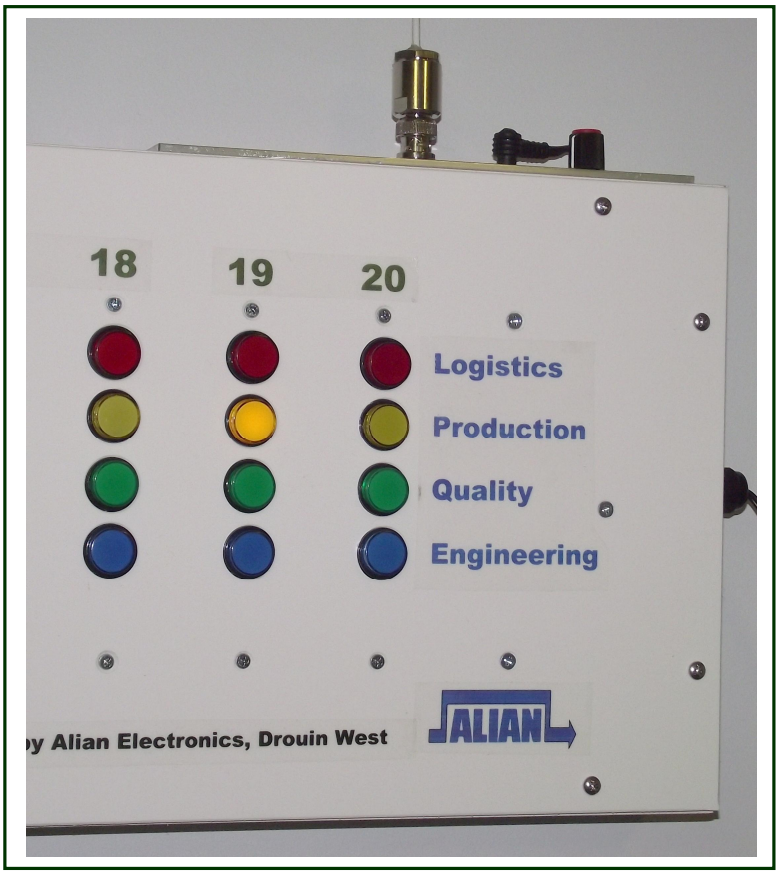
ANDON SYSTEM
OPERATION MANUAL
Release 5

August, 2018



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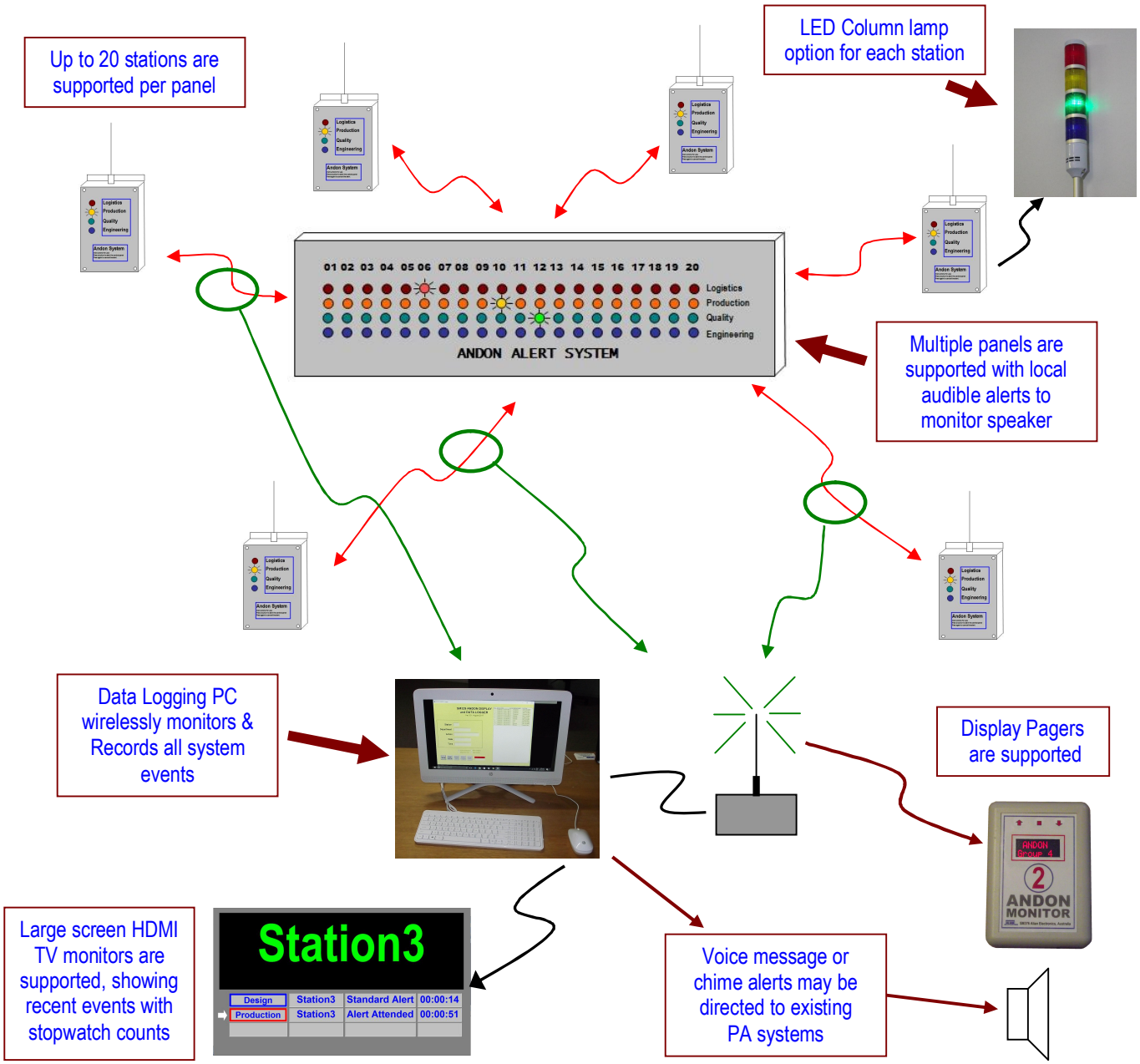
SYSTEM SUMMARY

An Andon system allows staff in a production or public interface area to quickly communicate with multiple lines of supervision and support. An operative in a business may have one general supervisor, but in the course of their work they may have to make regular contact with many departments. At any time, a production line employee may need to contact a materials supplier, an engineering expert or a safety officer. A bank teller in a large bank may need to call upon a loans specialist, a foreign currency expert or even a security operative. The person they seek may be at their desk, or they could be wondering around the building and any call for help must reach them by a single button press. Often there needs to be a permanent record for this callout so that line managers understand where problems and enquiries are coming from and to note how quickly they are being attended to. A good Andon system must do all of these things.

This system will perform all of these tasks and do it wirelessly over a wide area. There are eight components that can be combined to form a working system. Not all of these components will be needed for any given installation, but each item component serves a specific need.
Not all customer requirements and objectives are the same and the need to customise each system to suit those needs are essential.

SYSTEM COMPONENT OVERVIEW



1. The Station

An Andon station is a small wall mounted box with four or five illuminated, coloured buttons. When a button is pressed it can generate a regular or urgent call for attention to that specific location. A single press of any button causes the button to flash slowly. Pressing it a second time extinguishes the flash. Where a button is pressed and held for 2 seconds, it would indicate an 'urgent' condition by flashing rapidly.
Stations are wireless, have customised labelling for each department and can receive signals to let the caller know that someone is on their way. Stations are powered by low-voltage Plug Packs that connect to the nearest available 240V power outlet.

2. Station column lamps

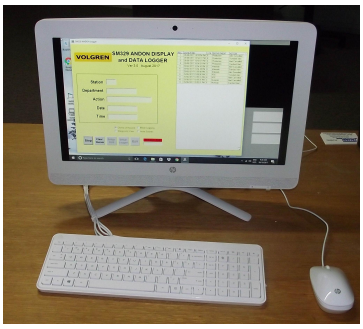
If a station is mounted in a difficult-to-see location, it can be useful to draw the attention of a support operative approaching that location. Where necessary, a column lamp can be placed above each station location. These lamps have colours matching the station buttons below and will replicate the state of the illuminated buttons on its associated station. Approaching support staff are then able to see the flashing or steady state of station lamps from a distance. Each column lamp is powered by the station itself and comes equipped with three metres of cable. Longer cable lengths are available upon request.

3. Display Panels

Wall-mounted Panel Units may be provided, each with a field of 4 or 5 rows of 20 buttons corresponding with all of the Stations mounted on production lines. Where any button at a station was pressed the corresponding button on each Panel would flash at the same rate. Where a flashing button is pressed at a Panel, it will make that lamp assume a steady glow state. This would also make the matching Station lamp assume a steady glow, as an indication that help is on its way. As a lamp is extinguished at a station it will extinguish the matching lamp at all 3 panels. When any panel lamp changes state (slow flash / rapid flash / steady glow / lamp off) each panel will chime and play a pre-recorded chime and voice announcement to an adjacent speaker (provided) A typical message may be: (chime) "*Attention Production*" Urgent (rapid-flash) signalling is followed by the message "*Urgent Alert*". The audio volume of these announcement messages are adjustable at each panel.
Where distances from panels to some stations are great, Panel units should be fitted with a larger antenna accessory that may be placed at a better location 5-6 metres away from the panel. Where Data Logger systems are configured to support Repeater Operation, even greater transmission/reception distances are possible.

4. The Data Logger

Where data logger, large screen Public Address, or pager functionality is required, a dedicated All-in-one PC is added to each system, equipped with a special transmitter/receiver unit.

