# Geoscan Research

## Repairs and Maintenance Components

**v27 22 April 2024**

The following list of components are the ones most commonly required. If you have any doubts about which components to buy etc. then do please contact us. Wiring details for data dump leads are given at the end.

Suggested suppliers are RS and Farnell who have outlets around the world. The RS and Farnell part numbers given below should be recognised on their international websites.

**RS Components :** https://uk.rs-online.com

**Farnell :** https://uk.farnell.com **Farnell** is known as Newark in the USA : https://www.newark.com

Instructions provided in the Notes that are highlighted in yellow are very important !!

| Description | Image | RS Part Number | Farnell Part Number | Other Suppliers and Part Number | Manufacturer | Manufacturer Part Number | Where Used | Notes |
|---|---|---|---|---|---|---|---|---|
| Memory Module GR881 | | 200-6577 | - | https://greenwichinstruments.com/ | Greenwich Instruments | GR881-HT | FM18, RM15 | See instructions below for "Changing the FM18 or FM36 memory Module" or see RM15 Manual Appendix C. Also refer to "Changing the RM15 Memory Module" instructions given below |
| Memory Module GR3281 | | 200-6583 Greenwich Instruments | **Alternative** 2518737 2516512 Maxim/AD/Dallas | https://greenwichinstruments.com/ | Greenwich Instruments / Alternative | GR3281-HT / DS1230Y-100+ DS1230Y-120+ | FM36, RM15 | See instructions below for "Changing the FM18 or FM36 memory Module" or see RM15 Manual Appendix C. Also refer to "Changing the RM15 Memory Module" instructions given below |
| Battery Pack Holder | | - | 3530792 (pack 5) | CPC: BT00839 or BT06500 https://cpc.farnell.com | Pro Power | A-305/IT 03.0100 or MP000320 | RM4, RM15, FM9, FM18, FM36 | You may need to trim one of the lugs, the rectangular one on the reverse side to PP3 clip, to enable the battery to touch the contact. **BT06500 is a suggestion not yet tested. Size looks OK.** |
| Battery, NiMH, AA, IEC Code: HR6 | | 908-4076 (each, pack 4, 2.4Ah) | 3923702 (pack 4, 2.5Ah) | CPC: BT05805 https://cpc.farnell.com | Duracell | Duracell Ultra | RM4, RM15, FM9, FM18, FM36 | Total of 8 batteries required. Alternatives available in many supermarkets etc. You may need to trim one of the lugs, the rectangular one on the reverse side to PP3 clip, to enable the battery to touch the contact. |
| Battery Charger, RM15, RM4, FM9, FM18, FM36, 18V dc, 830mA - **SERIES RESISTOR REQUIRED** | | 706-6464 | 2815685 | - | Mean Well | GE12I18-P1J | | Charger plug required as well (next). RM15: an 18 ohm resistor in series with the positive line is required. RM4, FM9, FM18, FM36: a 100 ohm resistor in series with the positive line is required. |
| Meanwell Charger UK AC Plug | | 178-3436 | 2848281 | - | Mean Well | AC plug-UK | | |
| Meanwell Charger Mixed AC Plugs | | 178-3439 | 2848282 | - | Mean Well | AC plug-MIX | | |
| Resistor 100 ohms, 0.6W, |  | 848-7247 (each pack of 25) | 1771963 (each, minimum of 25) | - | Vishay | MRS25000C1000FRP00 | RM4, FM9, 18, 36 Charger | |
| Resistor 18 ohms, 0.6W |  | 683-3134 (each pack of 25) | 9465065 (each, minimum of 10) | - | Vishay | MRS25000C1809FCT00 | RM15 charger | |
| Battery, CR2450 type | | 457-4634 (Panasonic) | 4199194 (Renata) 2065173 (Multicomp) | - | - | - | FM256 | When changing the battery, take care to not overbend the retaining arm in the battery holder. There are many other barnds also available. |

