65867713 x 10 ⁻¹¹
	= = = =

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VP_{sot} CALCULATION

 VP_{sat} is calculated as follows, where ma_t, and A₀ to A₅ are as described for VP_{air} , above:

$$VP_{Sat} = A_0 = (A_1 x m a_t^2) + (A_2 x m a_t^2) + (A_3 x m a_t^3) + (A_4 x m a_t^4) + (A_5 x m a_t^5)$$

FVALUE

To calculate the equivalent time at Sterilizing Temperature (for temperatures below, at and above Sterilizing Temperature) both in dry (FH) and steam (FO) sterilizing environments, using the following equation:

Where	Fval,	=	F value at time t (minutes)
	Fval _{t-1}	=	F value last iteration
	Т	=	Internal recorder iteration rate (minutes)
	ma,	=	Value of temperature measuring channel
	Target temp	=	121.1°С for Fo; 170°С for Fн
	Z	=	Temperature interval representing a factor-of-10 reduction in killing efficiency
		=	10°C for Fo; = 20°C for FH

Application Notes

To ensure that sterilizer loads which contain materials with differing thermal inertias are thoroughly sterilized, a typical sterilizer has up to 12 different measuring points within the load. To ensure accuracy, the temperature sensors should be calibrated, and the channel adjustment facility used to compensate for any inaccuracies found.

If each of the inputs is used to compute an F value, each of these values can then be used as an input to a Group Continuous Minimum function, with a high absolute alarm set at the correct F value. The alarm can be used to sound a warning, or an associated relay can be linked into the autoclave control system to signify the end of a sterilization cycle.

COMPRESSIBILITY FACTOR (Z FACTOR)

The compressibility factor is a density related measure of how far a particular gas deviates from a 'perfect' gas under any set of temperature and pressure conditions, and is given by the equation.

$$Z = \frac{P}{T} x \frac{1}{\rho}$$

where,	Z	=	Compressibility factor
	Р	=	Absolute pressure of the gas
	Т	=	Absolute temperature of the gas
	r	=	Gas density at pressure P and temperature T (from published tables)

Alternatively the Z-factor can be obtained experimentally.

MASS FLOW (SQUARE ROOT)

Note: The overall accuracy of a flow measurement installation depends on a number of factors outside the control of the recorder manufacturer. For this reason, the manufacturer takes no responsibility for the accuracy of results obtained using the mass flow equations implemented in the math pack.

It is not recommended that the recorder be used for custody transfer.

where,	Qm,	=	mass flow in kg/sec
	DeltaP,	=	measured value of differential pressure across the orifice plate at time t, in kPa
	AbsP, [']	=	absolute pressure at the upstream tapping at time t,in kPa(A)
	Temp,	=	absolute temperature at the upstream tapping at time t, in Kelvin
	K	=	Scaling factor (see below)
	Rg	=	Specific gas constant in J/(kg-K)
	Z	=	Compressibility factor
For the	recorder	user,	the equation above becomes: Mass flow = $md \times ma_t \times mb_t \div mc_t$
where,	ma,	=	the value, at time t, of the channel measuring the flow meter output
	mb	=	the value, at time t, of the channel measuring the absolute pressure of the fluid
	mc,	=	the value, at time t, of the channel measuring the fluid temperature
	md	=	the constant value derived from the following:

where,	K	=	scaling factor (see below)
	Rg	=	Specific gas constant in J/kg-K (see mass flow (linear) above)
	Z	=	Compressibility factor (see mass flow (linear) above)

SCALING FACTOR (K)

This is calculated from the following equation:

where,	S	=	the full scale output from the flow meter
	ma _{max}	=	the full scale input of the channel reading the output from the flow meter

ZIRCONIA PROBES

A zirconia (oxygen) probe consists of two platinum electrodes bonded to a pellet or cylinder of zirconia. At elevated temperatures, such a probe develops an electromotive force (emf) across it which is proportional to the probe temperature and to the log of partial pressure (oxygen) difference between its two ends.

OXYGEN CONCENTRATION MEASUREMENT

In order to measure oxygen concentrations, one end of the probe is inserted into the atmosphere to be measured, while the other end is subject to a reference atmosphere. For most applications, air provides a suitable reference (reference input = 20.95% for air).

The temperature of the probe is normally measured using a type K or a type R thermocouple. The temperature effect on the thermocouple is such that for successful operation with the recorder, the probe temperature must be greater than $700^{1}/_{2}$ C.

The probe output obeys a law described by the Nernst oxygen equation:

$$E = 0.0496 \ x \ T \ x \log \frac{P_1}{P_2}$$
 or, re-written $P_2 = \frac{P_1}{10^{0.049}}$

where,	P2 P1	=	Partial pressure of oxygen in the sampled gas (%) Partial pressure of oxygen in the reference atmosphere (%) (20, 85 for air)
		_	Farilal pressure of oxygen in the reference almosphere (%) (20.95 for all)
	с т	=	Electromotive force across the probe, in my
	I	=	Probe temperature in Kelvin

In order to obtain a useful result, it is necessary to scale the inputs and outputs correctly, the channel measuring the probe voltage will normally need a scale of 0 to 100 mV. The temperature measuring channel will probably be scaled at 300 to 1800K, while the output scaling will typically be 0 to 5% for boiler flues and 0 to 20% in kilns.

OXYGEN POTENTIAL MEASUREMENT

The oxygen potential of an atmosphere is a measure of its ability to oxidize or reduce. For any element, a value of oxygen potential (free energy of formation) is known. Above this value, the material will oxidize, below it, no oxidation will occur.

Oxygen potential is given by the equation: $Op = 0.00457 x T x \log Op'$

where,	Ор	=	Required oxygen potential (kilocalories)
	Т	=	Probe temperature (Kelvin)
	Op′	=	Partial pressure of oxygen in the reference atmosphere in atmospheres.