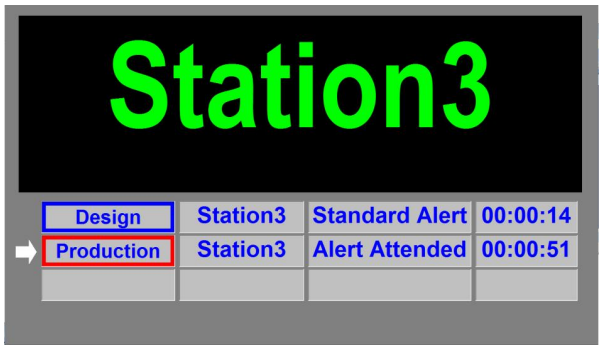


The standard Andon PC

This computer unit will 'listen' to all Andon button pressing traffic for that site. It will record details of each button press and add a unique Time and Date stamp to the record and added to a Microsoft Access style database file. A second database groups linked button presses into a single historical record that can be supplemented with operator comments or selected Reason Codes before being finalised as a single event that required treatment.

5. The Large Screen display

In some situations there is a need for a single large screen in a prominent location that will show off the most recent events that had taken place. This is possible where a 55-70 inch, HDMI TV screen may be coupled to a secondary video port on the Data Logging PC.



A typical view of a Large Screen monitor

The screen will flash the identity of the last station event in large text, while below, details of the last three events appear in a queue. A coloured border serves to highlight the colour of the department button that had been pressed. Station and Department titles are adjustable within the system setup area of the application. Each fresh event has its own stopwatch timer to indicate how long the alert has been in progress before being attended. With a HDMI video extender, the screen may be mounted up to 30 metres distant from the Data Logging PC.

6. Public Address announcements

It is possible to include audible responses to alerts triggered by stations, to then be played over a new or pre-existing public address system, or just over the speakers within the large screen. The Data Logger PC can be loaded with short MP3 or WAV files that represent activity for each Department and Station. The audio output of the Data Logger PC may then be coupled to the amplifier system to broadcast fresh event announcements. While any audio tracks may be played, the general format would be:

"<Alert Chime> Department Title to Station Title" For example "<*Chime> Quality Control to Testing Area."* These audible alerts may be played just once, or can repeat after a selected number of seconds until the alert is attended. The actual recorded sounds may be supplied by the client or prepared upon request.

7. Pager units

Where support staff are highly mobile around a factory space, they can carry a special display pager unit to inform them of alerts from station positions. In addition to beep and vibrate features, the pager units have a small 2-line display to indicate the identity of the station concerned. Paging alerts originate from the data logging PC after an event has been recorded, hence the computer option is essential where pager units are necessary.

Not all personnel carrying pagers need to be aware of all events, so a flexible setup arrangement allows an unlimited number of pagers to respond to one of five groups. Each group can then be associated with any combination of departments and stations. In this way, one pager may be configured to alert a manager when any alert takes place, while another pager carried by a Safety Officer may only respond to 'first Aid' calls for attention. Pager units may be recharged on a special AC charger.

8. Long Range Antennas

This wireless Andon system does not use conventional Wifi frequencies, which tend to be problematic in industrial situations where signals are affected by buildings and metal vehicles. This system uses VHF transmissions more suited to factory environments. Where ideal line-of-sight conditions exist, stations can communicate with Panels and Data Logger PC's up to 700 metres distant using the basic 45cm long vertical antennas. This maximum range will fall where transmissions are between buildings and around fixed obstructions. Where there is a risk that the range may be adversely affected, a higher gain ground-independent antenna may be used on the Display Panel or Data Logger receiver. This comes with a coax cable extension so that it may be mounted above an office space, away from obstructions.

ANDON STATIONS in detail

Andon station units are small wall mounted box with four or five coloured buttons that illuminate when pressed. When one of these buttons are pressed the Stations generate a ***Regular*** or ***Urgent*** alert for attention to that specific location.
The stations are wireless for ease of installation
Once an alert has been sent, it can also receive a signal to let the operator know that someone is on their way. Stations are powered by a low-voltage Plug Pack that can plug into the nearest available 230V AC power outlet.

Typical 4-button Andon Station

Adjacent system interference

Each station has an identifying Station Number, typically, between 1 and 20. This is set by two rotary switches inside the stations where a number from 1 to 99 may be selected. The Station normally has its identifying number printed on the front. This helps to identify where the station will appear as numbered column on a main Status Panel.
If another Andon system is operating within a two kilometres radius and Stations have the same number range, there is a possibility that transmissions from one can generate unwanted alerts on the other nearby system. This can be prevented by ensuring the affected system has its stations shifted to an alternate number range. For example, **System A** has ten stations labelled **1-10** and **System B** has stations **1-20.** If they are within radio range, then there is going to be a conflict of station adresses and one of them must move to a new range. So **System A** shifts its address codes from **1-10** to a new range of say **31-40**. This may resolve the primary problem, but create a new problem as all of the Station and Panel labelling still says **1-10**. This becomes an issue if a PC Data Logger option is included and it is recording events in the higher number range. The solution to this issue is to enter an **offset** value in the setup area of the data logging computer. This will deduct a fixed number from all station addresses before events are displayed and stored. So in **System A**'s case an offset of 30 will ensure that stations 31-40 will actually *be recorded* as Stations 1-10 by the PC. This effectively will avoid station conflicts between nearby systems.


Station power pack

The standard Station antenna is a narrow vertical antenna used to send and receive wireless signals to other components of the Andon system. Normally, this short antenna is sufficient, but where signal quality is degraded by shielding walls or vehicles, elevating this antenna with a short extension or replacing it with a higher gain antenna to improve the working range of the system.


A wall mounted station

Stations normally have four or five coloured buttons, **Blue**, **Green** **Yellow** **Red** **and** **Clear.** Each button represents a different department within the plant. When any button is pressed, it will flash slowly to indicate a need for attention by the corresponding department. This action sends an alert signal to the main Panel where the matching button will also flash slowly.

Pressing the same button a second time will cancel the alert both at the station and the main Panel, and the lamp will turn off. It is possible to signal for attention from more than one department simultaneously
Where a lamp has changed to a steady glow, it is an indication that a support person has pressed the corresponding flashing button at the central Display Panel. This steady-glow is an acknowledgement signal to confirm that a support group is responding to the request.

Urgency signal

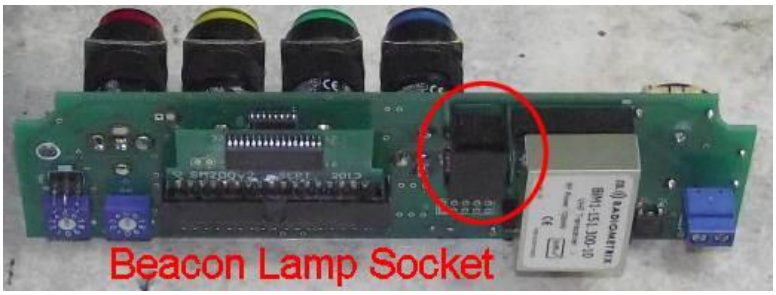
Where a second level of urgency may be required at stations, the user can press ***and hold*** a button for two seconds. This will change the slow flash to a rapid flash at both the station and the central Display Panel. The voice announcement will have the words "**Urgent Alert**" added to the announcement message. .

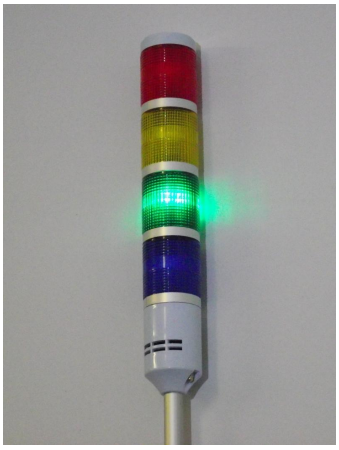
BEACON LAMP OPTION

An optional four-colour LED Column Lamp may be fitted to each station via a 6-wire RJ12 socket. Each lamp will operate in synchronisation with the matching illuminated button on the station.

This lamp allows the station alert to be identified at a greater distance than the smaller station buttons. The lamps are 60 cm tall and plug into a 6-wire socket inside the station via a two metre long flat cable.

The lamps are an intrinsically safe low-voltage DC that are powered through the cable connection to the station.





Beacon lamp option

THE DISPLAY PANEL in detail

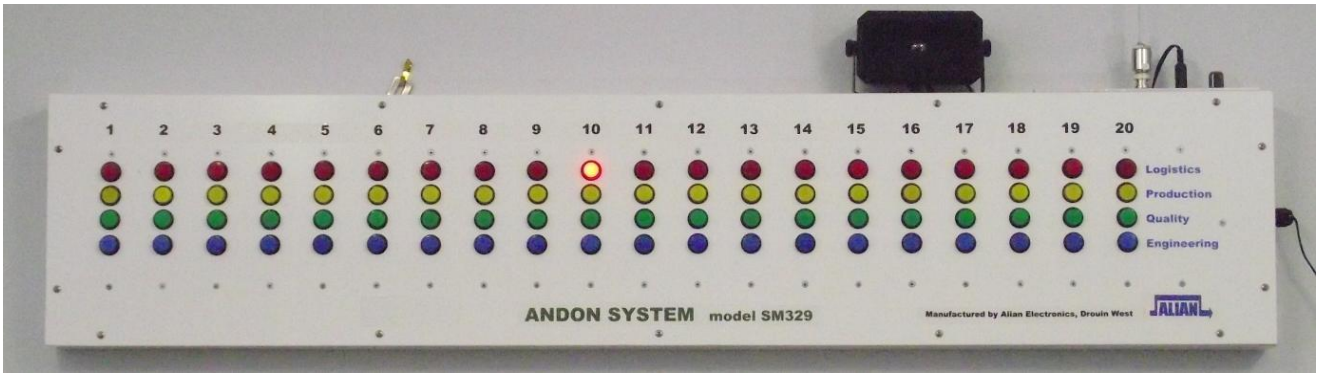
The standard Display Panel unit is wall mounted, 110 cm wide and 22 cm high and supports Up to 20 columns of illuminated buttons can communicate with up to 20 stations located in any single production area. It can co-exist with other, adjacent Andon systems by offsetting the station codes during installation.

