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Grant 20xx serie dataloggers, specificatie overzicht:

Inputs Channels

		Universal Analogue Inputs			Common Inputs				
Type	ADC	Differential	Single Ended	3 or 4 Wire	Pulse		Event	High Voltage	Internal Temperature Reference
2020 - 1F8 2020 - 2F8 2040 - 2F16 2040 - 4F16	X 1 X 2 X 2 X4	8 max 8 max 16 max 16 max	16max 16max 32 max 32 max	0 4* 0 8*	2 x Fast inputs at up to 64Khz	2 x Slow inputs at up to to 100Hz with debounce	8 x digital or 1 x 8 bit	2 2 2 2	1 1 2 2

*Each 3 or 4 wire input reduces the total number of differential inputs by 2 and total single ended inputs by 4.

Input Channel Combinations

	Thermocouple		Thermistor		Voltage		Current		Resistance		RTD	
	2020	2040	2020	2040	2020	2040	2020	2040	2020	2040	2020	2040
Single ended	16	32	16	32	16	32			16	32	16	32
Differential	8	16			8	16	8	16				
3 or 4 wire									4 (2F8 only)	8 (4F16 only)	4 (2F8 only)	8 (4F16 only)

Note:- 2020 / 2040 physical inputs are presented as a set of pins on a connector block. Each Connector block has 4 pins uniquely associated with inputs. An additional pin is the common for single ended use only. Each connector block can be configured as: (4 x Single ended) or (2 x Differential). On models 2F8 and 4F16 the block can also be used for 1 x 3 or 4 wire input. It is therefore possible to have a mix of single ended, differential and, if applicable, 3 or 4 wire inputs across different blocks as shown below:

2020 type 1F8			
Analogue to digital converter #1			
Block A	Block B	Block C	Block D

2 x Differential or 4 x Single ended inputs per block (= 8 Differential inputs maximum)

2020 type 2F8			
Analogue to digital converter #1		Analogue to digital converter #2	
Block A	Block B	Block C	Block D

1 x Four-wire, 2 x Differential or 4 x Single ended inputs per block (= 8 Differential inputs maximum)

2040 type 2F16							
Analogue to digital converter #1				Analogue to digital converter #2			
Block A	Block B	Block C	Block D	Block G	Block H	Block J	Block K

2 x Differential or 4 x Single ended inputs per block (= 16 Differential inputs max.)

2040 type 4F16							
A to D #1		A to D #2		A to D #3		A to D #4	
Block A	Block B	Block C	Block D	Block G	Block H	Block J	Block K

1 x Four-wire, 2 x Differential or 4 x Single ended inputs per block (= 16 Differential inputs maximum)

Reading Rate Combinations

The logger can read the inputs at one of four different reading rates. The number of different inputs that each analogue to digital converter can read depends upon the reading rate and whether or not mains rejection is turned on. With mains rejection turned on each analogue to digital converter can read 10 inputs per second. With mains rejection turned off each analogue to digital converter can read 20 inputs per second but with reduced accuracy if there is any interference from the local mains electricity supply. These readings can be shared amongst several inputs as shown in the tables below. Alternatively, with mains rejection turned off, each analogue to digital converter on a 2F8, 2F16 or 4F16 can operate at 100 readings per second but at this rate they can read one input only. Note that each analogue to digital converter on a 2F8/4F16 is connected to up to 8 inputs and on a 1F8/2F16 is connected to up to 16 inputs.