It can be shown that, because the oxygen potential of air is essentially constant over the temperature range 873 to 1473 Kelvins, the probe output is proportional to the oxygen potential of an atmosphere according to:

E = (10.84 T) + 40 mV between 873 and 1473 K

It is thus possible to measure oxygen potential directly from a Zirconia probe, using a standard input channel, scaled in units of Oxygen potential.

A typical input range would be 40 to 1124 mV, with a scale of 0 to - 100 kilocalories. Such scaling would be appropriate over the temperature range 873 to 1473K.

SWITCH

This function copies one of two input or derived channels' values according to the state of its 'Select channel B for Dnn' job. I.E. if a relevant switch job is active, copy the value of source channel B, otherwise copy the value of source channel A.

HIGH SELECT

This function has two input or derived channels as sources, and copies whichever has the higher value at the time.

LOW SELECT

This function has two input or derived channels as sources, and copies whichever has the lower value at the time.

STOPWATCH

The stopwatch starts counting as soon as the function is configured. The stopwatch can be disabled by a math pack 'job', and can also be reset to zero. The value is normally displayed as a number of 1/4 seconds, but if one of the date/time formats described in section 5.3.1 is selected, the value is displayed in hours/minutes/seconds.

TIME STAMP

When triggered by a math pack 'job' becoming active, the time stamp reads the current time and date from the system clock and holds it. The time or the date can be displayed, according to the configured value format.

Note: The display format selected affects only the value displayed, not the internal value of the channel. This internal value is a number of 1/4 seconds, either elapsed since enabled (stopwatch) or elapsed since 1st of January 1988 (Time Stamp). This allows time functions to be processed in the math pack. For example, two channels, each with a time stamp as its value can be subtracted to give the time between the two time stamps, and this can be displayed as elapsed time if so configured in the Value Format page.

Application Notes

Standard Power Industry Calculations

Eurotherm Chessell intelligent data acquisition units and chart recorders are used in many common power monitoring applications.

When fitted with the software option key 'math level II', and appropriate ac power transformers and transducers (see ac monitoring kits), the units can monitor many parameters common to the power industry. Among them:

- AC line voltage
- > AC line current
- Lead and lag power factor ratio
- Kilowatts power
- Kilovars power
- Kilowatt demand and average usage

These parameters can be displayed and/or logged to archival data storage for later PC analysis and reporting.

Power Factor Calculation



Standard Power Industry Calculations

The flow diagram on the previous page shows the configuration path on a Chessell data acquisition unit or recorder for a power factor calculation. Inputs to CH1 and CH2 are from WATT and VAR transducers. Blocks D1-5 show the math functions to be carried out on the unit in math channels D1-D5 (or any 5 math channels of choice).

For complete information on math functions and how to use them, please refer to your unit's Installation and Operation or Options manual.

Power and Peak Power Hold Calculation

Utility monitoring applications frequently require the measurement of peak power consumption measured for a specific period of time, e.g. hourly.

An active power calculation (the power value to be converted into any form of energy at the load) is given below as an example.



Alarm Re-Flash

Eurotherm Chessell intelligent data acquisition units and chart recorders are used in many power monitoring applications where a common requirement is alarm monitoring of multiple process variables, with a single alarm output.

When fitted with the software option key 'Timers, totalizers & counters', the recorder can be configured to 're-flash' the common alarm output should a second, third, fourth, etc., process variable go into alarm state once the relay output is already active.


4th and 5th Order Polynominals

Many sensors do not give a linear output. The linearization functions for the most common non-linear sensors, thermocouples and RTDs, are built as standard into Chessell recorders and data acquisition units. Other linearization functions can be incorporated in one of two ways, depending on the linearization data provided by the sensor manufacturer.

1) a custom curve can be input into the unit if data is provided in the form of point pairs;

2) a polynomial can be entered into the unit's math pack.

All Chessell intelligent units support third order polynomials in their advanced math packs, e.g., if a sensor output X is read on channel 1, then math channel 1 can be set to be:

$$A_0 + A_1 X + A_2 X^2 + A_3 X^3$$

For some sensors a third order polynomial does not adequately describe the linearization of the sensor and the curve must be expanded to a fourth or fifth order polynomial - this can be easily achieved in Chessell's advanced math packages as follows:

If the sensor linearization = a + bX + cX^2 + dX^3 + eX^4

Sensor output X is read on channel 1

Set math channel 1 function to 3rd order polynomial with; $A_0 = b$; $A_1 = c$; $A_2 = d$; $A_3 = e$

Set math channel 2 function to constant = a

Set math channel 3 function to multiply:

(math channel 1) x (channel 1) = $A_0X + A_1X^2 + A_2X^3 + A_3X^4$

Set math channel 4 function to add:

(math channel 3) + (math channel 2) = $a + A_0X + A_1X^2 + A_2X^3 + A_3X^4$

This fourth order polynomial can be further expanded into a fifth order polynomial as follows:

If the sensor linearization = $a + bX + cX^2 + dX^3 + eX^4 + fX^5$

Sensor output X is read on channel 1

Set math channel 1 function to 3rd order polynomial with; $A_0 = c$; $A_1 = d$; $A_2 = e$; $A_3 = f$

Set math channel 2 function to constant = b

Set math channel 3 function to multiply:

(math channel 1) x (channel 1) =
$$A_0X + A_1X^2 + A_2X^3 + A_3X^4$$

Set math channel 4 function to add:

(math channel 3) + (math channel 2) = $b + A_0X + A_1X^2 + A_2X^3 + A_3X^4$

Set math channel 5 function to constant = a

Set math channel 6 function to multiply:

(math channel 4) x (channel 1) = $bX + A_0X^2 + A_1X^3 + A_2X^4 + A_3X^5$

Set math channel 7 function to add:

(math channel 6)+(math channel 5) = $a + bX + A_0X^2 + A_1X^3 + A_2X^4 + A_3X^5$

Modifying Alarm Setpoints on the 4000 Series Using El Bisynch Protocol

There are three steps required to modify an alarm setpoint (and most other alarm parameters) on the 4000 series of recorders running the EI Bisynch (40001-emulation) protocol. All addressing is to the instrument logical unit address of 0 as all the alarm specifications are held in the mnemonic data.

