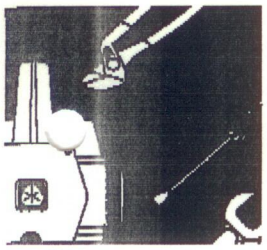

WORKSHOP INFO

Spectra Precision AB, Service Technology Dept., Danderyd, SWEDEN, November 1999 WI/9902A

Level: 1.

Instrument type: BBS computer.

Subject: Y2K rollover.

Description: No problems are anticipated with the Service technology BBS computer (GEOBASE) after the Y2K rollover. However, it is recommended that all service workshops download all the latest instrument programs and information from the BBS, before the Y2K rollover in case of a failure.

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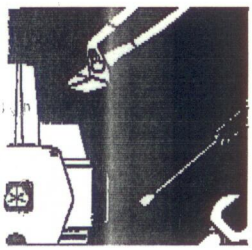

WORKSHOP INFO

Spectra Precision AB, Service Technology Dept., Danderyd, SWEDEN, September 1999 WI/9901A

Level: 1

Instrument type: Radio

Subject: Radio test cable, T71 601 316.

Description: To be able to test the radio closer the maximum range an extra attenuator of 30 dB is added. The cable will then include a damping of 120 dB.

Order an extra attenuator and modify existing cables at the workshops. New cables from stock are modified.

30 dB attenuator part nr: 571 908 896

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WORKSHOP INFO

Spectra Precision AB, Service Technology Dept., Danderyd, SWEDEN, August 1998 WI/9803A

Level: 1.

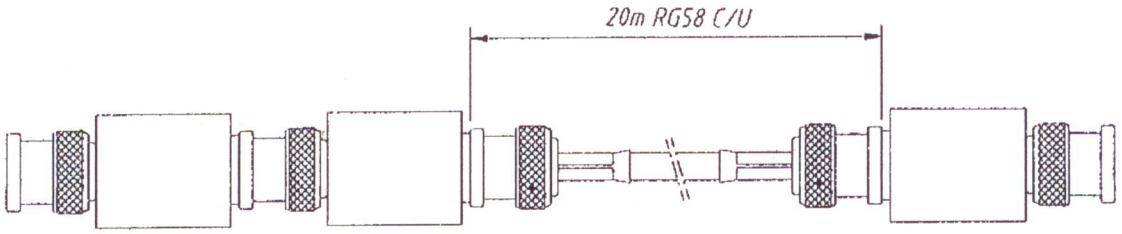
Instrument type: GeoRadio.

Subject: Radio test cable Part.no: T71 601 316.

Description: The radio test cable has been designed to test the radios transmission output power and receiver sensitivity.
When cable is connected it will create a condition equal to a 1000m radio link over flat ground with clear line of sight.
The cable includes a 90dB attenuator.
Use only on radios with an out put power of 1W or less.
The radio test cable can also be used to test radios that has frequency settings that are not allowed in the country were tested.

Tools and equipment

Description	Part number
Radio test cable	T71 601 316



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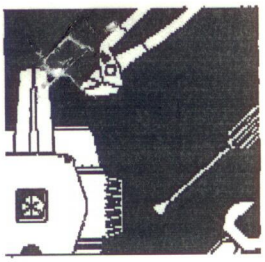
Performance

Item	Action	Performance	Result	Notes
1	Remove the radios antenna.			
2	Connect radio test cable.	Connect the radio test cable to the antenna connectors.		Separate the radios by at least 3m to avoid crosstalk.
3	Set both radios to the same channel	See user manual for GDM,GTR or ATS		Test all channels if needed.
4	Establish radio link.	See user manual for GDM,GTR or ATS		



WORKSHOP INFO

Spectra Precision AB, Technical Support Dept., Danderyd, SWEDEN, July 1998 WI/9802A

Level: 1.

Instrument type: Geodimeter system 600.

Subject: Setting up of calibration for the RMT 600 TS.

Description: To calibrate the RMT 600 TS aim the coarse sight towards a known angle, a reference mark. SST will recalculate and send the vertical angle offset to the RMT 600 TS.

Tools and equipment

Description	Part number
Tribrach ex. the special tribrach used for compensator calibration.	
Geodimeter 600.	

Performance

Item	Action	Performance	Result	Notes
1	Place a Geodimeter 600 in a fixed tribrach.			Preferably use the special tribrach used when calibrating the compensator.
2	Level the Geodimeter and initialize the compensator.			
3	Aim the telescope ~ horizontally (approx. 100 gon).	Make a mark on the wall were the haircross is aimed.		
4	Read the vertical angle in Grads.	Enter this value in the set-up file for SST *gdmt.def* row SP02.		

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5	Make a reference mark for the RMT 600 TS on the wall.	Draw an approx. 2 dm horizontal line 94 mm below the mark of the haircross.	94 mm is the difference between the optical axis and the coarse sight. *See fig 1.*
6	Make a test calibration with a RMT 600 TS.	Use SST, from main menu *Other Devices*.	

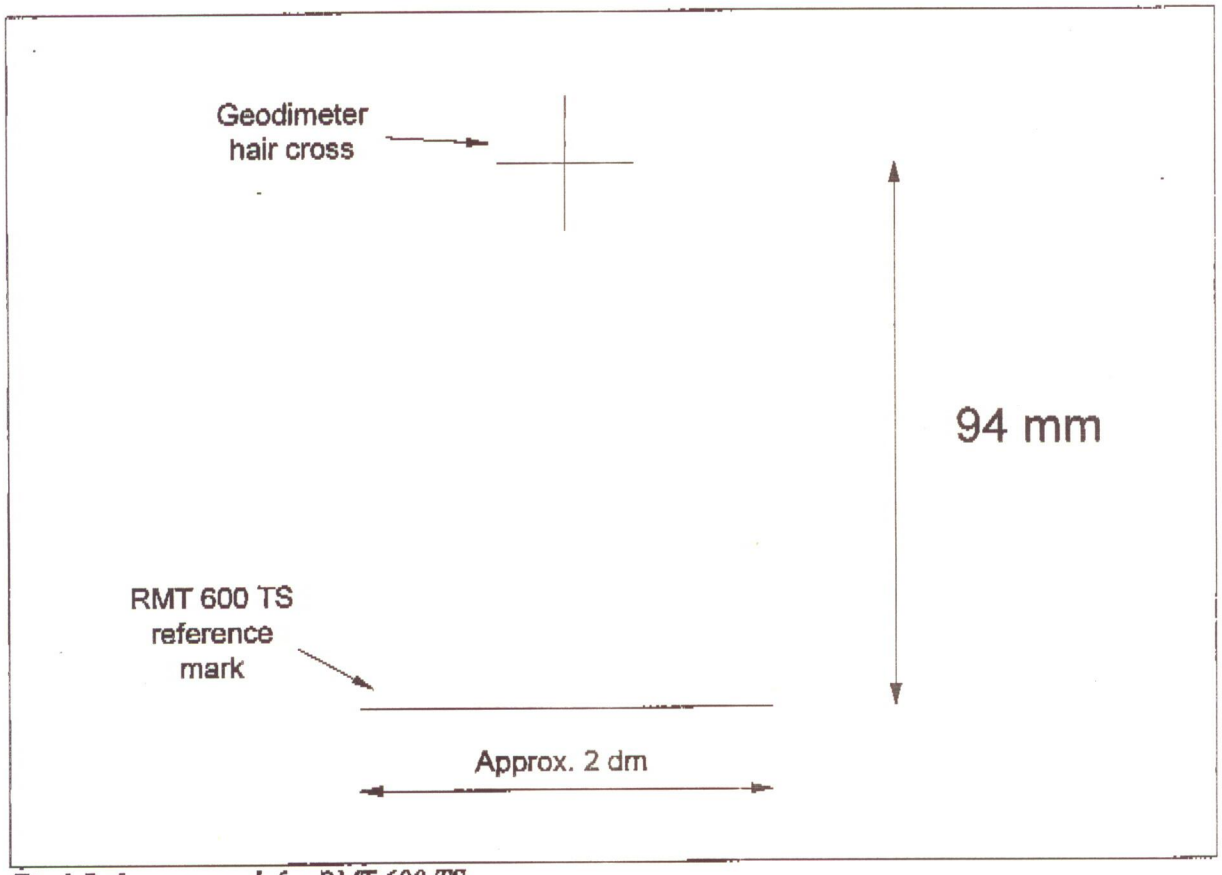


Fig 1 Reference mark for RMT 600 TS.

WORKSHOP INFO

Spectra Precision AB, Technical Support Dept., Danderyd, SWEDEN, **March 1998** **WI/9801A**

Level: 3.

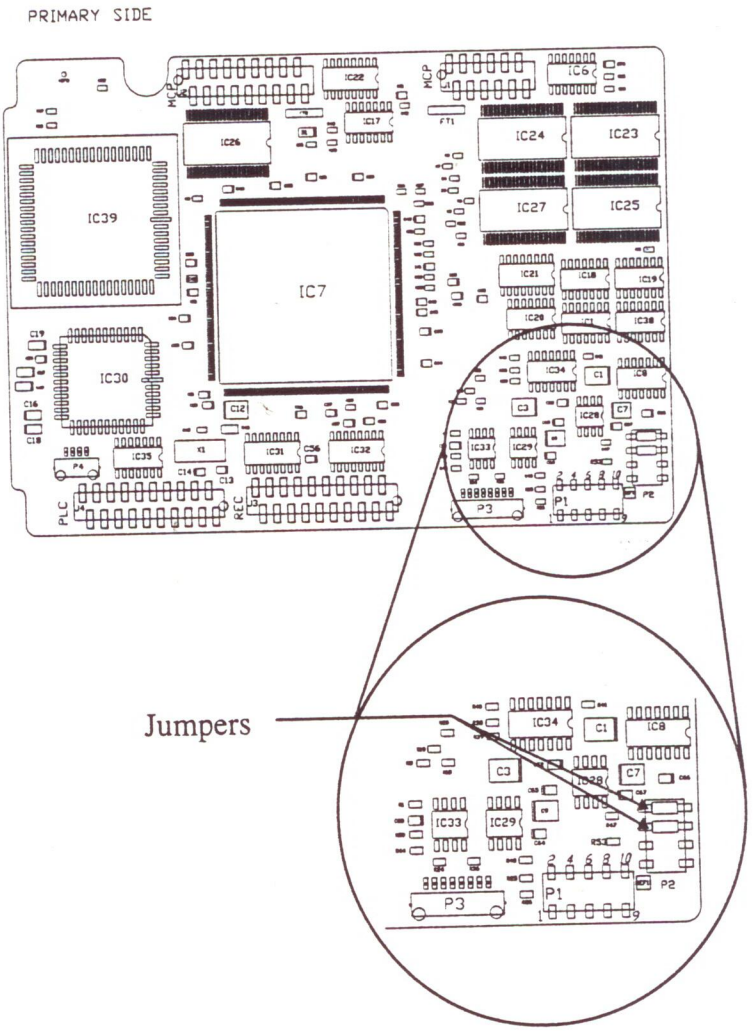
Instrument type: Geotracer system 2204 and 2404.

Subject: PCMCIA S-RAM Bootload cards Part.no: T71 601 290.

Description: If the firmware program locks up or gets corrupted a boot load can solve the problem. Bootboard cards can be ordered from the order department.

Procedure:

1. Remove the back cover with the CMD board.
2. Connect the jumpers on CMD board P2 according to picture below.



Original:

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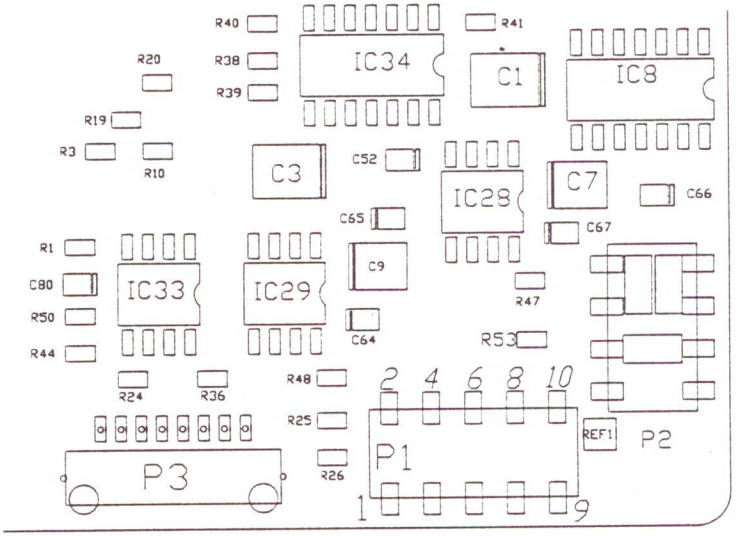
3. Insert the PCMCIA S-RAM card 1 with the b3.bin file in slot A (closest to the board).
4. Connect power to Port 4
5. Start the receiver.
6. The right LED will be yellow while the FLASH memory in the CMD board is programmed.
   If the FLASH is correct programmed all LED's will flash yellow. If not the left LED will be red.
7. Disconnect power.
8. Remove the PCMCIA S-RAM card from the card slot.
9. Change jumpers on the CMD back to the original position as below.
   This will allow next section of program to start from PCMCIA S-RAM card 2.



10. Insert the PCMCIA S-RAM card 2 with the testrom.hex file in slot A (closest to the board).
11. Connect power to Port 4.
12. Start the receiver.
13. The right LED will flash green and red for some seconds.
    Then the right and middle LED's will be yellow.
    Finally all three LED's will be green. If not the loading has failed and the lights will be red or some other colour.
15. Disconnect the power.
16. Remove the PCMCIA card from the card slot.
17. Upgrade the receiver with the latest firmware.
18. Assemble the receiver.

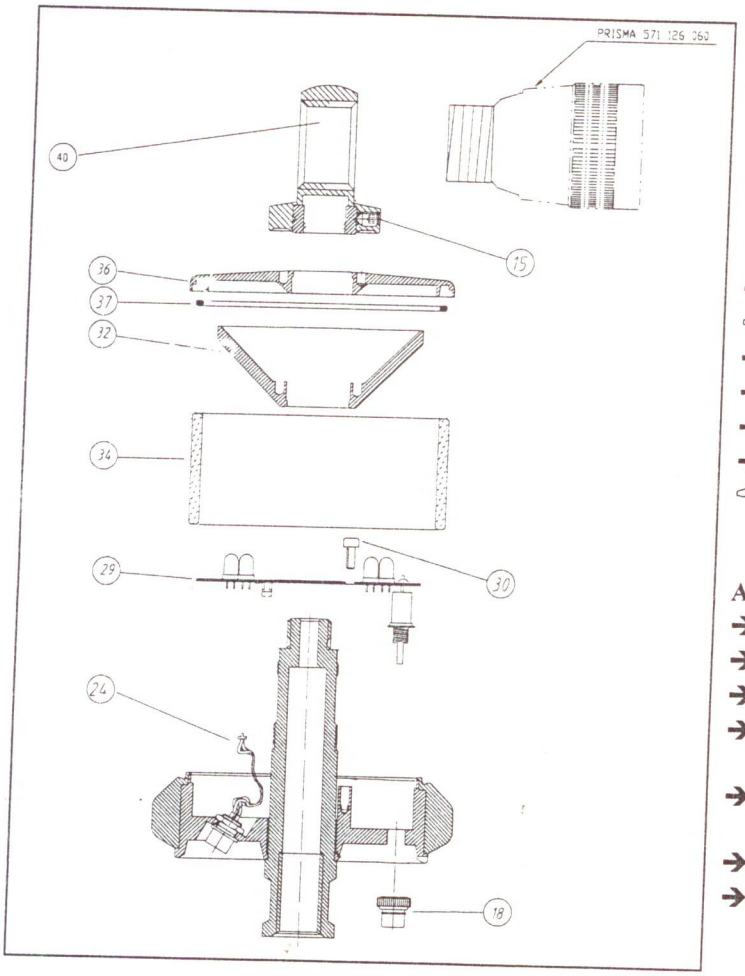
WORKSHOP INFO

Spectra Precision AB, Technical Support Dept., Danderyd, SWEDEN, October 1997. WI/9704A

Level: 3

Instrument type: Geodimeter System Accessories

Subject: RMT SUPER



Tools: Warm air gun
Special tool, part no: 571 601 120.
Open end wrench (21mm / 7/8").