When one of the operator buttons at a station are pressed, a corresponding lamp will flash on this panel. An announcing system built within the panel will sound a chime and say the name of the department that should respond to the request for attention. The volume of the voice announcement can be controlled via a volume control knob on top of the Central Panel.

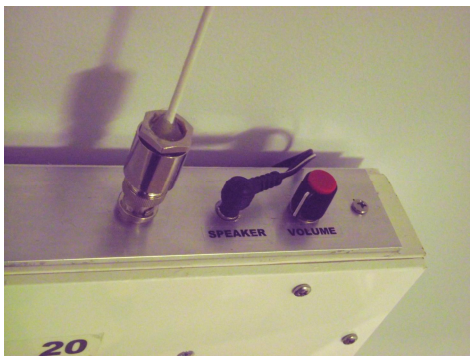
Pressing one of the flashing buttons will trigger the verbal response "Confirmed" from the voice announcement system and change the lamp to a steady glow.

Back at the station that originated the request, the flashing lamp there will also be updated to a steady glow, indicating that someone has responded to their call at the Display Panel.

Ideally, this panel should be mounted in a highly visible location, approximately head-height. This allows reasonable access to buttons by the operators, while providing some reasonable signal quality from distant stations.



VOICE ANOUNCEMENT PLAYBACK



Volume controls and antenna socket

When a button is pressed at a Station unit, this activates a flashing lamp at the display panel and triggers a pre-recorded message appropriate to the department requested. Each message is held digitally within an audio recording chip that can store up to 3 seconds of audio for each sound event.

A typical announcement would be:
"<Chime> ATTENTION, ENGINEERING". Urgent Alerts have the message 'URGENT ALERT" added to the end of each announcement.

The recording is played back via a 3.5Watt audio amplifier built into the Display Panel. The volume of the announcements can be adjusted with a volume setting knob. Pressing any button on the Display Panel will manually trip an alert so that volume may be set to a suitable level. The Display Panel has no internal speaker, so the external speaker provided connects to the 3.5mm SPEAKER socket adjacent to the antenna socket.

(Note that this announcement is keyed only to departments, not stations. The audible announcements that are generated within the Data Logger PC are more flexible as they can also announce station titles or play unique chime sequences for high-noise environments)

OPTIMISING WIRELESS RANGE

The Station Units and the Status Display Panel come equipped with a basic 'quarter-wave' style antenna, which should be capable of servicing a large area.
On a level, unobstructed path with stations and panel mounted 1.5 metres above the ground reliable operation should be attainable up to **700 metres** from the Main Panel.

- Industrial, production areas are generally more complex, with large areas of metal walls, moving machinery and inventory affecting the operating range of a station. This may affect the working range of a station. Where a station has problems in updating the man Display Panel, moving the station unit by even a few metres in a different direction may improve the link quality.
- When mounting a Station Unit in a production area more than a few hundred metres from the Display Panel, avoid mounting it directly onto a metal wall or column, as this would place the antenna very close to a metal area and affect its performance.
- As Status panels are central nodes that must receive signals from all stations, it is often worthwhile fitting the panel with the higher gain antenna option. This is a ground-independent PVC tube that may be suspended or cable tied above an office area.
- Height is good. So to improve performance, consider adding an extension coax cable to lift the receive antenna higher. Alternately, locate the entire receiver higher and extend the DB9 data cable to the PC instead.

These general hints also apply to any stations and panels that may be experiencing reception problems, as the radio equipment inside these units are identical to the Data Logger receiver


The high gain antenna, normally mounted vertically above a Display Panel or Data Logger PC

LARGE DISPLAY SCREEN OPTION

In some workplaces there is a need to show status information on the most recent events to a large area. A large screen tv can be coupled th the Data Logger PC via a secondary video port and be used a monitor via its HDMI input.

As this screen is likely to be mounted some distance away from the logger PC, HDMI video extender adapters (using network style Cat-5 cable) are used to extend the distance between the PC and screen by up to 30 metres.

The Large Screen option can show the latest events

The main area of the screen will show the title of the last station that triggered an event. If the event is an Urgent Alert , the same information witll flash with a red background.

Below this are three lines which shows a queue of the last thee station events. Each event line is made up of Station Title, Department Title, Alert Status and Event Stopwatch, which will display how much time has passed since the alert had commenced.

When any of the three events are 'Confirmed' (by an acknowledgement press of the flashing button on a Display Panel), the correaponding stopwatch will freeze with the final time interval shown. A white arrow indicates which line was the last one to have changed its status.

When the alert is eventually cancelled at a station or a main panel, the corresponding event will be deleted from the queue. All these events are also being recorded in the background by the main data logger capture function.

COMMENT ON SCREEN TYPES

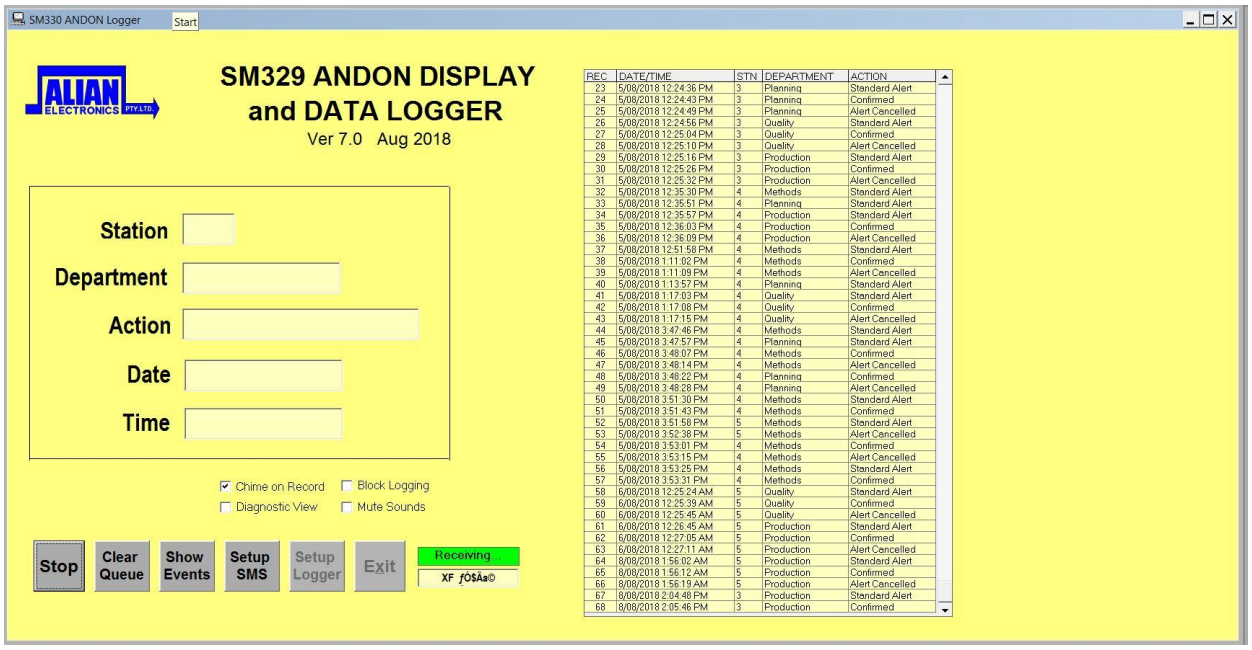
Most 60-70 inch screens will be fine for this application. Some screens have different resolution modes and may require that a 'zoom' function be invoked within its setup menus. Additionally, many screens have a time-out-timer which will automatically turn the screen off after 5-8 hours. This can usually be deactivated within the setup menu of the screen by placing it into 'Shop Demo' mode or similar.

When any HDMI monitor is connected to a PC it will generally take control of the audio output of that PC. This effect also applies to the Andon PC, so audio files that announce Anon events may be re-directed to the speakers on the large screen. In some situations this can be an advantage as large monitors have powerful audio output that can be adjusted via the supplied infrared remote. However, it may prevent the audio from being redirected to an external P.A. amplifier if one has been fitted. Within the Windows Control Panel area there is a Sound setting application that can be accessed and this may be used to direct the system sounds to the appropriate output.

The Andon System Data Logger

General Description

The Data Logger system resides within a conventional PC as a Windows based application. This system monitors the radio traffic between the various stations located around a plant and one or more Status panels and records the results in a database.



The Data Logger Application is compatible with all versions of windows from XP through to Windows 10. The PC must make a connection (via USB port & RS232 adapter) to an SM375 transmitter/receiver unit, which is in turn coupled to an antenna. As the transmitter/receiver is central to the system, it is important for it to reliably monitor all stations at the site, hence one of the high gain antennas are often connected to this unit.

The SM375 Andon transmitter/receiver unit for PC's

The SM375 also incorporates an active software filter ensuring that only valid Andon data traffic is forwarded to the data logging PC. The unit is powered by a separate 12V plug pack.

A small packet of data is generated whenever any button is pressed within the system. For redundancy purposes, this packet is sent three times in quick succession.
Each data packet contains information on Station identity, button pressed (department) and an action, such as starting or stopping an alert. It also contains data integrity characters to allow receiving stations to confirm the accuracy of the data packet.