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|---|---|---|---|---|---|---|---|---|
| Single Pole Single Throw (SPST) Momentary Push Button Switch | | 236-9373 | - | - | APEM | IPR3SAD-2 | FM256, CF6, CF51, MSP40, MSP25 | |
| Short Knoblet, M6 x 10 | | 702-7548 | - | - | RS Pro | - | PA5, PA20 Rectangular Bracket | |
| Long Knoblet, M6 x 20 | | 702-7557 | - | - | RS Pro | - | PA5, PA20 Rectangular Bracket, CF51 | |
| Spring loaded latch pair, Stainless Steel | | 206-4630 (pack 2) | - | - | Savigny | 40002 EIB | PA20 | |
| USB 2.0 Data Dump Cable. Male Mini USB B to Male USB A, 2m | | 252-062 | - | - | Bulgin | PX0441/2M00 | RM85 | |
| USB to RS232 Serial Adaptor | | - | - | CPC: CS34987 https://cpc.farnell.com | Newlink | NLUSB-0039 | DL10, RM15, FM9, FM18, FM36, FM256 | Not all adpters work correctly. We have found those with a Prolific chip set are more likely to work. Choose one with that spec if you are unable to source this part from your region. |
| Cap, Assembly Tool, Free | | 841-8995 | 314407 | - | Bulgin | PX0734 | Widely used | |
| Cap, Assembly Tool, Chassis | | 504-4588 | 314390 | - | Bulgin | PX0733 | Widely used | |
| Socket, Free, 2 pole | | 489-532 | 314213 | - | Bulgin | PX0736/S | PA5, PA20 | Instructions for assembly: see RM85 Manual Appendix E, RM15 Manual Appendix G. ENSURE INSERT IS PROPERLY SEATED ! |
| Socket, Free, 6 pole | | 489-560 | 314237 | - | Bulgin | PX0739/S | PA5, PA20, Chargers, Data Dump Leads | Instructions for assembly: see RM85 Manual Appendix E, RM15 Manual Appendix G. ENSURE INSERT IS PROPERLY SEATED ! |
| Plug, In-Line, 6 pole | | 489-576 | 314328 | - | Bulgin | PX0740/P | PA5, PA20 | Instructions for assembly: see RM85 Manual Appendix E, RM15 Manual Appendix G. ENSURE INSERT IS PROPERLY SEATED ! |
| Plug, Chassis, 2 pole | | 489-526 | 314249 | - | Bulgin | PX0735/P | PA5, PA20, RM15, RM85 | Instructions for assembly: see RM85 Manual Appendix E, RM15 Manual Appendix G. ENSURE INSERT IS PROPERLY SEATED ! |
| Plug, Chassis, 6 pole | | 489-554 | 314262 | - | Bulgin | PX0738/P | RM15, RM85, FM9,18,36, FM256 | Instructions for assembly: see RM85 Manual Appendix E, RM15 Manual Appendix G. ENSURE INSERT IS PROPERLY SEATED ! |
| Socket, Chassis, 6 pole | | 483-944 | 314298 | - | Bulgin | PX0738/S | RM15, RM85 GPS Adapter | Instructions for assembly: see RM85 Manual Appendix E, RM15 Manual Appendix G. ENSURE INSERT IS PROPERLY SEATED ! |
| Socket, 9 way 'D' Connector | | 473-896 608-0579 | - | - | RS Pro Hirose | - HDEB-9S(05) | Data Dump Leads | Pin Pitch = 2.74mm |

