1256 – A2

Grant
Working Instructions for 1250 Series Remote Squirrel Meter/Logger

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Introduction

These instructions are for the Squirrel itself, and do not include full details of remote operation, data transfer or analysis. Separate instructions are provided with each Grant computer program, and details of data output format are available for users who wish to write programs for other computers.

The following words have specific meanings in these instructions:

Resolution This is the minimum difference between two readings on the same range. For example, readings on a range of 0 to 62500Hz can be 0, 1, 2, 3....62498, 62499, 62500. The resolution is therefore 1Hz.

State When an event/digital channel is used to log events (as opposed to digital numbers), readings from each of the eight event inputs are stored either as "0" (contacts closed or voltage low) or as "1" (contacts open or voltage high). The number 0 or 1 is called the "state".

Note: The word "state" is also used in "logging state" (see E – Function 1) which can be **off, stop, start** or **log.**

A   Identification and Memory Size

A1 Model and Serial Number

1250 series Squirrels are made in different models, each with a particular combination of input types and ranges. Details of inputs and ranges for your Squirrel are listed on the data sheet supplied with these instructions. Model and serial number are printed on the Squirrel.

A2 Memory size

Data is stored as 12-bit numbers, each using one "memory slot". 1250 series Squirrels are available with approximately 41000, 84000 or 172000 memory slots. These values are halved when the Squirrel is used in latest mode so that one half can be used for logging while the other half is being downloaded. (See sub-functions 1.1 and 1.2 to check memory size and 7.2 to check logging mode).

The length of time logging can continue in earliest mode depends on the memory size and either the interval (for regular readings), or the frequency of readings (for readings triggered by events or alarms), or both. It is also dependent on the capacity remaining in the internal batteries or the external supply. In latest mode, the length of time logging can continue depends only on the capacity remaining in the internal batteries or the external supply.

Each set of readings uses one slot per channel (two slots per pulse-count channel). Readings triggered by an event or alarm use an extra three slots per set of readings to record date and time.

For example, a Squirrel with a 41000 slot memory set to record in earliest mode from eight channels at one-hour intervals would use 192 memory slots a day, so logging could continue for over 30 weeks. If the same Squirrel also had event or alarm readings occurring at an average rate of one per hour, 456 memory slots would be used per day and logging could only continue for over 12 weeks.

More memory is used if several logging runs are made in sucession without clearing the memory because a "header block" of up to 265 slots is stored in the memory at the beginning of each run. Multiple runs are not possible in latest mode.

B Safety and Operating Conditions

B1 Operator safety

TO PROTECT AGAINST SHOCK HAZARDS TO OPERATORS, Squirrel inputs and outputs should not be connected to voltages of more than 25V d.c. or r.m.s. a.c. with respect to earth (ground) unless the Squirrel is inside a protected enclosure.

B2 Squirrel safety

The insulation of the Squirrel is designed for voltages up to 25V. DO NOT APPLY LARGER VOLTAGES OR THE SQUIRREL COULD BE DAMAGED.

B3 Errors caused by ground connections

Voltage, current and thermocouple inputs While a reading is being taken these have both input terminals connected through a resistor network to Squirrel ground. At all other times both terminals are floating.

Squirrel ground may become connected to mains ground (earth), for example through a mains-operated computer or an earthed mains power pack. If this happens, measuring errors will be caused if *both* input terminals are at a voltages of more than ±0.5V with respect to Squirrel ground. No errors are caused if only one terminal is at a higher voltage.

All other inputs and outputs have one terminal permanently connected to Squirrel ground.

B4 Operating conditions

The Squirrel can be used at temperatures between −30 and +65°C and with relative humidity up to 95% (non-condensing).

At ambient temperatures below −5°C the LCD becomes progressively slower to change, and may go out altogether at temperatures below −30°C. However, this will not affect any other functions of the Squirrel: readings will be retained in the memory and logging will continue.

If a Squirrel is used in a low ambient temperature, internal condensation can occur if it is brought into a warmer atmosphere. The Squirrel should be placed in a plastic bag, sealed where cables pass into it. The bag should not be unsealed until the Squirrel has reached room temperature.

B5 Protection against memory loss

If the power supply voltage approaches a level where memory loss could occur, logging is stopped automatically. If any button is pressed the display will show **0.2 bat LO** for 2 seconds and then go out again. Readings stored in the memory will be preserved for at least three months after logging stops.

B6 Cleaning

Grease and dirt can be removed from the case with a mild soap solution on a damp cloth.

C Power Supply

C1 Internal batteries

The Squirrel is supplied with six size AA manganese-alkaline non-rechargeable 1.5V batteries (e.g. Duracell MN1500) which are easily available throughout the world.

If the internal batteries are down to less than a third of their original capacity, the word **bat** is included in the display.

C2 Changing internal batteries

C2 Batteries must be changed within 1 minute.
C3 Battery life remaining (indicated in days) is only 80% of that displayed.

This can be done while logging if an external power supply is connected while the batteries are changed. The external power supply must be above 7V as measured in function 0.3. Always replace the batteries as a complete new set of six, all of the same type and manufacturer.