Disassembly:

- ➔ Remove prism, undo screw (15) and remove prism holder (40).
- ➔ Use special tool to remove cover (36).
- ☞ Carefully apply warm air from above, into mirror.
- ➔ Use special tool to loosen mirror.
- ➔ Remove mirror (32) and window (34).
- ➔ Undo screw (30).
- ➔ Loosen rubber cover (18).
- ☞ Carefully move board RFC (29) upwards and disconnect (24).

Assembly:

- ➔ Connect (24) to RFC board.
- ➔ Mount board RFC (29) and tighten rubber cover (18).
- ➔ Mount the screws (30) lock with ***Loctite 242***.
- ➔ Glue the RFC board to the housing with ***Pliobond*** (4places, 90° in between).
- ➔ Mount window (34) and mirror (32), lock with ***Loctite 242***.
- ➔ Mount cover (36).
- ➔ Mount prism holder (40)

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SPECTRA PRECISION AB
Box 64 S - 182 11 Danderyd, SWEDEN
Tel: +46-(0)8-622 10 00, Fax: +46-(0)8-6221065, E-Mail: tecsup@geotronics.se

WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **February 1997.** **WI/9703A**

Level: 2

Instrument type: Geodimeter System 400 / 500 / 600 / 4000

Subject: Verification of cyclic error.

To verify if the GDM suffers from cyclic error, a special procedure of distance measurement must be performed, at a baseline specific for that purpose.

Principal for cyclic base line:
Put four prisms in a row at the same height and very accurate 2.5m in between. The pillar should be located at a distance of 5m from the first prism (fig 1).

Verification:
The distances of this baseline should be verified according to Geotronics Service Policies, WI9702A.

Performance:
Measure five times (min) against each prism (totally 20 measurements) calculate the mean value for each prism, tolerance is ± 3mm from nominal value on each prism.

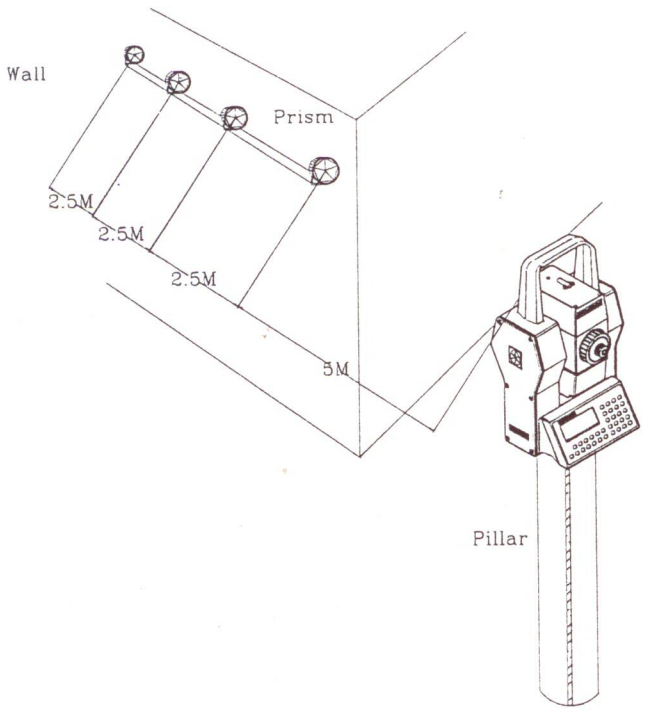

Fig 1

Note: Be sure that no reflexes from prisms not in use interfere with the measured prism.

Geotronics
GEOTRONICS AB
Box 64 S - 182 11 Danderyd, SWEDEN
Tel: +46-(0)8-622 10 00, Fax: +46-(0)8-6221065, E-Mail: tecsup@geotronics.se

WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **February 1997.** **WI/9702A**

Level: 2

Instrument type: Geodimeter System 400 / 500 / 600 / 4000

Subject: Calibration of baselines

Calibration of baselines must be performed regularly. The interval and procedure should be stated in the local calibration routine (see Service Policies).

Calibration of a baseline is made to determine the actual distance between the measuring pillar and the prism. The result should be posted on the measuring pillar with the following information:

- Date when the calibration was performed, (max. calibration interval 6 months)
- Signature of the person who performed the calibration
- Baseline distance
- Identification of pillar (only if more than one pillar is available)
- Next calibration date

Three different calibration methods can be used:

- New GDM from factory (only temporarily approved, until any of the other two methods can be used)
- GDM, calibrated on national measuring baseline
- Geotronics "special calibration GDM"

Procedure:

- Put GDM on pillar, switch on and let it warm up for 10minutes
- Enter correct PPM value
- Measure in D-bar, min 50 measurements

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Tel: +46-(0)8-622 10 00, Fax: +46-(0)8-6221065, E-Mail: tecsup@geotronics.se

WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **February 1997.** **WI/9701A**

Level: 1

Instrument type: Geotronics supplied tools

Subject: Calibration

In accordance to Geotronics Service Policies all tools must be calibrated and an administration system must be established. In WI9602 there is a routine describing who and when tools can be sent to Geotronics HQ for calibration.

At this point the schedule for sending tools to Geotronics HQ is postponed 1 year, that means no tools can be sent in until January 1998, or until information is sent out stating otherwise.

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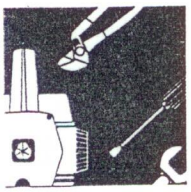
Box 64 S - 182 11 Danderyd, SWEDEN
Tel: +46-(0)8-622 10 00, Fax: +46-(0)8-6221065, E-Mail: tecsup@geotronics.se



WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **December 1996.** **WI/9605A**

Level: 3

Instrument type: GDM System 400, 500, 4000 and 600

Subject: For all above mentioned GDM, constants are available on the "GEOBASE" BBS, When attached to the BBS it is possible to direct download instrument constant files. Using the command "CON" opens the access to the specific area, from where the constants will be picked up. Follow the standard procedure in the BBS program.

Note1: Presently this option is only available for subsidiaries.

Note 2: It might occur situations where the system is unable to find the requested file, then please contact ASM technical Support.

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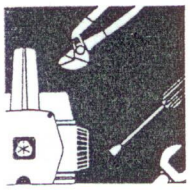

WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **November 1996.** **WI/9604A**

Level: 3

Instrument type: GDM System 500/600

Subject: Electrical adjustment of the distancemeter.

Description: Insufficient blackness of the greywedge can cause the TROL program to fail performing the F1/F2 test.

Remedy: To correct this problem an extra greywedge can be fitted. This means the test fixture will have two geywedges mounted on top of each other. (To order an extra greywedge please use the following part number;)
Greywedge Part no: 571 908 451

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Box 64 S - 182 11 Danderyd, SWEDEN
Tel: +46-(0)8-622 10 00, Fax: +46-(0)8-6221065, E-mail: tecsup@geotronics.se

WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **October 1996** **WI/9603A**

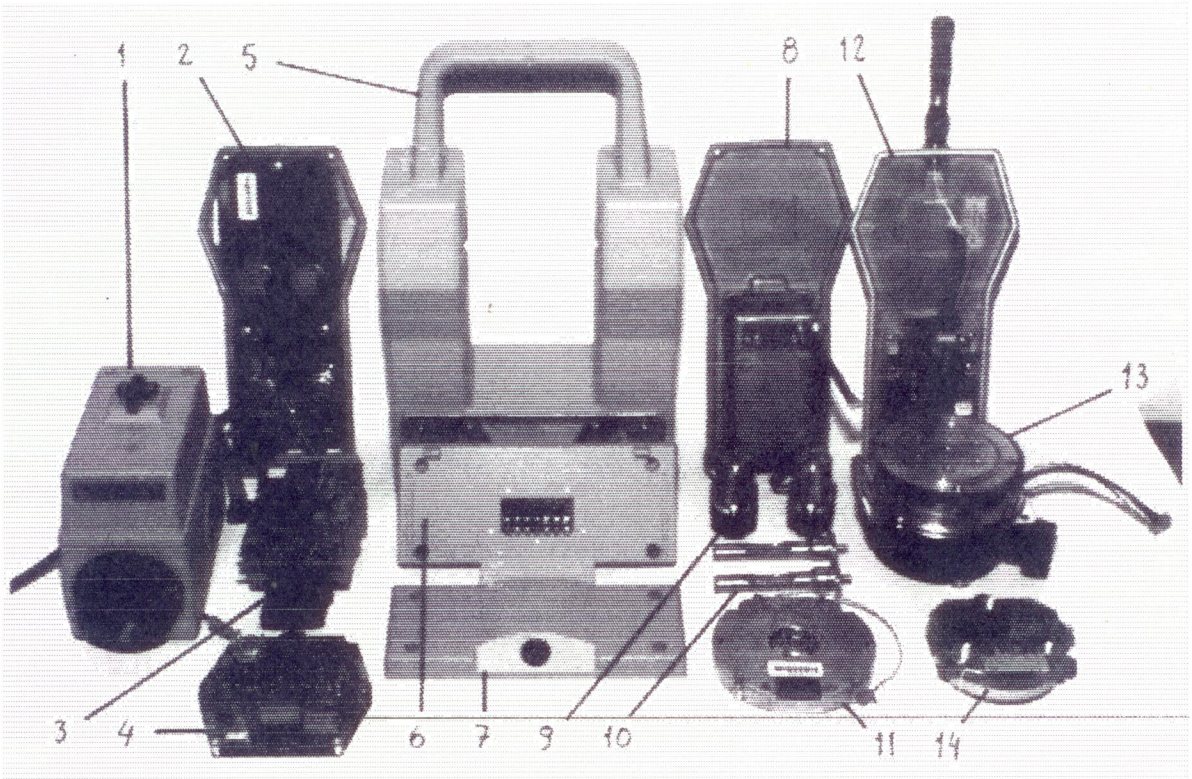
Level: 3

Instrument type: GDM 600

Subject: Internal cables and parts.

Outline GDM 600

1. Distance unit.
2. Side cover (Servo side).
3. Tracker unit.
4. Angle unit (POA, PAC board)
5. Alidade
6. Panel attachment.
7. Cover
8. Battery side cover.
9. Vertical and horizontal motor.
10. Vertical and horizontal wormscrew
11. Angle sensor
12. Radio side cover.
13. Base unit.
14. Compensator.



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WI/9603A
Cables GDM 600.

1 Horizontal sensor - POA board
Part no: 571 207 064

2 Vertical sensor - POA board
Part no: 571 207 062

3 Compensator - POA board
Part no:571 207 058

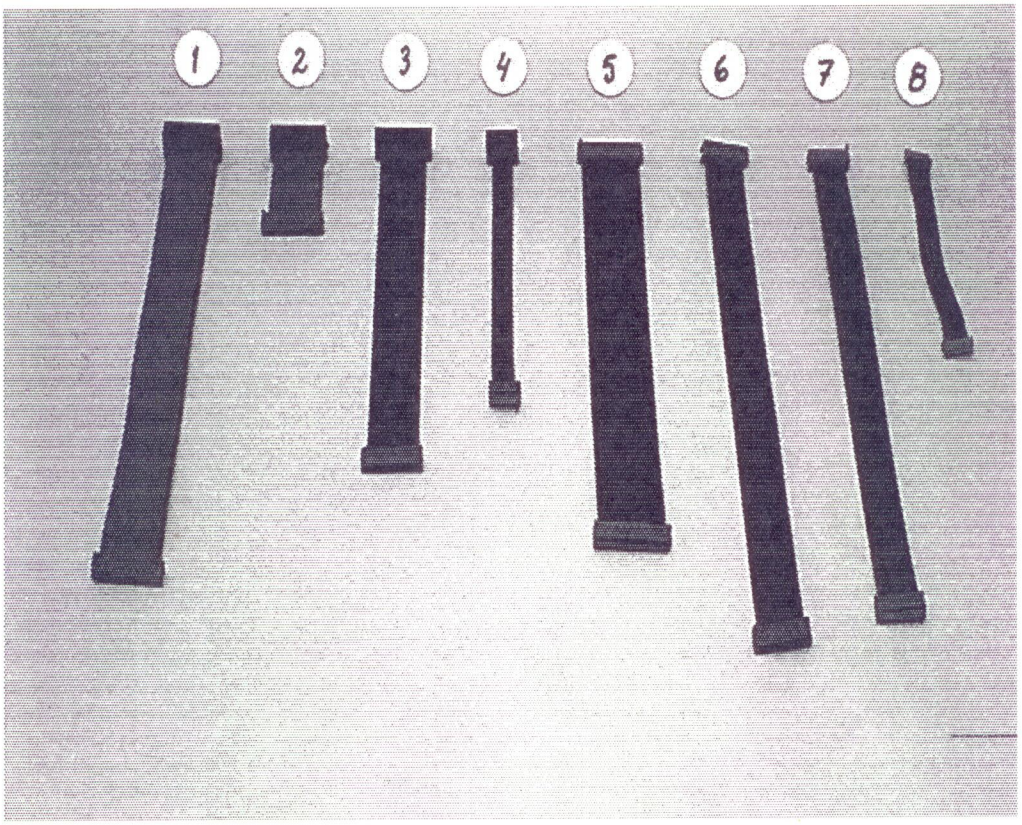
4 Compensator - PVX board
Part no: 571 207 054

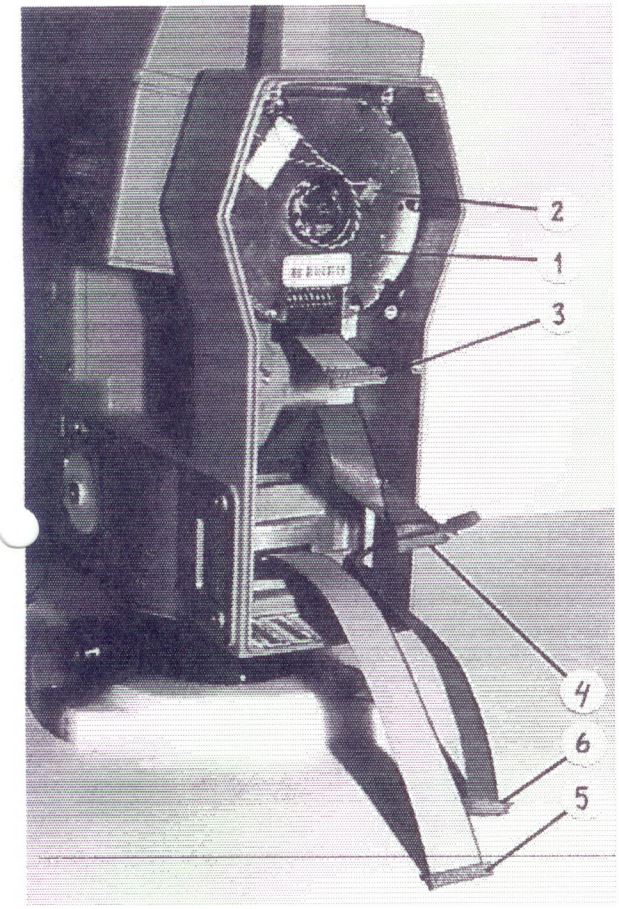
5 Panel attachment - POA board
Part no: 571 207 032

6 Panel attachment (COP board) - POAboard
Part no: 571 207 052

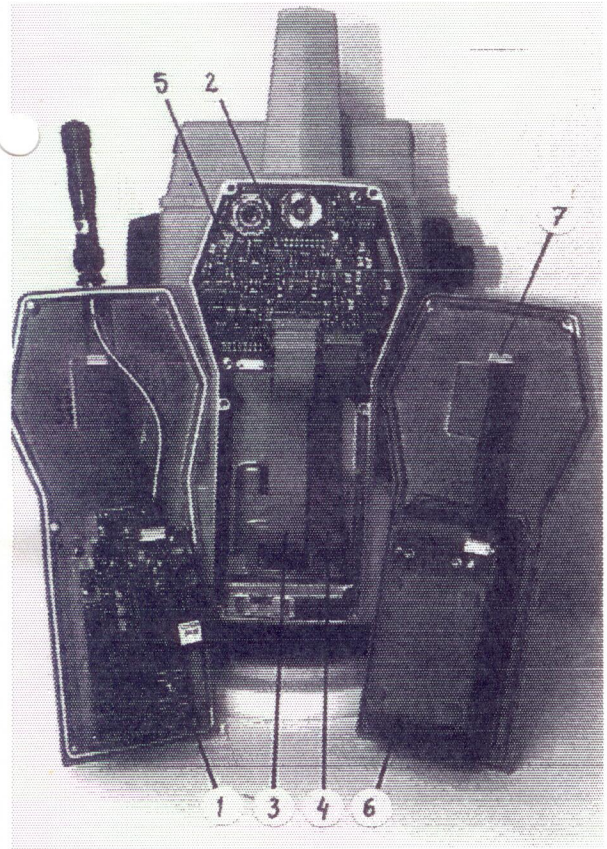
7 Cover (AMC board) - PVX board
Part no: 571 207 074

