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## Squirrel 2020 series

Powerful data loggers for standard and high speed applications

### Overview

The Squirrel 2020 series are high performance universal data loggers packed with powerful features to provide great flexibility to handle a wide range of routine and demanding applications.

Hand-held and lightweight, the Squirrel 2020 models are easy, fast and convenient to use – either as stand-alone loggers or as PC-linked data acquisition systems in industrial and scientific research and quality assurance applications.

Twin processors, multiple 24-bit analogue-to-digital converters, up to 16 universal channels and a choice of communications methods ensure that the Squirrel 2020 series provides state-of-the-art data logging and communication capability for sophisticated applications needs.



### Key features

- » Fully configurable via the integrated keypad
- » 8 true differential or 16 single ended universal analogue inputs for voltage, current or resistance
- » Analogue inputs can be used with thermistors, thermocouples, 2,3 or 4 wire RTD temperature sensors and 4-20mA signals
- » Logging rates of up to 100Hz on up to 2 channels (2F8 only)
- » Ethernet (2F8 only), USB and RS232 communication ports
- » Large non-volatile internal memory storage for up to 14 million readings
- » Removable MMC / SD card

- » Sensor power and FET outputs for use with external devices
- » Clear 128\*68 dot graphical LCD display

### Analogue inputs supported

- » Thermistors
- » Thermocouples
- » Pt100 / Pt1000 (maximum of four 3- or 4-wire Pt100 / Pt1000 sensors — model 2F8 only)
- » Voltage
- » Current
- » Resistance

The Squirrel 2020 series comprises two models:

- » **Squirrel 2020 – 1F8**
  - Up to 20 readings per second on 1 channel
- » **Squirrel 2020–2F8 (high speed model)**
  - Up to 100 readings per second on 2 channels
  - In-built Ethernet connectivity
  - Up to four 3- or 4-wire Pt100 / Pt1000 sensor inputs



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# Measurement, Control, and Datalogging Solutions



- » Up to 16 universal inputs
- » High precision (0.05% of reading + 0.025% of range)
- » Advanced data management to MMC /SD card or PC
- » Flexible communications (USB, Ethernet, RS232)
- » High speed option (100Hz)



## Communications

Ethernet (2F8 only), USB and RS232 serial ports are inbuilt. This allows simple connection to either a PC based TCP/IP network, a wireless to PC connection or to a GSM modem for remote data downloading. This flexibility enables global data access and retrieval as well as complete system integration of the SQ2020 series into complex and critical applications

## Multiple configurations stored in the logger:

Up to six logger configurations ( channel type, names, logging speeds, triggers etc.) together with the current configuration can be held in the logger's internal memory. Additional configuration settings can also be loaded from the external MMC/SD memory card. This allows the operator to quickly and easily switch between logger configurations without the need for a PC

## Software configuration via SquirrelView:

The SquirrelView software (supplied with the SQ2020 series data loggers) allows logger configuration, data download and export whilst giving the user full control over SQ2020. The optional SquirrelView Plus gives the user access to many advanced data analyses and archiving/transfer features. Refer to SquirrelView data sheet for specifications.

## Concurrent sampling:

The SQ2020 series uses multiple analogue and digital converters that enables true concurrent sampling and logging. It Allows the user to configure a channel to log at a rate of 100Hz(20Hz on 1F8) whilst retaining different sample speeds on the other channels. Ideal for measuring dynamic parameters that change at different rates such as temperature and pressure.

## Applications



Manufacturing



Biological Sciences



Medical Research

## Capabilities

- » Create complex schedules of logging rates, triggers and alarm outputs
- » Scale and view readings in real time on the integral display or on a PC running SquirrelView
- » Select logging rates up to 100 readings per second on up to 2 channels (20Hz maximum on Squirrel model 2020-1F8)
- » Derive up to 16 calculated (virtual) channels from real input channels using mathematical functions