If the batteries become completely exhausted and are replaced with a new set, the Squirrel will flash all the segments of the display, or **8.8 88888**, for up to 5 minutes whilst checking the memory.

If no external power supply is available, it is necessary to stop logging and wait for the display to go out before replacing the batteries. Settings and stored readings will be preserved, provided the change is completed within 1 minute. Logging can be restarted as soon as the new batteries have been fitted.

NEVER INSERT BATTERIES THE WRONG WAY ROUND

C3 Power consumption and battery life calculation

Function 0.2 displays the approximate remaining life of the *internal* batteries in days, while logging and while retaining data after the memory is full. The calculation also allows for enough power at the end to transfer all stored data to a computer. The battery life figure may increase if the number of channels set to log is increased (or the interval reduced) because the memory will be filled sooner.

The battery life calculation takes account of the channels, ranges and alarms selected, the logging mode, start and stop dates, and the recording and scanning intervals. The worst case is assumed if the length of a logging run depends on outside factors (examples are the event mode and externally triggered logging). Remote operation of the Squirrel uses more power, but, since this is under the user's control, it cannot be included in the battery life calculation.

The calculation is based on the battery voltage. It is approximate, and may go up and down by a few days as the battery voltage fluctuates. It applies only in ambient temperatures down to −20°C. At lower ambient temperatures life varies from battery to battery and at −30°C can be as low as one-tenth of normal life.

In earliest mode and using interval or event logging, without alarms, a new set of internal batteries will provide logging for six months or until the memory is full. Use of the alarm or averaging functions increases the battery consumption, so an external power supply should be used if the battery life indication in 0.2 shows this is necessary. It is also recommended that an external supply is used when in latest mode or for remote operation.

Functions 2 to 0 use much more power, so battery life should be checked in sub-function 0.2 before leaving the Squirrel to log. To save battery life, the display switches off automatically approximately 15 seconds after the last press of any button while in function 1, 10 minutes in functions 2 to 0.

C4 Additional external power supplies

The Squirrel can also be used with an additional external power supply. This is recommended for remote operation due to the higher power required to carry out the communications. If the external supply is disconnected the internal batteries provide back-up to keep the memory alive (see B5) or to continue logging. Note that with the external supply connected the number of days displayed in sub-function 0.2 will be an over-estimate.

Additional battery pack BP9 can be fixed to the Squirrel. It holds six size C manganese-alkaline batteries such as Duracell MN1400 (total 9V, 5.5Ah), and gives about 2½ times the life of internal batteries.

RB12 rechargeable battery (12V, 15Ah) gives about 7 times the life of the internal batteries before needing to be re-charged. MP9 power packs are available for operation from mains supplies.

Other power supplies can be used, with a voltage of 9 to 14V d.c. Connection cable LC27 incorporates a 250mA fuse to prevent damage in case of a fault.

C5 Rechargeable batteries

WE DO NOT RECOMMEND THE USE OF RECHARGEABLE NICKEL-CADMIUM BATTERIES in the Squirrel's internal battery compartment. Although these batteries will operate the Squirrel, it is not possible to measure how long they will continue to provide sufficient power because their output voltage remains almost constant throughout their working life, then falls rapidly.

D Switches

The block of four small switches is visible after removing the battery cover. The illustration shows the switches in an intermediate position. In practice either the letter or number is covered by the slider.

ON/OFF switch (yellow) switches off the Squirrel completely. Memory and settings are lost after 2 minutes. However, the power consumption when not logging is so low that it is only necessary to switch off completely if the Squirrel will not be used for several weeks.

RUN/RESET switch (orange) This is mainly for service engineers and is normally left at RUN. It can also be used to reset the Squirrel in the unlikely event of "lock-up" or "crashing" which could be caused by partially exhausted batteries or logger malfunction. To reset, put the yellow switch to OFF, then the orange switch to RESET. After 2 minutes, return the switches to ON and RUN, then the Squirrel will flash all the segments of the display, or **8.8 88888**, for up to 5 minutes whilst checking the memory. Settings and stored data will be lost but the Squirrel should operate normally.

50Hz/60Hz switch (red) The Squirrel has a circuit to reject mains interference and this must be set for 50Hz or 60Hz according to the local mains supply at the logging site. This must be set even if the Squirrel is operating on its internal batteries.

°C/°F switch (brown) The temperature ranges are displayed in °C or °F depending on the setting of this switch when the range is selected in function 5. If the switch is later changed, it will have no effect until the range is deselected and selected again.