8 Radio/battery sidecover - POA board
Part no: 571 207 022



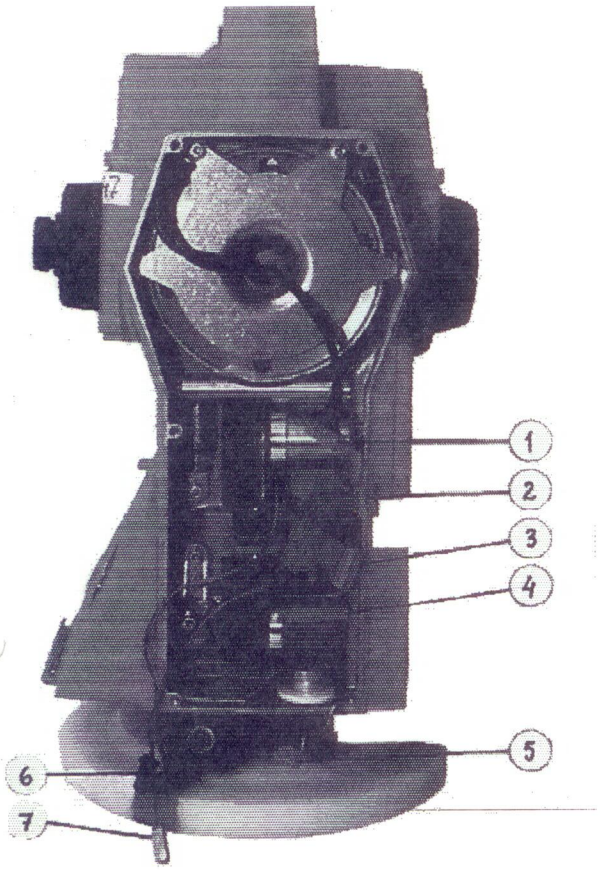


1. Vertical Sensor, part no: 571 206 210
2. Rotor cable from sensor.
3. Vertical Sensor → POA cable, part no: 571 207 062
4. Compensator → POA cable, part no: 571 207 058 (Note folding of cable).
5. Hor. sensor → POA cable, part no: 571 207 064
6. COP → POA cable, part no: 571 207 052

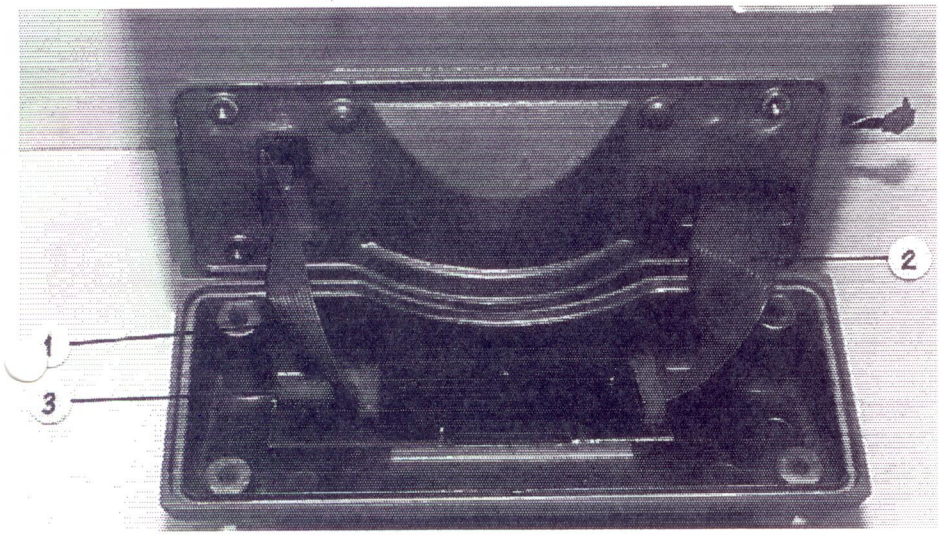


1. Radio side cover.
2. POA, PAC board.
3. Hor. sensor → POA cable, part no: 571 207 064
4. COP → POA cable, part no: 571 207 052
5. Rotor cable from Vertical sens or.
6. Battery cover
7. Radio/Battery → POA cable, part no: 571 207 022

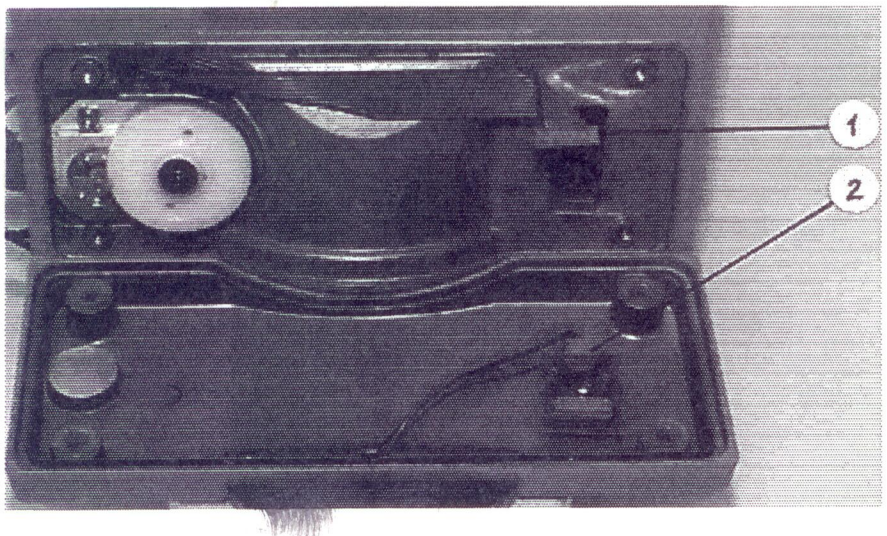
WI/9603A



1. DDC → PVX cable, part no: 571 207 122
2. Compensator → PVX cable, part no: 571 207 054
3. A/M cover → PVX cable, part no: 571 207 074
4. COP → PVX cable, part no: 571 207 032
5. Base unit → PVX cable.
6. Vertical motor → SRV 2
7. Horizontal motor → SRV 2



1. COP → POA cable, part no: 571 207 052
2. COP → PVX cable, part no: 571 207 074
3. Only used when two panel attachments are used



1. AMC → PVX
2. AMC → A/M button

Geodimeter Wiki

WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **October 1996.** **WI/9602A**

Level: 1

Instrument type: All

Subject: Calibration routines.

The calibration routine for all service equipment's used in a Geotronics Service Shop are divided in three categories, ***Standard tools*** *(e.g. frequency counters, multi meters)*, ***Geotronics made tools*** *(from now on named GEO tools, e.g. el box, measuring fixture)* and ***Fixed installation's*** *(e.g. base lines, angular test fixtures and optical bench)*.

Routine for calibration of *Standard* tools:
All external tools should be included in a calibration list (*inventory list*) for easy identification. In the list it should be stated:

The interval of calibration.
Where the calibration is performed.
Name of the person responsible of the calibration routines in the service shop.
If the tool is to be calibrated or not (*see SP/9522A in the Service Policy Manual*).

The calibration can be performed by any local authorised calibration organisation, such as the manufacture or similar.

Routine for calibration of *GEO* tools:
All GEO tools must be included in a calibration list (*inventory list*) for easy identification. In the list it should be stated:

The interval of calibration.
Name of the person responsible of the calibration routines in the service shop.
If the tool is to be calibrated or not (*see SP/9522A in the Service Policy Manual*).

The GEO tools must be sent to Geotronics HQ for calibration.
To avoid too much calibration work at the same time at HQ, all subsidiaries will have a specific time of the year, when they can send the tools in for calibration. This period is defined by the ASM department. When the tools arrive at HQ they will be taken care of immediately and shipped back with the next shipment. The tools are registered also at HQ to keep track of calibration results. This will be effective from 1st of January 1997.

Geotronics
GEOTRONICS AB
Box 64 S - 182 11 Danderyd, SWEDEN
Tel: +46-(0)8-622 10 00, Fax: +46-(0)8-6221065, Telex: 13659 GEO S

Routine for calibration of *Fixed installation's*:
Tools that are not transportable, collimator bench or others, will be submitted to special procedures. Special procedures could be either to use a new GDM from stock or special calibration GDM provided by the ASM department. These procedures will be described in separate WI's.

Calibration period.

Time period:		
	Asia Pacific	January
	Canada	February
	France	March
	Germany	April
	Japan	May
	Near East Africa	June
	UK	August
	USA	September
	Scandinavia	October

WORKSHOP INFO 1(2)

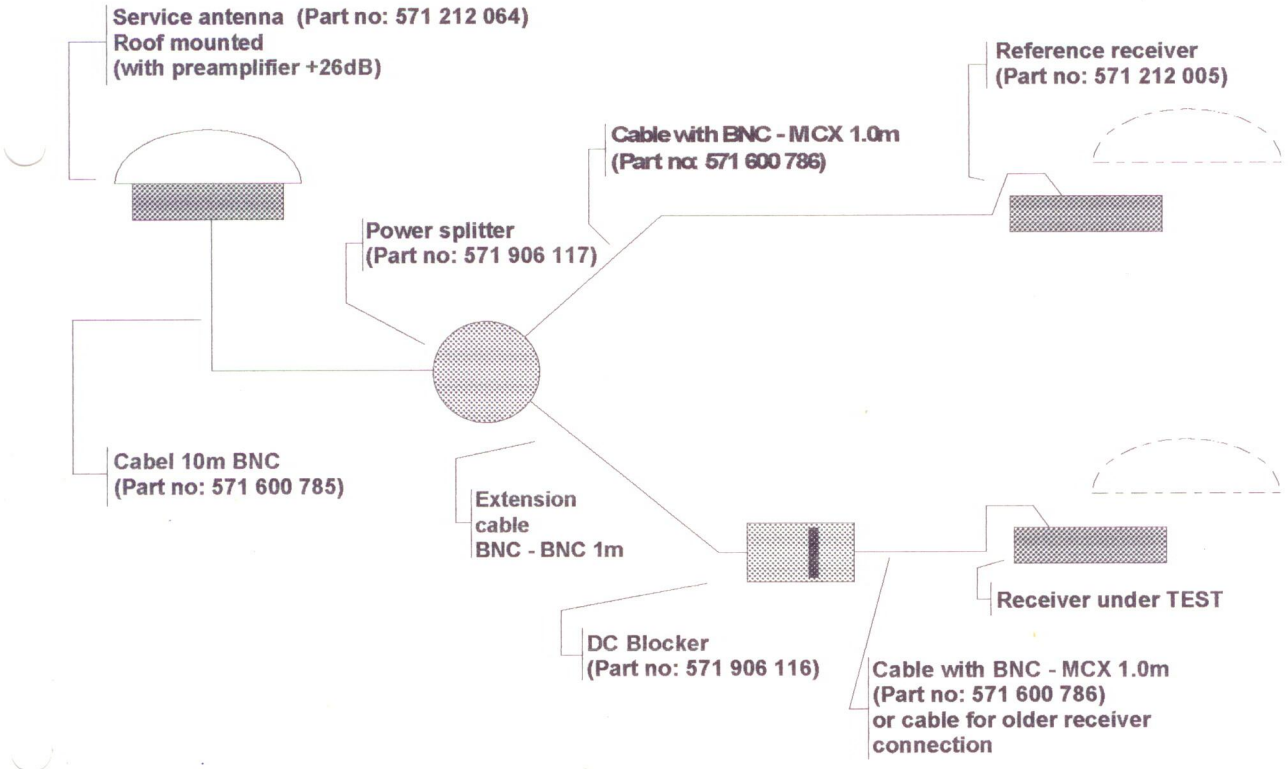
Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **March 1995.** **WI/9503A**

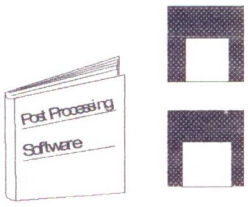
Instrument type: Geotracer system 2000

Subject: Service kit 571 600 787

Description: Service kit consists of following parts:

Service kit for GEOTRACER 2000





= Control unit Software (Part no: 571 123 800)

= Geotracer Post Processing Software (Part no: 571 123 400)
Including 2 Hardware keys (Part no: 571 123 401)

= Control unit GRID (Part no: 571 212 006)

= Control unit software Embedded (Part no: 571 123 816)

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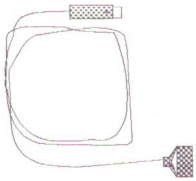


= Cable M88R - PC (PC/AT CABLE M88R)

= COM1 Test plug M88R (C8249820)

= BCW Test plug M88R (C8249830)

= M88 Series Hardware Reference Manual

= Test program M88R (NORAND Test M88R)

WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **February 1995** WI/9502A

Instrument type: Geodimeter System 600

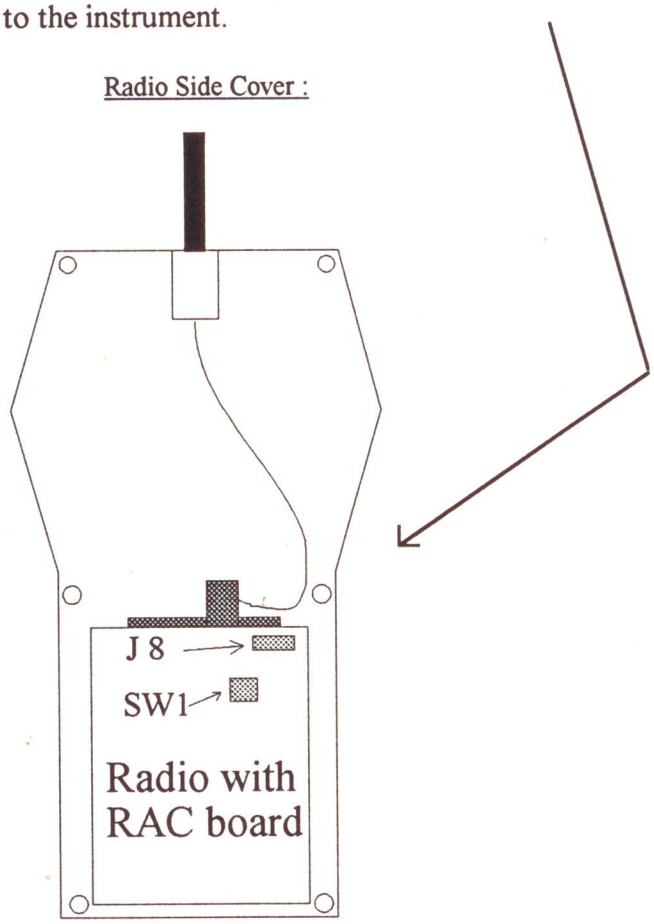
Subject: Upgrade the Geodimeter to robotic system.

Description:

1. Remove the side cover or battery side cover.
2. Connect the cable (571 207 024) from the Motorola radio side cover, J8 on the RAC board to J8 on the POA board.
   Be sure the switch, SW1 is set to : 1-OFF 2-ON 3-ON 4-ON.
   Mount the Radio Side Cover.

Note: be sure not to jam the antenna cable when the cover is attached to the instrument.

Radio Side Cover :



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3. Modify the MAP board to rev D02 according to TM9503A.

Note: MAP board rev C isn't compatible, **needs** to be a MAP rev D.