When the PC receives an alert from a station it may repeat and re-transmit the same signal one second later so that all display panels within reach will receive the same updates.

Where SM376 Pager Units are in use, the SM375 is used by the PC to transmit alerts and information directly to the pagers.

The Data Logger application is normally installed in a folder called **C:\SM329 Display Standard**. Within that folder there is a sub-folder called **Data** that contains the active database file called **ANDON_LOG.mdb** and a Settings database file called **SETTINGS.mdb** which is used for system settings within the program.

Sound files associated with alerts are stored in a sub-folder called **Sound Files**.

When the program records station activity a fresh record is generated and appended to the **ANDON_LOG.mdb** file. When the file reaches a predefined number of records (as held in the SETTINGS file) the data file is automatically archived and placed in a separate sub folder under **C:\SM329 Display Standard\Data** called **Backup**.
These backup files will therefore contain a fixed number of records. They are saved with an incremental number added to each file to prevent accidental over-writing of files. For example: **ANDON_LOG_001.mdb**, **ANDON_LOG_002.mdb**….

These files can be read by a local program or remote program such as Excel for statistical analysis.

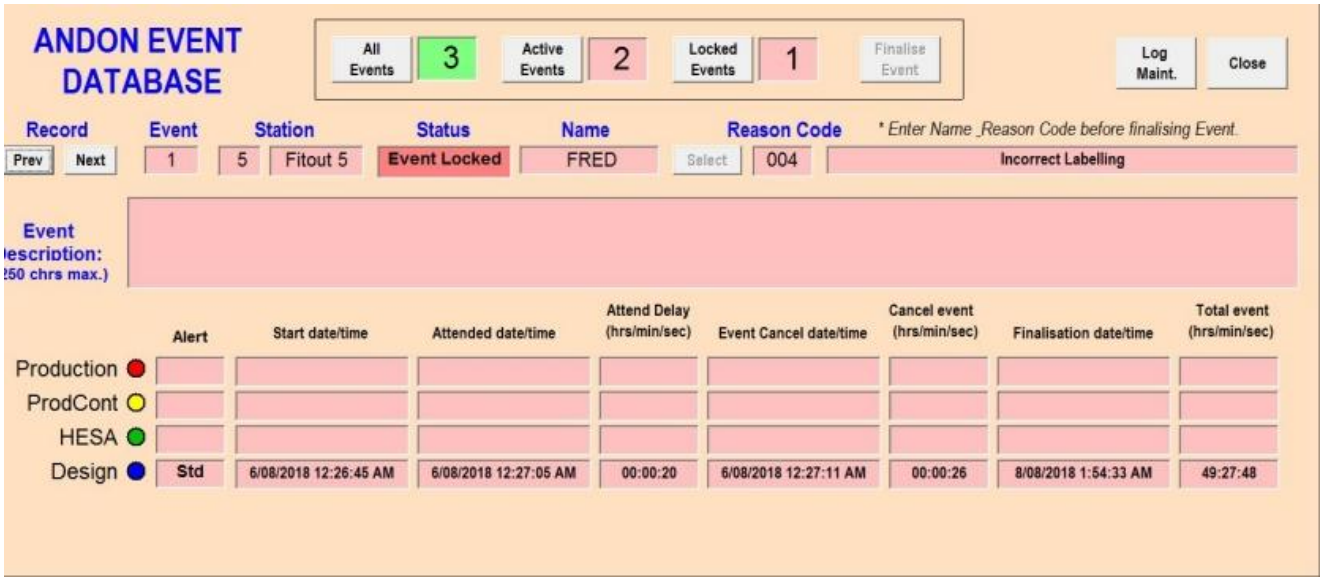
When the program is first activated, it looks for the presence of the Transmitter/Receiver unit. Once found it directs all incoming data to a small 'Receive Window' at the bottom of the screen. Typically this will show random characters, but it serves to indicate that live data is arriving into the application. The program will search this signal for patterns of data that it can use.

As information arrives it appears in a holding area (highlighted above in green) before being added to the end of the active data file.

Whenever a fresh record is added to the data file the PC sounds a chime. This sound may be suppressed by un-checking the 'Chime on Record' box on the screen.

THE EVENT DATABASE

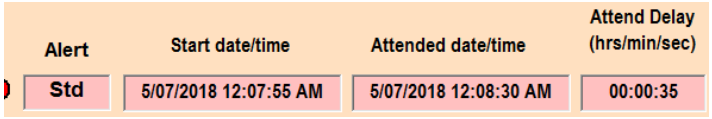
After the incoming alert has been documented in the primary log file, the program passes all the received information to the Event Database level for further processing. This layer operates independently of other logging features. It brings together all of the alert activities that relate to a specific incident into a single record, even if the database screen is not visible.



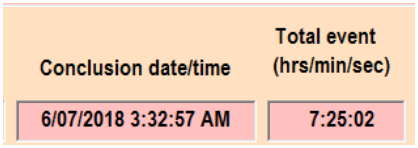
A typical Event being recorded by the Data Logger application

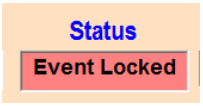
The events database follows a rigid set of rules:

- All incoming alerts will cause the computer to search the Events database to see if there is an open record in progress for that station number. If a matching station record is found, the computer will look for the matching department title in that record. If found, a date-time stamp will be added against that Department, a flag will be set indicating a Standard or Urgent Alert and if enabled, a Pager Escalation Timer will begin to count minutes lapsed against that same Department.
- If no currently open record is found, the computer will instead create a new record, with a new (sequential) record number, then automatically add the Station name and Station Title before inserting a Date and Time stamp against that Department.
- At some point, an operative will press the same flashing station button a second time. This could be at a Display Panel where the large array of buttons are located or at the station itself. This will change the lamp from flashing to a steady glow and the action is a confirmation to report that the station has been 'Attended'
- Back in the Event Database, the arrival of the Attended signal will cause the present Date & Time to be stamped alongside the corresponding Start Time. The computer will perform a Date-Time calculation from Started to Attended record and write the result to a third field of Hours/Minutes/Seconds taken for the alert to have been attended.



- This action of attending to an alert will freeze the Pager Escalation timer, so that the event will not trigger an Escalation Alert.
- Pressing the station button a third time (Cancellation) will extinguish the steady lamp, this action will be recorded in a similar fashion, but if the client does not use this information, cancellation details may be suppressed within the system settings.
- At some point in the future, an operator can attend the Events Database and click on the button labelled Active Alerts. This will allow the operator to step through and view all outstanding events in progress. The operator can add a **Reason Code** to the record from the drop down list on the screen. The operator can also type in a written description of how the event was resolved in the comments field. The **Operator Name** should also be entered.
- With an **Operator Name** and **Reason Code** now in the system, the operator may finalise the record by pressing the Finalise button. This will do several things. A Finalisation Date-time will be written to all active lines in the record. It will also calculate the total event time for each department and preserve this value as an Hours/Minutes/Seconds value.

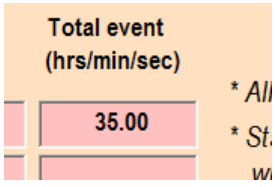




- Finalising a record action locks the record and prevents further changes. By doing so, it shifts the record from the Active to the Locked area of the database.
- Once a record has been finalised, any further button presses by that station will trigger the creation of a fresh record as a fresh event.

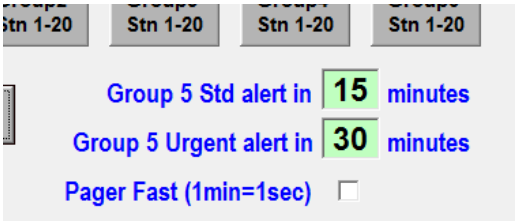
PAGER ESCALATION FEATURE

- This is a feature whereby an event that was triggered, but not attended to by staff (pressing the station button a second time for a steady glow) has remained unattended for a preset number of minutes to two different time thresholds.
- After the first threshold (typically 15 minutes) the Events Database program will generate a normal pager alert directed to Group 5 pagers. At the second threshold time (typically 30 minutes) A second pager alert, with the



more insistent ‘Urgent Alert’ beeping will be sent to Group 5. Group 5 pagers would normally be assigned to a second-level line supervisor.

- The time since an event was triggered appears as a minutes value in the right hand time column of unattended, active alerts. When an alert has been Attended this value is frozen. Once the record has been Finalised, this value is overwritten with a full Hours/Minutes/Seconds value corresponding with the interval between record creation and record finalisation.
- The Pager Escalation settings are at the bottom of the Pager Group Setup area, accessed via the main Setup Logger menu on the primary page. The logger program has to be briefly stopped before this menu can be accessed.



- A time value may be inserted to set the time period relating to the two levels of Pager Escalation.
- An additional check box is present below this time interval for testing purposes. When this box is checked, the Pager Escalation timers are accelerated from updates each miniute, to updates each second. Therefore with this box checked a 15 minute setting would trigger all group 5 pagers in 15 seconds and again in 30 seconds. For normal operation, this box is left Unchecked.

EVENT DATABASE FIELDS

The Event Database is in a common Microsoft Access (.mdb) file format called EVENT_LOG.mdb and it is made up of 50 fields of information. In its raw state, this file may be viewed in an Excel spreadsheet. Note that from within Excel, Date/time fields are often not fully revealed, but the data is present.