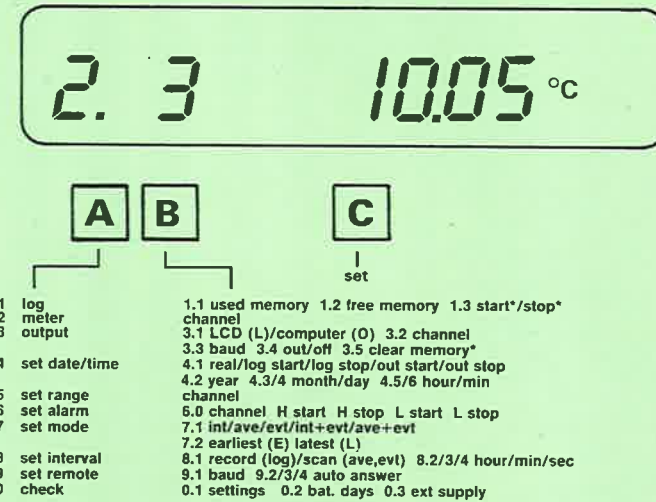|				
BROWN – °C	▶		◢	°F
RED – 50Hz	B		2	60Hz
ORANGE – RUN	⌒		3	RESET
YELLOW – ON	▭		◣	OFF
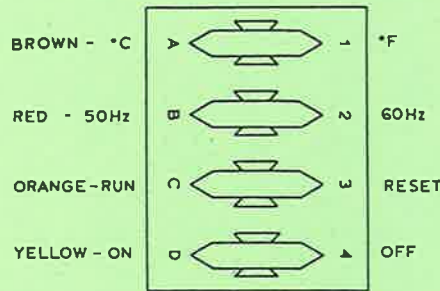
E Operation

The easiest way to learn how to operate the Squirrel is to go through the different setting functions a few times before starting the first logging run. The best order to do this is the same as when actually logging, as follows:
– switch on (see section D)
– set logging parameters in functions 4 to 8
– check settings and power supply in function 0
– check memory and logging state/mode in sub-functions 1.1 and 1.2
– initiate logging in sub-function 1.3
– display present values in function 2
– review stored readings in function 3
– stop logging in sub-function 1.3
– output to computer in function 3
– clear memory in sub-function 3.5.

Unless stated otherwise, the settings in functions 4 to 8 can only be altered while the logging state is **off** or **stop** (see function 1).

Typical display showing buttons and operating instructions

$$2.3 \qquad 10.05 \,°C$$

A	B		C
			set

1	log	1.1 used memory 1.2 free memory 1.3 start*/stop*
2	meter	channel
3	output	3.1 LCD (L)/computer (O) 3.2 channel
		3.3 baud 3.4 out/off 3.5 clear memory*
4	set date/time	4.1 real/log start/log stop/out start/out stop
		4.2 year 4.3/4 month/day 4.5/6 hour/min
5	set range	channel
6	set alarm	5.0 channel H start H stop L start L stop
7	set mode	7.1 int/ave/evt/int+evt/ave+evt
		7.2 earliest (E) latest (L)
8	set interval	8.1 record (log)/scan (ave,evt) 8.2/3/4 hour/min/sec
9	set remote	9.1 baud 9.2/3/4 auto answer
0	check	0.1 settings 0.2 bat. days 0.3 ext supply

Operating buttons

All operations are carried out with the three buttons on the front of the Squirrel labelled A, B and C above. Button A changes the function (first section of display), button B the sub-function or channel number (second section of display), and button C the other parts of the display. Settings made with button C are "fixed" by the next press of button A or button B.

Buttons can be pressed and released to change one step at a time. Holding a button down normally causes the display to step rapidly.

Display

All the segments on the display are shown below. As a check, all segments are displayed when C is pressed in sub-function 1.1.

```
ave    out   evt   int real start stop
            off                        TJ Hz
 8.18      bat   8:8.8:8.8  °C°F %
            log                        KmVA
```
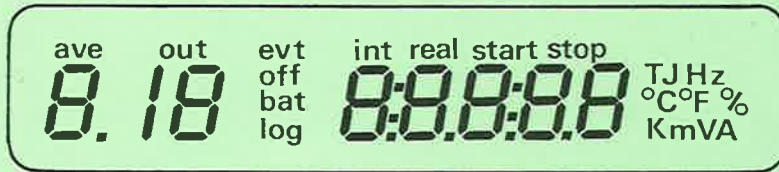
To save battery life, the display is automatically switched off approximately 15 seconds after the last press of any button while in function 1, 10 minutes after in functions 2 to 0.

The left-hand digit (below **ave**) displays the function number, corresponding with the first column of the instructions printed below the display. In function 6 this digit indicates whether the high or low arm level is being set.

The next two digits (below **out**) indicate the channel number or sub-function corresponding with the second column of the instructions.

The other five digits display readings or other information. Flashing is used to show that the indication concerned can be altered. A display of ━━━━━ shows that an indication is not set or not available.

Units of measurement are displayed to the right of the numbers.

Other information is given by the relevant annunciator (**ave, out, evt,** etc) being turned on.

HELP display

If **HELP** appears on the display, one or more settings must be, or have automatically been, changed so the Squirrel can function correctly. This can happen if inadmissible or incompatible settings have been made, such as a stop time set earlier than a start time..It can also happen if a vital setting has not been made at all, such as selection of at least one channel to log.