4. Load new MAP Program with rev. 632-01.04 and initialize the Control Unit.
Load new PVX Program with rev. 628-03.00 and initialize the Instrument.

Note: Programs are **not** compatible with other programs.
For example, a Control Unit prg. 632-01.04 will not work with GDM prg. 628-01.00 and lower. A GDM prg. 628-03.00 will not work with Control Unit prg. 632-01.02 and lower.

5. Verify with a function test :

- Switch on the Instrument and press **Ent** until the angles are shown.
- Select **RPU**: press **4** for numeric and ↑ for alpha.
- Press **3 (REMOTE)**.
- Press **1 (OK)**.
- Set Sector - **YES**.
- Set sector **A**.

- Set sector **B**.
- Aim the instrument vertical at the target (RMT).
- Press **ENT** and remove the Control Unit.
- Connect the telemetric link with the Control Unit and switch on the radio, press **PWR**.
- Radio communication will be established, press **ENT** until the angles are shown.
- Press **A/M** for search, instrument will lock on to the RMT.
- Switch of the system (**PWR**), wait a moment (the instrument will be in stand by mode).
- Switch on the system (**PWR**), press **YES** and the angles will be shown.
- Switch off the Control Unit.

The test is now completed.

ROBOTIC PARTS :		PART NR.
Radio Side Cover :	L25 0.5W	571 202 018
	H25 0.5W	571 202 026
	L12.5 0.1W	571 202 028
Telemetric link		571 180 810, specify 500/4000 or 600
Radio battery		571 905 091
Charger for radio battery		571 905 086
Holder for keyboard and telemetric link		571 202 288
Panel attachment cover		571 202 292
External battery 6Ah		571 202 194
System cable 1.0m		571 202 188
2.5m		571 202 216

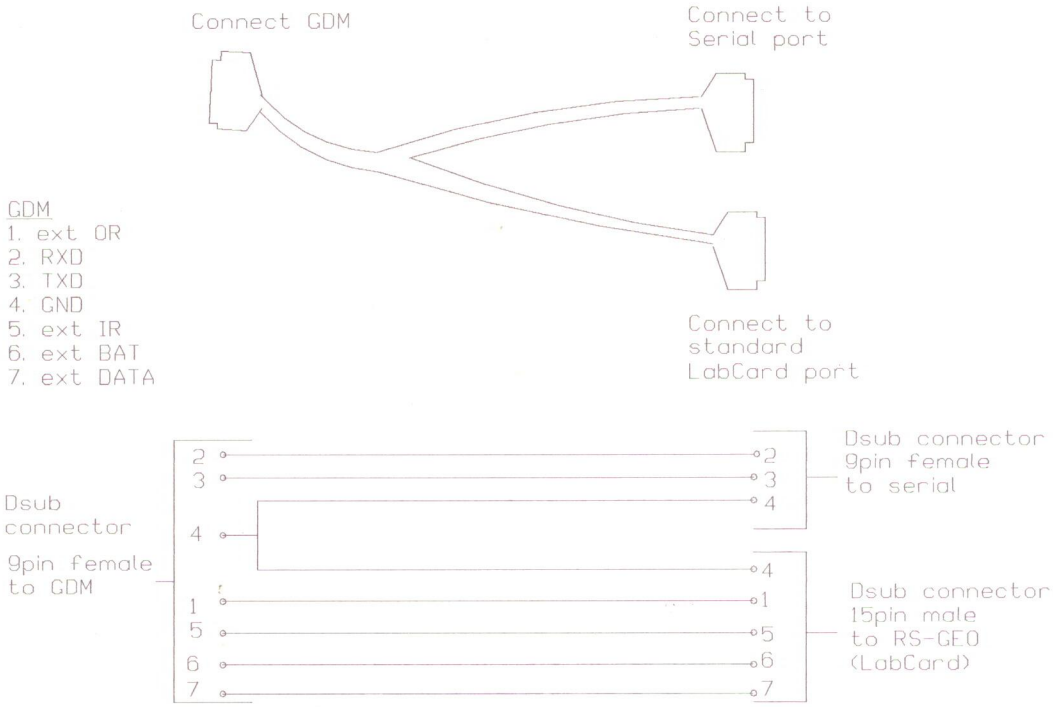
WORKSHOP INFO

January 1995, Geotronics AB, Technical Support Dept., Danderyd, SWEDEN. **WI/9501B**

Instrument type Geodimeter System 400, 500, 4000 and Geodolite

Subject: Info text

Description: Info texts **shall** be initiated in all instruments. Normal GSS initiation procedure is to be used. After initiation in main menu, use the F4 (Text) key and then F4 (Err Tex) key to initate the Info text. A special cable must be used. See figure below:



GEOTRONICS AB
Box 64 S - 182 11 Danderyd, SWEDEN
Tel: +46-(0)8-622 10 00, Fax: +46-(0)8-6221065, Telex: 13659 GEO S

WORKSHOP INFO

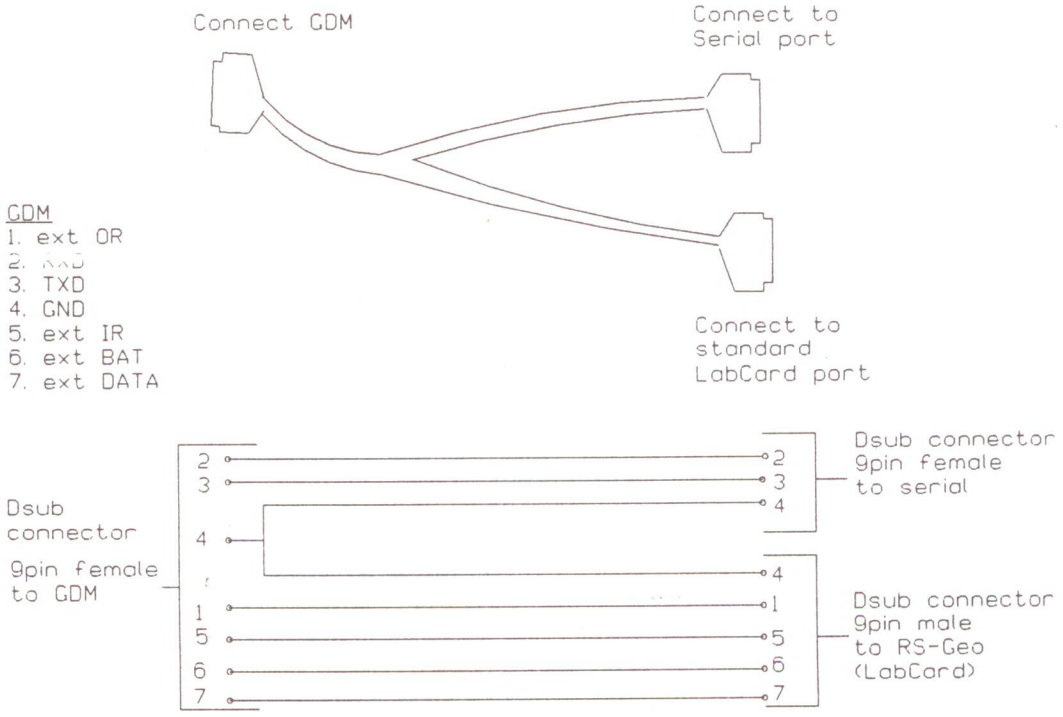
January 1995, Geotronics AB, Technical Support Dept., Danderyd, SWEDEN. **WI/9501A**

Instrument type Geodimeter System 400, 500, 4000 and Geodolite

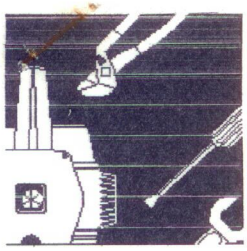
Subject: Info text

Description:

Info texts **shall** be initiated in all instruments. Normal GSS initiation procedure is to be used. After initiation in main menu, use the F4 (Text) key and then F4 (Err Tex) key to initate the Info text. A special cable must be used. See figure below:



GEOTRONICS AB
Box 64 S - 182 11 Danderyd, SWEDEN
Tel: +46-(0)8-622 10 00, Fax: +46-(0)8-6221065, Telex: 13659 GEO S



WORKSHOP INFO

Geotronics AB, Technical Support Dept., Danderyd, SWEDEN, **February 1995** WI/9500A

Subject: Automatic Play Analyser (571 600 310)

Description: Measure :

- Mechanical play, horizontal and vertical
- Starting current for horizontal and vertical motor

for servo driven instruments: GDM 400/500 Servo, 600 and 4000.

Automatic play analyser :

Interface
Connection box for GDM 400/500 servo /4400
Connection box for GDM 600
Cables:
J1 - J7
J2 - GDM(400/500 servo/4400)
J3 - GDM(600)
J4 - COM1(Computer)
J5 - LTP1(Computer)
J6 - PC-36(Computer)
J8 - GDM(Base unit/Encoder/Motors)
Mains cord
GND cord
PC-36(additional I/O-board)
Software "GEOGLAPP.EXE" (571 600 244)

Geotronics
GEOTRONICS AB
Box 64 S - 182 11 Danderyd, SWEDEN

INTERFACE:

A computer is connected to the interface and the interface to the Geodimeter via a connection box.
The computer needs an extra I/O board, PC-36 to be able to control the interface. The PC-36 has a 36-pin D-sub connector.

Front of the interface:

{ EINBETTEN Word.Picture.6 }

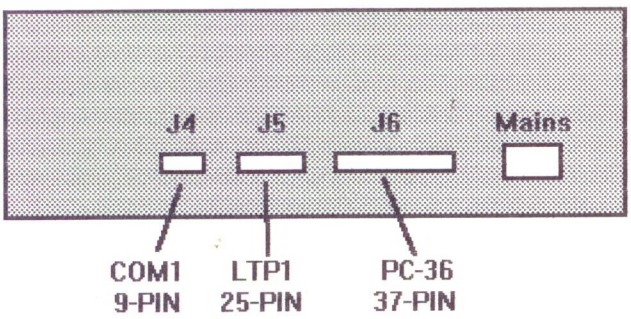
LED top row from left :

1. +5V
2. +12V
3. -12V

Bottom row from left :

1. D - Data
2. OR - Output Request
3. IR - Input Request
4. A - Counting Up
5. B - Counting Down
6. Vert - Vertical
7. Not Used
8. Not Used

Back:



Connect J4, J5 and J6 to the computer.

Measure the mechanical play with a complete instrument : GDM 600

Place the connection box (GDM 600) on the handle of the instrument.
Put the switch in "**GDM 600 COMP**" position on the connection box.

Connect cables :

1. J1 - J7
2. J2 - GDM
3. J8 - Encoder and Motors

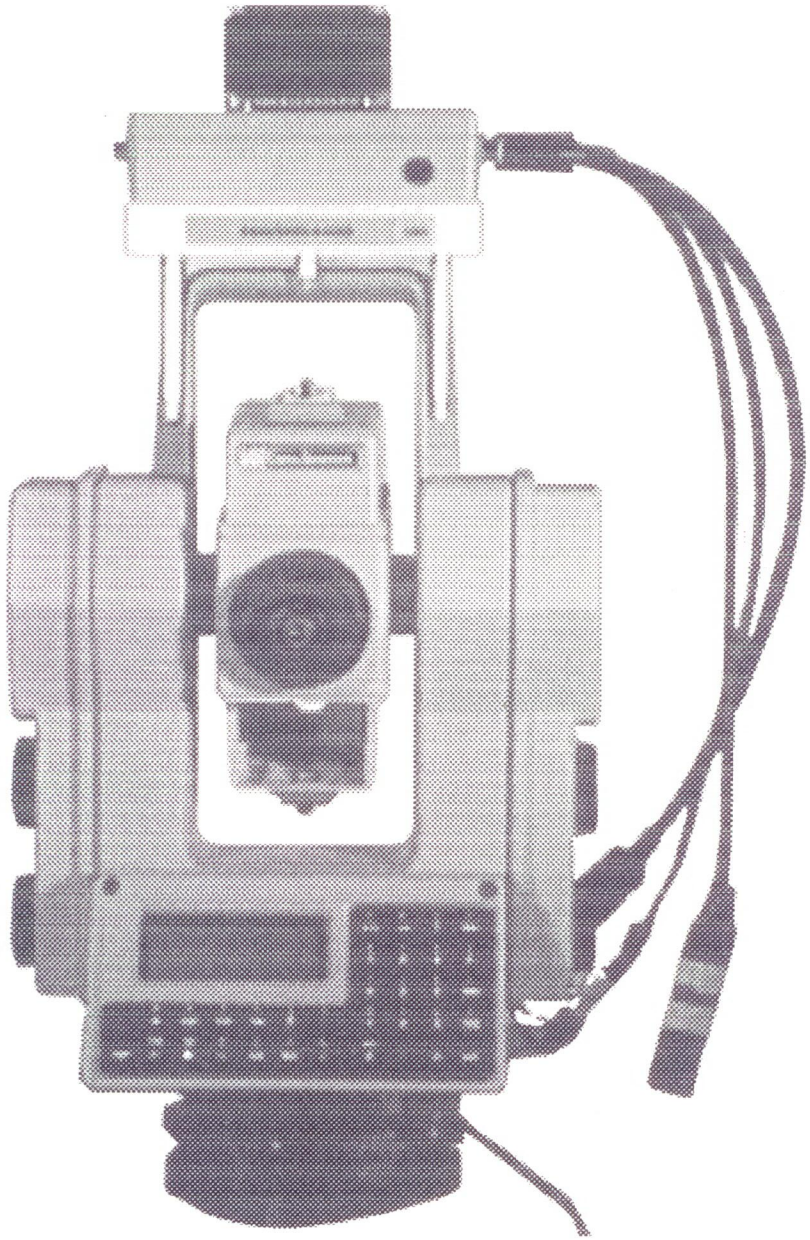
Switch on the instrument and run program "**GEOGLAPP.EXE**" on the computer.

Measure the mechanical play with a complete instrument : GDM 400/500 Servo/4400

Place the connection box (GDM 400/500 Servo/4400) on the handle of the instrument
Connect cables:

1. J1 - J7
2. J3 - GDM
3. J8 - Encoder and Motors

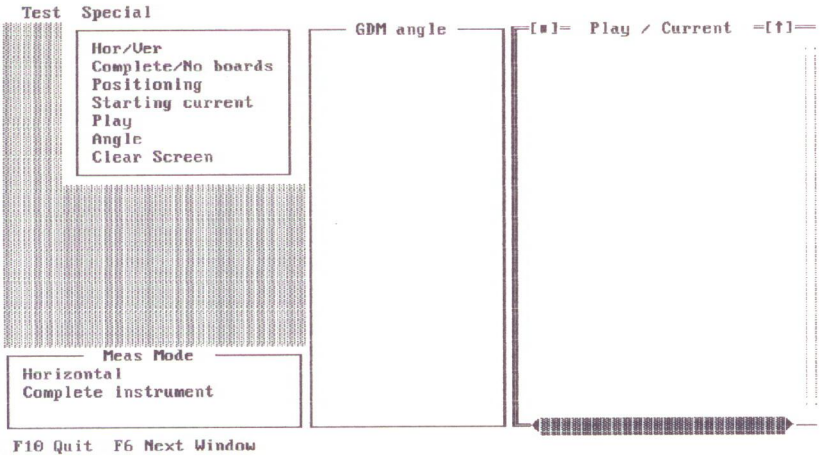
Switch on the instrument and run program "**GEOGLAPP.EXE**" on the computer.



"GEOGLAPP.EXE":

Switch on the computer and run program "**GEOGLAPP.EXE**".
When the first figure is shown press <**Enter**> to continue.