## Squirrel 2020 Technical Specifications

	SQ2020-1F8	SQ2020-2F8
Analogue input channel options	Analogue to digital converters: 1 Differential: 8 Single Ended*: 16 3 or 4 wire: 0	Analogue to digital converters: 2 Differential: 8 Single Ended*: 16 3 or 4 wire: 4
Additional channels * Please refer to our Technical Note for the configuration of these inputs	Pulse: (2 x fast-64kHz)& (2 x slow - 100Hz) Event/digital: 8 state inputs or 1 x 8 bit binary Single Ended*: 2 3 or 4 wire: 1 temperature	Pulse: (2 x fast-64kHz)& (2 x slow - 100Hz) Event/digital: 8 state inputs or 1 x 8 bit binary Single Ended*: 2 3 or 4 wire: 1 temperature
Logging speed	20 readings / sec on 1 channel	100 readings / sec on 2 channels
Communication	Standard:RS232 ( Auto bauding to 115200 baud) USB 1.1 & 2.0 compatible External options: GSM, Wifi and PSTN Modems	Standard:RS232 ( Auto bauding to 115200 baud) USB 1.1 & 2.0 compatible Ethernet 10/100 base TCP/IP. Requires external power supply. External options: GSM, Wifi and PSTN Modems
Analogue inputs	Accuracy: (at 25°C) voltage and resistance (± 0.05% readings + 0.025% range) Common mode rejection: 100dB Linearity: 0.015% Input impedance: > 1MΩ Series mode line rejection: 50/60Hz 100dB	
Analogue - digital conversion	Type: Sigma - Delta Resolution: 24bit Sampling rate: up to 10, 20* or 100* readings per sec. per ADC. No 100Hz on 1F8 (* with mains rejection off)	
Thermistor Ranges	Y & U-type: - 50 to 150°C Pt100/ Pt1000: - 200 to - 850°C (2 wire only on 1F8) Customer specific thermistor range	
Thermocouple Ranges; Differential and Single Ended	K-type: - 200 to 1372°C T-type: - 200 to 400°C N-type: - 200 to 1300°C	R-type: - 50 to 1768°C S-type: - 50 to 1768°C J-type: -200 to 1200°C B-type: 250 to 1820°C C-type: 0 to 2320°C D-type: 0 to 2320°C
Working environment	- 30 to 65°C, RH up to 95% (non-condensing)	
Voltage Ranges; Differential and Single Ended	- 0.075 to 0.075V, - 0.15 to 0.15V, - 0.3 to 0.3V, - 0.6 to 0.6V, 0.6 to 1.2V, 0.6 to 2.4V, - 3.0 to 3.0V, - 6.0 to 6.0 V, -6.0 to 12.0V, - 6.0 to 25.0V	
High voltage input range	4.0 to 20.0V, 4.0 to 40.0V, 4.0 to 60.0 (max 2 may be selected)	
Current Ranges, Differential (Requires external 10Ω shunt)	-30.0 to 30.0mA, 4 to 20mA	
Resistance Ranges, all 2 wire	0.0 to 1250Ω, 0.0 to 5000Ω, 0.0 to 20000Ω, 0.0 to 300000Ω	
Resistance range 3 and 4 wire (2F8)	0.0 to 500Ω, 0.0 to 4000Ω	
Digital/Alarm Outputs	4 open drain FET (18V 0.1A)	
Memory	Internal: up to 128M(up to 14 million readings) External: Up to 1Gb - removable MMC/ SD ( for transferring internal memory and storing setups only)	
Internal memory modes	Stop when full or overwrite	
Calculated channels	Up to 16 virtual channels derived from physical input channels	
Resolution	Up to 6 significant digits	
Display/Keypad	128*64 dot graphical display,4 button keypad	
Power supply	Internal: 6 x AA alkaline batteries External: 10-18VDC. Reverse and polarity and over-voltage protected	
Power consumption@ 9V	Sleep mode: 600µA Logging: 40 - 80 mA	
Power output for external device	Regulated 5VDC at 50mA or logger supply voltage at 100mA	
Time and Date	In-built clock in 3 formats	
Programming / logger setup	Squirrelview or Squirrelview Plus Software	
Dimensions (w x d x h), weight	235 mm x 175 mm x 55 mm, 1.2 kg, enclosure material ABS	

Please note: SQ2020 is supplied with software, manual, USB cable, wall bracket, batteries and 4 current shunt resistors.

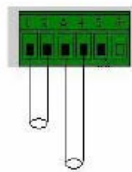


# DATA ACQUISITION Technical Information

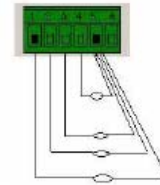


## SQ2020 1F8 channel inputs

The SQ2020 1F8 Squirrel data logger has a single analogue to digital converter (A/D) which corresponds to inputs on blocks A through to D (see below). Each connection block will accept up to 2 differential inputs or up to 4 single ended inputs (it is *not* possible to mix single ended and differential inputs on a block).



Differential Inputs



Single Ended Inputs



Input blocks A, B, C and D

### Mains rejection – what is it?

With mains rejection activated, the Squirrel data logger compensates for any interference from the local mains electricity supply (at either 50 or 60 Hz). This can be set in the logger setup screen in SquirrelView.