1	Event No	18	Dept 5 start	35	Dept 2 Station time
2	Station No	19	Dept 1 conf	36	Dept 3 Station time
3	Station Title	20	Dept 2 conf	37	Dept 4 Station time
4	Operator	21	Dept 3 conf	38	Dept 5 Station time
5	Reason Code	22	Dept 4 conf	39	Dept 1 stop
6	Reason Code text	23	Dept 5 conf	40	Dept 2 stop
7	Description	24	Dept 1 delay	41	Dept 3 stop
8	Event Lock	25	Dept 2 delay	42	Dept 4 stop
9	Dept 1 flag	26	Dept 3 delay	43	Dept 5 stop
10	Dept 2 flag	27	Dept 4 delay	45	Dept 1 Total
11	Dept 3 flag	28	Dept 5 delay	46	Dept 2 Total
12	Dept 4 flag	29	Dept 1 cancel	47	Dept 3 Total
13	Dept 5 flag	30	Dept 2 cancel	48	Dept 4 Total
14	Dept 1 start	31	Dept 3 cancel	49	Dept 5 Total
15	Dept 2 start	32	Dept 4 cancel	50	Show Cancel
16	Dept 3 start	33	Dept 5 cancel		
17	Dept 4 start	34	Dept 1 Station time		

SETTING STATION IDENTITY

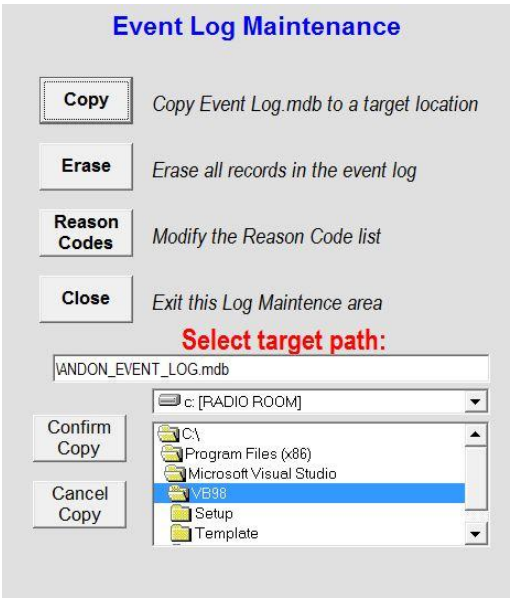
Each station is electrically identical, but inside the station enclosure are two ten-position switches labelled ‘TENS’ and ‘UNITS’, which gives a station range of 1 to 99 These switches are rotated to select the station address.

One method of testing a station operation is to get a second station and temporarily set it to the same address code. Then any button pressed on one station should appear on the second station unit as the two are bonded together by their address code. This effect should work even if the two stations are 500 metres apart (line-of-sight).

LOG MAINTENANCE AREA

On the Event Log screen there is an option button labelled **Log Maint.** Pressing this button will show the Event Log Maintenance page where two tasks may be carried out. The Event Log file may be copied to another location, or the event log file may be erased by the action of copying a blank master file over the top of the working file.

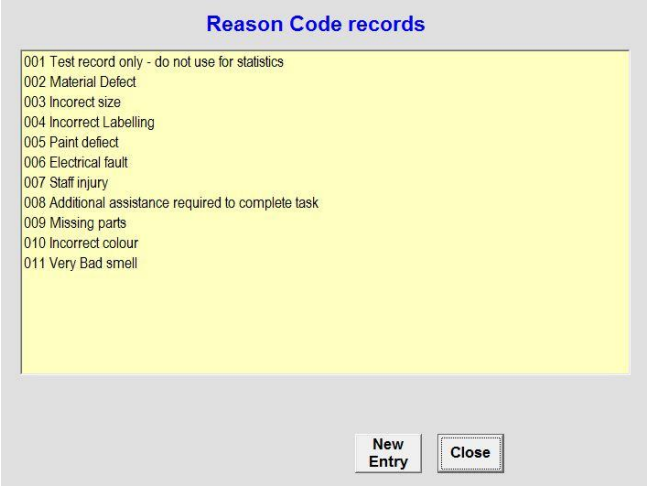
- Pressing COPY will reveal a drop box where a target drive and folder path is revealed for the file to be copied. If a network connection has been provided to the data logger PC then the log file may be copied to a virtual drive on a local server. Alternately a memory stick may be inserted into the logger PC and the Events file may be copied to it for later analysis.
- Pressing Delete will reveal confirm or cancel buttons for the deletion of the Events database records. This should only be done if the critical data has first been copied to a safe location.
- The process of deletion does not remove the Events Database file, but instead copies a blank (zero record) master file over the top of the working file. When the database is accessed after a deletion, the record count will be at zero.



Copy options in log maintenance

REASON CODES

Reason Codes are an auxiliary data file maintained by the system operator. It is a list of all likely issues that may occur on a production line. Ten Reason Codes are present in the standard release of software, but these existing codes may be edited or additional codes may be entered as required. Within the Event Log Maintenance page, an option button will reveal a sub-page for the management of these codes.



Changing the text of a code is largely intuitive. To edit a code simply click on an item in the list and a **Code Edit** line will appear at the bottom of this page. Changes may be made to this line, then saved or discarded as per the **Save** and **Cancel Edits** buttons.

Adding a new code is similar, except a fresh record is generated and appended to the Reason Code database,

THE SETUP MENU

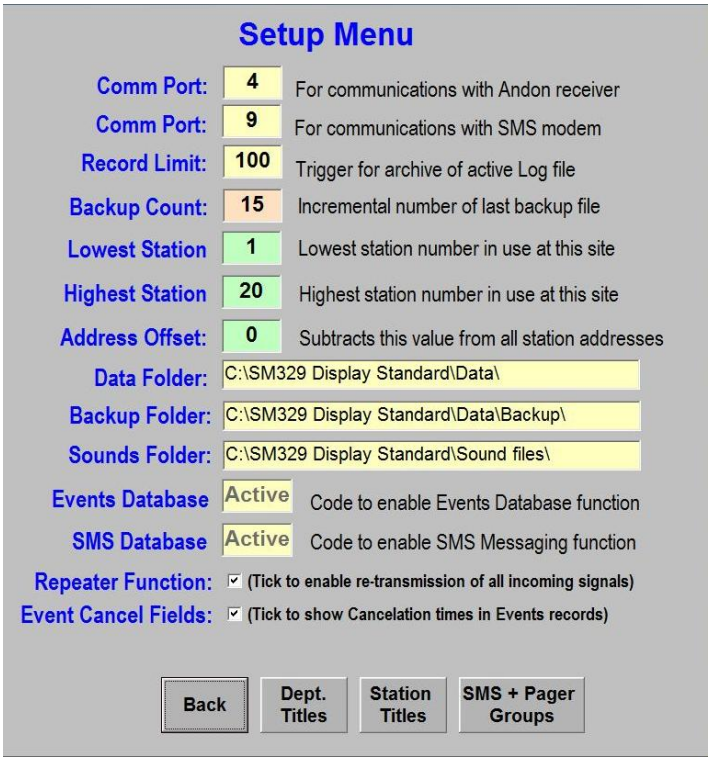
If the program is stopped by pressing the **STOP** button, the **EXIT** button and **Setup Menu** buttons are revealed. The **EXIT** button cancels the application and returns the user to the Windows desktop area.

Note that many of these settings are only loaded as the application is started, so after any setting has been changed it is important to quit out of the entire Andon program and re-launch it again to be assured that the latest settings are being engaged.

Clicking on the **Setup Menu** button brings up a password window on the screen.

The password for this is **NODNA** or the lowercase **nodona** (Andon backwards).
Do not mix upper and lowercase letters.

When entered correctly (within 10 seconds) a Setup Menu page will appear.



The System Setup page

These settings control many key aspects of each Andon system.

Comm Port (Andon communications)

The first item is the **Comm Port**, which is the port number of the active serial communications port that is being used to communicate with the SM375 Transmitter /Receiver unit.
This should not be changed unless the program is being set up on a new PC.

If some doubt exist over which port is the correct one being used by the USB adapter, launch **Device Manager** within Windows, then scroll down and click on the **PORTS (COM & LPT)** tab.

This will reveal the port correct designation for the RS232 interface. In the example shown here, the port **COM4** has been identified.

Comm Port (SMS Generator)

Similar to the Andon Port, this port communicates with a GSM SMS modem that allows for the transmission of SMS messages.
Where the SMS Messaging feature of the system is being used, the Comm Port of the SMS modem must be entered into this field.

Record Limit

The **Record Limit** is the number of records that will be accumulated before the file is copied to the backup area and the working log file (ANDON_LOG.mdb) is erased back to zero records.

Backup Count

The **Backup Count** reference cannot be changed. It is an internal counter that is used to ensure that every archive file created will have an incremental file name, so that valid data cannot accidentally be overridden.

Lowest & Highest Station

The **Lowest Station** field contains the first station name in use for the present system and the **Highest Station** field contains the last station number. In some situations, this number range may be higher than the labelled on the stations. If the **Address offset** field contains a value other than '**0**' then the range is likely to be different. (refer to the next section describing Address Offsets for details)

Address Offset

Normally at zero, this field may contain an offset value where two Andon systems are operating within the same area. All Andon systems use the same radio frequencies, but the data traffic from the stations use unique address codes to ensure correct responses to button presses.
If for example two factories only 1-3 km apart both have an Andon system with stations designated from 1 to 20, then a button press in one factory may possibly be logged by the system in the adjacent factory. This would of course be undesirable. To resolve this issue, one of the factories would alter the station codes set inside each station to the range of say 21 to 40. The settings program for that factory would have the Lowest Station set to 21 and the Highest station set to 40. Then when the Address offset field has a value of 20 entered, this will be subtracted from all log references. The effect is that the stations may still be numbered as 1 to 20 and they will be recorded as stations 1 to 20 in the logs, even though the actual radio codes are in the 21 to 40 range. Any code range up to 99 is permissible.

