GEOQUIP

WORLDWIDE

The Leader in Perimeter Protection Solutions

RAFID SPECIFICATION, INSTALLATION AND COMMISSIONING GUIDE FOR GROUND BASED SYSTEMS

QA311: Rev 1: 29/08/01

CONTENTS

1 INTRODUCTION

1.1 OVERVIEW

The RAFID detection system operates by detecting disturbances made in an electromagnetic field when an intruder passes through it. Two 'leaky feeder' cables are positioned parallel to each other at a fixed distance apart. A constant high frequency voltage is applied to one of the cables which then acts as a simple radiating aerial along its entire length. The second cable will have induced in it a small but constant voltage due to the electromagnetic field created by the first cable. Any object passing through the radiating field will modify the induced voltage in the second cable. A human body contains a large amount of saline water which, as the body moves through the field, creates a large signal to noise ratio in the second cable, suitable to be detected and used in an intruder alarm system.

There are various types of 'leaky feeder' cables manufactured dependent an their intended application. Originally designed for communication systems in tunnels and coalmines, the type used in RAFID has a solid inner conductor surrounded by an insulator with several individual wires acting as the 'screen'. Gaps between the individual screening wires allow radiation energy to leak out, or conversely, leak into the cable.

There are five main components required for any RAFID system. These are: -

1. Leaky feeder transmit cable.

2. Leaky feeder receiver cable.

3. Transmitter unit.

4. Analyser unit.

5. Receiver cable 'end of line' module.

The analyser unit comprises two parts, an RF board and a signal analyser board. Both these boards require on-site adjustments and are explained in the commissioning section of this report. For simplicity, the leaky feeder cables are referred to as 'sensor cables' in the following text. Figure 1 shows how the above components are arranged for any RAFID system.

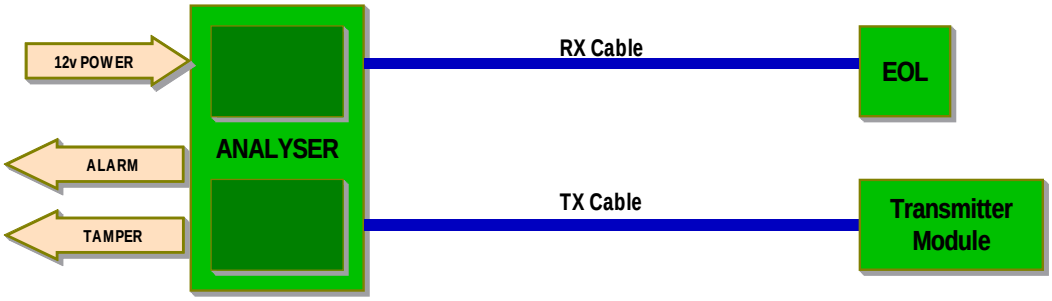


Figure 1

RAFID systems are intended for ground or wall based use where there are no (or very few) metallic objects in the vacinity of the sensor cables. There are several other factors discussed in this document that have to be considered at the outset of the system design to minimise any potential false alarms. This document aims to help the system specifier and installer to understand what has to be considered from initial conception to final commissioning of a typical RAFID system.

Figure 2 shows a typical layout of a two zone system. Photograph 1 shows a typical RAFID Analyser and photograph 2 shows a typical RAFID Transmitter.

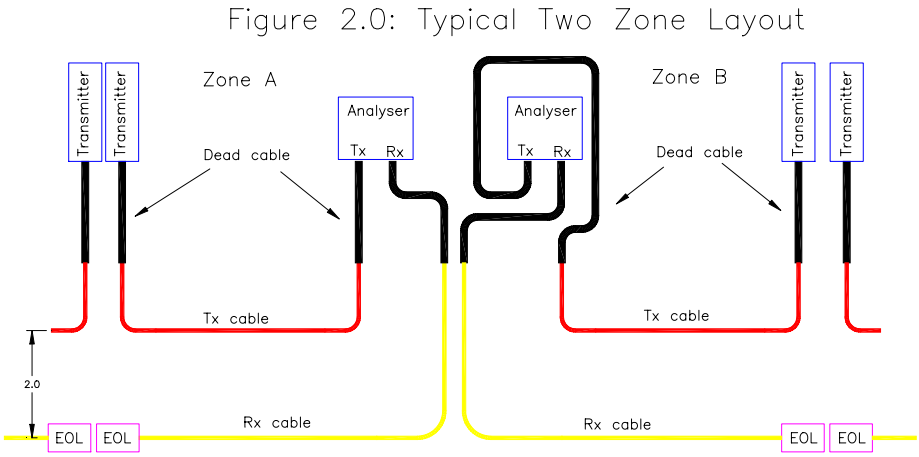


Figure 2

Photograph One: Typical RAFID Analyser

Photograph Two: Typical RAFID Transmitter

1.2 MAIN FEATURES

- Covert detection system
- Volumetric sensor – will detect above and below ground
- Detects very slow moving intruders
- Virtually immune from environmentally induced signals
- Fully tamper proof
- Single or dual zone operation
- Simple installation

1.3 SPECIFICATION – GROUND BASED SYSTEM

Detection range	2.5m wide x 0.5 high x zone length
Zone length	10m to 150m
Sensor	Spacing 2.0m apart
Probability of detection	Not less than 99% for intruder weighing 34kg walking over ground or climbing over a wall
Operating voltage	Analyser 12-15V dc@800mA Transmitter 9-12.5V dc self powered from transmitter cable

Outputs	RS485 Solid state Alarm and Tamper relays 250V 120mA ac or dc
Detection parameters	Adjusted by on board push buttons with LCD display
Operating temperature range	-40ºC to +70ºC
Operating humidity	Up to 95% RHNC
Operating frequency	40 to 41MHz (16 possible options)
Transmitter housing	Cast Aluminium Size 260 x 160 x 90mm Weight 2.9Kg
Receiver housing	Cast Aluminium Size 330 x 230 x 102mm Weight 3.6Kg

2 INSTALLATION GUIDE – GROUND BASED SYSTEM

2.1 INSTALLATION GUIDE

System reliability depends on the proper location and installation of the two sensor cables and correct connections. Detailed procedures for installing the sensor cables are included in this chapter. To properly install the cables and connectors, perform the following steps in order:

- Check the site plan to verify the cable route.
- Clean debris and any unwanted material identified in the site evaluation exercise.
- Check for any underground utilities.
- Mark the sensor cable route in accordance with the site plan.
- Dig the trenches or cut the slots.
- Lay the corrugated self-draining pipes in the trenches complete with pull cords.
- Pull the sensor cables into the pipes.
- Partially backfill the trenches.
- Perform a preliminary check of the system.
- Complete the back filling of the trenches.

2.2 SITE EVALUATION

All sites, where RAFID is to be used, must first be checked for suitability by a representative of Geoquip Limited. The following site conditions should be met:

- The site must be 10m away from moving traffic.
- There should be no metal objects on or below ground.
- There should be no mineralised rocks in the detection zone. These can be located using a quality metal detector such as the Fisher 1266-X model.
- The site should be, ideally, 10m away from water drainage pipes or ducts.
- There must be no other cables running underground, inside the proposed zone.
- People should not normally be within 5m of the detection zone.
- Large animals should be kept away.
- Any tree roots close to the zone must not move with the wind.
- All connectors must be sealed against moisture penetration.
- If lightning protection units are fitted, a low impedance earth path of 10Ω or less will be required close to the analyser and transmitter units.
- Minimum bend radius for sensor cables, 10m.
- Consideration is to be made of where the power and alarm signal cables are to be installed. Ideally, the power and alarm cables should be run in separate ducts.