Reading Rate	Maximum number of inputs which can be read at each rate with mains rejection turned on										
10	1										
5		2			1	1	1				
2			5		2	1		4	3	2	1*
1				8+/10*	1	3	5	2	4	6	8*

+2F8/4F16 only
*1F8/2F16 only

Reading Rate	Maximum number of inputs which each 1F8/2F16 A to D can read at each rate with mains rejection turned off																													
100*	1																													
20		1																												
10			2				1	1	1	1	1	1	1	1																
5				4			2	1	1						3	3	2	2	2	2	2	2								
2					10			2		5	4	3	2	1		2		5	4	3	2	1		9	8	7	6	5	4	3	2	1
1						16		1	5		2	4	6	8	10	1	5		2	4	6	8	10	2	4	6	8	10	12	13	14	15

*100 readings per second is not available on 1F8 loggers or when reading thermocouple inputs

Reading Rate	Maximum number of inputs which each 2F8/4F16 A to D can read at each rate with mains rejection turned off																													
100*	1																													
20		1																												
10			2			1	1	1	1	1	1	1	1																	
5				4		2	1	1						3	3	2	2	2	2	2	2									
2					8		2		5	4	3	2	1		2		5	4	3	2	1		8	7	6	5	4	3	2	1
1							1	5		2	4	5	6	7	1	5		2	3	4	5	6		1	2	3	4	5	6	7

*100 readings per second is not available when reading thermocouple inputs

Standard Ranges for Temperature Channels

Each channel can be individually set to any of the ranges listed below.

Pt100/1000 sensors can be used on 4, 3 and 2 wire inputs with linearization to BS-EN-60751 or JIS1604

Input type	Range (°C)	Range (°F)	Default Resolution
Y and U: Thermistor	-50 to 150	-58 to 302	0.01
S: Thermistor	-30 to 150	-22 to 302	0.01
P: Pt100/Pt1000	-200 to 850	-328 to 1562	0.1(Pt100) /0.01(Pt1000)
K: Thermocouple	-200 to 1372	-328 to 2501	0.1
T: Thermocouple	-200 to 400	-328 to 752	0.1
J: Thermocouple	-200 to 1200	-328 to 2192	0.1
N: Thermocouple	-200 to 1300	-328 to 2372	0.1
R and S: Thermocouple	-50 to 1768	-58 to 3214	0.1

Note:- The resolution can be changed in SquirrelView but the logger only gives 6 significant figures.

Standard Ranges for DC Voltage / Current and Resistance Channels
Each voltage/current channel can be any of the voltage or current ranges below. Mixed differential and single ended configurations are permitted. Note that current ranges use differential input channels only to provide necessary isolation.

Voltage Range	Default Resolution	High Voltage Range (Single ended only)	Default Resolution	Resistance Range	Default Resolution
-0.075 to 0.075V	0.000001	4.0 to 20.0V	0.001	2 wire	
-0.15 to 0.15V	0.00001	4.0 to 40.0V	0.001	0.0 to 1250.0 O	0.01
-0.3 to 0.3V	0.00001	4.0 to 60.0V	0.001	0.0 to 5000.0 O	0.1
-0.6 to 0.6V	0.00001			0.0 to 20000.0 O	0.1
-0.6 to 1.2V	0.0001	Current Range		0.0 to 300000.0 O	1.0
-0.6 to 2.4V	0.0001	(requires external 10 O			
-3.0V to 3.0V	0.0001	shunt resistor)		3 and 4 wire	
-6.0V to 6.0V	0.0001	-30.0 to 30.0mA	0.001	0.0. to 500.0O	0.01
-6.0 to 12.0V	0.001	4.0 to 20.0mA	0.001	0.0 to 4000.0O	0.1
-6.0 to 25.0V	0.001				

Standard Ranges for Event and Pulse Count / Frequency Channels
Event 1 x 8 bit digital number (0 to 255) or 8 x individual bits indicating 8 x individual events.
Pulse Count (millions) 16.5, 33, 67, 134, 268, 536, 1073, 2147, 4295, 8590, 17180 or 34360.
Pulse Frequency 0-64KHz Fast mode (no signal conditioning)
0-100Hz, Slow mode (with signal conditioning / contact debounce)

Scaled Ranges
Scaled ranges can be created within SquirrelView using any of the standard ranges to display a sensor's output directly in the correct units. For example, a humidity sensor with a 0-1V output could have a scaled range created so that it displayed as 0-100%rh on the logger and when analysed in SquirrelView.