HELP is always followed by a number which indicates the function in which a setting needs to be, or has automatically been, made or corrected. Cycling to the necessary sub-function will show one of the following:
– inadmissible setting replaced by admissible setting (which can then be altered if desired)
– inadmissible setting cancelled (set to ━━━━━) but no other setting substituted
– inadmissible setting remains as ━━━━━ and user must make a setting (for example, at least one channel must be set to log)
– memory full (in sub-function 1.1).

EEEEE display and lock-up

In the unlikely event of a software "crash" the Squirrel will stop loggging but the readings in the memory will be preserved. Pressing any button will display **1.1 stop** and **EEEEE**. Data can be downloaded to a computer and logging can be re-started in the normal way (check settings first in 0.1).

Should the Squirrel "lock up" and all the buttons become inoperative, reset the Squirrel as described in **D**. Memory and settings will be lost.

NOTE The buttons will also be inoperative when in remote operation. When in this mode the display will show **out** and **232**. See section K, Remote operation, for more information.

FUNCTION 1 – log

| 1 log | 1.1 used memory | 1.2 free memory | 1.3 start*/stop* |

Function 1 is primarily used to start and stop logging (sub-function 1.3). Sub-functions 1.1 and 1.2 enable the user to check the Squirrel's logging state and mode, the amount of memory, and the LCD.

Logging state and mode

Logging state The four logging states are:
off – not logging, no readings stored in memory
stop – not logging, but readings stored in memory
start – not yet logging, but set to start at a preset time or on receipt of an external start signal or when an alarm level is crossed (see sections E (Function 4), F and G).
log – logging in progress.
Logging mode is displayed as one or two of **int, ave,** and **evt** (set in function 7).

1.1 used memory

The display shows the logging state, the logging mode and the number of memory slots already used for storage of "header blocks" (see A2) and readings. Pressing C displays all segments of the LCD to check that they are functioning.

When latest mode has been selected in 7.2 and the memory is full, the display automatically returns to zero and then counts up again.

1.2 free memory

The display shows the logging state, the logging mode and the number of memory slots available for further logging. If the memory has been cleared (see sub-function 3.5) the display shows the Squirrel's total memory capacity. If there are readings in the memory, and the Squirrel is in earliest mode, the total memory can be checked by adding together the number of readings displayed in 1.1 and 1.2.

When latest mode has been selected in 7.2 and the memory is full, the display will show **LOOP** to indicate the oldest readings are being overwritten.

1.3 start*/stop*

To initiate a logging run Press C for 2 seconds. The word **off** or **stop** changes to **start** or **log**.
To stop a logging run Press C for 2 seconds. The word **log** or **start** changes to **stop**. Pressing C for 2 seconds stops logging even if a preset stop time has been set (see function 4), and resets log stop and log start times to ━━━━━.

HELP displays in function 1

HELP 1 is displayed when a faulty memory location is found or when trying to start logging if the memory is full.
HELP 4 is displayed if log start or stop time have been set earlier than the real time.
HELP 5 is displayed if no channels have been set to log.
HELP 7 is displayed if set in latest mode and the memory is not empty. Return to 3.5 and clear the memory.

Function 2 – meter

2 meter   channel

Readings can only be displayed·for a channel if a range has been selected in function 5. Select the desired channel with B. The display shows the present value from that channel, updated at least at the minimum interval rate (see data sheet card).

```
2. 3        10.05 °C
```

Over-range readings are displayed as **HI**, under-range as **LO**. Open-circuit thermocouple probes are displayed as **OP**.

Pulse count channels set to count will display an accumulating total. Except when in the **log** state, the count can be reset to zero by pressing button C.

Event channels set to "state" range are displayed as two half-channels, **H** plus inputs 8 to 5 and then **L** plus inputs 4 to 1.

When using a 1250 series Squirrel in the restricted mode (see Function K, Remote operation, for more information), function 2 is the only function available. B will still select the channel as normal. C will only work if the Squirrel is not logging.

Function 3 – output

3 output	**3.1 LCD(L)/computer(O)**			
	3.2 channel	**3.3 baud**	**3.4 out/off**	**3.5 clear memory***

When the Squirrel is set to earliest mode in sub-function 7.2, stored data can be displayed on the LCD or fed to a computer. Data can only be fed to a computer from completed runs. Function 3 is inoperative while there are no readings stored in the memory.

When latest mode is selected, only function 3.5 is available.

3.1 enables the output to be set to LCD (**L**) or computer (**O**). 3.2 to 3.4 are used as described below, according to the type of output selected.

3.5 allows the memory to be cleared, but only if the logging state is **stop** (the logging state flashes on the display). Press C for 2 seconds to clear the memory: **stop** changes to **off** and all start and stop times are unset and displayed as ▬▬▬▬▬.

Output to display will be of all readings unless output start and stop times have previously been set in function 4. The Squirrel takes approximately 10 seconds per 1,000 readings to find the selected **out start** time. Output can be stopped at any time by pressing A or B.