Next to be considered is the positioning of the analysers and transmitter units. If the system is to be completely covert, then analysers and transmitter units should be installed underground and manholes with suitable drainage and ventilation are to be provided. As a safety measure, a float switch should be installed to give warning of rising water level. A nearby building or wall may be used to house the receiver and transmitter modules. In this case the sensor cables can be fed to their respective modules using 'dead' coaxial cable (PRG11). Up to a maximum of 50m of cable can be used.

2.3 SITE PREPARATION

For a completely covert system, a total of three cable ducts have to be cut out of the ground, the deep of the ducts should be as soon below. Two of the ducts are to house the sensor cables, spaced 2m ±25mm apart and a third is to carry the power and signal cables which should be positioned on the protected side of the zone spaced at least 0.5m away from the nearest sensor cable.

If manholes are used to house analyser and transmitter units, then the minumum size of 0.8m cube, brick lined with suitable drainage. Should be used with an earth spike installed in the base. A non-rusting cover is to be fitted over the manhole which is also to provide adequate ventilation.

Into each of the sensor cable ducts, 50mm minimum diameter corrugated self-draining pipe has to be laid (with pull cord). These pipes are to be the full length of the active zone. The pipes terminate at the analyser and transmitter box or at the start of the conduit 'dead section' section, if conduit is used. The pipes are then covered with the spoil taken when the ducts were excavated. See Figure 3 below.

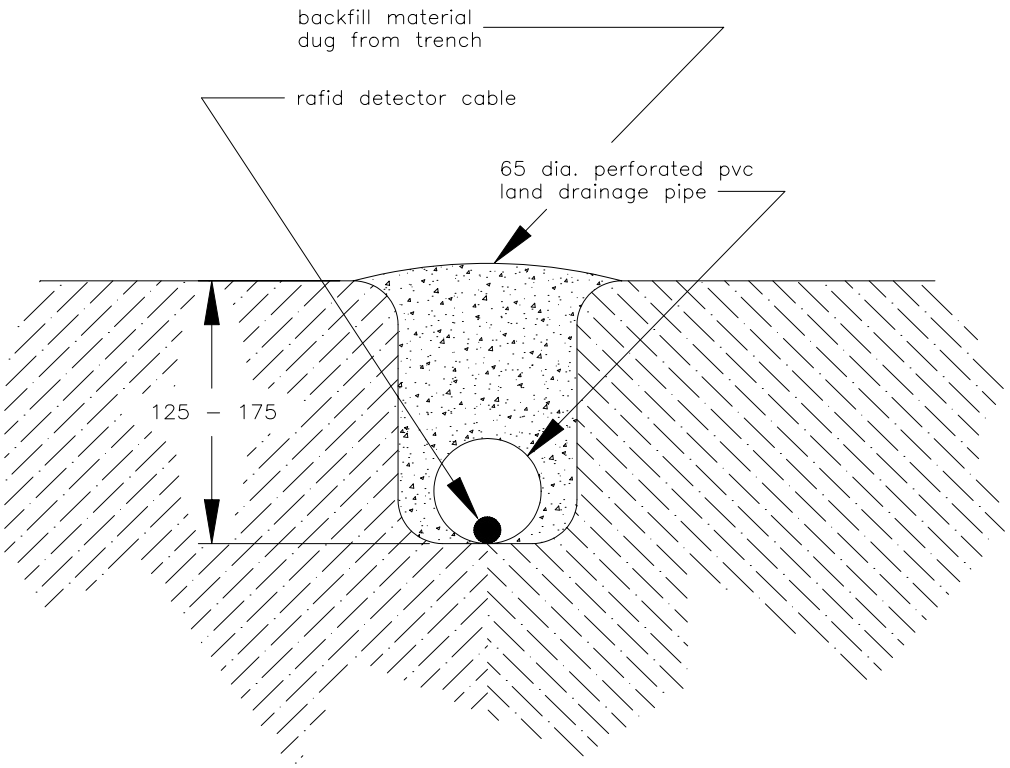


Figure 3

Ground Type	Nominal Burial Depth
Soil	150mm ±25mm fitted inside 60mm plastic self draining water pipe
Gravel	150mm ±25mm fitted inside 60mm plastic self draining water pipe

Asphalt up to 100mm thick	125mm ±12mm fitted inside 25mm plastic tube
Asphalt more than 100mm thick	50mm ±12mm fitted inside 25mm plastic tube
Non-reinforced concrete up to 100mm thick	125mm ±12mm fitted inside 25mm plastic tube
Non-reinforced concrete more than 100mm thick	50mm ±12mm fitted inside 25mm plastic tube

A 90º bend made in the path of the detection zone should be made using a smooth curve having a 10m minimum radius. Alternatively, the bend can be made from a series of 4m straight lines inclined by 30º to each other. See Figure 4.

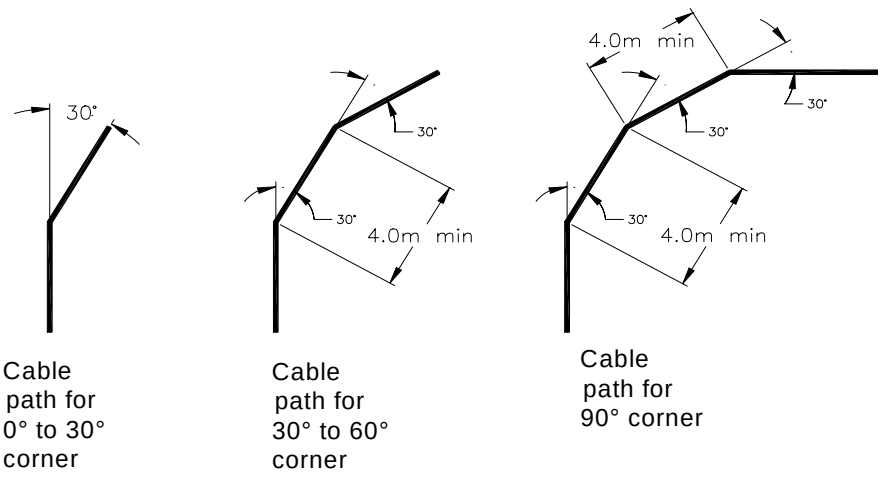


Figure 4

2.4 INSTALLATION

Both power and signalling cable must be suitable for direct burial and kept as far apart from each other as possible. These cables should be installed into the power duct prior to any RAFID electronics being fitted.

The two RAFID cables can be drawn into their respective underground pipes taking care not to damage or twist them during the process.

The pre-assembled analyser and transmitter units can be located in the manholes provided and the system wired up.

First consider the manhole holding one (or two) transmitters. The following tasks have to be done:

1. Connect the earth spike to the earth stud on the transmitter chassis assembly.

2. Cut the sensor cables to length.

3. Mount the ‘UHF’ type connectors on to the ends of the sensor cables in accordance with the GA0079 drawing. Cover the completed assembly with adhesive lined heatshrink tubing.

4. Fit the End-of-Line terminator to the far end of the receive cable.

5. Plug the transmit cable into the transmitter unit.

6. Connect the float switch sensor to the appropriate signal pair of wires.

Now in the other manhole holding one (or two) analyser units and power supply. The following tasks have to be done:

1. Connect the earth spike to the earth stud on the receiver chassis assembly.

2. Cut the sensor cables to length.

3. Mount the ‘UHF’ type connectors on to the ends of the sensor cables in accordance with the GA0079 drawing. Cover the completed assembly with adhesive lined heatshrink tubing.