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|---|---|---|---|---|---|---|---|---|
| D' Connector Shell, 9 way | | 484-789 | 469889 | - | MH Connectors | MHDPPK9-K | Data Dump Leads | |
| Plug, 4mm, Black | | - | 1101101 | - | Deltron Components | 550-0100-01 | PA5, PA20 | |
| Plug, 4mm, Red | | - | 1101098 | - | Deltron Components | 550-0500-01 | PA5, PA20 | |
| Plug, 4mm, Green | | - | 1101102 | - | Deltron Components | 550-0400-01 | PA5, PA20 | |
| Plug, 4mm, Blue | | - | 1101103 | - | Deltron Components | 550-0200-01 | PA5, PA20 | |
| Plug, 4mm, Yellow | | - | 1101104 | - | Deltron Components | 550-0700-01 | PA5, PA20 | |
| Plug, 4mm, White | | - | 1101105 | - | Deltron Components | 550-0600-01 | PA5, PA20 | |
| Socket, 4mm, Black | | - | 1101113 | - | Deltron Components | 563-0100-01 | PA5, PA20 | |
| Socket, 4mm, Red | | - | 1101100 | - | Deltron Components | 563-0500-01 | PA5, PA20 | |
| Socket, 4mm, Green | | - | 1101115 | - | Deltron Components | 563-0400-01 | PA5, PA20 | |
| Socket, 4mm, Blue | | - | 1101117 | - | Deltron Components | 563-0200-01 | PA5, PA20 | |
| Socket, 4mm, White | | - | 1101118 | - | Deltron Components | 563-0700-01 | PA5, PA20 | |
| Socket, 4mm, Yellow | | - | 1101119 | - | Deltron Components | 563-0600-01 | PA5, PA20 | |
| Cable Drum for 50m Cable | | - | - | Canford: 35-5002 https://www.canford.co.uk UK distributor for Schill Cable Drum | Schill www.schill.de | Canford: CDP266 Schill: 23001000000 | PA5, PA20 Cable Drum | You will need to drill a 27.18-27.77 mm hole in the screw mounted plate, and file a notch, in order to mount a Plug, chassis 2 pole, Bulgin connector and cap in place. |
| Arctic PVC Cable, Orange, 3 Core 0.75 mm², diameter approx 6.7 - 7.1 mm | | 776-1963 (100m reel) | - | Canford: 33-324 (per metre) https://www.canford.co.uk | - | - | PA5, PA20 Cable Drum | Do NOT use more than 50m to avoid measurement errors in dry conditions. Instead make up extension leads. Parallel up blue and green wires for potential line - provides redundancy. |
| Cable, Orange. 30 strands of 0.2 or 0.25mm, approx 3mm diameter, Tri-rated | | 180-5952 (100m reel) | 2528160 (per metre) 2501503 (100m reel) | - | RS Pro / Multicomp Pro | - / PP001257 | PA5, PA20 jump leads, remote probe lead, extension leads, adapters | |
| Multicore Cable, 16-2-4A, Unscreened, 4 Core, 0.5 mm², 25 m, 6.3mm diameter | | - | 3372855 (25m reel) | - | Multicomp Pro | MP002385 | Data Dump Leads | The cable type is not critical for data dump leads. Alternatives may be acceptable. |
| Cable Tidy | | - | - | CPC: PL10040 https://cpc.farnell.com | Pro Elec | H FRAME | PA5, PA20 Extension Leads | |
| Releaseable Cable Ties, Small, 140mm | | 549-870 | 131-21410 | - | HellermannTyton | 131-21410 REL140-PA66-BK | PA5, PA20, cables | |
| Releaseable Cable Ties, Large, 250mm | | 549-886 | 1168950 | - | HellermannTyton | 131-22510 REL250-PA66-BK | PA5, PA20, cables | |
| Self-adhesive Cable Clip | | 404-437 | - | - | RS Pro | - | PA20 Beams | This is a suggested replacement for the black clips that are afixed to the PA20 beams |

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| Trimmer Tool for FM sesnor balance and alignnment | | 543-434 | 145507 | - | Vishay | ACCTRITOB308 | FM9,18,36, FM256 | Discard metal part since it is magnetic. Add red tape round tool to make it easier to locate in the field |
| LOW STRENGTH Threadlock for stopping Bulgin connector retaining ring shaking loose | | 908-2789 | 537056 | - | RS Pro / Loctite | - / 222, 10ML | Retaining ring of large Bulgin Connectors | Do NOT let threadlock come into contact with polycarbonate cases |
| Silicone Sealant, 90ml | | - | 521826 | - | Dow Corning | 744 WHITE | Widely used | Once opened, block the nozzle with a small screw and seal the top with seloptape to slow down the setting of the silicone if not used for a time. |
| Synthetic Lubricant for shafts, 85g | | 184-7967 | 537159 | - | Loctite | 399420 | MSP40, MSP25 | Do NOT use on the bearings which should be left to dry run. |
| Steel Alloy Compression Spring for platform | | 121-236 | - | - | RS Pro | - | MSP40 | 110mm x 17.6mm, 1.3N/mm |
| Steel Alloy Compression Spring for brass contact s | | 821-346 (pack 10) | - | - | RS Pro | - | MSP40, MSP25 | 44.5mm x 5.5mm, 0.23N/mm. Cut down to 18mm length using chisel. |
| Grit block | | 692-817 | - | - | RS Pro | - | MSP40, MSP25 | |
| Collar, 12mm shaft, Stainless Steel | | 693-1975 | - | - | Huco | 46102012 | MSP40, MSP25 | Ideally dip the M6 screw in anti-sieze compound (the screw will be stainless steel for using with a gradiometer). One Piece Clamp Screw, Bore 12mm, OD 28mm, W 11mm |
| Collar, 20mm shaft, Aluminium | | 435-0983 | - | - | Ruland | MCL-20-A | MSP40, MSP25 | Ruland Collar One Piece Clamp Screw, Bore 20mm, OD 40mm, W 15mm |
| Felt for making wheel hub seals | | 733-6775 | - | - | RS Pro | - | MSP40, MSP25 | Viscose, Wool Felt Sheet, 1m x 500mm x 3mm, though typically 4-5mm thick. Fix in place with contact adhesive. |
| Felt for making internal hub washers | | 733-6772 | - | - | RS Pro | - | MSP25 | Viscose, Wool Felt Sheet, 1m x 500mm x 1.5mm |
| Clevis Clips | | 839-280 | - | - | RS Pro | - | MSP40, MSP25 | Bright Zinc Plated Steel Retaining Clip, 5/16in Diameter |