Data Folder

This field contains the data path to the location where the active log file is located. Usually it is a file path within the current computer, but where network drive mapping has been prepared by an IT specialist, it is possible for this path to point to a location on a file server elsewhere at the site.

Backups Folder

Similar to the Data Folder, this is the path where archived log files are incrementally saved once the target number of records have been reached.

Sounds Folder

Most systems will have some audio .wav or .mp3 files associated with announcements of system events. Typically this would be up to five sound files for Department identities and 20 sound files for station identities.
This field contains the file path to the location of these sound files.

Events Database & SMS Database

These fields are left blank if the Events Database or SMS messaging facilities are not being used. Where these features have been included in a package, the word 'Active' is displayed in the matching field.

The Repeater Function

The **Repeater Function** check box may be checked where the data logger computer is also being used as a repeater of all transmissions at this site. When checked, the data logger program will look for the arrival of any valid data packet, then immediately re-transmit the same information 3 times using its own centrally located antenna. This is useful if one or more of the Display panels in the system cannot receive signals from all stations because of shielding or interference.

Event Cancelled Fields

When this box is checked, the Events page will have ten additional fields of information revealed. These fields record the cancellation time and dates from when the alert lamps are extinguished at stations and Display panels.
When the box is un-checked, these fields of information are concealed, in order to match requirements at some locations where this additional information is not required.

OPTION BUTTONS AT THE BOTTOM OF THE SETUP PAGE

The **Department Titles**, **Station Titles** and **Pager Group** menus are all accessible from this setup menu. These sub-menus are dealt with in separate sections of this manual.
To return to the main screen click the **BACK** button. The logging of received information will recommence when the **START** button is pressed within the program.

ANTENNA LOCATION ON DATA LOGGER

The Data Logger receiver unit must recover signals from any button pushed on any field station, or control panel. Under ideal line-of-sight conditions, this range should be up to 700 metres. However if the receiver antenna is lying down on it side, or placed close to a metal surface, then this working range will be significantly reduced.

These pointers will help to improve data logger performance:

- Ensure that the receive antenna is vertical. (to match the polarisation of the antennas of the stations and central panel) Don't lay the receiver & antenna on its back.
- Ensure that it is not shielded by a metal frame or wall cladding, or filing cabinet, by placing the receiver above the obstruction, or a couple of metres away from the obstruction.
- Height is good. So to improve performance, consider adding an extension coax cable to lift the receive antenna higher. Alternately, locate the entire receiver higher and extend the DB9 data cable to the PC instead.

These general hints also apply to any stations and panels that may be experiencing reception problems, as the radio equipment inside these units are identical to the Data Logger receiver.

FIELDS OF INFORMATION IN LOG FILES

The primary 'Access' data files consist of six fields of information.

RECORD	(numeric)
DATE	(Date/time)
SOURCE	(numeric)
STATION	(numeric)
DEPARTMENT	(TEXT)
ACTION	(TEXT)

The **RECORD** field is a self-incrementing number that counts the record as it is added to the file.

The **DATE** field is a Date & Time stamp that records (by PC time) when the record was added.

The **SOURCE** field is a 2-digit numeric expression of both DEPARTMENT and ACTION.

The first digit of **DEPARTMENT** is encoded as follows:

1 = Title1 (as per Button Titles 1 field in the Setup page)
2 = Title2 (as per Button Titles 2 field in the Setup page)
3 = Title3 (as per Button Titles 3 field in the Setup page)
4 = Title4 (as per Button Titles 4 field in the Setup page)
5 = Title5 (as per Button Titles 5 field in the Setup page)

The second digit of **ACTION** is encoded as follows:

0 = Alert Cancelled
1 = Standard Alert
2 = Urgent Alert
3 = Confirmed

For example a value of **31** in the **SOURCE** field represents a **Standard Alert** (**1**) for the Third department in the Title list (**3**).

The **STATION** field contains the number of the station that generated the alert condition.

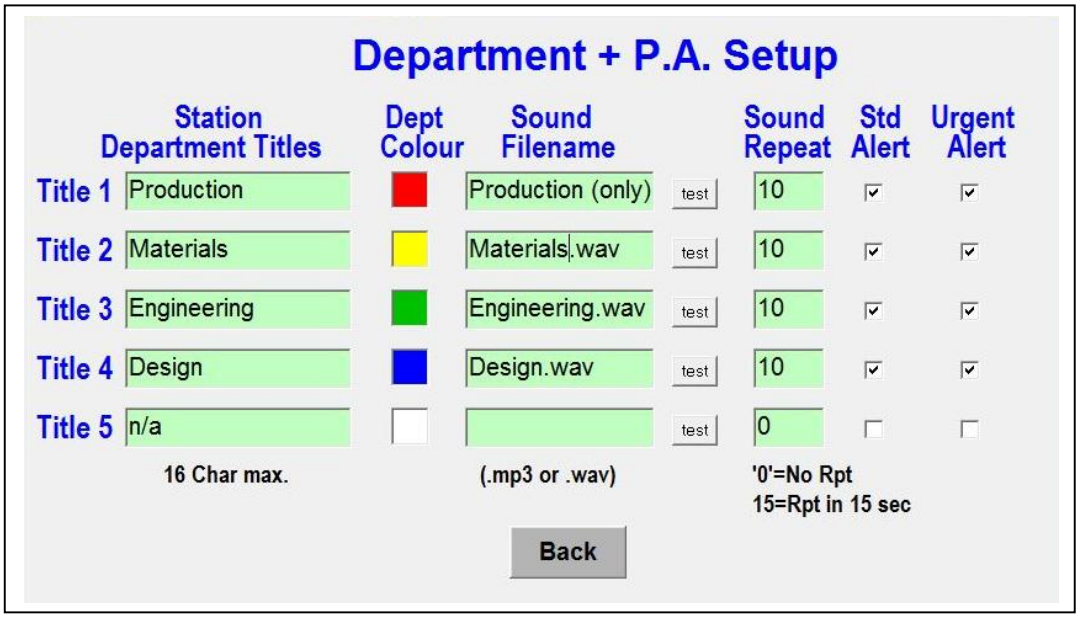
The remaining two fields of **DEPARTMENT** and **ACTION** are plain text equivalents of the information held in the **SOURCE** field.

DEPARTMENT & P.A. SETUP PAGE

When setting up the Data Logger system it is necessary to have the title text for each department linked with the buttons of the Andon Stations. This must take place in the **Department Setup** sub-menu, which is accessed by clicking on the **Department Titles** button at the bottom of the main Setup menu.

Department Titles

The **Department Title** text in the left column should be a short text string that describes each department. This text will appear within Data Log files and the optional large TV screen and on the character display of the pager units. While this field supports up to 16 characters of text, it is recommended to abbreviate the titles where possible. If Pager Units are in service, the Department title needs to be limited to just 8 characters so that it will fit the display screen.



Department Colours

Next to each department is a coloured square which represents the colour of the lamp on the corresponding station button. Standard colours (from top to bottom) are RED, YELLOW, GREEN, BLUE and CLEAR (White). Where a different station button colour scheme has been used, the colours may be clicked on here to reveal a drop-box where alternate colours may be selected and saved to permanent memory within the program.

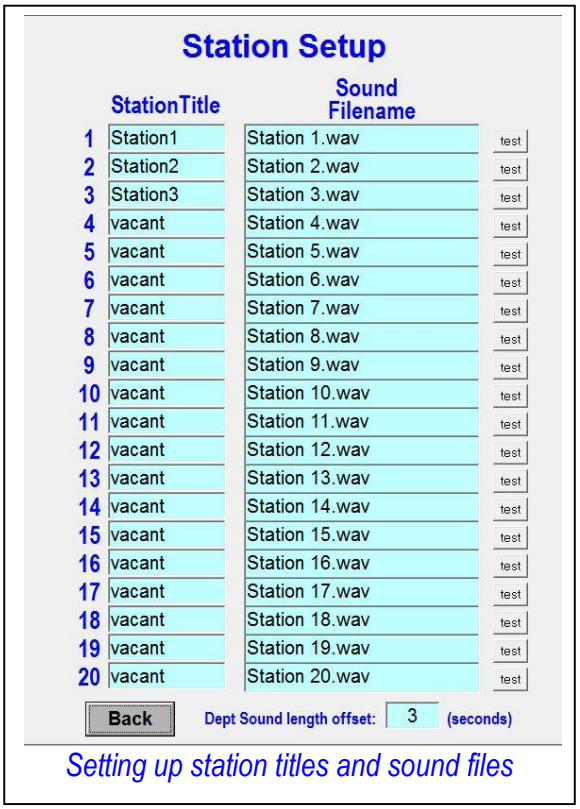
STATION SETUP PAGE

The **Station Setup** page is similar to the **Department Setup** page, where a title must be applied to each station and (if required) an audio file can be associated with each station. The corresponding **TEST** button will simply play the listed audio file once.

At the bottom of this list is a time offset (in seconds) that will transpire before any of these messages will play. This allows the Department message to finish before the Station message starts when both messages are being cascaded.

Where there are no Department messages and only Station messages are used, the 'repeat' delay on the Department will still apply and the Dept Sound Offset can be set to zero.

Note that changes to this page may not always be implemented until the logger program is stopped and re-started.



Setting up station titles and sound files

P.A. Message Setup

This system supports the playing of audible messages into a site P.A. system when operators have tripped system alerts from their stations. These messages may be sound effects or verbal announcements. It is also possible to combine audio files from Department Titles with audio files from Station Titles in order to produce a composite message for the P.A. system. For example: "***Attention...Production Support to Gearbox Assembly***" While this appears to be a single message to the listener, it is a composite where the text in **red** was an audio recording file associated with a department and the text in **blue** was a recording associated with a station.