4. Connect both the transmitter and receiver cables into the analysers keeping them as far apart as possible. Transmitter cable plugs into the left-hand connector. Receiver cable plugs into the right hand connector.

5. Connect the 110V or 240V ac to the adjustable PSU and the 12V dc supply to the analyser(s).

6. Connect alarm, tamper and float switch signals to the signal cable in accordance with the wiring diagram supplied with the equipment.

7. Commission the completed zone.

3 COMMISSIONING.

3.1 GENERAL

There are two aspects to commissioning a RAFID system. One is to set up the RF side of the system, the second is to set up the analyser to meet the required detection criteria.

Figure 5 below shows the location of components referenced in this section.

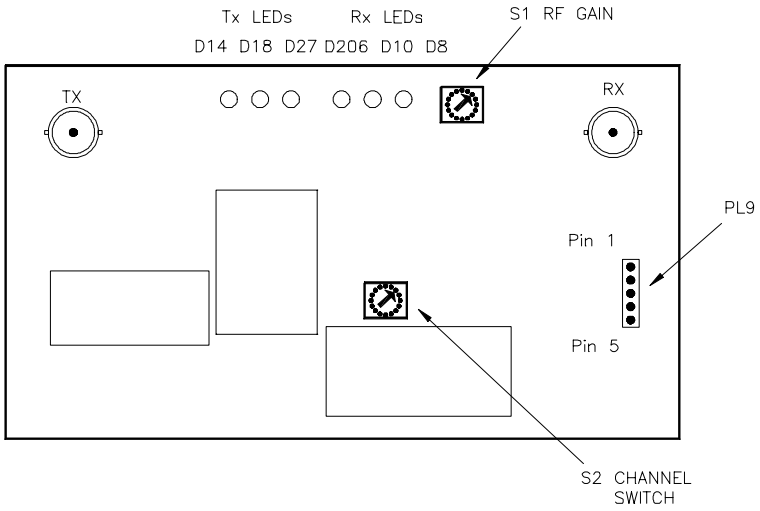


Figure 5

Both the RF board in the analyser unit, and the transmitter module, have been factory pre-set to operate at the correct frequency and the power output of the transmitter set to 600mW.

The table 1 below shows all the possible frequency setting which the transmitter can be programmed to operate at. To re-programme a transmitter module requires the use of a PC running a special program. Hence, this parameter is NOT field adjustable.

For any multi-zone site, adjacent zones are factory pre-set to operate on a frequency channel that is at least 60kHz apart. The RF board has a channel select switch, S2, that is set to the appropriate transmitter frequency shown in table 1. Labels attached to both the transmitter and analyser units show which zone they are to be installed on, the channel select switch number and operating frequency.

Table 1- RAFID Transmitter Frequency Setting

Switch S2 Position	Frequency MHz	Switch S2 Position	Frequency MHz
0	40.320	8	40.560
1	40.350	9	40.590
2	40.380	A	40.620
3	40.410	B	40.650
4	40.440	C	40.680

5	40.470	D	40.710
6	40.500	E	40.740
7	40.530	F	40.770

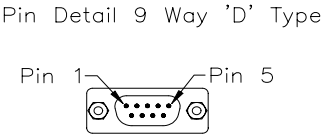
3.2 SETTING THE RF BOARD AND TRANSMITTER

The object here is to first check there are no tamper faults with the RAFID sensor cables, set the Automatic Gain Control and test the Received Signal Strength Indication (RSSI) is 2.5V ±10%.

1. Apply 12V dc to the system.

2. Remove the lid on the transmitter box.

3. Using a dc voltmeter, check on pins 1 and 5 of the 'D' type connector (located next to the small SMB connector) reads 12V (+0.5/-3V).



4. Adjust the system 12V dc supply until the transmitter voltage is correct.

5. Replace the lid on the transmitter box.

6. Check on the RF board, the fault indictor LED's associated with the Transmitter D14, D18 and D27 are all OFF.

7. Check on the RF board, the fault indictor LED's associated with the receiver cable and end of line unit D206, D10 and D8 are all OFF.

8. If D27 is ON check that S2, the channel frequency select switch, is in its correct position.

9. If any other of the above LED's are ON at this stage there is a fault with the dead cables, sensor cabling, end of line module or transmitter unit.

Table 2 shows the function of the RF receiver LED indicators.

Table 2 RAFID Receiver LED's

LED	Function
D8	RX cable fault (current low)
D10	RX cable fault (current high)
D14	TX cable fault (current high or FS1 tripped)
D18	TX cable fault (current low)
D24	RX detection level below optimum
D25	RX detection level above optimum
D27	TX RF level fault (low)

D206	Receiver local oscillator out of lock

If all the above LEDs are out, then the AGC and RSSI level can be checked.

1. Check the gain switch S1 is in position D.

2. Using a dc voltmeter meter measure the AGC voltage between PL9 pin 2 and 0V. This voltage should be in the range +0.6V to +0.8V for correct operation of the RF board. If the AGC is outside these limits adjust S1 until the AGC comes within range. Seek advice from Geoquip Limited if there is there is a problem in achieving this condition.

3. On the main analyser board press the 'UP' button several times to select the menu option that shows :

RSSI CONTROL OFF

4. If 'ON' is showing, press either the + or – buttons to turn it 'OFF'.

5. Press the 'UP' button to select the next menu option :

RSSI LEVEL
(2.55V)

6. The RSSI level is shown on the second line in brackets.

7. Check the RSSI is reading between 2.55V ±10%.

8. The RF board is now set up.

3.3 SETTING THE ANALYSER BOARD.

The analyser board takes the following four signals from the RF board:

1. ALL_OK signal.

2. RSSI level.

3. Phase signal.

4. Amplitude signal.

The ALL_OK logic signal is set when a sensor cable short circuit, open circuit is detected or if the transmitter fails. The analyser simply operates the tamper alarm under these fault conditions. There are no adjustments associated with the ALL_OK signal.

RSSI is simply displayed on one of the menu screens to check the RF board's received amplitude signal level is correct.

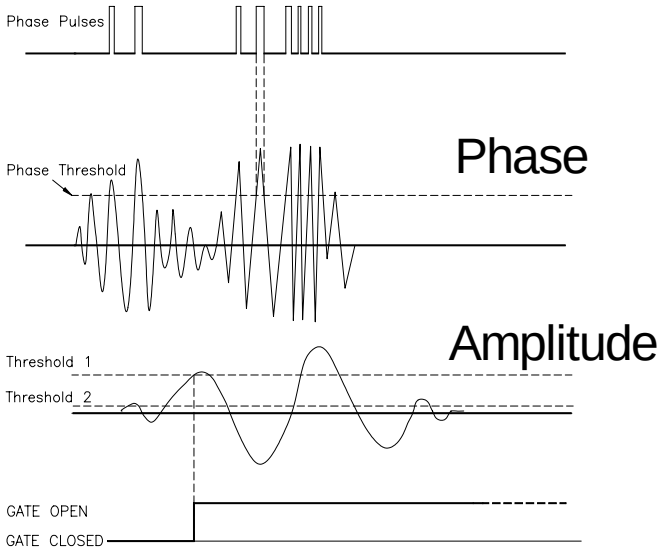
Both phase and/or amplitude signals are used by the analyser in order to detect an intruder. Some understanding of the significance of the phase and amplitude signals is required before attempts are made to set up the analyser board.