## Changing the RM15 Memory Module

**Version 3 28/4/2022**

**Instructions**

Please refer to Appendix C in the RM15 manual for detailed instructions on how to upgrade memory capacity or replace memory modules. Note that the modules supplied now have slightly thicker pins than the original modules, so the pin fit can be very tight – you may have to place two thumbs on top and two forefingers underneath whilst applying a very strong pressure to push the pins into the socket. If using the alternative DS1230Y then the pin fit can be a bit loose, so to stop the part being shaken out, apply blobs of silicone sealant or other fixing material to the ends to keep in place.

**Resetting the RM15**

After resetting the RM15 (last item in the Setup Menu), you should go through the following procedure. Select the Comms menu. Step down the parameter lists and deliberately change both settings away from that displayed and then revert back to the original parameter setting (or another of your choosing). Do this for both parameters before using End M. This will ensure a proper reset. **If you do not do this data will not download**.

## Changing the FM18 or FM36 Memory Module

**Version 3 28/4/2022**

**Instructions**

Tools required: small screwdriver supplied with the instrument to remove the lid and a flat bladed screwdriver with a blade about ¼ inch wide - the instrument screwdriver is not suitable. Make sure you are as anti-static as possible (for example avoid wearing nylon shirts etc) – preferably use a grounded anti-static mat. Avoid carrying out the operation in rooms fitted with nylon or plastic flooring. Avoid handling the memory module or PCB's unnecessarily, holding the PCB by the edge wherever possible.

1 Lay out a sheet of aluminium foil (approximately 50 x 50 cm) on a table.

2 Sit the instrument on the aluminium foil with the tube vertical at the edge of the table and the handle supported so that it is horizontal. Have a box or stack of books at the rear of instrument about 5cm high.

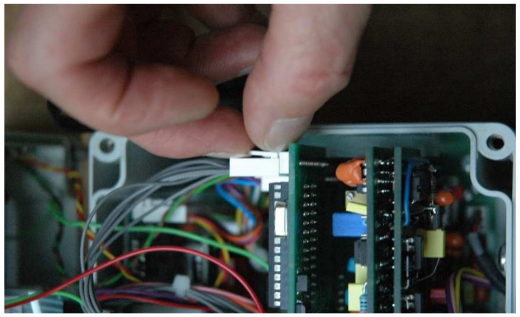
3 The instrument MUST be switched Off.

4 Unscrew the lid and very gently remove it vertically, ensuring the wires inside do not catch inside. Place the lid vertically on the box or stack of books.

5 There are three PCB's that plug into the motherboard. The board nearest the handle is the receiver PCB, the board in the centre is the A/D PCB and the board furthest from the handle is the microprocessor (uP) PCB that has the memory module on that is to be changed.

6 Unplug the uP PCB and raise it up slightly without straining any wires using your left hand. Next identify an 8-way connector on the right-hand side of the uP PCB, at the top, with 7 grey wires coming from it, and going to the keypad tail in the lid. Under this is a 2-way connector with brown and green wires going to the buzzer.

7 We will undo the top connector first. Use the fingernail of your centre finger to gently lever the two tabs on the right-hand side whilst you use the fingernail of the thumb to engage with the two very small tabs at the base of the housing to push the connector off the uP PCB. Do NOT pull on the wires or force things.



8 Remove the 2-way connector (with brown and green wires) located just underneath the 8-way connector in the same way.

9 You can now remove the uP PCB entirely.

10 Lay the PCB down on the aluminium foil with the 8-way and 2-way connectors on the left-hand side and the PCB edge connectors at the bottom. Identify the memory module in the bottom right-hand corner which will be a GR3281 for an FM36 or a GR881 for an FM18. Note the orientation of the writing relative to the PCB.