All audio announcements are simply short .WAV or .MP3 files placed in the C:\SM329 DISPLAY…\SOUND FILES\ folder of the Data Logging PC. The Andon program will automatically play them when needed.

Sound Examples:
<unique 4-second doorbell chime>
<brief chime…..Attention Quality Control>
<brief chime…..Quality Control to….Station fifteen>
(Where '*Station 15*' is a Station sound file with a 3 second offset delay)

The workplace environment will determine the most appropriate P.A. format for each Andon installation. In quiet office environments, a succinct verbal announcement can relay exactly what action should be taking place. In a louder factory environment, voices on P.A. systems tend to be unintelligible and staff will have great difficulty understanding what was said, particularly if they are already wearing ear protection. In this situation it is more appropriate to use fixed sound effects. For example, 4 seconds of a unique xylophone chime sequence will cut through the ambient noise much clearer than just spoken words. Clicking on the **TEST** button adjacent to each filename can be used to test a sound and confirm that the message is correctly present in the Sounds folder.

The **Sound Repeat** field determines the time interval (in seconds) between the commencement of each repeating P.A. announcement. Where a time delay of **'0'** is entered, the PA announcement will be issued only once for each new event, then halt.

The ticks in the check boxes adjacent to each Department Title determine if the P.A. system will respond to **Standard Alerts**, **Urgent Alerts** or both.

P.A. INTERFACING

A typical rack mounted P.A. system (centre)

Establishing the initial audio connection between the Data Logger PC to a P.A. amplifier may create some difficulties.
Sometimes a PC will try to redirect audio into an external HDMI screen. This is not useful as the screen may be located well out of reach. Using Windows **Sound Manager** feature, it may be necessary to change the default audio back to 'Speakers' so that P.A. audio comes out of the green-ringed 3.5mm stereo jack on the rear of the PC.
From here the audio can connect to the P.A. input via a patch cable that will convert the 3.5mm stereo jack to 6.3mm mono plug that most amplifiers have as an auxiliary input. (both channels of the stereo circuit should combine to the single input.)

Audio drive levels in both the PC output and the PA input will have to be adjusted to produce sufficient sound levels without distortion. It is recommended to alter the PC Windows **Sound Event** settings so that they are mostly turned off. This will stop unwanted Windows chimes and error beeps from being extended to the P.A. system.

In some situations Earth-loops may develop between the PC and the PA. system because of grounding differences. The symptom of this is a constant 50Hz hum in the background of the P.A. system. This can be resolved by adding an **audio isolation transformer** in line with the cable between the PC and the P.A. system.

PAGER UNITS

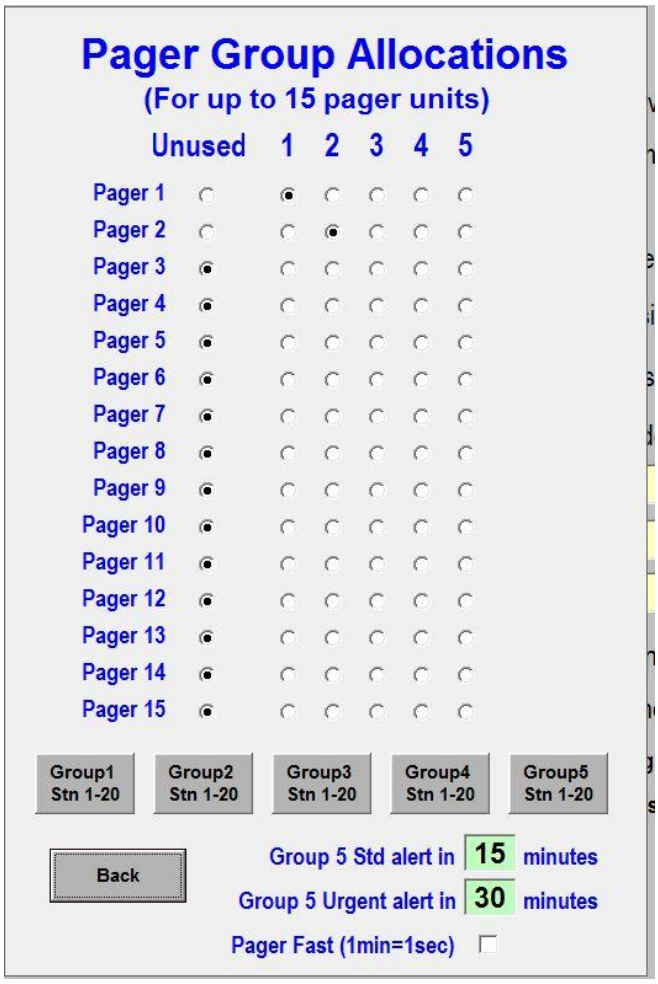
Where support staff in a large workspace are highly mobile, it can be useful for them to carry a pager unit that will indicate alerts that are relevant to their work. The Pager Units monitor the same frequency as the rest of the Andon network but they only respond to specific alerts forwarded by the Data Logger PC. The pagers are equipped with vibration and audible alerts and have a two-line OLED display that will indicate both the Department to be alerted and the Station identity that initiated the alert.

Any number of pagers may be used within a system, but all pagers must be associated with one of five predefined groups. Each group may then respond to a selected range of alarm events, as configured within the Data Logging PC. Internal error checking ensures that each unit will only respond to transmission events specifically directed to it..

The two line message consists of the **Station Name** and the **Department** name of the alert. A **Standard Alert** new message will be accompanied by a simple triple-beep sound (and vibration if enabled). **Urgent Alert** messages are identified by the longer 5-beep sound.
To halt the sound, the centre button above the display must be briefly be pressed. This will stop the beep alert and the message will appear steadily on the screen for five seconds, before reverting to the standby state. During that five seconds, the pager unit will not respond to other incoming messages.

GROUP SETTING MODE

This is a non-volatile setting that allows each pager to be allocated to display groups 1 to 5. To access this mode press and hold the centre button above the display for five seconds. The display will beep and show a screen that says **SETUP GROUP=4** etc. Pressing the **Up** and **Down** arrows will step through the five group numbers. When complete, press the centre button to return to the normal screen.



Each pager has a number printed on its front label, so that they are not accidentally mixed up with other pagers assigned to alternate groups.

From within the **Andon Setup** area, the **Pager Group Map** (shown right) should be used to record the group number to which each pager has been allocated.
For example, the adjacent image shows Pager One has been assigned to Group 1 and Pager 2 has been assigned to Group 2

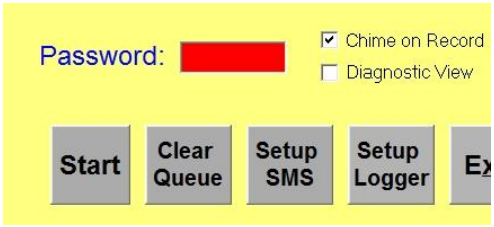
Escalated Alerts

In conjunction with the Events database, pagers can be used to alert a supervisor when an alert has not been attended by the usual support staff within a preset time period.
At the bottom of the **Pager Group Allocations** page there are fields containing two Escalation Delay timing values. Typically, these are set to 15 and 30 minutes respectively. Whenever a fresh alert is activated from any station a separate timer begins counting minutes. If that timer reaches the first Escalation Delay then a Standard Alert (3 beep cadence) is issued for the station and department concerned to all **Group 5** pagers. If that timer reaches the second Escalation Delay then an Urgent Alert (5 beep cadence) is issued for the station and department concerned to all **Group 5** pagers. If that alert is confirmed or cancelled before the Escalation Delay times are reached, then the timer is reset and an Escalated Alert is not triggered.

For setup and training purposes a check-box labelled **Pager Fast** is provided on the same **Group Allocations** page. When this is checked, timing intervals are changed from minutes to seconds. This allows the facility to be demonstrated or tested without having to wait for a longer time interval

PAGER ALERT MATRIX

From the main logging screen, press **STOP** to suspend logging operation. The Setup options buttons will now be accessible. Click on **Setup Logger** and the red password entry screen will be shown. The default password is '**andon'** backwards.



This action will reveal the main **Setup Menu**. From this location select the **Pager Groups button**, followed by the Group 1 **Setup button**. Here a matrix of check boxes will allow the operator to choose which station or which department that Group 1 will respond. There are five pages of settings that correspond with each of the five groups. On the vertical axis Station numbers are represented. On the horizontal axis the departments are represented.

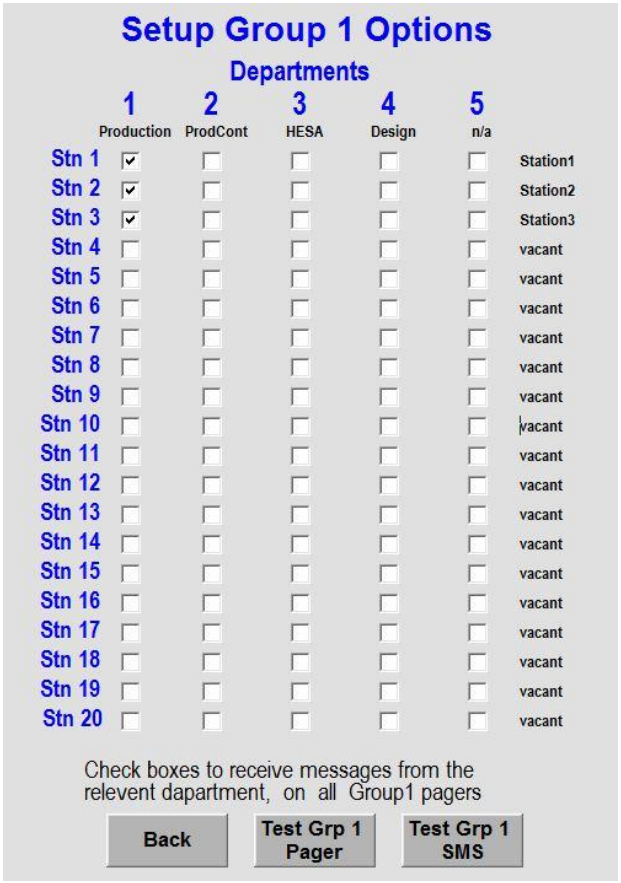
Any or all of these boxes may be checked to select which Department and/or Station will send an alert to this Group.