Both phase and amplitude signals are generated to a greater or lesser extent as a person moves through the RF field between the Tx and Rx sensor cables. It is only the *change* in field activity that is used by the analyser board. Hence, the lower frequency cut-off point for both signals is set at approximately 0.2Hz. The upper cut-off point is approximately 15Hz for the amplitude signal and 40Hz for the phase signal. There is a plug in band-pass filter, on the analyser board, set to 0.2Hz to 40Hz

for both channels though which both signal channels pass before feeding a gain controlled amplifier and then to a PIC microprocessor.

The Timing Diagram below shows a typical relation between phase and amplitude signals as a 'typical body' moves through the 2m spacing between the Tx and Rx sensor cables. Note that the amplitude signal is a much lower frequency than the phase signal and also phase signals appear (sometimes) *before* the gate is opened. This is the reason why there is a gate pre-delay option to capture these phase signals.

Timing Diagram

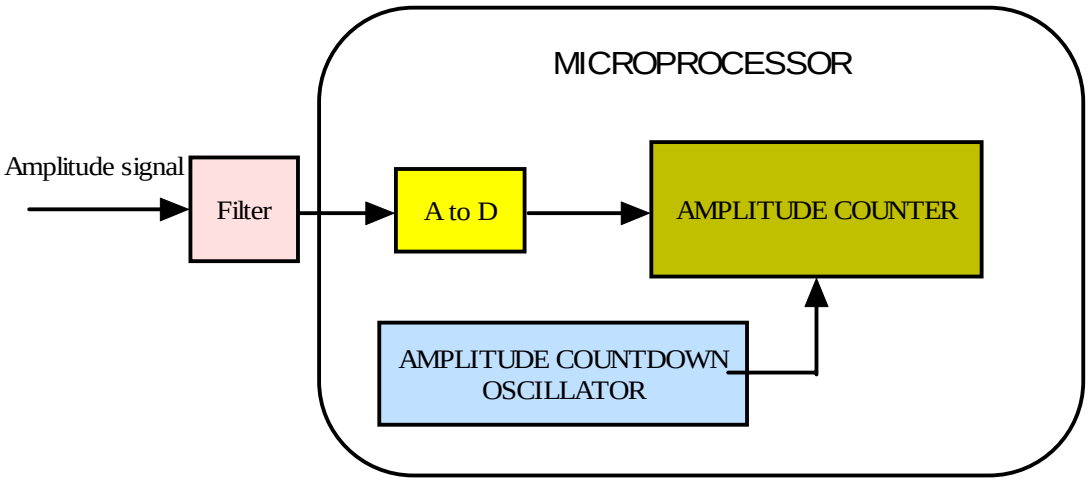


Dependent on site conditions, sometimes there are phase signals without any significant amplitude signal being present and vice-versa. The analyser is programmed to take into account these types of variations together with one or two special modes of operation to detect unwanted spurious signals. Signals due to rain and wind should not be a problem to the system given that the sensor cables are mechanically protected and do not move about.

3.4 FIRMWARE DESCRIPTION

3.4.1 Amplitude Only

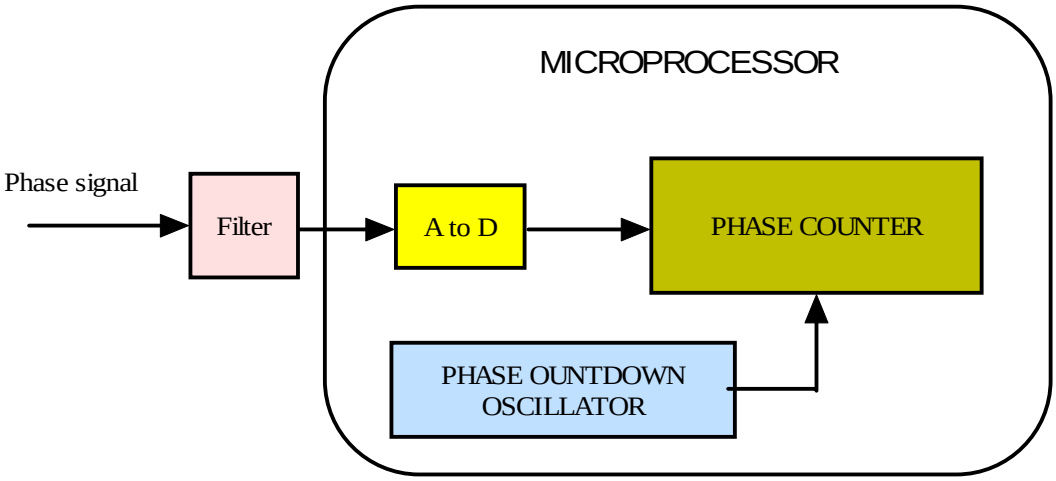
The block diagram below shows the basic arrangement of how the analyser operates in the standard 'AMP ONLY' mode.



In the ‘AMP ONLY’ mode of operation, phase pulses are ignored. Only when the desired number of ‘AMP COUNTS’ is reached, the alarm triggers. The ‘A COUNTDN’ setting is used to remove any amplitude counts remaining in the counter after the ‘GATE TIMER’ period has elapsed.

3.4.2 Phase Only

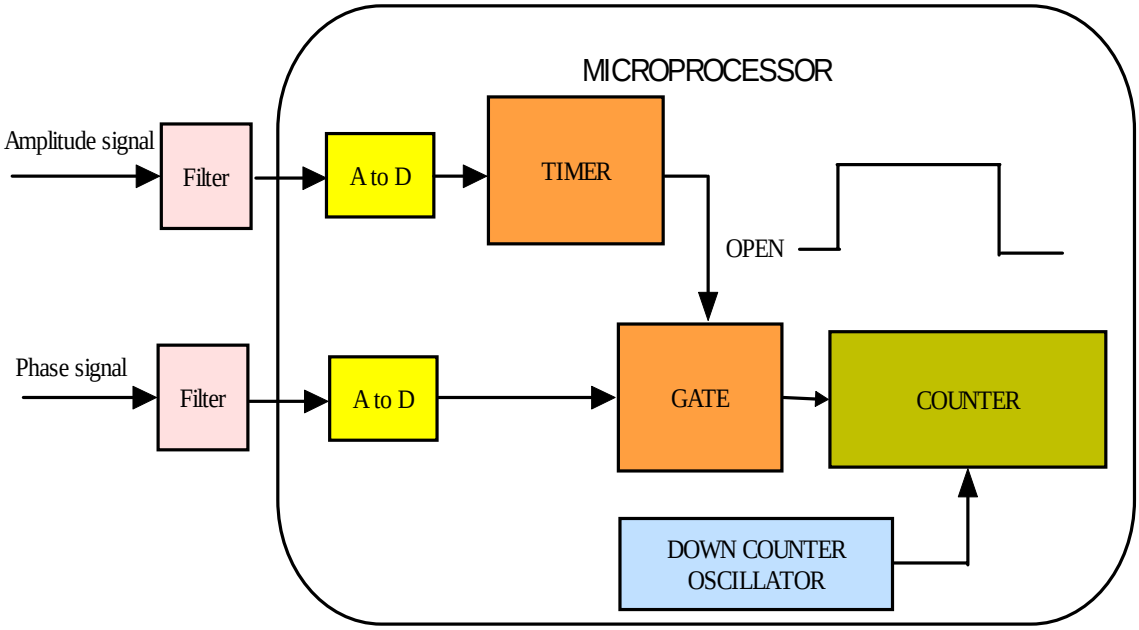
The block diagram below shows the basic arrangement of how the analyser operates in the standard ‘PHASE ONLY’ mode.