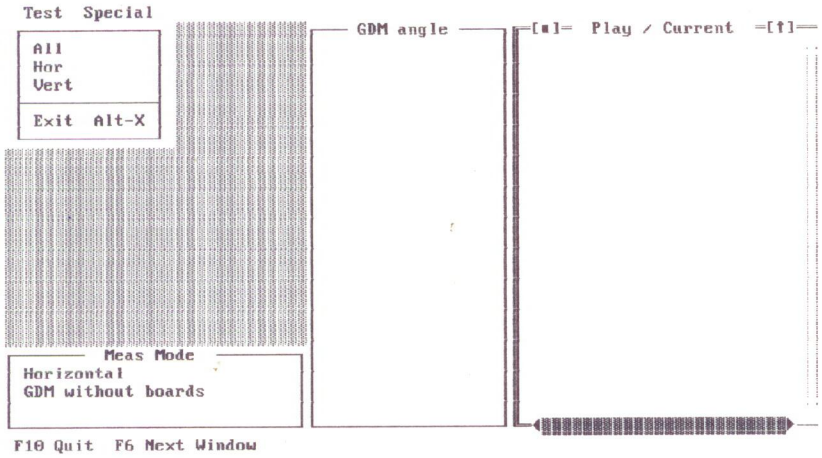
Set the program for the right measuring mode, "**Complete Instrument**" (see figure below, bottom left) by changing mode in the special menu.
To get the special menu press <**Alt**> and <**S**> and change measuring mode by moving the cursor down to "**Complete/No boards**" and press <**Enter**>.
See figure below:



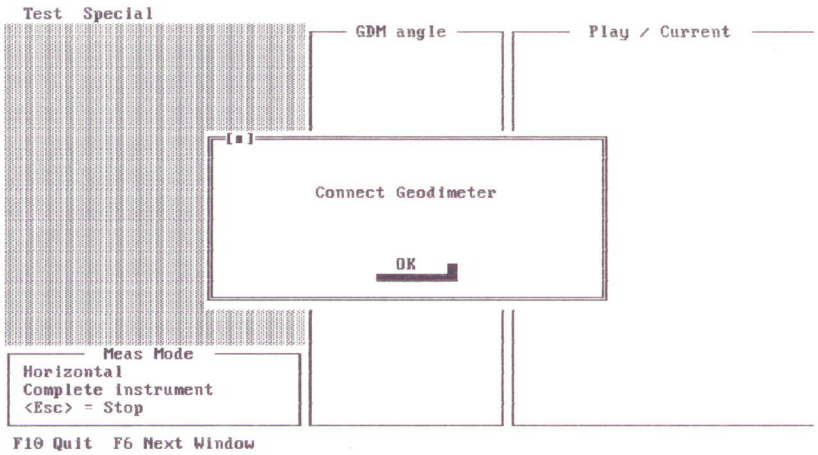
From the "**Special menu**" is it also possible to:

Hor/Ver - Change horizontal or vertical mode.
Complete/No boards - Change measuring mode.
Positioning - Positioning to a specified angle.
Starting current - Measure a single starting current of the instrument.
Play - Measure a single play of the instrument.
Angle - Displays the angle.
Clear Screen - Clear the screen.

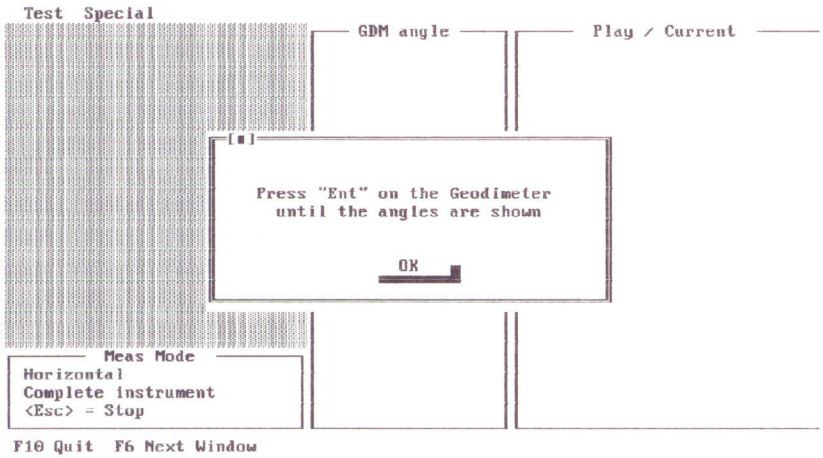
To run the program press <**Alt**> and <**T**> for the test menu, see figure below:



Choose either "**All**" for both horizontal and vertical measuring or "**Hor**" for horizontal and "**Ver**" for vertical measuring.
Press <**Enter**> and the figure on the next page will be shown.



Connect the Geodimeter and Press <**Enter**>, and this figure will be shown:



Switch of the compensator and press <**Ent**> on the Geodimeter until the angles are shown. Press <**Enter**> on the computer to start the program.

The play and the starting current will be measured on four places in both horizontal and vertical mode. The angle of the Geodimeter will be shown in the "**GDM angle**" column and the result in the "**Play / Current**" column.

TOLERANCES:

Horizontal play : mean value max. **35** cc
Vertical play : mean value max. **45** cc

Starting current for ESCAP motor (larger motor with metal coating):
Horizontal : mean value max. **91** mA
Vertical : mean value max. **85** mA

Starting current for MiniMotor (smaller "black" motor):
Horizontal : mean value max. **70** mA
Vertical : mean value max. **65** mA

November 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd SWEDEN
WI/9411B

Subject: Service equipment GDM System 500/600

Description: To perform adjustment of the distance meter in GDM system 500/600 instruments the following special equipment is neccessary:

Test box el.	part no: 571 600 089
Tuning fixture	part no: 571 600 106
Tuning software	part no: 571 600 113

Follow the procedures on following pages.

GEODIMETER SYSTEM 500/600 .

Electrical adjusting tools.

4.1.1 General Description.

With the help of the software (571 600 113), elbox (571 600 089) and trim fixture (571 600 106) the distance unit for system 500/600 is electrically adjusted. A set of adjusting steps is gone through one by one:

1. **Power connection to the distance unit.**
2. **Adjustment of the light output (not used).**
3. **Measuring signal, in search mode.**
4. **Adjustment of the inner-path signal level.**
5. **F1/F2 adjustment.**
6. **Adjustment of the greywedge working point.**
7. **Distance check at low and high signal.**
8. **Haircross illumination and tracklight control.**
9. **Range check.**

4.1.2 Tools.

Software "TROL"	part no:	571 600 113
Testbox (Interface)	part no:	571 600 089 (including cables)
Tuning fixture	part no:	571 600 106

Accurate voltmeter (DMM, resolution: 0.1mV and tolerance +/- 1.2% + 2 digits)

The program contains:

- Instructions how the adjustments shall be performed.
- Input of measured values: Sig.level (DC)
  Lin.signal (AC)

- Control of the external greywedge.
- Input and output of measured signals.
- Control signals and communication with the distance unit via LabCard

4.1.3 Voltage measurment.

Voltage measurements are made via labcard 14 bit analog inputs.

Analog input channels:

Probe (DC)
Probe mean value (DC)
Probe (AC)
Sig.level

Probe measurement specification:

Probe X1:

Measurement range:	**-1.5V - +1.5V**
Accuracy:	**+/- 0.3mV (DC), +/- 1.1 mV (AC);**
Max divergence in range:	**0 - 1V**

Probe X10

Same as above multiplied by 10.

Accurate calibration of voltmeter and probe is needed to get relevant measurement values.

4.2.1 How to use the program.

Root menu.

F1-Help
Help text/manual.

F2-Trim
Will show a table menu,
where the different adjustment steps are shown.

Root
Serial no:
Scratch ? Y/N

1. Main power on
2. High/Low light power
3. Signal in search mode.
4. Inner path adjustment.
5. Freq1/Freq2 adjustment
6. Greywedge working point
7. Strong/weak signal check
8. Crosshair/Tracklight
9. Range check

Finished

F3-Volt meter
Possibilities to use the LabCard voltmeter outside the adjustment program. One or two channels can be used. Via the first menu at the root directory the right analog channel is chosen: F1-lower
F2-upper
F10-ready

In the second menu the channel: F1-probe (DC)
F2-Probe Meanvalue (DC)
F3-Probe (AC)
F4-signal level
F5-Photo detector is chosen

Then max reading is set: 0 - 2V = X1 probe
2 -15V= X10 probe

When the key F10-Ready is pressed the measurements starts.

F4-Calibration:
Calibration of the LabCard voltmeter.
When the calibration has been performed the obtained calibration constants will be used at every voltmeter measurement in the program. Every channel has it's own scale factor and offset (note: X10 probe setting has it's own constant). The calibration constant is saved in a file called SCF.DEF.

In the menu F4 calibrate:
- F1-Probe (DC)
- F2-Probe Meanvalue (DC)
- F3-Probe (AC) (note: no X10 in probe AC)
- F4-Signal.level
- F5-Photo-detector

To perform calibration:
Press **F2**, main power on, then press the "**Esc**" key
Press **F4** calibration
Follow TROL program instructions.

- F1 Probe X1: (DC)	- short circuit probe, then connect max **1.5V (DC)**
- F1 Probe X10: (DC)	- short circuit probe, then connect max **15V (DC)**
- F2 Probe X1: Meanvalue (DC)	- short circuit probe, then connect max **1.5V (DC)**
- F2 Probe X10: Meanvalue (DC)	- short circuit probe, then connect max **15V (DC)**
- F3 Probe X1: **1.5khz** (AC)	- connect **5mV (AC),** then connect **100mV (AC)**
- F4 Signal level: (DC)	- short circuit **pin 7 and pin14 (GND) on J3,** - connect **1-7V DC to pin 7 and pin 14(GND) on J3.**
- F5 Photo detect: (DC)	- short circuit **pin 23 and pin14 (GND) on J3,** - connect **1 - 7V DC to pin 23 and pin14 (GND) on J3**

Any power source that will provide this type of voltages can be used for calibration purposes,
- 1-15 V (DC) (DC POWER SUPPLY),
- 5mV-100mV (AC) 1.5khz (SIGNAL GENERATOR or GDM)
Also a accurate voltmeter (DMM has to be used), resolution **0.1mV**, tolerance **+/- 1.2% +2** digits.

F5-TrimProt
Text and adjustment results are stored and updated in two files, while adjustments are made.
The text file: xxxxxx.TRX
The reult file: xxxxx.TRD

F6- Com port

- Com port no	- 1
- Baud rate	- 1200
- Parity	- even
- Char lenght	- 7
- Stop bit	- 2
- LPT port address	- 888
- Time out	- 15/30 (fast/slow computer)
- End char	- >
- Distance	-
- Pulse/step	-
- Pulse/start	-
- Not used	- C:\
- Path to distance meter	- C:\
- Not used	- C:\
- Switch setting	- MS

4.2.2 Extra command.

There is also an extra command row, always shown when
"F2 trim" is used

These commands can be performed aside from the trim-menu.
F1-PwrOff
Power from the test box to the distance unit is disconnected
F2-PwrOn
Activates the test box
F3-Reset
Reset is sent to the distance unit
F4-Pwr down
The distance unit is set in "power down" mode
F5-NormPwr
The distance unit is set in "normal" power mode
F6-Done off
Removes the "Done" mark at the row that's marked in the menu
F7-Key
Unlocks/locks the order of the adjustment steps
F10-Quit

4.2.3 The adjusting steps

The trim menu is numbered from 1 to 9. When one adjustment is done,
the prompt automatically jumps to the next position.
The only possibility to change that order is to press the F7 key (lock/unlock)
Then any of the 9 positions can be chosen. This is indicated by the key symbol in the
upper right hand corner of the screen.

There are three ways to go back from the trim menu to the root menu:

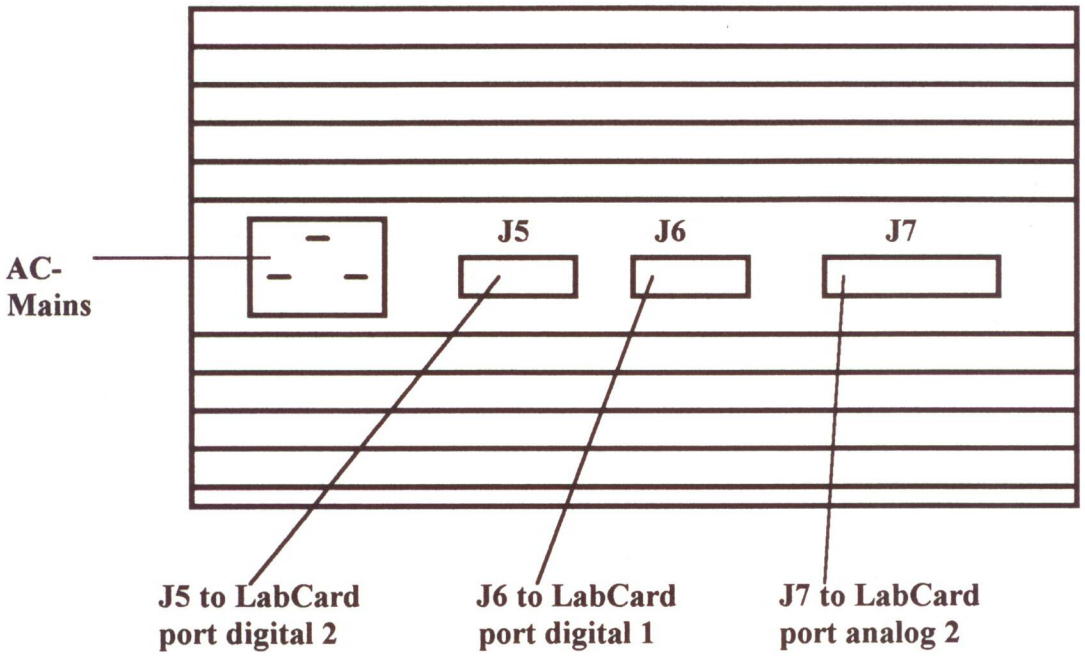
- **1. Choose root in the menu**
- **2. Press the "Esc" key**
- **3. Go through the whole menu and choose.**

Both 1 and 2 will work the same way the adjustment state will be saved in the "state.par" file.
The computer can now be shut off. When started again and entering the adjustment menu in
the "TROL" program, it will be at the same state as where it was left.
Note: When using alternative 3, the state.par file will be cleared.

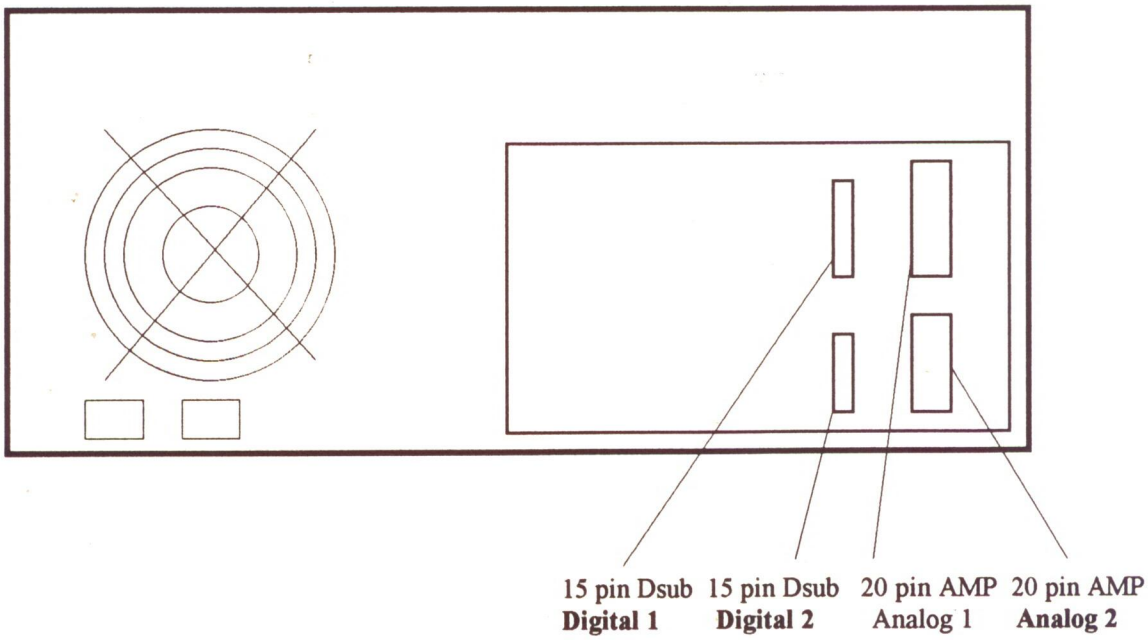
cont.