Display stored readings (L)

In 3.2, pressing C displays each channel number in turn (flashing) in the right-hand section together with **L**. Event channels set to "state" range are displayed as two half-channels, **H** plus inputs 8 to 5 and then **L** plus inputs 4 to 1. When the desired channel number appears, press B. The display changes to **3.4, off** (flashing), and **L**. Press C to display the earliest reading of the selected time period. Press and release C to step through readings one at a time, or at a rapid rate if C is held down.

At the end of each recording run **PIP** is displayed, then the readings from the next run. If C is being held down for rapid stepping, release and press again to display the next run.

At the end of the last run, **E** is displayed and **out** changes to **off** on the next press of C. B can then be stepped through 3.5 and 3.1 to obtain 3.2 again and select another channel for display.

The first reading on a pulse channel set to count will be displayed as ▬▬, as will any other readings where no data could be stored.

If no readings have been stored from the selected channel for a particular run, ▬▬▬▬▬ will be displayed followed by **PIP** or **E**. C can then be pressed to display readings from any later runs.

Output to computer (O)

Connect the computer to the Squirrel and select **O** in 3.1. Press B to display **3.3** and baud rate, which can be selected with C. This is the same baud rate as that used in sub-function 9.1; any changes in 3.3 will also be made in 9.1. Fixing the baud rate with B displays **3.4,** with **0** and **off**. Press C to change **off** to **out**. Readings are then transferred as demanded by the computer. **0** changes to a four digit number which increments as each block of data is transferred to the computer.

```
3. 3        4800
```
baud rate

Function 4 – set date/time

4 set date/time   **4.1 real/log start/log stop/out start/out stop**
                 4.2 year   **4.3/4 month/day**   **4.5/6 hour/min**

Select 4.1 and step with C to the type of date and time to be set. Press B to move to 4.2. Select year with C and fix with B. Then set month, day, hour and minute in 4.3 to 4.6 in the same way.

Real date and time

Real time is set to the nearest minute, but can be synchronised with other devices to the nearest second (see H2 for details).

```
4. 3        real
            1 1:30
```
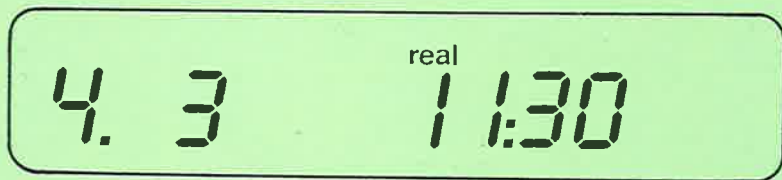
Log start and stop

This allows preset times to be set for the start and end of a logging run. Log start and stop times are reset to ━━━━━ when logging is stopped manually in sub-function 1.3 and when the memory is cleared. Log start time can be altered after the end of a logging run. Log stop time can be altered at any time.

Output start and stop

This enables a display of stored readings to be those taken only during a selected period. Output start and stop times can be altered during or after logging, and are reset to ━━━━━ when the memory is cleared.

HELP displays in function 4

HELP 4 will be displayed if:
– log start or stop times are set earlier than real time
– log stop time is set earlier than log start time
– out stop time is set earlier than out start time
– log stop or out start/stop are changed while logging or waiting to log and are set earlier than real
   time or log start time.

Function 5 – set range

5 set range   **channel**

A channel selected with B can be set with C to any of the ranges available for that channel, or set not to log (displayed as ━━━━━). The data sheet card gives a list of ranges for each channel. During setting, the display shows the maximum value of the range concerned, together with appropriate symbols (**mV, °C, K,** etc). The digital range is shown as **255**, and the "state" range is shown as **H1010.**

HELP displays in function 5

HELP 7 will be displayed if **evt** has already been selected in function 7 but the event channel has not been set to "state". It will also be displayed if **evt** only has already been selected in function 7 and a pulse count (not pulse rate) channel is selected.

HELP 8 will be displayed if a scan or record interval has already been set in function 8 and an attempt is made in function 5 to set too many channels to be able to log at the set interval (see data sheet card for minimum intervals).

Function 6 – set alarm

6 set alarm   **6.0 channel**   **H start H stop L start L stop**

See section G for description of alarm readings and the use of alarms to start and stop logging.

Alarm levels can be set on any analogue or pulse range, but can only be set on an event/digital channel when it is set to record digital numbers from 0 to 255.

When 6 is selected, **6.0** appears on the left with the number of the first channel set to log at the right. Step through the channel numbers with C and press B to enable alarm levels to be set on the selected channel. The display then shows **H**, channel number, **start** and ━━━━━ (flashing).

```
                    start
H 2     - - - - -
```
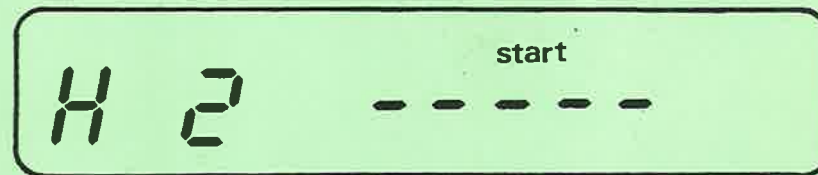
High alarm start level can now be set. Press C to display the lowest value of the range with the first digit (or the minus sign) flashing. Tap C and release quickly to step to the desired value. When the first digit has been set to the correct value, press C and hold it down until the next digit flashes. This again can be stepped to the desired value by tapping C and releasing quickly, and so on until all digits have been set. Then press B to set high alarm stop level.