Calculated Channels
Up to 16 calculated channels can be derived from physical input channels. Common arithmetic functions, that is +, -, x, ÷ and = are permitted together with brackets, ( ) and numerical values. For example, if channel 1 is measuring voltage and channel 3 is measuring current then a calculated channel could be produced to give power (= voltage x current). Calculated channels are calculated only once per second and only from channels being read at the same reading rate.

Analogue Inputs
Common mode:
Range ±25V isolated
Rejection >100dB
Input Impedance:
approximately 10MO on ranges = 2.5V
approximately 1MO for all other ranges
Linearity 0.0015%
Series mode line rejection:
50/60Hz 100dB
Digital Inputs
Zero input voltage = 0 to 0.5V (or shorted input)
One input voltage = 2.7 to 5V (or open circuit input)
Input protection will turn on below about -0.5V and above about 6V
Resolution
6 significant digits (that is the sixth digit is meaningful).
Analogue-Digital Conversion
Type: Sigma-Delta
Resolution :24Bit
Sampling Rate:
Mains rejection on:
1F8 – up to 1 x 10 readings per second
2F8 – up to 2 x 10 readings per second
2F16 – up to 2 x 10 readings per second
4F16 – up to 4 x 10 readings per second
Mains rejection off:
1F8 – up to 1 x 20 readings per second
2F8 – up to 2 x 100 readings per second
2F16 – up to 2 x 100 readings per second
4F16 – up to 4 x 100 readings per second
Alarm outputs
4 x open drain FET (18V 0.1A)
Power output for external devices
5VDC at 50mA or Supply Voltage (from the external power supply or internal battery) at 100mA
Time and Date
In built clock – 3 formats
The clock will operate for up to 24 hours without batteries
Scaled Ranges
Displays the readings in the required Engineering Units

Memory Modes
Stop when full or Overwrite the oldest readings
Programming/Logger setup
SquirrelView or SquirrelView Plus
Communications
RS232 auto ranging to115200 bps
USB 1.0 and 2.0 compatible
Download Speed
Logger to External MMC – approximately 3Mb per minute
Logger to PC via RS232 – up to 115Kb (auto bauding)
Logger to PC via USB – approximately 1Mb per minute
External MMC to PC via MMC – function of card reader and PC.
Internal Batteries
6 x AA Alkaline batteries.
Preferred - Procell LR6 (2.7Ah)
Minimum: 5.4V is cut off
(Low battery warning at 6.0V)
Nominal high voltage 9.6V
External Supply
Nominal 12VDC (10V to 18V DC)
External supply voltage must be at least 0.5V greater than the internal batteries to prevent discharge of internal batteries
Note:- use of external supply without internal batteries is not recommended, a warning message is displayed if this is attempted to indicate that data loss may occur
Battery Endurance (days)
Estimated battery endurance assuming that the logger does not power any external sensors from the sensor power supplies.

Logging Interval	1F8	2F8 & 2F16	4F16
Continuous	1.75	1.25	0.75
5s	2.5	2	1.25
10s	5	3.75	2.5
15s	8	6	4
30s	16	12	8
1min	25	19	12
5min	75	58	37
15min	120	92	62

Current Consumption at 9VDC
Sleeping 600uA
Logging <55mA for 1F8, <85mA for 2F8 and 2F16 and <130mA for 4F16
Optional
External AC to 12VDC supply
97-263V 50/60Hz
Single fit UK/Euro/USA mains plug
Fused DC supply lead
Enclosure
Custom moulded plastic
Dimensions and Weight
Dimensions: 2020 = W225xD170xH55mm
2040 = W225xD170xH92mm
Weight: 2020 = approx. 1.2kg
2040 = approx. 1.5kg
Case material: ABS
Case flammability: UL 94 HB
Display and Keypad
4 Navigation keys
LCD with 2 lines of 20 characters
Battery state indication
External power applied indicator
Navigator prompt
Read and/or Change (see the TUI for more detail):
Logging:- Arm/Disarm/Pause/Continue
Meter any channel
Select from setup options
Date and time
Status/diagnostics/faults/supply voltage/Text
Alarms – assign outputs.
View used and free memory
View logger type
Key pad lock to prevent any change of set ups.
Environment
Highest accuracy over range +5 to +45°C
Reduced accuracy over range -20 to +60°C
(Refer to accuracy specifications for more information)
Relative Humidity 90% at 45°C, non-condensing