Root:	Back to root menu.
Serial no:	The serial no. must be written, so the program can determine if it is adjusting a GDM 500 or a GDM 600
Scratch Y/N:	Start from the beginning and clear the STATE.PAR file
1. Main power on:	Power to the distance unit, reset and open the external greywedge.
2. High/Low light power:	Option to change the light power, presently not used .
3. Signal in search mode:	Measurement of signal level in search mode. Tolerance **7V +/- 2V (DC).** If out of tolerance adjust **R41** on the DIP
4. Inner path adjustment:	The instrument is set in the test mode and cal. via the computer. Turn the screw clockwise and adjust to **100mV (AC) +/- 30 GDM System 500** and to **170mv (AC) +/- 30 GDM System 600**. Three test measurements are made.
5. Freq1/Freq2 adjustment:	The greywedge is turned to the signal/noise lim. **F1 = 5mV AC tol +/- 0.5mV.** Press any key the program starts to measure in **F2**, The value in **F2** shall be **F1 + 0.1mV AC - + 1.5mV, but max 6.5mV** If **F1** is out of tolerance adjust on external greywedge to **5mV**, then adjust **R14** on the DIP board to signal/noise level. Press "Esc" and run test again. If F2 is out of tolerance, no adjustments possible, change DIP board
6. Greywedge working point:	Measure the Sig.level and Lin.signal, in D-bar mode. **Sig.level = 6,2 +/- 0.3V.** **Lin.signal = 120 +/- 30mV.** If Sig.level out of tolerance adjust R41 on the DIP board and go through the adjustments from step 3 again.
7. Strong/weak signal:	Five measurements with strong signal and five measurements with weak signal are made. Mean values of distances , spread and measuring time is calculated
8. Crosshair/tracklight:	Control that the crosshair illumination are flashing. Measure the TRK-mod signal at the TTB board middle pin (probe x 10).
9. Range check	Turn GDM away from the fixed prism use the special prism described in WI 93002, hold it directly in front of the lens of the GDM and measure the Lin signal. Tolerance: **510/ = 10 - 13mV** **520/ = 14 - 20mV** **540/ = > 20mV** **600 - = 10 - 17mV** **600Mr = 17 - 40mV** **600Lr = > 40mV** Result saved in directory:TROLDAT.

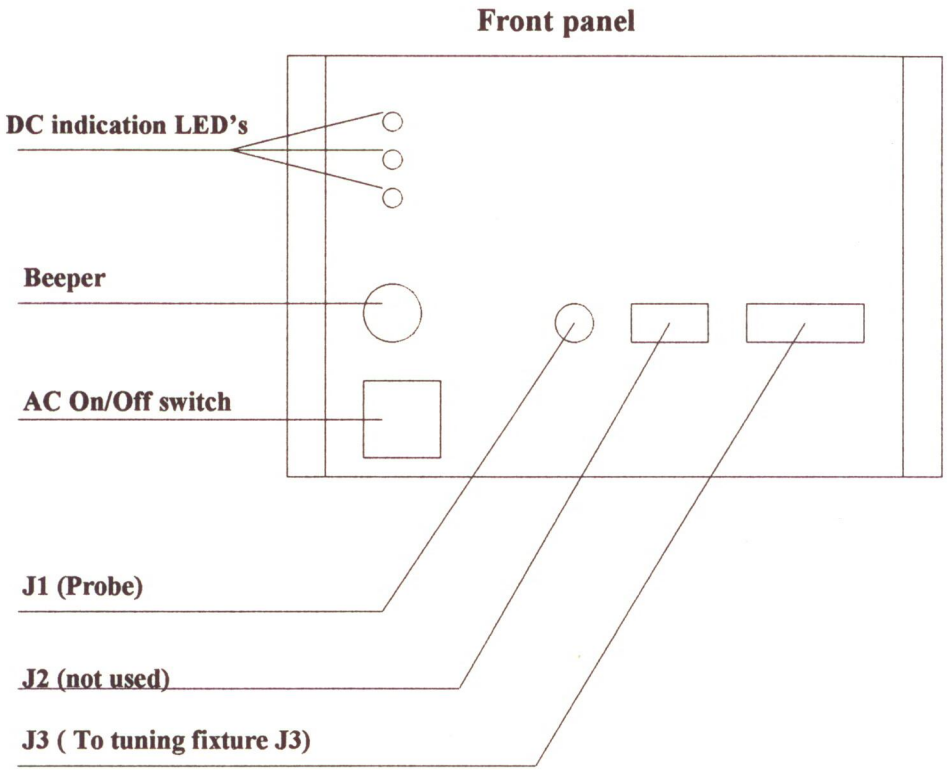
Test box GDM System 500/600, back panel.
Part no: 571 600 089



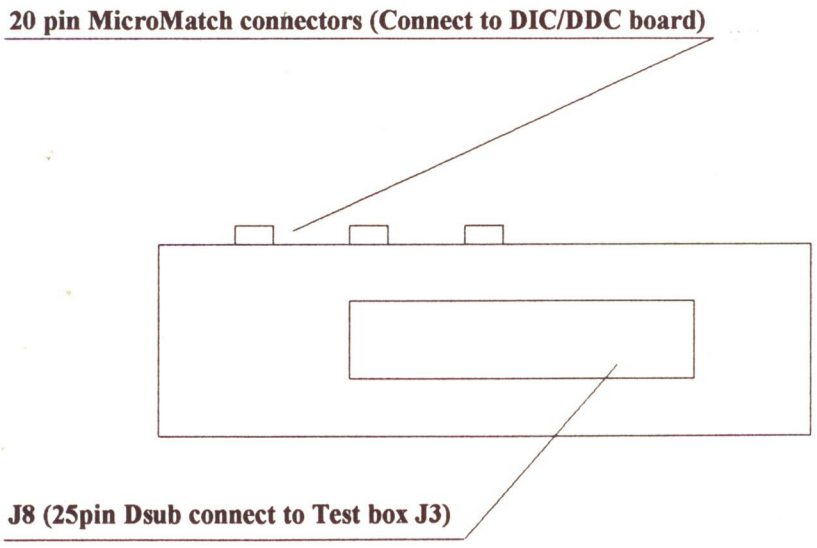
PC back panel, LabCard connector configuration.



Test box GDM system 500/600, front panel.
Part no: 571 600 089



Tuning fixture part no: 571 600 106, connection box.



Geotronics

WORKSHOP INFO

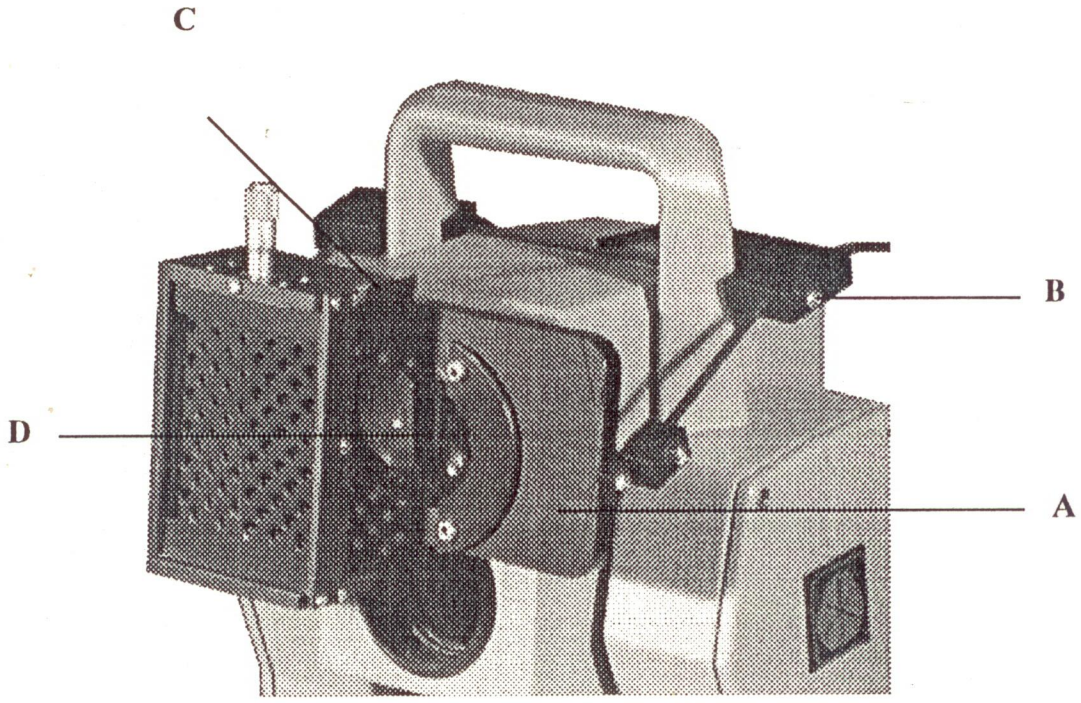
March 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI/ 9407A

Instrument type: Geodimeter System 400 instruments

Subject: **Adapter (908 143 402)** for Range Tester (571 113 614)

Description: Tool to verify the range performance independently of actual measuring conditions.
Description as per Technical Info February 24, 1981

1) Fit the adapter (A) , adjust the straps to suitable lenght (B).
2) Position the range tester on the plate (C), receiver optics must be fully covered (D).
3) Measuring methode:
   a) Measurements are made at a baseline (30-70m) indoors or outdoors, minimum environmental influence.
   b) Filter may be used to make calibration settings stabile.
   c) Adjust your calibrated range tester to the signal/noise threshold at your reference distance
   d) Read the micrometer value for comparison to the reference values calibrated for each Geodimeter model.



EGLU/LN/mj

TECHNICAL INFO

February 24 1981
Part.No. 571.113.614

RANGETESTER FOR GEODIMETERS

Instrument type: GDM 120-family

Subject: Special designed transmitteraperture for determination of

Maximum range in GDM 110 and GDM 116

Minimum range in GDM 112 and 120.

Handling

To establish the correct setting of the micrometer for the various instrumentmodels, referencemeasurements using new Geodimeters have to be carried out.
Due to local differences of

1. Number of prisms
2. Referencedistance
3. Quality of glass (window)
4. "Standard weather"

Each serviceshop have to find their own micrometervalues to assure that instruments that have been repaired still meets the rangespecification.

		Micrometervalue (Min) (Max)
Example	GDM 110	1,2 - 3,3
	GDM 112	0 - 0,8
	GDM 116	1,8 - 4,0
	GDM 120	0 - 1,2

Enclosed is a filter that can be fitted to the tester in order to get higher settings which in some cases will increase the accuracy, especially when the referencedistance is short.

Geotronics

WORKSHOP INFO

May 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI / 9406B

Subject: **Test box, part no: 571 600 089, tuning fixture part no: 571 600 106**

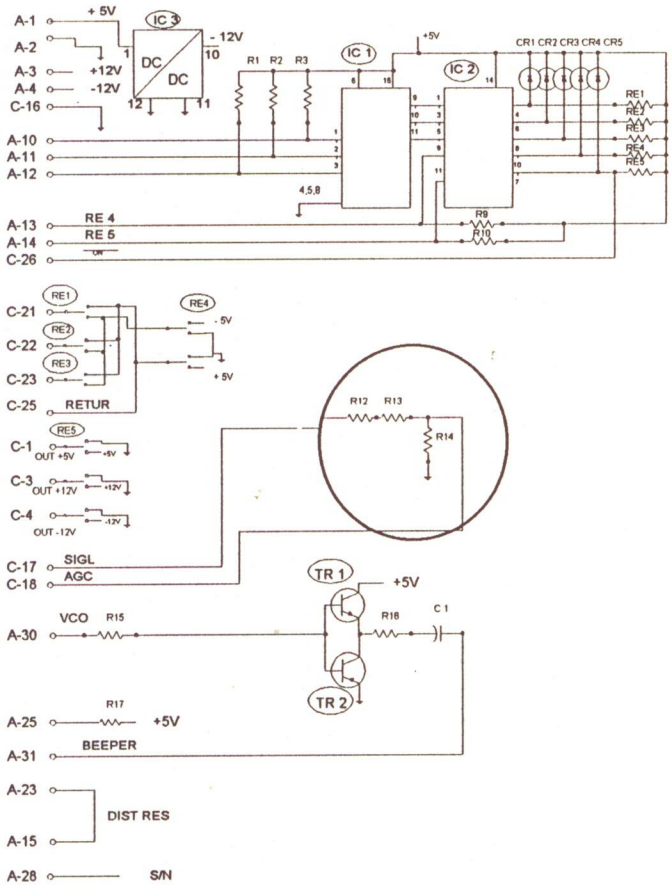
Description: Upgrading of test box for GDM System 600.
To perform electrical adjustment with the GDM 600
a modification on the digital board in the box is necessary.

Additional components:

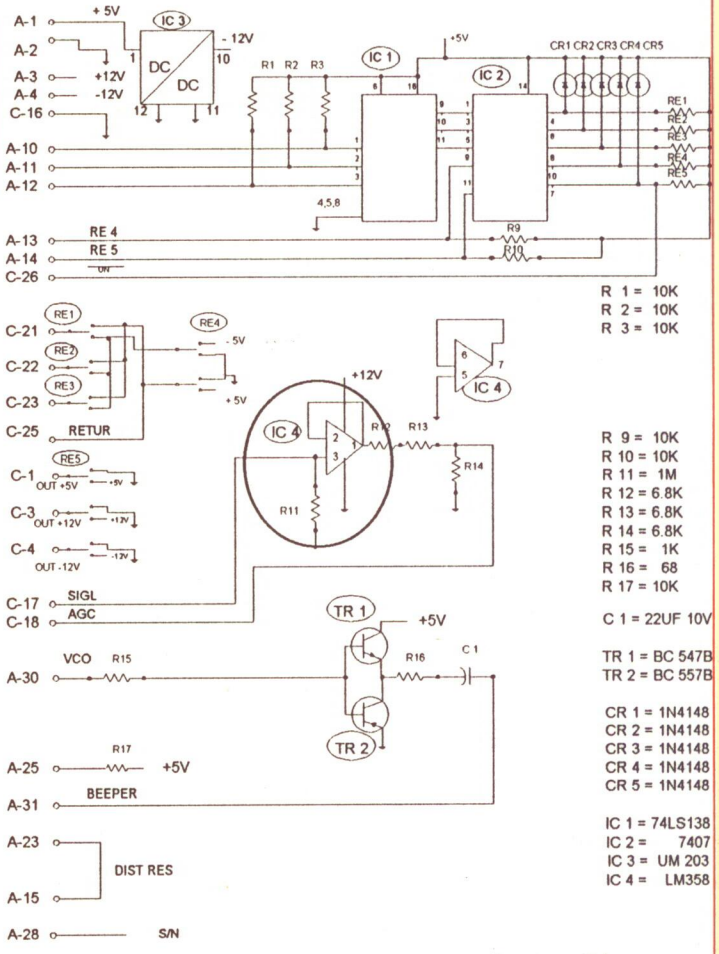
IC 4,	LM 358	Part no: 571 901 099
R 11,	1 Mohm	Part no: 571 901 140
IC Socket	8 pin	Part no: 571 904 139

Add these components according to the schematics.