In the ‘PHASE ONLY’ mode of operation, amplitude pulses are ignored. Only when the desired number of ‘PHASE COUNTS’ is reached, the alarm triggers. The ‘P COUNTDN’ setting is used to remove any phase counts remaining in the phase counter if the desired number of phase pulses has NOT reached the number set by the ‘PHASE COUNT’ setting.

3.4.3 Gated Mode

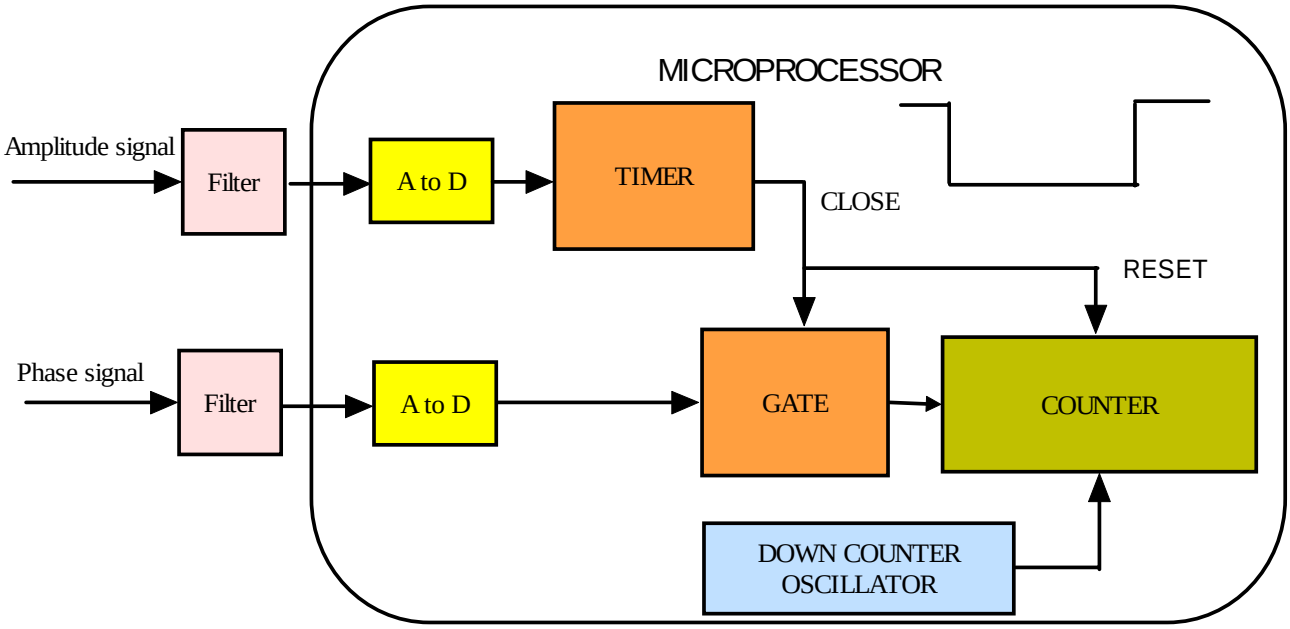
The block diagram below shows the basic arrangement of how the analyser operates in the standard ‘GATED’ mode.



In the ‘GATED’ mode of operation the system operates similar to a timer counter using the amplitude signal to operate a ‘GATE TIMER’ which, when triggered, opens a ‘GATE’ to allow phase pulses to pass through. When the counter reaches a ‘PHASE COUNT’ number, the alarm is triggered. If the ‘PHASE COUNT’ is not reached a ‘DOWN COUNTER OSCILLATOR’ removes one count at a time dependent on the ‘P COUNTDN’ setting.

3.4.4 Reverse Gated Mode

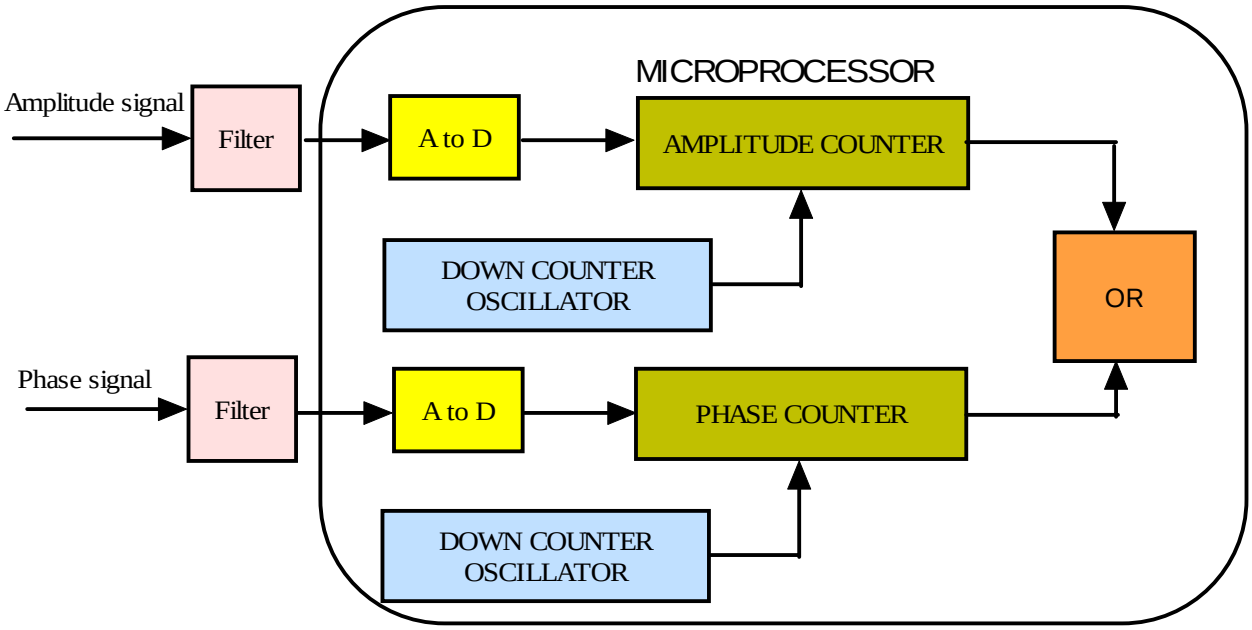
The block diagram below shows the basic arrangement of how the analyser operates in the 'REVERSE GATED' mode.



This mode of operation is operates in a similar manner to the normal 'GATED' mode except the amplitude signal is used to STOP phase pulses from being counted and holds the phase counter reset for the period set by the gate timer. Reverse gate mode is only to be used where there are normally NO significant amplitude signals present when an intruder passes through the detection zone. The system detects therefor on phase signals only. This mode of operation is only used to remove any unwanted spurious alarms due to sudden changes in *amplitude* as well as phase signals.

3.4.5 Phase or Amplitude Mode

The block diagram below shows the basic arrangement of how the analyser operates in the 'Phase OR Amplitude' mode.



In this mode of operation if either the amplitude OR the phase counter reaches their respective counts as set by ‘AMP COUNT’ or ‘PHASE COUNT’, the alarm will operate. This mode of operation gives the most sensitive type of detection.

3.5 MENU DESCRIPTION

Setting up the analyser involves the operator in scrolling through several menus on the LCD display fitted to the analyser board. An understanding of each of the menus is required before attempting to set up the analyser board.

The menu structure is on a rotating basis. To move forward to the next menu press the ‘UP’ button. To move backwards to the previous menu, press the ‘DOWN’ button. To change any of the displayed values, the engineer must be logged on. Pressing the ‘+’ or ‘-’ buttons will then change the current setting displayed on the screen. Also certain screens are not available if the engineer is not logged on.