1. Obtain the alarm parameters from the configuration and place them into a buffer

- 2. Modify the required alarm parameter in the buffer
- 3. Write the new alarm data back into the instrument configuration

For modifying an alarm setpoint to 50% of the scale range on alarm number one on channel number one, the strings detailed below need to be sent to the instrument.

1. Obtain the alarm parameter \$0000"0GA>0101#>0101 specifies the channel and alarm number

2. Modify the alarm setpoint value \$0000"0A3>1FFF#>1FFF specifies the setpoint value

3. Write the alarm data back into the configuration \$0000"0EA#

This example uses the ASCII form of the protocol where no error checking is used. If the ANSI form of the protocol is being used a <BCC> value needs to be added at the end of the transmitting string.

Please refer to the product communications manual for protocol details.

This example has been tested using Windows Hyper terminal and a 4000R running El Bisynch ASCII.

Daylight Savings Time

Many recorders and data acquisition units use archive logging to collect process data for Quality Control, Continuous Emissions Monitoring and other general process record maintenance. For these records it is important that the archived data be correctly dated and show the right time. In many regions, clocks are changed twice a year, necessitating a clock change on the recorder for the data to be correct.

But how does our instrumentation handle this task automatically, without the need for human intervention?

Using the timer option (available on all intelligent recorders and data acquisition units), it is a simple task to set up two timer functions, one for the date in April when clocks are advanced, and one for October when the clocks are moved back again.

- > Set the precise date on timer 1, say 04/30/2000 for Summer, and the clock for 02:XX, duration 1 second
- Set up job 1 as "Add 1 hour"
- Set the precise date on timer 2, with October date for time change, and the clock for 02:XX, duration 1 second
- Set up job 1 as "Subtract 1 hour"

When archiving to disk (either the internal floppy or PC card drives), a single archive file is maintained while the system clock is advanced and/or turned back one hour.

Continuous Emissions Monitoring (using Level II Math Capabilities)

The requirement to monitor and report on the products of combustion has been mandated by the EPA since the Clean Air Act (CAA) of 1990. Chessell intelligent recorders offer an excellent solution for small site monitoring where a large, computer-based system is not cost effective. Using their advanced (level II) math capabilities, the recorders and data acquisition units have the ability to monitor, alarm and store data for the required EPA reports. CEM regulation is tied to the oxygen content of stack gases.

Although there is variance between states, monitoring of the following parameters is generally required:

- Rolling averages of stack gases and opacity
- Fotalization of BTU rates
- Alarming of out of permit conditions
- Calculation of emissions in lbs/hr
- Correction of data from analyzers to a standard O2 percentage

Rolling Average

One of the most frequently required calculations is a rolling average. The majority of parameters analyzed for CEM are made on a periodic basis, e.g. per 5 minutes, and require an hourly rolling average. The rolling average math function on Chessell units takes the average value of the sampled channel a specified number of times, at a specified time period. For example, for a rolling hourly average where a sample is taken every 5 minutes, the most recent 12 samples will be averaged (12×5 minutes = 60 minutes). In this example the first reading is discarded and replaced by the 13th sample and so on.

Excess Oxygen Correction

Normalizing the readings from a combustion analyzer requires correction of data to a specific oxygen concentration (7%). This is accomplished by using math channels on the unit, as specified below.



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Continuous Emissions Monitoring Calibration Override

The recorder or data acquisition unit can automatically document analyzer calibration cycles and discount the readings that occur during calibration. Calibration cycles can be flagged using a contact input from the analyzer. The "sample & hold" function of a math channel holds, during the calibration mode, the last analyzer output, thus avoiding corruption of averages and alarm conditions.

Normalizing the readings from a combustion analyzer requires correction of data to a specific oxygen concentration (7%). This is accomplished by using math channels on the unit as specified below (using D7 & D8 as inputs and replacing calculations D9 & D10 from previous block diagram).



Calculation of Total Time Above Permit Limit

Where a site is required to submit an Excess Emissions Report, the calculation of time out of compliance may be automated by the unit, for the time period specified.



BTU/HR Power Calculations

Chessell recorders and data acquisition units can be easily configured to perform BTU calculations by using the instruments' mathematical functions. BTU/hr calculations are made by multiplying the temperature drop (DT) in Fahrenheit across a heat exchanger by the mass flow-rate (Qm) of water through the heat exchanger (lbs/hr). The BTU equation is:

Power (BTU/hr) = DT x Qm, wh0

For our sample application, we will assume that the inlet and outlet temperatures of the heat exchanger are being measured in °F. We will also assume the flow through the heat exchanger is measured in gallons per minute (GPM).

Since our sample application has the temperatures in °F, calculating DT is simply a matter of subtraction. Since the heat exchanger's flow is being measured in GPM we will need to convert the input channel's readings to GPM by using a conversion factor in one of the derived (math) channels on the recorder. The equation for this is;

Qm	=	Qv x C1 x C2, where;
Qv	=	volumetric flow-rate (recorder input in gallons per minute)
C1	=	period scalar to change time base of minutes to hours
	=	60 (number of minutes in hour)
C2	=	linear scalar to change gallons (of water) to lbs
	=	8.337 (weight in lbs of 1 gallon of water)
C1 x C2	=	500.22
	ntor i	ate the equation as the constant value helew

which we enter into the equation as the constant value below

BTU/hr = (inlet temp (°F) - outlet temp (°F)) x Qv x 500.22

A sample instrument configuration is as follows: Channel 1 - Exchanger Inlet Temperature in °F Channel 2 - Exchanger Outlet Temperature in °F Channel 3 - Water flow through the heat exchanger in GPM

Configure DV1 to subtract channel 2 from channel 1 = DT Configure DV2 to be the constant value 500.22 Configure DV3 to multiply channel 3 by DV2 (convert GPM to lbs/hr) Configure DV4 to multiply DV1 by DV3 = BTU/hr

The resulting BTU/hr value is now available on DV4. This value can be traced or totalized (energy) or both.