OLD VERSION



NEW VERSION



R 1 = 10K
R 2 = 10K
R 3 = 10K

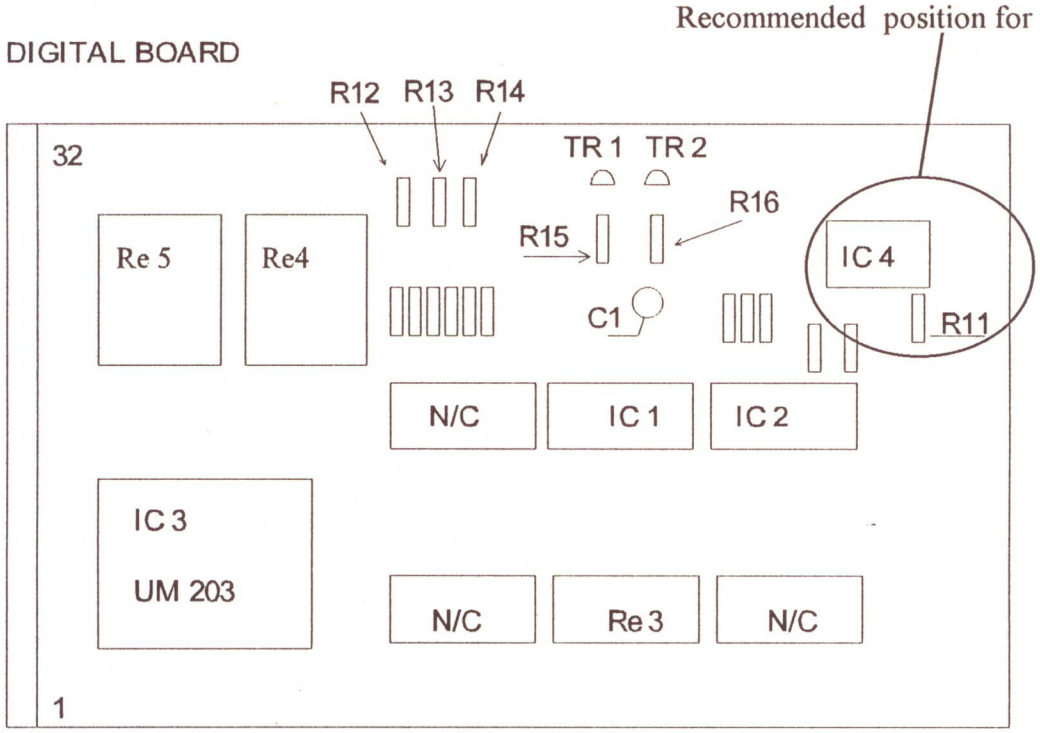
R 9 = 10K
R 10 = 10K
R 11 = 1M
R 12 = 6.8K
R 13 = 6.8K
R 14 = 6.8K
R 15 = 1K
R 16 = 68
R 17 = 10K

C 1 = 22UF 10V

TR 1 = BC 547B
TR 2 = BC 557B

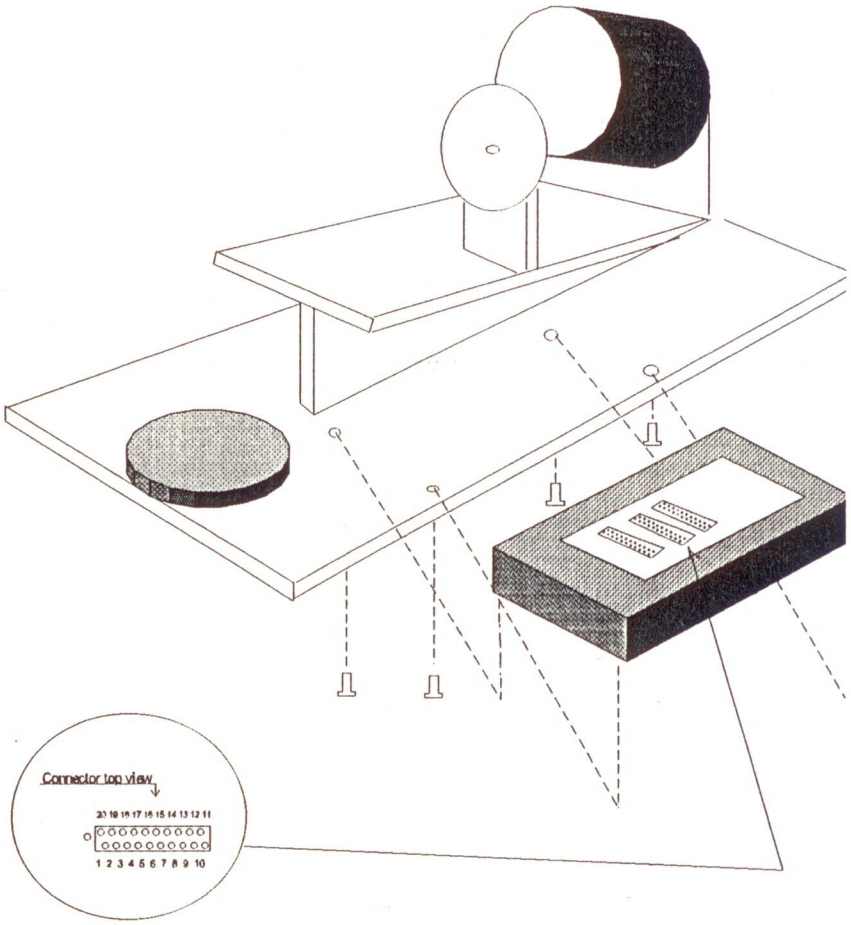
CR 1 = 1N4148
CR 2 = 1N4148
CR 3 = 1N4148
CR 4 = 1N4148
CR 5 = 1N4148

IC 1 = 74LS138
IC 2 = 7407
IC 3 = UM 203
IC 4 = LM358



Additional modification in the connector box on the tuning fixture part no: 571 600 106

- Open the box
- Solder a jumper between connector pin 14 and 15 on any of the 20 pin MicroMatch connectors.



Note: The test box (571 600 089) will not provide a beeper signal when the GDM is aimed at the prism, as in the GDM system 500.

Geotronics

WORKSHOP INFO

March 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI/ 9405A

Instrument type: Geodimeter System 600 instruments

Subject: Tuning fixture 571 600 106; **Mod kit (555 600 106)**

Description: The existing tuning fixture has to be modified slightly to fit System 600 instruments.

- Exchange the mechanical parts to make space for rotation of instrument.
- Inter connection cable; tuning fixture (20p) <=> DDC board (12p)

Preis DM 130,--/Stück

Geotronics

WORKSHOP INFO

March 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI / 9406A

Subject: **Test box, part no: 571 600 089**

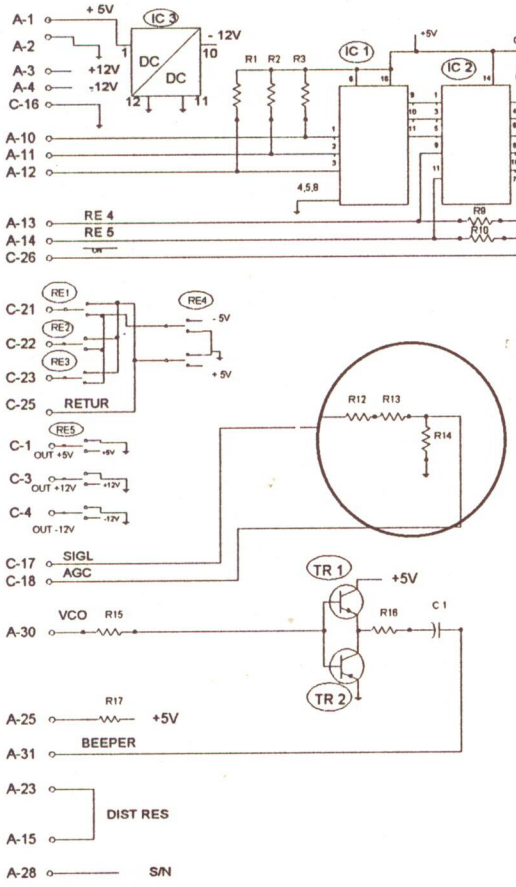
Description: Upgrading of test box for GDM System 600.
To perform electrical adjustment with the GDM 600
a modification on the digital board in the box is neccessery.

Additional components:

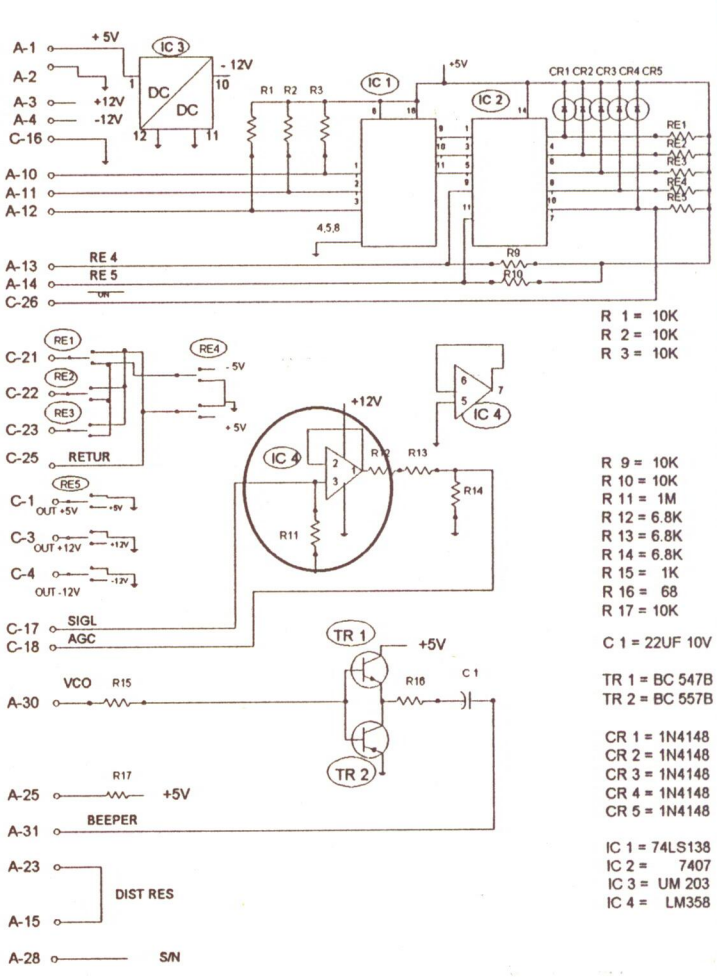
IC 4,	LM 358	Part no: 571 901 099
R 11,	1M ohm	Part no: 571 901 140
IC Socket	8pin	Part no: 571 904 139

Add these components according to schematics.

OLD VERSION



NEW VERSION



R 1 = 10K
R 2 = 10K
R 3 = 10K

R 9 = 10K
R 10 = 10K
R 11 = 1M
R 12 = 6.8K
R 13 = 6.8K
R 14 = 6.8K
R 15 = 1K
R 16 = 68
R 17 = 10K

C 1 = 22UF 10V

TR 1 = BC 547B
TR 2 = BC 557B

CR 1 = 1N4148
CR 2 = 1N4148
CR 3 = 1N4148
CR 4 = 1N4148
CR 5 = 1N4148

IC 1 = 74LS138
IC 2 = 7407
IC 3 = UM 203
IC 4 = LM358

Geotronics

WORKSHOP INFO

March 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI/ 9404A

Instrument type: Control unit 603/604

Subject: Initialization of Labels and Texts

Description: As we in the present program version (... 612-**01.01**) need a part of the **I.MEM** and the use of (P40) **UDS** to initialize the control unit, a configuration-number activating these two options must be installed during the initialization-procedure. Ones initialized the conf.number should be cleared until a customer-related conf. number is installed. (options purchased by end user)

For control units not yet fitted with these functions HQ will supply the configuration number to enable Label and Text init of customer units while in the service workshop.

As long as the config.number been used for "INIT"only, no charge will be made. The actual instrument is then "marked" in the option data base => thus next order for options will be considered "first time" and charged accordingly.

Procedure described is for this release only!.

Geotronics

WORKSHOP INFO

January 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI/ 9403A

Subject REFERENCE-KIT Geodimeter System 600 ; **Part No: 571 900 005**

Description:

Part No;		Description;
555 180 418		Servo motor
555 202 120		Keyboard to control unit (Alpha)
555 202 160		Keyboard to control unit (Numerical)
571 144 930		Compensator unit (fitted with PMU-3)
571 200 060		Greywedge incl. motor
571 201 040		Board DIP
571 201 080		Board DIR
571 201 390		Board DIT-H
571 202 018	*	Radio side cover complete
571 202 048		Worm screw complete
571 202 130		Control unit; Alpha
571 202 210		Angle sensor
571 203 040		Board SRV
571 203 060	*	Board TRE
571 203 080		Board PVX
571 203 100	*	Board TAM
571 203 120	*	Board TAC
571 203 260		Board DDC
571 203 280		Board POA
571 203 300		Board PAC
571 203 360		Board FUB

* Tracker unit / Radio side cover (not yet available)

January 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI / 9402A

Subject: **GEO BASE information**

Description: This information regarding the GEOBASE BBS is to be regarded as confidential. More information regarding functions and features will be distributed later.

Equipment at HQ:
Computer: **Remedy** 486 SX 33
Modem : **US Robotics *SPORTSTER***
Program : **PC-Board** (Bulletine board system)

Communication parameters: **1200 - 14400** Baud, **No** parity, **8** data bits **1** stop bit

Equipment locally:
Computer: Any 286 - 486 with serial communiction ports
Modem: Any standard modem with a specified baud rate min 9600
Program: Standard communication program (Recommended: **PCplus**)

Additional information: Telephone no: +46 8 622 10 59

User name:
Password:

The *user name* and *password* are specific for every user, if more than one person should use this system it will requier additional *user name* and *password*. The *user name* and *password* will be distributed directly to the persons concerned.

Geotronics

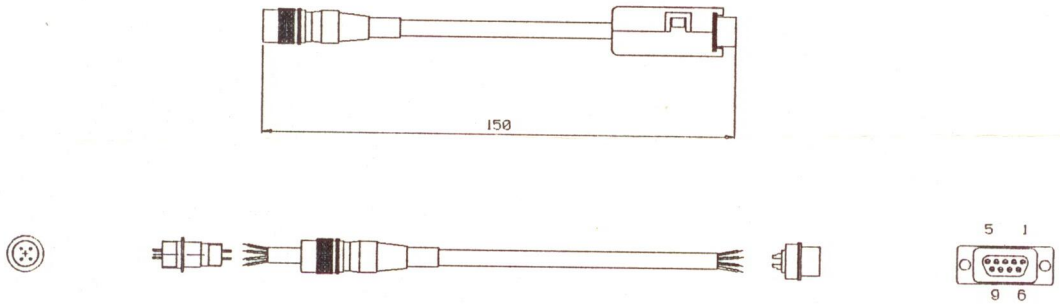
WORKSHOP INFO

January 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI/ 9401B

Instrument type: Geodimeter System 600- Instruments

Subject: Adapter cable (D-sub <=> Hirose) Part No: 571 600 338

Description: To be used with existing power supply , battery and communication connectors in the Service Workshop.



Hirose		D-don 9
		1 = NC
2 = RXD	———	2 = RXD
1 = TXD	———	3 = TXD
4 = GND	———	4 = GND
		5 = NC
3 = 12 V	———	6 = 12 V
		7 = NC
		8 = NC
		9 = NC

Geotronics

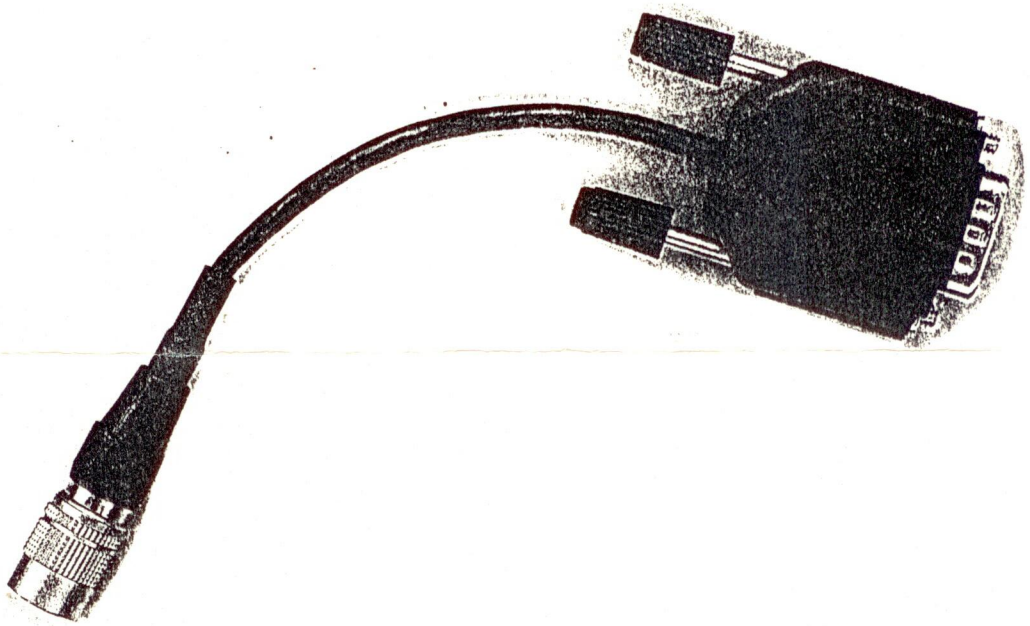
WORKSHOP INFO

January 1994
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI/ 9401A

Instrument type: Geodimeter System 600- Instruments

Subject: Adapter cable (D-sub <=> Hirose) Part No: 571 600 338

Description: To be used with existing power supply and battery connectors in the Service Workshop.