For higher logging speeds, the mains rejection can be turned off. However, this will have the effect of reducing the reading accuracy dependant upon the level of interference then experienced by the Squirrel data logger.



## DATA ACQUISITION Technical Information

### With Mains Rejection turned on (default setting)

The SQ2020 1F8 can take up to 10 readings per second, this can be 10 readings on a single channel or 10 readings spread across multiple channels.

When wanting to log once a second or faster with mains rejection turned on the SQ2020 1F8 can have any **ONE** of the following configurations across the blocks A, B, C and D.

	Samples per Second			
	10	5	2	1
Configuration 1	1			
Configuration 2		2		
Configuration 3			5	
Configuration 4				10
Configuration 5		1	2	1
Configuration 6		1	1	3
Configuration 7		1		5
Configuration 8			4	2
Configuration 9			3	4
Configuration 10			2	6
Configuration 11			1	8

**Note:** Each configuration refers to the number of inputs possible with the selected sample speed.

For example: Configuration 5 has 1 input at 5 samples per second, 2 inputs at 2 samples per second and 1 input at 1 sample per second. Therefore the maximum number of channels that can be sampled is 4.



## DATA ACQUISITION Technical Information



### With Mains Rejection turn Off

The SQ2020 1F8 can take up to 20 readings per second, this can be 20 readings on a single channel or 20 readings spread across multiple channels.

When wanting to log once a second or faster with mains rejection turned off the SQ2020 1F8 can have any **ONE** of the following configurations across the blocks A, B, C and D.

	Samples per Second				
	20	10	5	2	1
Configuration 1	1				
Configuration 2		2			
Configuration 3			4		
Configuration 4				10	
Configuration 5					16
Configuration 6		1	2		
Configuration 7		1	1	2	1
Configuration 8		1	1		5
Configuration 9		1		5	
Configuration 10		1		4	2
Configuration 11		1		3	4
Configuration 12		1		2	6
Configuration 13		1		1	8
Configuration 14		1			10
Configuration 15			3	2	1
Configuration 16			3		5
Configuration 17			2	5	
Configuration 18			2	4	2
Configuration 19			2	3	4
Configuration 20			2	2	6
Configuration 21			2	1	8
Configuration 22			2		10
Configuration 23				9	2
Configuration 24				8	4
Configuration 25				7	6
Configuration 26				6	8
Configuration 27				5	10
Configuration 28				4	12
Configuration 29				3	13
Configuration 30				2	14
Configuration 31				1	15

**Note:** Each configuration refers to the number of inputs possible with the selected sample speed.

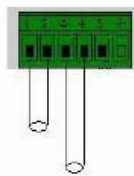
For example: Configuration 18 has 2 inputs at 5 samples per second, 4 inputs at 2 samples per second and 2 inputs at 1 sample per second. Therefore the maximum number of channels that can be sampled is 8.

DATA ACQUISITION  
Technical Information

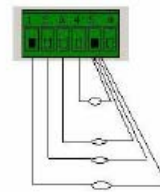


**SQ2020 2F8 channel inputs**

The SQ2020 2F8 Squirrel data logger has two analogue to digital converters (A/D's) which increases logging flexibility over the 1F8 model. The first corresponds to inputs on blocks A and B and the second corresponds to inputs on blocks C and D (see below). Each connection block will accept up to 2 differential inputs or up to 4 single ended inputs (it is *not* possible to mix single ended and differential inputs on a block).



Differential Inputs



Single Ended Inputs



The First A/D uses input blocks A&B

The Second A/D uses input blocks C & D

**Mains rejection – what is it?**

With mains rejection activated, the Squirrel data logger compensates for any interference from the local mains electricity supply (at either 50 or 60 Hz). This can be set in the logger setup screen in SquirrelView.

For higher logging speeds, the mains rejection can be turned off. However, this will have the effect of reducing the reading accuracy dependant upon the level of interference then experienced by the Squirrel data logger.



## DATA ACQUISITION Technical Information



### With Mains Rejection turned on (default setting)

The SQ2020 2F8 can take up to 10 readings per second on blocks A and B, and 10 readings per second on blocks C and D. This can be 10 readings on a single channel or 10 readings spread across multiple channels across blocks A and B, and 10 readings on a single channel or 10 readings spread across multiple channels across blocks C and D.

When wanting to log once a second or faster with mains rejection turned on the SQ2020 2F8 can have any **ONE** of the following configurations across blocks A and B, and **ONE** of the following configurations across blocks C and D.