This example has been for Fahrenheit and GPM inputs. Any temperature and flow units can be incorporated into a BTU/hr calculation by converting the temperature input into Fahrenheit on a DV channel (see linear scalar above) and modifying the linear and period scalars for the flow-rate.

Weir Flow Calculation

A common way to measure freshwater, run-off and effluent flow is to use a rectangular or V-Notch weir. The weir is nothing more than an opening with known dimensions. Flow through the weir is simply a function of the level of the fluid in the weir. What often presents a challenge is the fact that the formula that converts level to flow includes a very precise exponent value. A typical example is:

An ultrasonic level sensor is used to measure the level in a concrete-walled holding chamber that is 16 feet high. The V-Notch weir is 13 feet from the base of the vault. The formula for the effluent flow for this case is:

 $Q = 2.49 L^{5/2}$ Where: Q = discharge (cfs); L= Level in the weir (ft)

The IOS 2500 measures the height (level transmitter with 4-20mA scaled to 0 to 16 feet) and makes the flow calculation (Q) using a constant, a variable (level minus the 13 foot elevation of the weir from the bottom of the vessel), and the fractional exponent. The calculated flow can then be read digitally over the Modbus[®]/Profibus communications link or be transmitted as a scaled 4-20mA analog signal. In addition, alarm trips can be set at various vault levels to warn that an overflow condition is nearing.

Indicator Minimum, Maximum, Average and Time Above Threshold

Chessell's 2408*i* intelligent process indicator can actually calculate the logged minimum, maximum and average values of the process input. In addition, the time the process value is above threshold level can also be calculated. All of these derived values can be re-set.

Info	Information List		Adjustable Range	Default Setting	Customer Setting
L06.L	Logged Minimum Process Value	These values	Can be manually adjusted	Read-only	Read-only
LOG.H	Logged Maximum Process Value	are logged by the indicator	Can be manually adjusted	Read-only	Read-only
L066.A	Logged Average Process Value	from switch on.		Read-only	Read-only
LOG.T	Time Process Value is Above the Threshold	To reset, switch the indicator off	Time displayed in minutes	Read-only	Read-only
L06.U	Process Value Threshold for Timer Log	or scroll to	Between display min and max	0	
RES.L	Logging Reset	select YES	no Logging in progress YES Will reset logged values	no	

The logged values (minimum, maximum, average and time above threshold level) reside in the INFORMATION list on the menu structure. The 2408*i* allows the user to 'promote' up to twelve commonly used parameters into the HOME list. This will give the operator quick access by simply pressing the enter key on the unit. This feature, used in combination with HIDE and READ ONLY, allows you to organize the way in which you want your indicator formatted.

To hide, reveal or promote parameters, select EDIT level as follows:



888.797.2475

Indicator Minimum, Maximum, Average and Time Above Threshold

Promote Example:



The parameter LoG.L will now appear in the HOME list. Repeat the procedure for any other parameter you wish to promote (see indicator manual for a full list of available parameters). To demote a parameter go to Edit level, select the parameter from the relevant list and change the choice from Pro back to Alter, rEAd or HidE.

To return to the operator level:



Redundancy for Alarm Notification and Data Acquisition

For many process applications there is a requirement for redundancy of alarm notification and data capture. The Eurotherm Chessell model 4100G video graphic recorder offers this by combining its existing alarm annunciation and data archiving to local drive, with the very latest in process instrumentation - browser-enabled DAQ.

The 4100G offers an integral option that provides the user with all the recorder's local capabilities as well as the ability to view process data through a PC based web browser. An authorized individual simply gets on the Internet, enters the recorder's IP address and can then view download and capture in CSV format, the same information that he/she would see on the local recorder's screen. Additionally, through the web browser, the viewer can review all the historical data (roughly the last hour's worth) that is stored in the memory of the web server, part of the recorder. This data capture and archive is in addition to that being carried out locally at the unit, where data is archived to the recorder's integral PC card or 3.5" floppy drive. Finally, the recorder can initiate and send e-mail messages to predetermined individuals when alarm conditions exist. This e-mail alarm notification runs in tandem with the normal visual alarm notification on the recorder itself, plus alarm annunciation via the unit's relay outputs.

So, using existing Internet services and a free browser, one can obtain all the functionality of the local recorder from a personal computer anywhere in the world. This provides a new level of process monitoring redundancy (for virtually no additional cost), reduces process monitoring labor costs and provides nearly infinite flexibility in extending process visualization to those interested in improving process performance.

Graphic Networking

The 4181G, 4250G and 4250D can be used as master units in a network of Eurotherm non-graphic recorders. This stand-alone, graphic (XIODL) network gives connectivity of as many as 512 channels that can be displayed on the master unit without the need for serial communications to a PC network. The graphic master can also be used as a network logger and printer for electronic archiving of data and chart production. A combination of up to seven 4181M's, 4250M's and 4000R's can be linked to a single 4181G or 4250G, or eight units to a 4250D.



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4000R

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Digital Communications Hardware Guide

RS232, RS422 and RS485 Transmission Standards

This section defines the differences between the RS232, RS422 and RS485 digital communications standards. Details of configuration, cabling and termination will help to establish basic communications.

The Electrical Industries Association, (EIA) introduced the Recommended Standards, RS232, RS422 and RS485. These standards define the electrical performance of a communications network. The table below is a summary of the different physical links offered by the three standards.