3.5.1 Logging On/Off

To log on, menu 2 must be selected. Starting at power on, the menu 3 appears:

LOG #000 TAMPER
01Jan00 00 : 00 : 00

Pressing the ‘DOWN’ button twice displays menu 1 which displays current firmware revision.

GEOQUIP - - - RAFID
PGM0158 Rev xx

Pressing the ‘UP’ button displays menu 2 which allows the engineer to log on or off.

PASSCODE
0000

To log on press and hold down the ‘+’ or ‘-’ key until your pass code number is shown, your initial pass code number will be supplied to you by Geoquip Limited. Press the ‘UP’ button. If the correct pass code is entered, the display changes to menu 2a:

CHANGE PASSCODE
****

Otherwise, menu 3 is displayed and you are not logged on.

To log off select menu 2, enter any number (0001) and press the ‘UP’ button.

3.5.2 Changing a Pass Code

To change a pass code select menu 2a:

CHANGE PASSCODE
****

Press the ‘+’ button which changes the display menu 2b:

CHANGE PASSCODE
CURRENT: 0000

Enter your current pass code number and press the ‘UP’ button. If accepted, the following display menu 2c will be shown:

CHANGE PASSCODE
New Code: xxxx

Press the ‘+’ or ‘-’ buttons to enter your new pass code number and press the ‘UP’ button to confirm. The display then shows menu 3.

3.5.3 Event Log

LOG #000 TAMPER
01Jan00 00 : 00 : 00

The analyser keeps a log of the past one hundred events together with the date and time of each event. The engineer at this stage (without being logged on) can scroll backward through the log file by pressing the ‘-’ button and then forwards by pressing the ‘+’ button. Pressing the ‘UP’ button causes menu 4 to appear:

LOG
Clear Log ?

Pressing the ‘+’ button changes the display to menu 4a:

CLEAR LOG
Are You Sure ?

Pressing the ‘+’ button again clears the log and menu 2 is re-displayed:

LOG #000 CLEARED
01Jan00 xx : xx : xx

Otherwise, pressing the ‘UP’ or ‘DOWN’ button, menu 5 is displayed and the log is NOT cleared.

3.5.4 Date Settings

Pressing the ‘UP’ button causes menu 5 to appear which shows the current Date.

DATE
10 Jan 2000

To change the date, display menu 5. Press the ‘+’ button, the following display appears:

DATE
10 Jan 2000

Press the ‘+’ button to increment the units figure. Press the ‘UP’ button to display:

DATE
25 Jan 2000

Press the ‘+’ or ‘-’ button to select Feb, March etc. Press the ‘UP’ button to display:

DATE
25 Aug 2000

Press the ‘+’ or ‘-’button to increment or decrement the year. Finally, press the ‘UP’ button to accept the new date setting.

DATE
25 Aug 2001

3.5.5 Time Settings

Pressing the ‘UP’ button causes menu 6 to appear which shows the current Time.

TIME
00:00:00

To change the time, display menu 6 and follow the same procedure as in menu 5 above.

3.5.6 Processing Mode

Pressing the ‘UP’ button causes menu 7 to appear shows the current Mode setting

PROCESSING MODE
Phase OR Ampltd

If the ‘UP’ button is pressed NOW, menu number 8 will appear and the Mode is not modified. When logged on, the engineer can, by pressing the ‘+’ or ‘-‘ buttons, select one of five modes of operation, i.e. Amplitude Only, Phase Only, Phase or Amplitude, Gated, Reverse Gated. A full explanation of each of these modes is given in Section 3.4.

3.5.7 Amplitude Gain

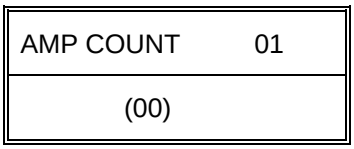
Pressing the ‘UP’ button causes menu 8 to appear which displays the current amplitude gain setting and a bar graph of the real time amplitude signal.

AMPLTD GAIN 100
▬▬▬▬▬

The gain can be adjusted from 0 to 255 by pressing the ‘+’ or ‘-’ buttons. The bar graph operates from zero to full scale.

3.5.8 Amplitude Count

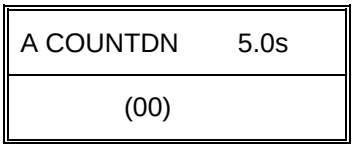
Pressing the ‘UP’ button causes menu 9 to appear which displays the current amplitude count setting and the real time number of amplitude counts that have occurred.



The amplitude count can be adjusted from 1 to 99 by pressing the ‘+’ or ‘-’ buttons.

3.5.9 Amplitude Count Countdown

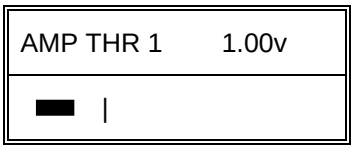
Pressing the ‘UP’ button causes menu 10 to appear which displays the current amplitude count countdown setting and the real time number of amplitude counts that have occurred.



The countdown time interval can now be adjusted from 0.1sec to 25.0sec by pressing the ‘+’ or ‘-’ buttons.

3.5.10 ‘Low’ Amplitude Threshold

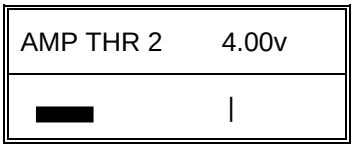
Pressing the ‘UP’ button causes menu 11 to appear which displays the current 'low' amplitude threshold together with a bar display of the real time amplitude signal. The point at which ‘AMP1’ LED is activated, on the analyser board, is also indicated by a line on the bar display area.



The ‘low’ amplitude threshold can now be adjusted from 0.00 to 5.00V by pressing the ‘+’ or ‘-’ buttons.

3.5.11 ‘High’ Amplitude Threshold

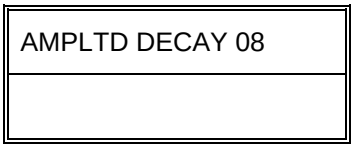
Pressing the ‘UP’ button causes menu 12 to appear which displays the current ‘high’ amplitude threshold together with a bar display of the real time amplitude signal. If the system mode is set to ‘Amplitude Only’, the point at which the alarm is operated is also indicated by a line on the bar display area. The line also indicates at what level the gate (see timing diagram) operates if the system is operating in ‘Gated’ mode.



The ‘high’ amplitude threshold can now be adjusted from 0.00 to 5.00V by pressing the ‘+’ or ‘-’ buttons.

3.5.12 Amplitude Delay

Pressing the ‘UP’ button causes menu 13 to appear which displays the current amplitude decay factor.



The decay factor can now be adjusted from 1 to 50 by pressing the '+' or '-' buttons. A full explanation of the Amplitude Decay factor is given in section 4.6.

3.5.13 Amplitude Pulse Width Discrimination

Pressing the 'UP' button causes menu 14 to appear which displays the current Amplitude Pulse Width Discrimination (PWD) factor.

AMPLTD PWD 60ms

The PWD factor can now be adjusted from 0.4ms to 976ms by pressing the '+' or '-' buttons.

3.5.14 Phase Gain

Pressing the 'UP' button causes menu 15 to appear which displays the current Phase Gain value together with a real time 'scope' display (in the lower part of the display) of the number of phase pulses counted in a given time period. The max number of phase pulses, per time period displayed, is seven.

PHASE GAIN 180
_ _ _ _ _ _ _ _ _ _ _ _ _

The time period (or time base of the scope display) can be adjusted from 00.1s to 9.99s using menu 28. Setting the time period to 1.0s gives a total time base time of 16 seconds which is normal for most applications.