This is a very flexible arrangement. For example, Should all of Group 1 boxes be ticked, then all pagers set to Group 1 will respond to every alert that takes place. As many pager units as necessary may be assigned to that group

Conversely, Group 2 may well be configured to respond to First Aid alerts only, then a first aid staff member can carry a Group 2 pager and will only be alerted when medical emergencies occur.

For clarity while setting up, all Station and Department titles are shown on each setup page.

All settings are stored indefinitely within the PC memory.
It is recommended that after making changes to any system setting, that the Andon application is then stopped and re-started. This will ensure that all changes are fully engaged by the program.



Testing the pagers

To test whether a given pager has been correctly associated with that group, click on the **Test Grp 1 Pager** button to force a test transmission that will trip alerts on all matching pages. The word **TEST** should appear on the top line of any Pager Display that had been previously assigned to that group. Each group has its own test button for this purpose. Pager tests are not recorded and do not show up on any event logs.

Testing SMS Alerts

Where SMS text alert features have been implemented within a system, the Test Grp 1 SMS button will send a test SMS message to all phones listed within the SMS setup records that have been allocated to that same group.
Where phones have been flagged to be inactive at that time of day or day of the week, then those phones will not be included in the group of phones being tested.

When the settings have been completed, pressing the **Back** button will save changes and restore the previous screen.

OPERATING THE SM376 PAGER UNIT

Selecting a Group

From the main screen, press and hold the centre ■ button for 5 secs. The display will double beep and say "**SETUP'** and **GROUP=n** (Where n is group number **1** to **5**

- pressing ▲ arrow increments the GROUP number
- Pressing ▼ arrow decrements the GROUP number
- Pressing ▲ or ■ or ▼ buttons will save the setting to permanent memory, generate a long beep and restore the **Main Screen** view.

Show Software Version

From the **Main Screen**, press the ▲ button. The display will beep and say "**Version'** and **n.n** where **n.n** is the present software release for this unit.

- pressing ▲ or ■ or ▼ buttons will restore the **Main Screen** view

Accessing the SET PAGER ADDRESS Mode

This is pager setting that allows a unique location address code to be set. Normally this code is left at 10, but it may be incremented up to 20 provided the pager application program has a matching address change. It is used to ensure there are no data conflicts between nearby company sites which also using Andon pagers.

Pressing ▲ for **5 seconds** will place the pager into the **SET PAGER ADDRESS** mode where the screen will show the text **ADDRESS CODE=nn** where **nn** equals a decimal value that corresponds with the pager address between 10 and 20.

- pressing ▲ arrow increments the address
- Pressing ▼ arrow decrements the address
- Pressing ■ will save the present setting to permanent memory, generate a long beep and restore the **Main Screen** view.

Show Battery Voltage

From the **Main Screen**, press the ▼ button. The display will beep and say "**BATT'** and **n.nV** where **n.n** is the present battery voltage. Note that the internal link **LK1** must be in the **BATT** position for the correct voltage to be displayed. A typical reading would be 7.4V, or 8.2V for a freshly charged battery.

- pressing ▲ or ■ or ▼ buttons will restore the **Main Screen** view

Automatic Power Off Feature

The SM376 pagers monitor the battery voltage carefully to prevent over-discharge that will damage the internal battery pack. Where the battery voltage falls to a 6.5V threshold, it will trip a low-battery alert for one minute, then shut itself down. At this point the unit should be returned to a charging station. The unit will restore normal operation if it is turned off and back on again.

BATTERY CHARGER UNITS

A battery charge indicator will provide a low battery warning when a charge will be required soon. The internal Lithium Polymer battery must be charged by a compatible charging unit.

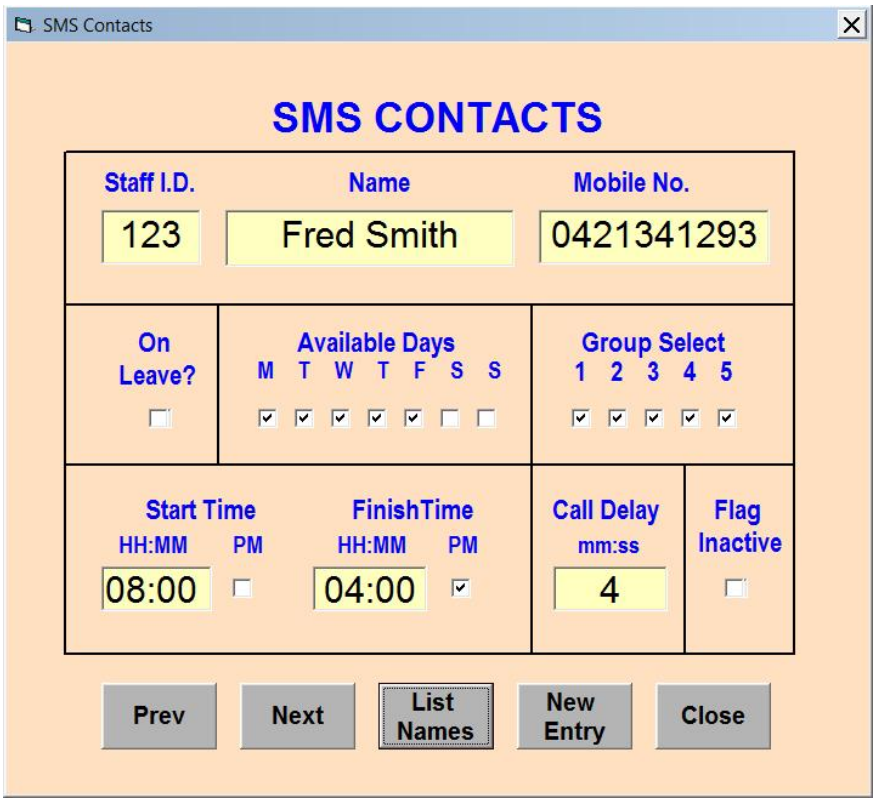
Presently, the recommended charger is a dual-charger unit that can recharge two pagers simultaneously can then be placed on the charger unit provided, or a spare battery can be inserted while the primary battery is being charged. Allow up to 1 hour for a recharge cycle to be completed..

The Andon Pager Charger

Inside the battery compartment of each pager is a 7.4V, 450 ma/h battery pack that plugs into the rear of the pager via a 3 pin power connector. Where continuous use is essential, spare batteries are available to swap out as required.

SMS MESSAGING DATABASE

A versatile feature of the Andon System is the SMS option. Where a system has the SMS features armed within the Setting area with the appropriate access code, it becomes possible to access a special database to administer an SMS call database from the main menu.
Selecting Setup SMS will invite the user an SMS access code into the red password box. This is simply the three letters: 'SMS'



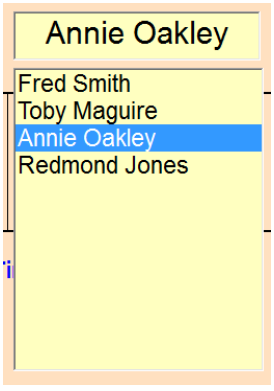
A typical SMS user profile record

One new record is created for every individual who wishes to be notified of alert events. The system coordinator must complete this form, including phone number and the normal working hours and work days of each person. In this way alert events should not disturb off-duty staff.

When a person is on leave for reason of recreation or sickness, the '**On Leave'** box may be checked to temporarily block the inclusion of that person to system alerts.

The **Group Select** boxes should be checked to register which paging groups are of interest to that person, so that they need not be disturbed by alerts from production areas that are of little interest to them.

A **Call Delay** interval (in minutes and seconds) may be added to each record. If this is set to 0 then the system will immediately generate message alerts identifying the station and department concerned. If a time value is entered here, then there will be a matching delay before the message is sent. In this fashion, it is possible to send messages to several persons at intervals, ensuring that both persons do not respond at the same time.



To select a new profile, click on the **List Names** button, then click to select the person required. Selecting **New Entry** will allow a blank record to be added to the file for a new person to be added to the list.

SPECIFICATIONS

SM329 Station Unit

Dimensions	120mm x 200mm x 65mm
Supply	24V D.C.
Transmitter	100mw, 151.300 MHz
Data transmission	1200 baud AFSK
Antenna connection	50 Ohm, BNC socket

SM330 Display Panel (20 station)

Dimensions	1100mm x 225mm x 65mm
Supply	12V D.C.
Transmitter	100mw, 151.300 MHz
Data Transmission	1200 baud AFSK
Antenna connection	50 Ohm, BNC socket
Audio announcer	3.5 Watt

SM376 Pager Unit

Dimensions	105mm x 75mm x 25mm
Supply	7.4V 2S Lipo battery .
Receiver	151.300 MHz

Data Logger PC

HP 19” screen, All-in-one PC
1TB hard drive
HDMI port

Note the 151.300 MHz is a designated LIPD (Low Interference Potential Device) frequency and no communications licence is required to operate this equipment.