High alarm stop level If an input value varies around the alarm level, the alarm signal will switch rapidly on and off. To avoid this, the stop level has to be lower than the start level for a high alarm (and higher for a low alarm). The difference is preset at 10 times the resolution, but can be changed to a different value (in the same way as the start level), subject to a minimum difference equal to the resolution.

Low alarm start and stop levels can be set in the same way.

ALARM LEVELS ARE CANCELLED AUTOMATICALLY IF THE RANGE OF A CHANNEL IS ALTERED IN FUNCTION 5.

HELP displays in function 6

HELP 6 is displayed if incorrect settings are attempted:
– alarm level outside the range set for the channel concerned
– high stop level not lower than high start level
– low stop level not higher than low start level
– high start level lower than low stop level
– low start level higher than high stop level.
HELP 8 is displayed if **int** is selected in function 7 and alarms are set with the scan interval greater than the record interval.

Function 7 – set mode

	record mode	memory mode
7 set mode	**7.1 int/ave/evt/int+evt/ave+evt**	**7.2 earliest(E)/latest(L)**

7.1 allows the record mode to be set. Press C to select mode. Modes are:

int – a set of readings is taken and stored at the end of each recording interval.

ave – inputs are scanned at the end of each scan interval and the average of the values obtained is stored at the end of each recording interval. Readings from pulse channels set to "count" and from event/digital channels set to "state" cannot be averaged, so the actual values at the end of the recording interval are stored.

evt – event inputs are scanned at the end of each scan interval. Whenever any of the eight inputs of the event/digital channel change from 0 to 1 or 1 to 0, time is stored and the state of each of the eight event inputs. Readings are also taken and stored from all other channels set to log. The **evt** mode can be used *only* if the event/digital channel is set in function 5 to its "state" range (displayed as **H1010** during range setting). "Count" channels cannot be used in **evt** mode.

If **evt** is selected as well as **int** or **ave**, readings from all channels are stored:
– at the end of each recording interval
– each time any event input changes state

7.2 allows the memory mode to be set. Press C to select mode. Modes are:

earliest (**E**) – readings are taken from the start time until the memory is full, or the stop time is reached. In this mode the whole memory is available for recording data.

latest (**L**) – in this mode the readings are also taken from the start time until the memory is full, however, subsequent readings then overwrite the earliest readings already in memory. When the data is downloaded, the readings start from the earliest ones still in memory. Only half of the memory is available for recording data in this mode, this means that THE MEMORY MUST BE CLEARED IN FUNCTION 3.5 BEFORE STARTING LOGGING IN LATEST MODE.
Multiple logging runs are not possible in latest mode.

HELP displays in function 7

HELP 5 is displayed if:
– **evt** is selected but the event channel has not been set to "state" in function 5
– **evt** only is selected with a pulse count/rate channel set to "count"
– **ave** is selected but none of the channels set in function 5 are of a type which can be averaged.

Function 8 – set interval

8 set interval	**8.1 record(log)/scan(ave,evt)**	**8.2/3/4 hour/min/sec**

8.1 record (log)/scan(ave,evt)

The recording interval (displayed as **log**) is the interval between storage of one regular set of readings (interval or average) and the next. The scan interval (displayed as **ave evt**) is the interval between readings taken for averaging, or the interval between scans to check if an event has occurred or an alarm level has been crossed.

No scan interval can be set if no alarms have been set in function 6 and the mode set in function 7 is **int** only. No recording interval can be set if the mode set in function 7 is **evt** only.

8.2/3/4 hour/min/sec

Recording and scan intervals can be set as hours and minutes (with seconds fixed at **0**) or as minutes and seconds (if hours are set to **00**). The maximum interval is 24 hrs 59 mins 0 secs. (See data sheet card for minimum intervals). The scan interval cannot be set to less than 1/4000 of the recording interval. For example, if the recording interval is 24 hours the scan interval cannot be shorter than 22 seconds.

```
 ave        evt
 8. 4       0.00.30
```

HELP displays in function 8

HELP 5 will be displayed if a scan or record interval is set which is too short for the number of channels set in function 5 (see data sheet card).

HELP 8 will be displayed if:
– record interval is set shorter than scan interval
– record interval is set longer than 4000 x scan interval
– either interval is set to 0: 00:00

Function 9 – set remote

9 set remote   **9.1 baud**   **9.2/3/4 auto answer**

9.1 baud – press C to select the baud rate used for remote communication. This is the same baud rate as that used in sub-function 3.3; any changes in 9.1 will also be made in 3.3

9.2/3/4 auto-answer – 9.2, 9.3 and 9.4 are used to send different command strings to a Hayes compatible modem, see section K, Remote operation, for more information.