Per A/D	Samples per Second			
	10	5	2	1
Configuration 1	1			
Configuration 2		2		
Configuration 3			5	
Configuration 4				8
Configuration 5		1	2	1
Configuration 6		1	1	3
Configuration 7		1		5
Configuration 8			4	2
Configuration 9			3	4
Configuration 10			2	6

**Note:** Each configuration refers to the maximum number of inputs possible with the selected sample speed.

For example: Configuration 5 has 1 input at 5 samples per second, 2 inputs at 2 samples per second and 1 input at 1 sample per second. Therefore the maximum number of channels that can be logging on a single A/D in this configuration is 4.



## DATA ACQUISITION Technical Information



### With Mains Rejection turn Off

The SQ2020 2F8 can take up to 100 readings per second on blocks A and B, and up to 100 readings per second on blocks C and D. This can be 100 readings per second on a single channel or 20 readings per second spread across multiple channels across blocks A and B, and 100 readings per second on a single channel or 20 readings per second spread across multiple channels across blocks C and D

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

When wanting to log once a second or faster with mains rejection turned off the SQ2020 2F8 can have any **ONE** of the following configurations across blocks A and B, and **ONE** of the following configurations across blocks C and D.

Per A/D	Samples per Second					
	100	20	10	5	2	1
Configuration 1	1					
Configuration 2		1				
Configuration 3			2			
Configuration 4				4		
Configuration 5					8	
Configuration 6						8
Configuration 7			1	2		
Configuration 8			1	1	2	1
Configuration 9			1	1		5
Configuration 10			1		5	
Configuration 11			1		4	2
Configuration 12			1		3	4
Configuration 13			1		2	5
Configuration 14			1		1	6
Configuration 15			1			7
Configuration 16				3	2	1
Configuration 17				3		5
Configuration 18				2	5	
Configuration 19				2	4	2
Configuration 20				2	3	3
Configuration 21				2	2	4
Configuration 22				2	1	5
Configuration 23				2		6
Configuration 24					7	1
Configuration 25					6	2
Configuration 26					5	3
Configuration 27					4	4
Configuration 28					3	5
Configuration 29					2	6
Configuration 30					1	7

**Note:** Each configuration refers to the number of inputs possible with the selected sample speed.





## DATA ACQUISITION Technical Information



For example: Configuration 19 has 2 inputs at 5 samples per second, 4 inputs at 2 samples per second and 2 inputs at 1 sample per second. Therefore the maximum number of channels that can be logging on a single A/D in this configuration is 8.

### Setting up Channels Squirrelview

When setting the channels in Squirrelview where you are not able to use every channel because of the sample rates, you need to make sure the setup is correct. In the diagram below you can see the red line denotes the divider between the 2 A/D's and in the case below there is one channel at 100 Hz on the first A/D and 1 channel at 20 Hz on the second A/D.

The screenshot shows the 'Logger Setup (Untitled) - For 2F8 Loggers' window. It features a menu bar (File, Squirrel View, Options, Help) and a toolbar. The main area is a table with columns: Sensor Type, Description, Block, Connections, and Log Method. The table is divided into two sections: 'Calculated Channels' and 'Actual Channels'.

Sensor Type	Description	Block	Connections	Log Method
Voltage - Differential : -6 to 25 V	Channel 1	A	1(+ve) to 2(-ve)	Sample Interval: A (100 Readings Per Second) Logging Interval: (00:00:00)
Not Set	Not Set	A		Not Set
Not Set	Not Set	A		Not Set
Not Set	Not Set	A		Not Set
Not Set	Not Set	B		Not Set
Not Set	Not Set	B		Not Set
Not Set	Not Set	B		Not Set
Not Set	Not Set	B		Not Set
Voltage - Differential : -6 to 25 V	Channel 2	C	1(+ve) to 2(-ve)	Sample Interval: B (20 Readings Per Second) Logging Interval: (00:00:00)
Not Set	Not Set	C		Not Set
Not Set	Not Set	C		Not Set

Below the table are several control panels:

- Logger Control:** Includes buttons for 'Set Logger Time Manually' and 'Set Logger Time to PC Time'. The PC Time is shown as 06/09/2006 16:48:09.
- Logger Identification:** Fields for 'Logger ID' and 'Job Description'.
- Memory Mode:** A dropdown menu set to 'Stop when Full' and a 'Max Memory Allocated to this Job' dropdown set to 'All Free Memc'.
- Delayed Start:** Includes an 'Enable' checkbox and radio buttons for 'Real Time' and 'Elapsed'.
- Sensor Power Timers:** Fields for 'A (Supply)' and 'B (SV)' with time and 'Continuous' checkboxes.
- Start Logging At:** A date and time field set to 06/09/2006 16:46:34.
- Communication:** A section at the bottom of the interface.