EIA Standard	RS232C	RS422	RS485
Transmission mode	Single ended	Differential	Differential
Electrical connections	3 wire	5 wire	5 wire
No. of drivers and	1 driver,	l receiver	1 driver,
receivers per line	10 receivers	32 drivers,	32 receivers
Maximum data rate	20k bits/s	10M bits/s	10M bits/s
Maximum cable length	50ft, (15M)	4000ft, (1200M)	4000ft, (1200M)

Note: RS232C has been abbreviated to RS232. The RS232 standard allows a single instrument to be connected to a PC, a Programmable Logic Controller, or similar devices using a cable length of less than 15M. Chessell recorders and data acquisition units utilize 5-wire RS485.

The RS485 standard allows one or more instruments to be connected (multi-dropped) using a two wire connection, with cable length of less than 1200M. 31 Instruments and one 'master' may be connected in this way. The balanced differential signal transmission is less prone to interference and should be used in preference to RS232 in noisy environments. RS422/RS485 is recommended for plant installation. Although RS485 is commonly referred to as a 'two wire' connection, a ground return/shield connection is provided as a 'common' connection for Series 2000 Instruments, and in general this should be used in installations to provide additional protection against noise.

Strictly speaking, RS422 is a standard permitting 'point to point' connection of two pieces of equipment using a full duplex, differential signal on two pairs of wires. In principle, therefore, an RS422 link only allows a single instrument to be connected to a PC. However, Chessell instruments provide an enhanced version of RS422 that also meets the full electrical requirements of RS485 described above. This allows up to 31 instruments to be connected on the same network, but only with a 5 wire electrical connection. The transmission and reception of data use two pairs of twisted cable, with a separate cable provided for common. The optional screen will provide additional noise immunity.

The 2 wire RS485 should be used where possible for new installations where multi-drop capability is required. RS422 is provided for compatibility with existing Eurotherm instruments. Some earlier Eurotherm Controls instruments use a terminal marking that is different from that used in the RS422/RS485 standards. The table below compares this marking.

RS422/RS485	Eurotherm
A'	RX+ or RxB
B′	RX- or RxA
A	TX+ or TxB
В	TX- or TxA
C & C′	Common or Sig Gnd

Using RS232 or RS422/485, the Chessell instruments operate in a half duplex mode that does not allow the simultaneous transmission and reception of data. Data is passed by an alternating exchange.

Most PCs provide an RS232 port for digital communications. The Eurotherm Controls KD485 Communications Interface unit is recommended for interfacing to RS422/485. This unit is also used to buffer an RS422/485 network when it is required to communicate with more than 32 instruments on the same bus, and may also be used to bridge 2 wire RS485 to 4 wire RS422 network segments. Wiring information for this unit is given at the end of this section, or refer to KD485 Installation and Operation Manual, available on request from Eurotherm Controls (tel: 703 471 4870), for a full description.

Selecting RS232 or RS422/485

Changing between RS232, RS422, and RS485 is possible for Chessell instruments by fitting/configuring the communications module of the required type.

Chessell communications hardware is dependent on the model ordered, please check the model specifications (model specification sheets can be downloaded from the Chessell web site, www.chessell.com).

Cable Selection

The cable selected for the digital communications network should have the following electrical characteristics:

- Less than 100 ohm/km nominal dc resistance (typically 24 AWG or thicker)
- Nominal characteristic impedance at 100 kHz of 100 ohms
- Less than 60 pF/m mutual pair capacitance, (the capacitance between two wires in a pair)
- Less than 120 pF/m stray capacitance, (the capacitance between one wire and all others connected to earth)
- For R\$422/485 applications, use twisted pair cables

The selection of a cable is a trade off between cost and quality factors such as attenuation and the effectiveness of screening. For applications in an environment where high levels of electrical noise are likely, use a cable with a copper braid shield, (connect the shield to a noise free earth). For applications communicating over longer distances, choose a cable that also has low attenuation characteristics.

In low noise applications and over short distances it may be possible to use the earthed screen as the common connection. Connect the common to the earthed screen via a 100 ohm, 1/4W carbon composition resistor at the PC and all instruments.

For RS422/485 it is possible to operate the system with unscreened twisted data pairs, earth is used as the common connection. Connect the common to earth via a 100 ohm, 1/4W carbon composition resistor at the PC and all instruments. This system is not recommended.

The following list is a selection of cables suitable for RS422/485 communication systems, listed in order of decreasing quality.

Cables marked '*' are suitable for use with the wiring descriptions that follow.

Cables marked '**' use a different color coding from that used in the wiring descriptions.

Part number

Belden Description

9842	2 twisted pairs with aluminium foil screen plus a
	90% coverage copper screen **
9843	3 twisted pairs with aluminium foil screen plus a
	90% coverage copper screen **
9829	2 twisted pairs with aluminium foil screen plus a
	90% coverage copper screen
9830	3 twisted pairs with aluminium foil screen plus a
	90% coverage copper screen *
8102	2 twisted pairs with aluminium foil screen plus a
	65% coverage copper screen
8103	3 twisted pairs with aluminium foil screen plus a
	65% coverage copper screen *
9729	2 twisted pairs with aluminium foil screen
9730	3 twisted pairs with aluminium foil screen *

The following is a selection of cables suitable for RS232 communication systems listed in order of decreasing quality:

Part nu	umber	
Alpha	Belden	Description
	8102	2 twisted pairs with aluminium foil
		screen plus a 65% coverage copper
		screen **
5472	9502	2 twisted pairs with aluminium foil
		screen *
2403	8771	3 separate wires with aluminium foil
		screen **

Grounding

Ensure all grounding points are noise free.

To reduce interference from external electrical signals, ground the cable screen at a single ground point. There must not be multiple ground paths in a single cable run. When using a Eurotherm Controls KD485 Communications Adapter unit, do not connect the screen from one side of the interface to the other. Rather, ground each of the cables separately at a local ground point.

The digital communication outputs of all modern Chessell instruments are isolated. To avoid common mode noise problems, connect the common line to ground at one point through a 100 ohm, 1/4W, carbon composition resistor. The resistor will limit the ground current.