2020/2040 Accessories

Item	Part number	Comment
Probes and sensors		Please refer to the Grant probe leaflet
GSM kit	SQA20A802	External GSM modem, harness and antenna.
Ethernet Kit	SQA20A801	External Ethernet Null modem adaptor kit.
MMC	MMC-64	64Mb (External) MMC – Grant preferred type. Note MMCs up to 256Mb are supported
12VDC lead	LC76	2.1mm DC connector, fused 1.8m lead. 10-18VDC.
25 pin D sub-min	SB102	25 pin D Sub-min connector and hood, primarily for digital inputs.
Universal AC power supply	MPU 12V	AC97-263V 50/60 Hz to 12.5VDC at 1.25A regulated. Supplied boxed inclusive of 3 x single fit mains plug for UK, Euro and American power outlet sockets
Pel case	PEL4	Weatherproof, chemical and corrosion resistant enclosure customised for 2020/2040
Current Shunt	CS202	Precision resistance 10O 0.1% 15ppm 0.125W for -30 to +30mA and 4-20mA applications
Serial lead	LC71	2020/2040 to PC serial port lead
Replacement wall bracket	WB6	Wall and desk bracket
Replacement USB lead	LC77	USB lead is supplied with product
Calibration	CAL2020	This certificate provides verification that your logger has been tested

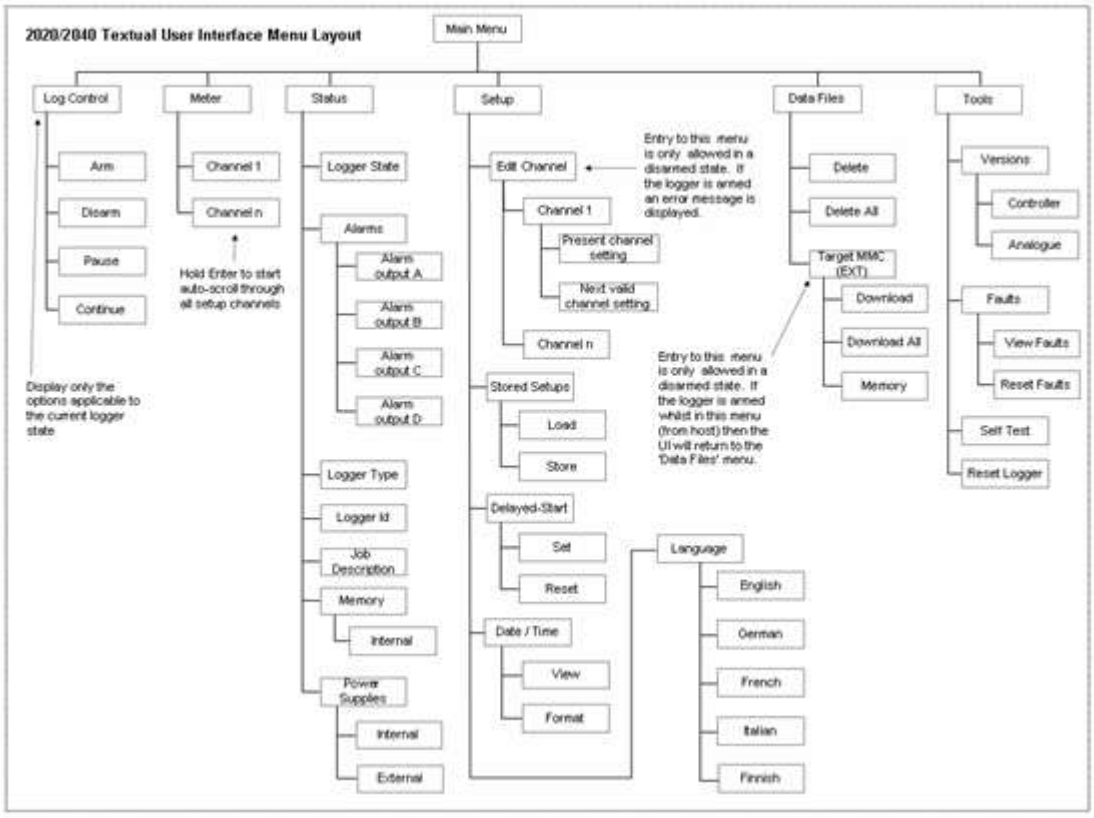
Certificate	CAL2040	and is working accurately within its published specification. This authentication is now a standard requirement within most Quality Control departments