The Phase Gain factor can now be adjusted from 00 to 255 by pressing the '+' or '-' buttons.

3.5.15 Phase Count

Pressing the 'UP' button causes menu 16 to appear displays the Phase Count factor together with a real time value of the actual count value. The Phase Count factor is the point at which the alarm will operate if ever the count value reaches that quantity.

PHASE COUNT 05
(00)

The Phase Count factor can now be adjusted from 01 to 99 by pressing the '+' or '-' buttons.

3.5.16 Phase Count Down

Pressing the 'UP' button causes menu 17 to appear which displays the Phase Count Down factor together with a real time value of the actual count value. The Phase Count Down factor is the time taken for the system to remove one accumulated count from the count value.

P COUNTDN 5.0s
(00)

The Phase Count Down factor can now be adjusted from 0.1sec to 25.0sec by pressing the '+' or '-' buttons.

3.5.17 Phase Cap

Pressing the ‘UP’ button causes menu 18 to appear which displays whether or not the Phase Cap function is ON or OFF.

PHASE CAP Off

The Phase Cap function can be switched ON or OFF by pressing the ‘+’ or ‘-’ buttons.

Phase Cap function is only used in a ‘PHASE ONLY’ system. It is used to stop the system going into alarm when an excessive number of phase pulses occur in a very short period of time (less than say 500mS).

If the PHASE CAP is set to ‘ON’ and the ‘UP’ button is pressed, menu 18a will appear which displays how long the Phase Cap function is active for once the system has detected an *amplitude* signal at Amp Threshold 2 (see timing diagram).

PHASE CAP On
WINDOW 0.9s

The Phase Cap factor can now be adjusted from 0.1sec to 9.9sec by pressing the ‘+’ or ‘-’ buttons.

Pressing the ‘UP’ button, menu 18b will appear which displays how many phase pulses have to be counted, in the set window, before the count value is reset to zero.

PHASE CAP On
TARGET 20

The Target number can be adjusted from 01 to 99 by pressing the ‘+’ or ‘-’ buttons.

Pressing the ‘UP’ button, menu 18c will appear which displays the period of time, after the count value has been set to zero, that the system will ignore phase pulses.

PHASE CAP On
DEAD TIME 2.0s

The Phase Cap factor can now be adjusted from 0.1sec to 25.0sec by pressing the ‘+’ or ‘-’ buttons.

3.5.18 Gate Time

Pressing the ‘UP’ button causes menu 19 to appear which displays the Gate Time value.

GATE TIME 7.5s

The Gate Time factor can be adjusted from 0.1sec to 25.0sec by pressing the ‘+’ or ‘-’ buttons.

When the system is set to operate in ‘GATED’ mode then both phase *and* amplitude signals are required to trigger an alarm, Gate Time is the period in which the system counts phase pulses (see timing diagram). After the Gate Time has elapsed, any phase pulses counted are reset to zero unless the system has counted enough pulses to create an alarm condition

3.5.19 Gate Trigger

Pressing the ‘UP’ button causes menu 20 to appear which displays the Gate Trigger options.

GATE TRIGGER
Level

The Gate Trigger options can be adjusted by pressing the ‘+’ or ‘-’ buttons. There are three options to choose from i.e. Level, Edge Non-Retrig and Edge Retrig. The gate is always triggered using the amplitude signal and can be considered like a re- triggerable or non-retriggerable monostable with the option if the input stays above the Amp Threshold 2 the output stays active.

3.5.20 Gate Pre-delay

Pressing the ‘UP’ button causes menu 21 to appear which displays whether or not the Gate Pre-delay is ON or OFF.

GATE PRE-DLY Off

The Gate Pre-Delay can be set ‘ON’ or ‘OFF’ by pressing the ‘+’ or ‘-’ buttons.

Since phase pulses can be detected *before* the gate is triggered this option, if set ‘ON, allows phase pulses to be counted for a short period before the gate is opened.

If set to ‘ON’ and the ‘UP’ button is pressed, menu 21a will appear which displays the Pre-delay period.

GATE PRE-DLY On
0.5s

The pre-delay period can be adjusted from 0.1sec to 2.0sec by pressing the ‘+’ or ‘-’ buttons.

3.5.21 External RSSI

Pressing the ‘UP’ button causes menu 22 to appear displays the current whether the external RSSI (or external AGC) control of the RF board is ON or OFF. This should be set to OFF.

RSSI CONTROL Off

3.5.22 Real Time RSSI

Pressing the ‘UP’ button causes menu 23 to appear which displays the current real time value of the RSSI signal.

RSSI LEVEL
(2.50v)

3.5.23 Alarm Relay

Pressing the ‘UP’ button causes menu 24 to appear which displays how long the alarm relay operates for.

ALARM TIME 2.0s

The Alarm Time can be adjusted from 0.1sec to 10.0 sec by pressing the '+' or '-' buttons.

3.5.24 Alarm Relay State

Pressing the 'UP' button causes menu 25 to appear which displays the powered up state of the Alarm Relay.

ALARM RELAY
Secure = Closed

The Relay 'Closed' or 'Open' can be changed by pressing the '+' or '-' buttons. N.B. beware, the system is NOT power fail safe if alarm relay is set to 'Open'.

3.5.25 Tamper Relay State

Pressing the 'UP' button causes menu 26 to appear which displays the powered up state of the Tamper Relay.

TAMPER RELAY
Secure = Closed

The Relay 'Closed' or 'Open' can be adjusted by pressing the '+' or '-' buttons.

3.5.26 On Board Beeper

Pressing the 'UP' button causes menu 27 to appear which displays whether or not the on board Beeper is active. The beeper sounds for the length of time the Alarm Relay operates.

BEEPER Off

The Beeper can be enabled 'On' or 'Off' by pressing the '+' or '-' buttons.

3.5.27 Scope Setting

Pressing the 'UP' button causes menu 28 to appear which displays the time base period for the Scope setting used in some of the Phase menus above. Also shows, in the lower window, the real time value of the phase pulses counted in each time slot.

SCOPE 0.3s/div
_ _ _ _ _ _ _ _ _ _ _ _ _ _

The Scope time base factor can be adjusted from 0.1s/div to 2.0s/div by pressing the '+' or '-' buttons.

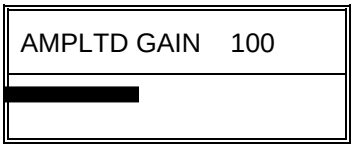
3.6 SETTING UP ANALYSER BOARD

Log on as described in section 3.5.1 above and ensure the following defaults are set:

PROCESSING MODE	GATED
AMP GAIN	20
AMP COUNT	10
AMP COUNT DWN	10 sec
THRESHOLD 1	0.5
THRESHOLD 2	3.0
AMP DECAY	4
AMP PWD	100 ms
PHASE GAIN	100
PHASE COUNT	99
PHASE COUNT DWN	5 sec
PHASE CAP	OFF
GATE TIME	10 sec
GATE TRIG	EDGE RETRIG
PRE-DELAY	ON
PRE-DELAY TIME	0.5 sec
RSSI CONTROL	OFF
RSSI	2.5V (as set by the RF board)
ALM TIME	3.0 sec
ALM RELAY	CLOSED
TMP RELAY	CLOSED
BEEPER	ON

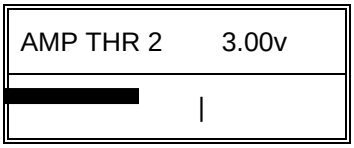
3.6.1 Setting the Amplitude Sensitivity.