Wiring General

Route communications cables in separate trunking to power cables. Power cables are those connecting power to instruments, relay or triac ac supplies and wiring associated with external switching devices such as contactors, relays or motor speed drives.

Communication cables may be routed with control signal cables if these signal cables are not exposed to an interference source. Control signals are the analog or logic inputs and analog or logic outputs of any control instrument.

Do not use redundant wires in the communications cable for other signals.

Ensure cable runs have sufficient slack to ensure that movement does not cause abrasion of the insulating sheath. Do not over tighten cable clamps to avoid accidental multiple grounding of the screen conductors.

Ensure that the cable is 'daisy chained' between instruments, i.e. the cable runs from one instrument to the next to the final instrument in the chain.

Wiring RS232

To use RS232 the PC will be equipped with an RS232 port, usually referred to as COM 1.

To construct a cable for RS232 operation use a three core screened cable.

The terminals used for RS232 digital communications are listed in the table below. Some PC's use a 25 way connector although the 9 way is more common.

Standard Cable	PC socket	pin no.	PC Function *	Instrument Terminal	Instrument Function
Color	9 way	25 way			
White	2	3	Receive (RX)	Tx	Transmit (TX)
Black	3	2	Transmit (TX)	Rx	Receive (RX)
Red	5	7	Common	Signal Grouund	Common
Link together	1	6	Rec'd line sig. detect		
	4	8	Data terminal ready		
	6	11	Data set ready		
Link together	7	4	Request to send		
	8	5	Clear to send		
Screen	1	Earth			

* These are the functions normally assigned to socket pins. Please check your PC manual to confirm.





Wiring RS422 or 4-wire RS485

To use RS422, buffer the RS232 port of the PC with a suitable RS232/RS422 converter. The Eurotherm Controls KD485 or 261 Communications Converter unit is recommended for this purpose. Figure 2.6 shows connections for this unit. Instruments on an RS422 communication network should be chain connected and not star connected.

To construct a cable for RS422 operation, use a screened cable with two twisted pairs plus a separate core for common. Although common or screen connections are not necessary, their use will significantly improve noise immunity.

The terminals used for RS422 digital communications are listed in the table below.

Standard	PC socket	PC	Instrument	Instrument
Cable	pin no.	Function*	Terminal	Function
Color	25 way		Recorder	
White	3	Receive (RX+)	ТхВ	Transmit (TX+)
Black	16	Transmit (RX-)	TxA	Transmit (TX-)
Red	12	Transmit (TX+)	RxB	Receive (RX+)
Black	13	Transmit (TX-)	RxA	Receive (RX-)
Green	7	Common	Signal Ground	Common
Screen	1	Earth		

* These are the functions normally assigned to socket pins. Please check your PC manual to confirm.



www.chessell.com/support/index.html

Wiring 2-wire 485 - examples for 2000 controllers

To use RS485, buffer the RS232 port of the PC with a suitable RS232/RS485 converter. The Eurotherm Controls KD485 Communications Adapter unit is recommended for this purpose. Eurotherm does not recommend the use of an RS485 board built into the computer since this board is unlikely to be isolated, which may cause noise problems, and the Rx terminals are unlikely to be biased correctly for this application.

To construct a cable for RS485 operation use a screened cable with one (RS485) twisted pair plus a separate core for common. Although common or screen connections are not necessary, their use will significantly improve noise immunity.

The terminals used for RS485 digital communications are listed in the table below.

Standard	PC socket	PC	Instrument	Instrument
Cable	pin no.	Function*	Terminal	Function
Color	25 way			
White	3	Receive (RX+)	HF (b) or (B+)	Transmit (TX)
Black	16	Transmit (RX-)		
Red	12	Transmit (TX+)	HE (A) or (A+)	Receive (RX)
Black	13	Transmit (TX-)		
Green	7	Common	HD	Common
Screen	1	Earth		

* These are the functions normally assigned to socket pins. Please check your PC manual to confirm.



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Wiring RS422 and RS485 controllers

It is generally not possible to connect controllers using a 2-wire standard to controllers on a 4-wire standard. This may be required, for example, if 2000 series controllers are to be added to an existing installation.

It is, however, possible to modify the existing communications link by adding a special version of the KD485 converter unit, supplied as KD485-ADE 422-422. This is shown in the diagram below.

The standard KD485 unit converts from 232 to 4-wire 485 and this link is used to communicate to the existing Eurotherm controllers. The second KD485 is the special version which converts from 4-wire to 2-wire 485 communications. It's input side behaves to the 4-wire link, as another controller would on an existing system. At the same time the communications messages from the computer are passed onto the output side of this unit. This is connected to the 2-wire communications link, that will contain the series 2000 controllers. Any responses from controllers on this link will cause data to be placed on to the 4-wire link and from there will be passed back to the computer.



Controllers (1 to 31) Connected to a PC using a mixed standard of RS-422 (or RS485 4-wire) and RS485 2-wire

Connections for up to 63 controllers



Figure 2.5

It is allowable to substitute one instrument in the first group with a communications isolator type KD485. Up to a further 31 additional instruments can be added as shown.

Large RS422/485 Networks

Networks with more than 32 instruments will require buffering of the communication lines. The Eurotherm Controls KD485-ADE 422-422, Universal Serial Interface unit is recommended for this purpose.

The KD485 in this format sets the transmit lines to non tristate.

NOTE Large networks using RS422 4-wire controllers could use the Eurotherm 261 Universal Serial Interface Unit. To set the transmit lines to non tristate in 261, change links 4 and 5 from position B to A.

Instruments on an RS422/485 communication network should be chain connected and not star connected.





Illustrates the wiring of a network for communicating with a large number of instruments.