HELP displays in function 9

HELP 9 will be displayed if there is a timeout (no response within a certain period) from the modem.

Function 0 – check

0 check   **0.1 settings**   **0.2 bat days**   **0.3 ext supply**

0.1 settings

Pressing C steps quickly through all settings previously made in functions 4 to 8. The function number alternates with **0** at the left of the display; the sub-function or channel number appears in the middle section; and the settings in the right-hand section.

Only those settings actually made are displayed in function 0. For example, if no start or stop times have been set in function 4, the display will go straight to function 5 after real hours/minutes in sub-function 4.5. Similarly, only those channels set to log are displayed in function 5, and only alarm levels actually set are displayed in function 6. Real time displayed in 0.1 is not automatically updated.

0.2 bat days

0.2 displays the approximate days life before start time, during logging, and after logging stops, USING THE INTERNAL BATTERIES ALONE. If the Squirrel is not set up to log, **HELP** will be displayed, exactly as in 1.3. Use of functions 2 to 0 shortens battery life, so it is important to check battery life before returning to function 1.

The battery life calculation takes into account:
– the present battery voltage
– the number and type of channels set to log
– the scan and record intervals
– the log start and stop times, if pre-set.
When logging from external trigger signals, the calculation assumes the trigger signal is present continuously.

When the Squirrel is used with an external power supply, no power is taken from the internal batteries, but they will provide back-up if the external supply is interrupted.

0.3 ext supply

0.3 displays the voltage of the external power supply (even if no supply is connected, a voltage of 1V or less may be displayed).

0.4 test

0.4 steps through data required only by service engineers.

HELP displays in function 0

HELP 4 is displayed if the log start/stop time is earlier than the real time. This happens if the real time reaches the log start/stop time while in function 0.

HELP 5 is displayed if no channels have been selected.

F   External Trigger Signals to Start and Stop Logging

Logging can be started and stopped by external signals or by the Squirrel's own alarm signals (see section G).

Logging is initiated in the usual way by pressing C for 2 seconds in sub-function 1.3. The word **start** appears on the display in place of **stop**. Logging begins as soon as the external start signal is received, and **start** changes to **log**.

Recordings are made in the normal way until the external stop signal is received (**log** then changes to **stop**). Any number of further sub-runs can be started and stopped by external signals. A run can also be stopped by pressing C for 2 seconds in sub-function 1.3.

A header block of data is stored when logging is initiated. If recording is temporarily stopped by the external stop signal and then re-started by a start signal, the time is recorded with the first reading of the new sub-run, but a new header block is not stored.

F1   Setting up

All connections are made to the signal connector (15-way male D). Connect pin 12 (external reading link) to pin 9 (common – Squirrel ground). Connect external trigger signal Hi to pin 13 (external trigger input) and external trigger signal Lo to pin 9 (common – Squirrel ground).

F2   Trigger signals

If external contacts are used, logging will start when they close to connect pin 13 to pin 9, and stop when they open. Alternatively, voltage levels can be used instead of contacts. In this case a low level of less than 0.5V d.c. will start logging and a high level between 4 and 6V d.c. will stop logging.
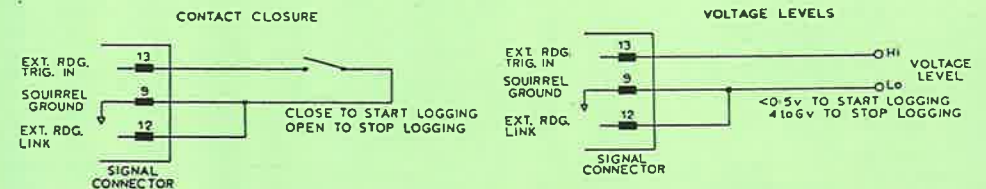
Externally-triggered logging signals

G   Alarm Operation

G1 Alarm recordings

When an alarm level is set on any channel in function 6, that channel is scanned at the end of each scan interval set in function 8 (pulse channels set to count are scanned only at the end of each record interval).

Normal readings are taken according to the logging mode selected in function 7. In addition, an alarm recording is made whenever an input value crosses an alarm start or stop level. Alarm recordings consist of time, plus the readings from all channels set to log. Readings are instantaneous values even if the mode includes **ave**.

G2 Alarm signals

Alarm signals are provided by a transistor output which can pass a current of up to 50mA (with voltage drop of less than 0.5V) from an external source of up to 25V d.c. If the alarm signal is also to be used to start and stop logging as described in G3, the external source must be between 4 and 6V d.c.

A non-latched alarm output is provided by an internal connection between pin 15(+) and pin 9 (Common – Squirrel ground) as soon as any alarm start level is crossed and disconnected when **all** stop levels have been crossed in the opposite direction.