Select menu 8:



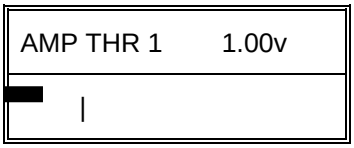
Arrange for a person to walk over the zone and adjust the amplitude gain to give approximately 80% deflection on the lower part of the display. Check when the zone is clear of people, the display shows only one or two bars.

Select menu 12:



Check when a person walks across the zone at 1m/s, the amplitude bar graph display crosses ‘AMP THR 2’ level. Adjust the threshold if required.

Select menu 11:

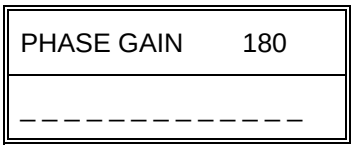


When the zone is clear, adjust ‘AMP THR 1’ so the ‘AMP 1’ led does not come on too often due to any background noise level.

Having set menus 8, 11 and 12 check how many amplitude counts are made when a person crosses the zone (both in a fast manner and also when moving slowly). The ‘AMP COUNT’ (menu 9) should be set to the lower figure, minus 2.

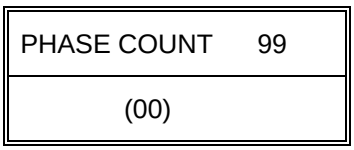
3.6.2 Setting the Phase Sensitivity

Select menu 15:



Arrange for a person to walk over the zone at 1m/s and adjust the phase gain until the ‘PHASE’ led flashes on. Increasing the gain figure by a further 25 should ensure reliable phase operation.

Press the reset button on the analyser board (located left of the display) and select menu 16:



Check how many phase counts are obtained when a person crosses the zone (both in a fast manner and also when moving slowly) and set the phase count to a number that gives reliable detection.

3.6.3 Other Considerations

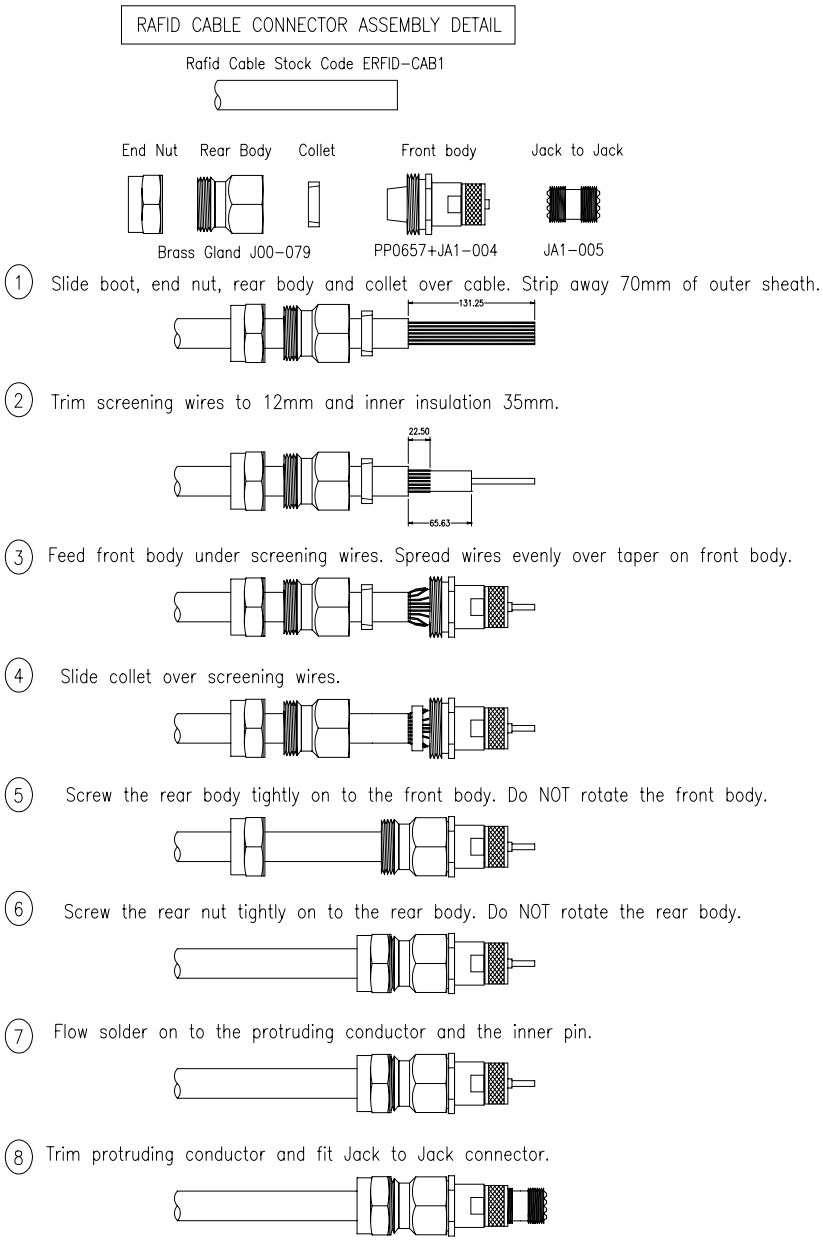
Once the analyser has been set for the required detection, switch off the beeper and set the alarm timeout period. The default values given above for decay and PWD should only be adjusted on advice from Geoquip Limited.

Count down values for amplitude and phase can be modified to make the system less prone to possible false alarms but should be done after a period of evaluation. Detection must be checked if any changes are made.

The power supply used must be adjustable over the range 12 to 15V dc and capable of supplying 800mA.

4 CONNECTION DIAGRAMS

4.1 GA0079 RAFID CONNECTOR ASSEMBLY DETAIL DIAGRAM

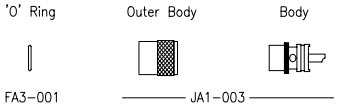


4.2 GA0080 RAFID DEAD CABLE TO LEAKY FEEDER ASSEMBLY DETAIL DIAGRAM

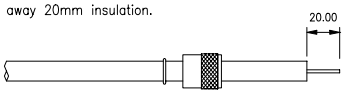
RAFID DEAD CABLE CONNECTOR ASSEMBLY DETAIL

Rafid Cable Stock Code GRFID-CAB2

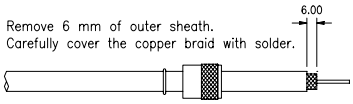
Heat Shrink Stock Code D00-041 (240mm Long)



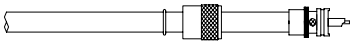
① Fit 'O' ring and outer body over cable and strip away 20mm insulation.



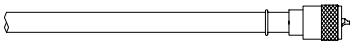
② Remove 6 mm of outer sheath. Carefully cover the copper braid with solder.



③ Screw body on to cable. Solder through both holes. Solder centre conductor to central pin. Trim and clean pin.

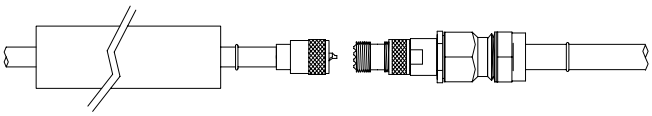


④ Screw outer body on to main body.



LEAKY FEEDER TO DEAD CABLE ASSEMBLY DETAIL

① Fit the dead cable to the Rafid cable by first sliding the heatshrink over one of the cables. Position the 'O' rings approximately 25mm from each connector body.



② Screw the two connectors firmly together and shrink the heatshrink into place.