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Connections

RS232 connections of the 261

Standard	Cable PC socke	et pin no.	PC Function *	261 Terminal	261 Function
Color	9 way	25 way			
White	2	3	Receive (RX)	2	Transmit (TX)
Black	3	2	Transmit (TX)	3	Receive (RX)
Red	5	7	Common	7	Common
Screen		1	Earth		

* These are the functions normally assigned to socket pins. Please check your PC manual to confirm.

R\$422/485 connections of the 261

Standard Cable	e PC socket pin no.	PC Function *	Instrument Terminal	Instrument Function
Color	25 way			
White	3	Receive (RX+)	HF (b) or (B+)	Transmit (TX)
Black	16	Transmit (RX-)		
Red	12	Transmit (TX+)	HE (A) or (A+)	Receive (RX)
Black	13	Transmit (TX-)		
Green	7	Common	HD	Common
Screen	1	Earth		

* These are the functions normally assigned to socket pins. Please check your PC manual to confirm.

Connections for the KD485-ADE



Figure 2.7

Further details are available in KD485 Installation and Operation Handbook. Plesae contact Eurotherm Controls in Reston, VA at (703)-471-4870 or www.eurotherm.com/controls.htm for the KD485 unit.

Glossary of Terms

The following glossary is general to all the manufacturer's products and may contain terms which are not applicable to your specific unit. In particular, many of the terms are relevant only to configurable recorders.

Com	A function which is triggered when an input signal or a signal derived from it reaches a certain value (absolute or deviation alarms) or changes faster than a specified rate (rate- of-change alarms) or changes state (digital alarms). Once triggered, the alarm can ini- tiate a job list, such as causing a relay out- put to change state, sounding a buzzer, changing chart speed etc.	Alarm
	An input which changes in a smooth (non- stepped) way (e.g. thermocouples, resistance thermometers).	Analog input
Co	An output from the recorder which is a scaled and linearized copy of an analog input or derived channel. Also called retransmission output.	Analog output
	A resistive device which reduces the signal voltage by a known ratio (usually 100:1).	Attenuator
Cont	The recorder can detect an open circuit at its input terminals. As a part of the channel con- figuration, the instrument's response to an open circuit can be defined as "None", "Drive high" or "Drive low". If "none" is selected the trace is allowed to drift accord- ing to what the input wiring is picking up (acting as an aerial). Drive high (low) causes the trace to be drawn at the extreme right (left) side of the chart.	Break response
	A mechanical paper transport system for containing and feeding the chart past the pens or printhead at a known speed. The cassette includes reservoirs for unused (pay- out tray) and used (take-up tray) sections of chart.	Chart cassette
Deriv	Also known by the abbreviation CJC. The voltage generated by a thermocouple (TC) junction depends on the temperature difference between the actual bonded junction (the hot junction), and the other (non- bonded) end of the conductors (the cold junction (CJC). Thus, for any reading from a TC to be accurate, the temperature of the CJC must be taken into account. This can be done in three ways: Internal, External or Remote.	Cold Junction Compensation
Digit	ture detectors measuring the temperature near the terminal blocks (the cold junction for directly connected TCs).	
	External. For remote TCs, the cold junction can be held at a known temperature. This temperature is entered (in degrees) as a	

part of the CJC configuration.

Remote. For remote TCs, an auxiliary temperature detector can be used to measure the cold junction temperature. This detector is then connected to a separate input channel. This input channel number is entered as a part of the CJC configuration.

Communications Most recorders now offer a "Serial Communications" option to allow a computer (PC) to communicate directly with one or more recorders in order to configure them, or to read information from them regarding the process variables being measured.

Configuration This is used as a verb to mean "the process of telling your recorder what you want it to do", and as a noun to mean "the way in which the recorder has been set up (or configured)". Recorders fitted with memory card or communications options can save their configuration to the memory card or to the host computer. This ensures against loss, and also allows configurations to be copied from one recorder to another.

Continuous trace This is used to describe recorders which have a single pen associated with each process variable, and this pen traces the value continuously. See also multipoint recorder.

- Counters Counters can be incremented or decremented by digital/discrete inputs or by job list action. Counters can be preset. Each counter can have a set point which triggers a job list when the counter value passes through the set point either incrementing (High) or decrementing (Low).
- Data A general term describing the successful reading of an input signal. The term Data Acquisition Unit describes those units which are able to read input signals and act upon them (alarms retransmission math functions etc) without necessarily having the facility of displaying or recording them.
- erived channel A "pseudo" channel which contains the results of math pack operations so they can be traced on the chart, logged etc.
- (DV) The result of one or more input channel or (DV) derived channel being acted upon by a mathematical function (e.g. channel average).
- igital (discrete) An input which has only two states (on or input off). Examples are switch inputs or voltage pulse inputs.
 - Event input A discrete (switch) or digital (voltage level) input. When active, an event input can initiate a job list.

Glossary of Terms

Graphics recorder/unit	A recorder or display unit which uses a touch- sensitive liquid crystal display both as its operator interface, and to display traces as though on a chart. Recorders can come with or without charts; chartless recorders using electronic storage rather than paper to save information.
Hysteresis	When an input signal is "hovering" near a setpoint, then an annoying and potentially damaging series of alarms can be generated, instead of just one alarm which can be acknowledged and the cause dealt with if necessary. To avoid this, a "hysteresis" value can be entered in the alarm configuration, which effectively puts a dead band round the set point. For example an absolute high alarm with a set point of 100 and a hysteresis value of 10, would be triggered when the input signal value rose above 100, but would not re-trigger again until after the alarm had been "cleared" by the process value falling below 90. An attempt to depict
Start	End
n without hysteresis	
Input signal value	
arm with hysteresis 🛶	Alarm off only when value falls below 90.

this example is given in the figure below.