11 Keeping the PCB flat on the aluminium foil, slide initially just the tip of the screwdriver gently into the gap between the module and its socket. **VERY GENTLY** rotate the blade to lift the module slightly – do **NOT** use the screwdriver as a lever. Once the module is raised slightly, slide the blade further in and repeat the rotation to further raise the module out of its socket. Repeat until the module is prised out completely.

12 Whilst you are touching the aluminium foil, remove the new module from its packaging, avoiding touching the pins. Position the module over the empty socket on the uP PCB, taking great care to position the module the correct way round – the dot should be at the same end as the notch in the IC socket and towards the edge of the PCB.

13 Make sure each pin is in line with and started into the socket. Firmly but carefully press the module completely into the socket – it may be easier to press each row of pins into the socket in turn. Take great care to avoid bending the pins – check after inserting the module to see that none are bent underneath. Please note that the GR3281 modules supplied now have slightly thicker pins than the original modules, so the pin fit can be very tight – you may have to place two thumbs on top and two forefingers underneath whilst applying a very strong pressure to push the pins into the socket. If using the alternative DS1230Y then the pin fit can be a bit loose, so apply blobs of silicone sealant or other fixing material to the ends to keep in place.

14 We can now put the uP PCB back in place.

15 Slide the uP PCB gently into the Perspex PCB guides. Insert the PCB into motherboard, ensuring that you align the edge connect pins correctly – please check! **THEN CHECK AGAIN** because if you later power up the instrument with the PCB plugged in incorrectly you could damage it.

16 Next insert the brown/green 2-way connector into the uP 2-way connector – again support the PCB when doing this to avoid stress.

17 Next insert the 8-way connector with 7 wires into the 8-way connector at the top of the uP PCB– support the PCB when doing this to avoid stress.

18 Carefully place the lid on top of box – feed the keyboard tail into slot between the uP PCB and the battery pack compartment and check there are no wires near the box edges where they can be trapped and then screw the lid into place.

19 Switch on.

**Resetting the FM18 or FM36**

The display will show random characters and symbols and we need to access and change the Setup menu settings to obtain a normal display. Go through the motions of accessing the setup menu even though everything on the display will still appear random: step down though each Setup menu setting and change each setting away from the current value using first the left key then back to the previous value using the right key. Do this for each menu item. As you do this the display will still show random characters. Then press End Menu, turn off the instrument and then turn on again. You should now have a more normal display. Now go through the Setup menu again and ensure there are valid settings – often they will not be until corrected in this second pass. Now press End Menu again. Clear the memory.

The instrument should now be ready for use. **Please check all is well by collecting some data on the tabletop even if readings are full scale, along with some dummy data using Finish Line, and then dump of the data and check it looks correct. Do this before using it on a proper survey.**

## RS232 Data Dump Cable Wiring

Note that a link is required inside the Bulgin 6 way connector for some cables

| | Bulgin 6 way Connector | | | | 9 pin D Connector | | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Function | Wire | | Pin | Function | Wire | |
| **RM85** | 2 | GND | Green | | 2 | TX | Red | Can also use an RM15 or FM256 Data |
| | 3 | RCV | Yellow | | 3 | RCV | Yellow | Dump Lead in an emergency |
| | 4 | CTS | White | | 5 | GND | Green | |
| | 5 | RTS | Black | | 7 | CTS | White | |
| | 6 | TX | Red | | 8 | RTS | Black | |
| **RM15** | 2 | GND | Green | | 2 | TX | Red | Can also use an FM18/36 Data |
| | 3 | RCV | Yellow | | 3 | RCV | Yellow | Dump Lead in an emergency |
| | 4 | CTS | Link | | 5 | GND | Green | |
| | 5 | RTS | | | | | | |
| | 6 | TX | Red | | | | | |
| **FM256** | 2 | GND | Green | | 2 | TX | Red | Can also use an FM18/36 Data |
| **DL256** | 4 | CTS | Yellow | | 5 | GND | Green | Dump Lead in an emergency |
| | 6 | TX | Red | | 7 | CTS | Yellow | |
| **FM18/36** | 3 | GND | Green | | 2 | TX | Red | |
| **DL10** | 4 | CTS | Link | | 5 | GND | Green | |
| | 5 | RTS | | | | | | |
| | 6 | TX | Red | | | | | |