A latched alarm output is provided by an internal connection between pin 14 (+) and pin 9 (Common – Squirrel ground) when an alarm start level is first crossed, and then latched to remain connected until C is pressed in sub-function 1.3 (even if logging has already stopped because the memory is full).
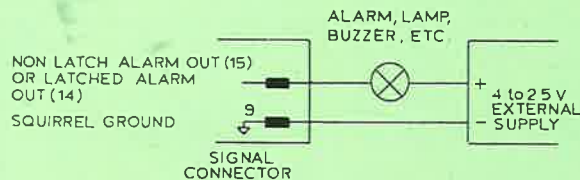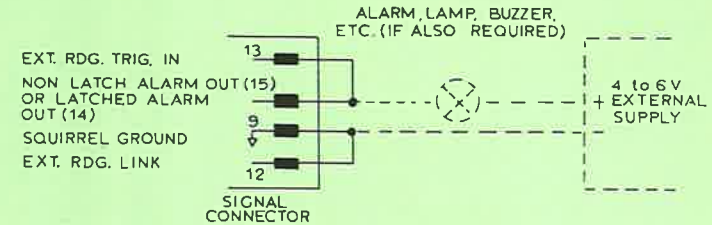

Use of alarm output

G3 Use of alarm signal to start and stop logging

All connections are made to the signal connector (15-way male D). Connect pin 12 (external reading link) to pin 9 (Common – Squirrel ground). Connect pin 15 (non-latched alarm output) OR pin 14 (latched alarm output) to pin 13 (external reading trigger input).

If pin 15 (non-latched alarm output) is connected to pin 13 (external reading trigger input), logging will take place whenever at least one channel is in an alarm condition.

If pin 14 (latched alarm output) is connected to pin 13 (external reading trigger input), logging will start as soon as any alarm level is crossed and continue until logging is stopped, **either** by pressing C in sub-function 1.3 **or** when the memory is full.

Use of alarm signal to start and stop logging

H   Synchronisation of Squirrels

If several Squirrels are used for long periods as part of the same logging system, the small differences between their clocks could cause problems in correlating results. This can be overcome by using the clock of one Squirrel to drive the others.

H1 Squirrel clock pulses

All connections are made to the signal connector (15-way male D).

On all 1200 and 1250 Series Squirrels a 1Hz clock pulse is available between pin 11 (1Hz clock output) and pin 9 (Common – Squirrel ground). If pins 11 and 9 are connected to pins 10 (1Hz clock input) and 9 (Common – Squirrel ground) of other 1200 or 1250 series Squirrels, those Squirrels will operate from the incoming clock pulses instead of from their own clocks.

Real time and date should be set on the "driven" Squirrels **after** connection to the driver, but other operating routines described in E are unaffected.

H2 Synchronisation to the nearest second

Real time is only displayed in minutes but the Squirrel's internal clock can be set to the nearest second. After the real time has been altered with C in function 4, the clock is automatically set to 0 seconds the next time A or B is pressed.

To synchronise two Squirrels, re-set them to the same time and press B on each Squirrel at the same time.

I   Trigger Signal to Switch on Sensors

A transistor inside the Squirrel provides a switching signal 5 seconds before each reading is taken in the interval and averaging modes, and continuously while in functions 1 or 2.

The transistor can pass a current of up to 50mA (with voltage drop of less than 0.5V) from an external source of up to 25V d.c. The signal is available between pins 12 (Sensor switch-on) and pin 1 (Common – Squirrel ground) of the output connector (15-way female D).

Note that the signal will not be present 5 seconds before the first reading of a logging run or sub-run. Also the signal will be on continuously if the scan interval is 5 seconds or less.

J Data Output

The computer and modem outputs are on the output connector (15-way female D). See the data sheet for details of connections.

The output is RS232 with baud rates of 300, 600, 1200, 2400, 4800 or 9600. Data output is 1 start bit, 8 data.bits, no parity bit, and 1 stop bit. Separate instructions are provided with each Grant computer program, and details of data output format are available for users who wish to write programs for other computers.

K Remote Operation

K1 Modem setup

Select 9.1 and use C to select the baud rate. This will also adjust the baud rate set in 3.3. Connect the Squirrel to the computer or modem.

If the Squirrel is directly connected to the computer, then go on to section K2.

If the Squirrel is connected to a modem which is set up manually, set it to auto-answer (see the modem's manual) and go on to section K2.

If the Squirrel is connected to a Hayes compatible modem, then select 9.2 and press C until **out** appears. If **HELP 9** appears, then repeat the process in 9.3. When the modem recognizes one of the command strings sent by function 9.2 or 9.3, it will indicate that it has been set to auto-answer (see the modem's manual). 9.4 will reset the modem to the default factory settings (see the modem's manual).

K2 Remote operation

Return to function 1.1 and wait for the display to blank. Run Remotewise on the computer and follow the instructions given in the software. The Squirrel display will show **out** and **232** while communicating with the computer. While **232** is displayed the buttons on the Squirrel will have no effect.

Remotewise can be used to put the Squirrel into restricted mode. The display will be blank in this mode. Pressing button A will display function 2, B and C will then work as normal. The display will blank if a button is not pressed within approximately 15 seconds (rather than the usual 10 minutes). No other functions are available in this mode. The display must be allowed to blank before control can be returned to Remotewise.