Input channel	An input circuit which accepts voltage, current or digital input signals from the user.
Input signal	A voltage, current or digital input applied to the recorder input circuits. See also Analog input and Digital (discrete) input.
Job list	A set of actions to be carried out by the recorder, when the job list becomes active. Typical "jobs" are to activate a relay, dis- play a message, change chart speed, etc.
Linearization table	Most transducers produce an output which is not directly proportional to the input. For example, the voltage output from a thermo- couple does not vary linearly with the tem- perature it is exposed to. The recorder uses a "look-up" table to find a temperature value for any mV input from a specified thermo- couple type. Similar tables exist for other transducers such as resistance thermom-

Al

Log Logging allows process variable values to be printed numerically in tabular form on the chart. Alternatively, logs can be sent to

eters. In most modern instruments, the user can enter one or more tables of his/her own.

	the memory card (if fitted).
Mathematical function	With the math pack option(s) fitted, a num- ber of mathematical functions become avail- able to the user. For example, you may want to look at the difference between two input signals, in which case a simple Subtract func- tion would be used. The resulting Derived Variable can be traced, using a derived chan- nel, or could be used to trigger a job list if the difference between the two input signals became too great or too small, and so on. A complete list of functions is given below, but not all are available on all instruments.
Measured value	An umbrella term which means: the value of an input channel, derived channel, totalizer, counter, timer, etc., measured in mathemati- cal units as a proportion of the span. See also Process variable.
Memory card	Used to describe SRAM (Static Random Ac- cess Memory) solid state memory cards, or portable hard or floppy disks, used to record configurations, data etc. which can then be taken to a remote PC for further analysis, if required.
Multipoint recorder	This is used to describe recorders which have multiple pen printheads rather than individual pens to produce the trace on the chart. Each trace is made up of dots, produced by the printhead as it traverses across the chart at regular intervals. Advantages are that many more traces can be laid down on the chart, the traces can be annotated for identifica- tion and messages can be printed on the chart. Disadvantages are that fast transients may be missed at low chart speeds.
Operator interface	A term used to describe the controls (e.g. pushbuttons, keypads) and visual feedback (display) that are used to operate and con- figure the unit.
Paper transport system	This includes the chart cassette and the me- chanical system, motors, etc., needed to move the chart through the cassette. The paper transport system is often considered to be an integral part of the writing system.
Pen	A fiber-tipped disposable stylus with an in- tegral ink reservoir. Used to draw (trace) the value of a single process variable on the chart in continuous trace recorders.
Pen offset compensation	With most continuous trace recorders, the mechanical positions of the pen tips are off- set, in the time axis, in order that they do not collide with one another as they traverse the chart. A result of this is that simulta- neous events in more than one channel can appear to be very far from simultaneous, particularly at slow chart speeds. To over- come this apparent time difference, most recorders now offer pen offset compensa- tion, which delays the signals of all but the final channel. This has the disadvantage that

changes may not appear on the chart until a

Glossary of Terms

Pen tray	With modular recorder designs, each pen has its own mechanical system (including motor and feedback device) associated with it to drive it backwards and forwards across the chart. Pen tray is the general term for such mechanical systems. With some record- ers, the pen drive electronics are integral with the pen tray.
Printhead	This is a device which, together with a dis- posable multi-color cartridge, allows multi- point recorders to mark the chart.
Process variable	An umbrella term which means: the value of an input channel, derived channel, totalizer, counter, timer, etc., measured in engineer- ing units (e.g. Degrees Celsius). See also Measured value.
Relay output	A set of contacts which changes state as a result of a job list being run. Relays are energized continuously except when "in alarm", so that if power to the recorder fails they go into their "alarm" state.
Resistance thermometer	Also known as a resistance temperature detector (RTD), a resistance thermometer is constructed of a material whose resistance varies in a known way on the temperature it is exposed to. The resistance variation is non-linear, but for any given type, this non- linearity is well known and invariable and is compensated for by linearization tables in the recorder memory.
Retransmission output	See Analog output.
Setpoint	Also known as "threshold", this is the point at which an alarm becomes active or inac- tive. See also hysteresis.
Shunt	The input circuit of each recorder channel measures voltage signals. If current signals are connected to the recorder, a low value resistor must be placed across the inputs, to convert the current signal to Volts, according to Ohms law (Volts = Amps x Ohms). Thus, a 0 to 20 mA (0.02 Amps) signal applied across a 250Ω resistor produces a voltage range of

0 to (0.02×250) Volts = 5 Volts.

Such resistors are called "Shunt resistors" or "Shunts" for short, and are usually of very close tolerance.

- Span Span has two common meanings: the rightmost grid of the chart, or the value given by (maximum value - minimum value). The two meanings are identical where the minimum value is zero.
- Trace The line produced on the chart or display screen showing the value of the process variable being measured.
- Thermocouple A junction of two dissimilar metals which produces a small voltage, the value of which depends on the temperature of the junction. The voltage varies in a non-linear way with temperature, but for any given type, this non-linearity is well known and invariable and is compensated for by linearization tables in the recorder memory.

Threshold See setpoint.

- Timer Timers carry out general timing functions, and can initiate job lists.
- Totalizer A mathematical function which allows flow rates (e.g. cubic feet per second) to be converted to actual quantities (e.g. cubic feet).
- Transducer A device which produces an electrical output proportional to temperature, flow rate, pressure, speed, position etc. Common transducers are potentiometers, thermocouples, resistance thermometers (RTDs) and flow meters.
- **Transmitter** Thermocouple wire (compensation wire) is expensive, and if the thermocouple is a long way from the measuring device, it is often less expensive to install a "transmitter" local to the thermocouple. This device converts the mV signal from the thermocouple to a mA signal which can then be wired to the recorder using normal copper wire. Transmitters can be self powered, or they may need power generated for them. Most recorders can be fitted with Transmitter Power Supplies as an option.
- Writing system A general term used to describe the mechanical means of moving pens/printheads across the chart width. The term often includes the paper transport system used to drive the chart through the cassette.
 - Zero Zero is generally taken to mean the value associated with the left-most grid line on the chart. Its actual value need not be zero, as long as it is less than the Span value.

Informações sobre programação www.soliton.com.br - e-mail: soliton@soliton.com.br

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