Software
SquirrelView V3
SquirrelView Plus V3
SquirrelView V3
upgrade

Policy note – if lost, the battery cover will be replaced free of charge to the customer

What do I get when I order a 2020/2040
Customised* packaging designed for Airfreight containing;
2020/2040 customer specific variation
Set of 6 AA batteries
Set of 4 precision 10R current sense resistors
Desk/wall bracket
USB lead
SquirrelView Software on CD
Connector kit with cable ties
User Guide (A5 format)
Certificate of Conformity

*The packaging is designed to accept a 2020 or 2040, the power supply option and there is a spare compartment for non-specific accessories. The packaging should be retained for carriage returns or storage when product is not in use.
TUI – Textual User Interface (MMI)



Memory

Internal

Type	MMC (Multi Media Card)
Size	16Mb
Readings	each reading is 8bytes or one data point
Time stamp	each time stamp is 8bytes or one data point – a time stamp occurs every second.
House keeping	including 4 set ups is approximately 1Mb (Note set up in use is also stored)

Number of readings – based on 15.0Mb available.

No Channels	Rate	Readings (approximately)	Note
1	1Hz	937,500	16 bytes for each readings (8+8)
10	1Hz	1.7 x 106	88 bytes for 10 readings (80+8)
1	10Hz	1.7 x 106	88 bytes for 10 readings (80+8)
1	100Hz	1.85 x 106	808bytes per 100 readings (800+8)

In order to estimate the number of readings, apply the formula:

Readings = 15,000,000 / (8R + 8)

Where R = the number of readings per second, that is (No. of channels x Rate). This must be a whole number.

External

Type	MMC
Size	up to 256Mb
Implementation	Copy internal memory to an accumulating external memory (Internal memory from many loggers can be transferred to the external memory until the card is full)
	Up load to logger stored set ups from the external memory.
	Use to transport logger data to external device

Note:- Logging to external memory is not available

Fault Table
The following are a list of faults that can be reported by the logger.

Code	Fault	Comments
	Controller / Common Faults	
102	TUI_FAILURE	The display is not detected / present
103	DATA_ACQ_COMMS_FAILURE	The acquisition has not replied to a command from the controller. A 103 is raised and the acquisition reset. If the acquisition does not respond to a reset, communications to it will be then be disabled the logger put into fatal fault. If the reset was successful but this resetting cycle occurs 3 times in one job then the logger is also put into a fatal fault state.
104	POWER_LOSS_DETECT	Detection that a un-controlled power down event occurred whilst Armed
105	REAL_TIME_CLOCK_FAILURE	
106	CPU_A2D_FAILURE	CPU internal A2D fault (was 121 pre v3)
107	FLASH_DISK_FAILURE (also WRITE_SETUP_FAILURE pre V2.1)	MMC failure on self-test. If reset of logger does not cure, try cycle of the power then, if needed, an internal format. (was also used for 121 cause pre v3)
118	STATE_CHANGE_DENIED	Development fault – unexpected behaviour
119	LOG_MGR_WRITE_FAIL	Failed to write to internal MMC. Could be that MMC has reached its wear limit and requires replacement
120	LOAD_SETUP_FAILURE	Failure during load of the current setup.
121	WRITE_SETUP_FAILURE	Failure during write of setup.
122	LOG_MGR_WRITE_TIMEOUT	Timeout when waiting for write semaphore
125	POWER_CRITICAL	The power has dropped to less than 5.4v whilst the logger was armed. The logger will attempt to disarm upon this event before raising this fault
126	POWER_LOSS	The power has dropped to less than 5.4v whilst the logger was armed and no batteries are detected. This fault should never be seen but is raised to ensure logger goes fatal (if it's seen, something has gone wrong!)
201	CPU_RAM_FAILURE	Unused at present
202	A2D_COMMS_FAILURE	Unused at present
203	SPARE1	Reserved for future use
204	SPARE2	Reserved for future use
205	SENSOR_POWER_FAILURE	Sensor power has failed, try removing the external load to reset the internal fuse. If the fault persists then contact support.
206	SENSOR_POWER_LOW	Power low may be due to an overload of the power supply.
207	POST_INVALID_CONFIG	Unused at present
208	POST_FAILURE	Logger Self Test problem. Run self test in Squirrelview diagnostics to view cause
209	POST_ERROR	Logger Self Test problem, will still operate in a degraded manner. Run self test in Squirrelview diagnostics to view cause

See technical support if fault is not listed above

Accuracy figures

The accuracy figures are quoted over a logger temperature range of +5 to +45°C and assume that the logger is at a constant temperature. If the logger's temperature is varying then the errors could be considerably worse, especially for thermocouple measurements. These are worst case figures and are given as ±(percentage of reading + percentage of range) or ±(percentage of reading + fixed value). The errors at 25°C are generally less than half of those quoted and over the ranges -30 to +5 and +45 to +65°C the errors are generally about twice those quoted.

Analogue Ranges

Analogue Range	% of reading	% of range
4 to 60V	0.15	0.025
4 to 40V	0.15	0.03
4 to 20V	0.15	0.05
Reference temperature		0.1
Voltage Differential -0.6 to 2.4V	0.05	0.025
Voltage Differential -0.6 to 1.2V	0.05	0.025
Voltage Differential -0.6 to 0.6V	0.05	0.025
Voltage Differential -0.3 to 0.3V	0.05	0.025
Voltage Differential -0.15 to 0.15V	0.05	0.025
Voltage Differential -0.075 to 0.075V	0.05	0.05
Voltage Single ended -0.6 to 2.4V	0.05	0.025
Voltage Single ended -0.6 to 1.2V	0.05	0.025
Voltage Single ended -0.6 to 0.6V	0.05	0.025
Voltage Single ended -0.3 to 0.3V	0.05	0.05
Voltage Single ended -0.15 to 0.15V	0.05	0.1
Voltage Single ended -0.075 to 0.075V	0.05	0.2
Current Differential -30 to 30mA	0.05	0.03
Current Differential 4 to 20mA	0.05	0.03
Voltage Differential -6 to 25V	0.1	0.025
Voltage Differential -6 to 12V	0.1	0.025
Voltage Differential -6 to 6V	0.1	0.025
Voltage Differential -3 to 3V	0.1	0.025
Voltage Single ended -6 to 25V	0.1	0.025
Voltage Single ended -6 to 12V	0.1	0.025
Voltage Single ended -6 to 6V	0.1	0.025
Voltage Single ended -3 to 3V	0.1	0.025
Resistance 2-wire 0 to 300000R, sub-range 0 to 33000R	0.1	0.0005
Resistance 2-wire 0 to 300000R, sub-range 33000 to 300000R	0.4	0.0005
Resistance 2-wire 0 to 20000R	0.05	0.005
Resistance 2-wire 0 to 5000R	0.1	0.01
Resistance 2-wire 0 to 1250R	0.05	0.04
Resistance 3-wire 0 to 4000R	0.1	0.01
Resistance 3-wire 0 to 500R	0.05	0.05
Resistance 4-wire 0 to 4000R	0.075	0.005
Resistance 4-wire 0 to 500R	0.075	0.025

Analogue Range	% of reading	% of range
Thermistor U-type -50 to 150°C, sub-range -50 to 100°C	0.15	0.01
Thermistor U-type -50 to 150°C, sub-range 100 to 150°C	0.4	
Thermistor Y-type -50 to 150°C, sub-range -50 to 100°C	0.2	0.015
Thermistor Y-type -50 to 150°C, sub-range 100 to 150°C	0.4	
Thermistor S-type -30 to 150°C, sub-range -30 to 15°C	0.1	0.03
Thermistor S-type -30 to 150°C, sub-range 15 to 150°C	0.05	0.01
Pt100 BS EN 60751 2-wire -200 to 850°C	0.1	0.1
Pt100 JIS 1604 2-wire -200 to 850°C	0.1	0.1
Pt1000 BS EN 60751 2-wire -200 to 850°C	0.1	0.02
Pt100 BS EN 60751 3-wire -200 to 850°C	0.1	0.1
Pt100 JIS 1604 3-wire -200 to 850°C	0.1	0.1
Pt1000 BS EN 60751 3-wire -200 to 850°C	0.1	0.02
Pt100 BS EN 60751 4-wire -200 to 850°C	0.075	0.05
Pt100 JIS 1604 4-wire -200 to 850°C	0.075	0.05
Pt1000 BS EN 60751 4-wire -200 to 850°C	0.075	0.02
Thermocouple J-type Differential -200 to 1200°C, sub-range -200 to -50°C	0.4	0.1
Thermocouple J-type Differential -200 to 1200°C, sub-range -50 to 1200°C		0.1
Thermocouple K-type Differential -200 to 1372°C, sub-range -200 to -50°C	0.7	0.1
Thermocouple K-type Differential -200 to 1372°C, sub-range -50 to 1372°C	0.05	0.1
Thermocouple N-type Differential -200 to 1300°C, sub-range -200 to -50°C	1.5	0.13
Thermocouple N-type Differential -200 to 1300°C, sub-range -50 to 1300°C		0.13
Thermocouple R-type Differential -50 to 1768°C, sub-range 0 to 350°C		0.4
Thermocouple R-type Differential -50 to 1768°C, sub-range 350 to 1768°C		0.23
Thermocouple S-type Differential -50 to 1768°C, sub-range 0 to 350°C		0.4
Thermocouple S-type Differential -50 to 1768°C, sub-range 350 to 1768°C		0.25
Thermocouple T-type Differential -200 to 400°C, sub-range -200 to 0°C	0.7	0.3
Thermocouple T-type Differential -200 to 400°C, sub-range 0 to 400°C		0.3
Thermocouple J-type Single ended -200 to 1200°C, sub-range -200 to -50°C	0.8	0.18
Thermocouple J-type Single ended -200 to 1200°C, sub-range -50 to 1200°C		0.18
Thermocouple K-type Single ended -200 to 1372°C, sub-range -200 to -50°C	1.5	0.18
Thermocouple K-type Single ended -200 to 1372°C, sub-range -50 to 1372°C	0.05	0.18
Thermocouple N-type Single ended -200 to 1300°C, sub-range -200 to -50°C	2.5	0.25
Thermocouple N-type Differential -200 to 1300°C, sub-range -50 to 1300°C		0.25
Thermocouple R-type Single ended -50 to 1768°C, sub-range 0 to 350°C		0.8
Thermocouple R-type Differential -50 to 1768°C, sub-range 350 to 1768°C		0.5
Thermocouple S-type Single ended -50 to 1768°C, sub-range 0 to 350°C		0.8
Thermocouple S-type Differential -50 to 1768°C, sub-range 350		0.5

to 1768°C		
Thermocouple T-type Single ended -200 to 400°C, sub-range -200 to 0°C	1.5	0.6
Thermocouple T-type Single ended -200 to 400°C, sub-range 0 to 400°C		0.6

Digital Ranges
The accuracy for all of the digital ranges is ±(0.0035% of reading + 1Hz/Count).

Time
The real-time clock accuracy is better than 3 seconds per day plus the initial 1 second setting accuracy.