Geotronics

WORKSHOP INFO

October 1993
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI/9310A

Instrument type: Geodimeter Instruments

Subject: Lubrication of instruments and sub units

Description: To maintain specified instrument performance service workshops must not use other than by GEOTRONICS AB approved type (Part No) of grease at each position/function.

Below is a summary of greases and their general purpose. In the maintenance manual for each Geodimeter system you will find details of lubricants/lubrication when applicable.

Part No	Name	General purpose	
571 905 940	Isoflex OPN4 (TOPAS)	Foot screws (Tribrach)	
571 905 942	MS4	Screws/Threads	
571 905 943	Rocol ASP	Motion screws Vert/Hor	
571 905 944	Isoflex NBU 15	Servo drives (cog wheel)	
571 905 946	High vacuum grease	Water/dust protection - Bottom part - Pivot axes - Gear housing	
571 905 948	Uni silicon TKH 1011	(System 500) Sealing for focusing mechanism telescope	
571 905 949	Isoflex PDL 300A	(H.V) Locking surface, slide bearings	
571 905 950	Fluolub 175	Rubber seal telescope (System 400)	
571 905 952	Unimoly C220	Basic surface treatment (Servo drives)	
571 905 953	DFIM	Threads/Occular	
571 905 955	Catenera KSB 12	Bearing	
571 905 956	Isoflex Topas L30	Motion Control (Non metal)	Servo
571 905 957	Isoflex Topas AK50	Motion Control (Metal)	Servo

Geotronics

WORKSHOP INFO

October 1993
GEOTRONICS AB
Technical Support Dept.
Danderyd, SWEDEN
WI/9310A

Instrument type: Geodimeter Instruments

Subject: Lubrication of instruments and sub units

Description: To maintain specified instrument performance service workshops must not use other than by GEOTRONICS AB approved type (Part No) of grease at each position/function.

Below is a summary of greases and their general purpose. In the maintenance manual for each Geodimeter system you will find details of lubricants/lubrication when applicable.

Fettliste

Part No	Name	General purpose
571 905 940	Isoflex OPN4 (TOPAS)	Foot screws (Tribrach)
~~571 905 942~~	~~MS4~~	Screws/Threads
571 905 943	Rocol ASP	Motion screws Vert/Hor
571 905 944	Isoflex NBU 15	Servo drives (cog wheel)
571 905 946	High vacuum grease	Water/dust protection - Bottom part - Pivot axes - Gear housing
571 905 948	Uni silicon TKH 1011	(System 500) Sealing for focusing mechanism telescope
~~571 905 949~~	~~Isoflex PDL 300A~~	(H.V) Locking surface, slide bearings
571 905 950	Fluolub 175 / N/A	Rubber seal telescope (System 400)
~~571 905 952~~	~~Unimoly C220~~	Basic surface treatment (Servo drives)
571 905 953	DFIM (DF1M)	Threads/Occular
571 905 955	Catenera KSB 12	Bearing
~~571 905 956~~	~~Isoflex Topas L30~~	Motion Control (Non metal) } Servo
571 905 957	Isoflex Topas AK50	Motion Control (Metal) } Servo

nur 500 und 600 GDM

Rutschkupplung Servosystem

Didtung für Focusring

Nur für 400

Mit Punkt wichtiger.

Geotronics

TECHNICAL INFO

April 1993
GEOTRONICS AB
Technical Support Dept.
Danderyd, Sweden
571/93012

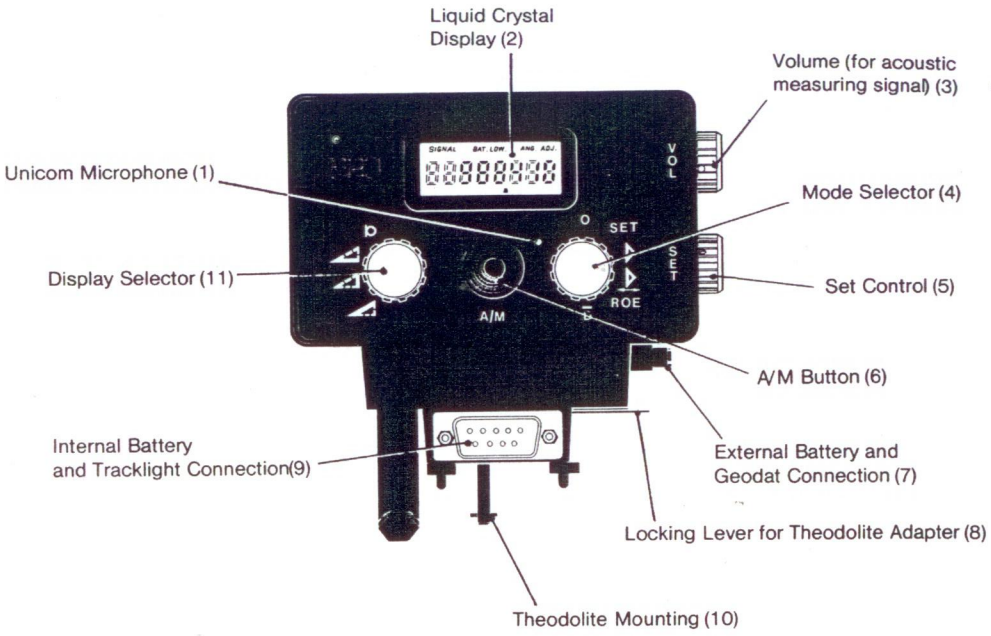
LABELS FOR GEODIMETER 500/400/4000 SYSTEM; PROGRAM { 542-22.1 / 582-15.3 / 588-07

GSS/EXC F3/F2 3EBENE öffnen

LABEL	FUNCTION
	H2 V SD
0	Information.
1	Data used in INFO/DATA combination.
2	Station no.
3	Instrument height.
4	Point code.
5	Point no.
6	Signal height.
7	Horizontal angle.
8	Vertical angle.
9	Slope distance.
10	Vertical distance = In difference height.
11	Horizontal distance.
12	Used when calculating surface.
13	Volume by P25.
14	Percent of grade.
15	Area name (for naming project area).
16	Horizontal angle difference C1 C2.
17	Horizontal angle C2.
18	Vertical angle C2.
19	Vertical angle difference C1 C2.
20 OFFSET	Lenght offset, added to slope distance. Min value for offset -1.0. Max value for offset 1.0.
21 Horizontal Ref	Horizontal reference angle. Program vector.
22 Kompensator	Switch for compensator on/off.
23	Status.
24	Horizontal angle C1 (Mean).
25	Vertical angle C1 (Mean).
26	Setting out vertical angle. Program for store and set of vertical position.
27	Setting out horizontal bearing. Program for store and set of horizontal position.
28	Setting out horizontal distance.
29	Setting out difference in height.
30	Parts per million atmospheric. Correction factor. Send PPM to DIM. Minimum PPM value = -60. Maximum PPM value = 195.
35	Instrument height.
36	Signal height.
37	Northings = X value.
38	Eastings = Y value.
39	Height = Z value.
40	Difference X-Coord.
41	Difference Y-Coord.
42	Difference Z-Coord.

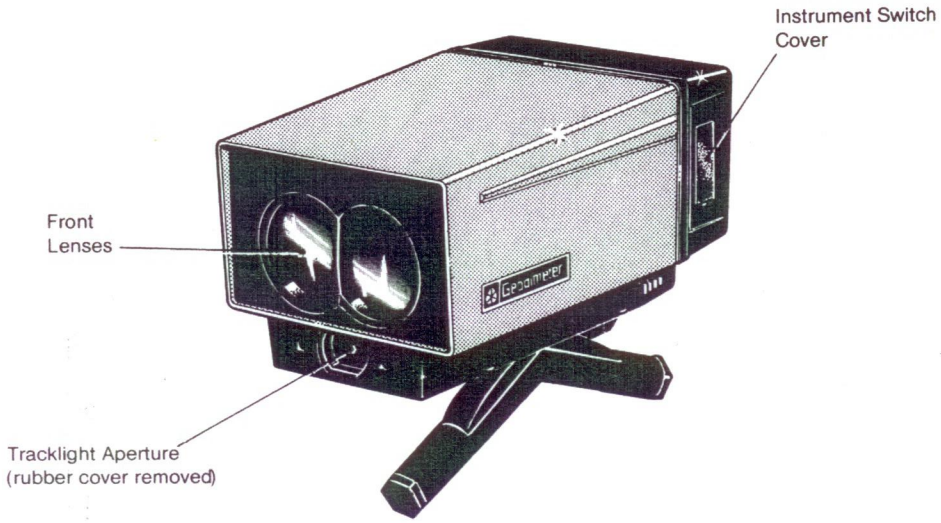
43	Universal transverse mercator. Scale factor.
44	Slope Inclination.
45	Difference height.
46	Standard deviation.
47	X-Coord relative.
48	Y-Coord relative.
49	Z-Coord relative.
50	Job file name (for measured data).
51	Current data. Year/Month/Day.
52	Current time. Hours:Minutes:Seconds.
53	Operator identification.
54	Project identification.
55	Instrument serial no (old way e.g. 69123).
56	Temperature.
57	Blank.
58	Earth radius.
59	Refraction coefficient.
60	Shot id.
61	Activity code.
62	Reference object.
63	Diameter.
64	Radius.
65	Geometry code.
66	Figure code.
67	Set out coord X.
68	Set out coord Y.
69	Set out coord Z.
70	Object id.
71	Object no.
72	Radial offset (abskissa).
73	Right angle offset, indicating deviation perpendicular.
74	Air pressure.
75	Set out difference height.
76	Set out difference horizontal distance.
77	Set out difference horizontal angle.
78	Uart control register.
79	End.
80	Road line.
81	Road line: A-parameter for clothoids.
82	Road line: Section increment.
83	Road line: Offset from centre of line.
100	Program date.
101	Prom-Version.
102	Horizontal angle preset.
103	Korrektur Vertical angle offset.
104	Plumb gain X.
105	Battery date.
106	Plumb gain Y.
107	Plumb offset X.
108	Plumb offset Y.
109	Crosstalk.
110	Mean value no.
111	Mean value delta.
113	Oktant code horizontal.
114	Oktant code vertical.

115		A/D reading. Cos horizontal.
116		A/D reading. Sin horizontal.
117		A/D reading. Cos vertical.
118		A/D reading. Sin vertical.
119		A/D reading. Offset.
120		A/D reading. Plumb reference.
121		Operating time.
122		A/D reading. Plumb X.
123		A/D reading. Plumb Y.
130		Horizontal sensor no.
131		Vertical sensor no.
136		RAM-checksum.
138		Plumb noice.
139		Correction vertical.
140		Correction horizontal.
146		Extra correction sensor constants on or off. On=9 Off=6.
149		Maximum label (2 or 3).
150		Instrument centre correction vertical.
151		Instrument centre correction horizontal.
152		Plumb compensator no.
153	Freischaltcode	Configuration number I.
154		ICC. horizontal plumb.
155		Model no (e.g. 440).
156		Owner.
157		Distance meter no.
165		Horizontal angle.
166		Vertical angle.
167		Number of meas. Plumb init.
168		Horizontal angle in radians from PAS.
169		Vertical angle in radians from PAS.
172		Diode type (0,1,2 or 3).
175		Horizontal angle for pos.
176		Vertical angle for pos.
179		Revision PAS.
180		Revision MOS/SER.
181		Revision TRA.
182		Revision DIM/LDM.
183		Horizontal offset (5^{c}).
187		Prism constant.
188	Freischaltcode	Configuration number II.
209		Gdm constant. ; Korrektur bei gleichbleibender Fehler z.b. 3mm
210		Collimating error, horizontal.
211		Collimating error, vertical.
212		Tilt-axis error.
213		Internal instrument no.
214		Collimating error horizontal RPU.
215		Collimating error vertical RPU.
216		Scale-factor for "MILLS".
218		Horizontal angle reference target.
219		Vertical angle reference.
220		Horizontal angle reference target RPU.
221		Vertical angle reference RPU.
247		Radio command.
250		RSGEÖ (R/D test).



FRONT VIEW

Fig. 1.2 Instrument General Detail



REAR VIEW

Fig. 1.3 Instrument General Detail

Basic Description

Fig. 1.4 shows a simplified block diagram of the functions of the instrument. The following description gives the operator an insight into the capabilities of the instrument.

Geodimeter 220 forms a part of a measurement system. The instrument is fitted with a two way data communication which can be connected to the optional recording instrument – Geodat if required.

The instrument operates in the infrared range of the electromagnetic spectrum and transmits an infrared beam which is optically aligned to a target. The target comprises a reflecting prism or prisms depending on range (see Specification). The returned signal is received by the instrument and is applied to a phase comparator. The output is decoded and presented onto an easy to read LCD display. The result can be entered into an automatic recording data memory, Geodat, for processing either by desk top calculator or computer at a convenient time.

Geodimeter 220 has a built-in vertical angle sensor (automatic reduction sensor) for the calculation of horizontal and vertical distances. For more precise measurements the angle value can be adjusted to the Theodolite value to obtain very high accuracy. This is mainly used when defining the vertical height, in trigonometric levelling and other precise surveying measurements.

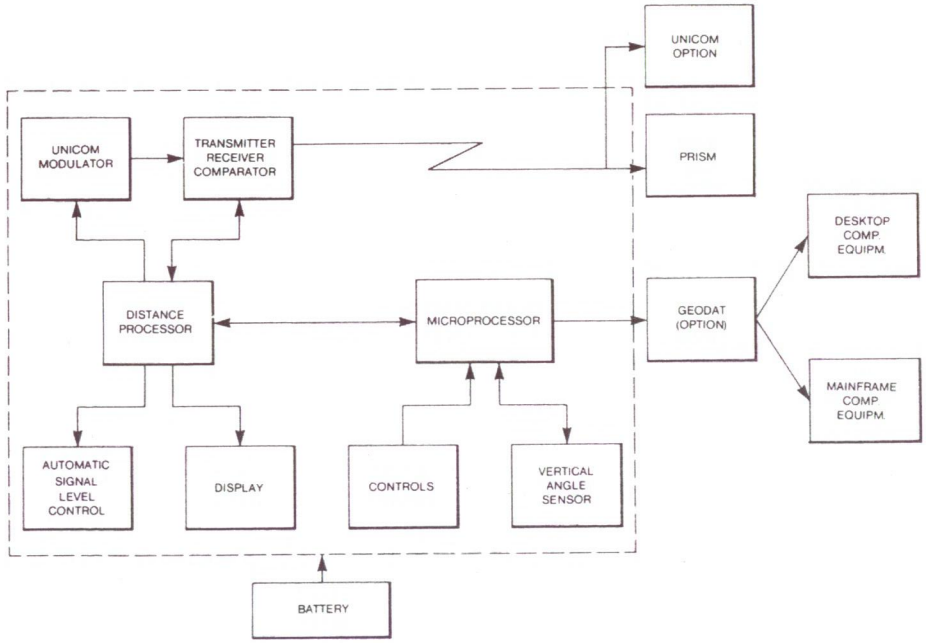


Fig. 1.4 Geodimeter 220 – Simplified Block Diagram

TECHNICAL SPECIFICATION FOR GEODIMETER 220

DISTANCE MEASUREMENT

Range at standard clear using Geodimeter prisms	1 prism – 2300 (1.4 miles) 3 prisms – 4000 (2.5 miles) 8 prisms – 5500 (3.4 miles)
Shortest measuring distance	0.2m (0.7ft)
Read-out	Liquid Crystal Display (LCD) Separate switches – 400gon or 360° metres (m) or feet (ft) face left or face right (see Operating Manual Page 1.2)
Distance accuracy	Standard measurement ▷ ±(5mm +5ppm) ±(0.02ft +5ppm) M.S.E. Arithmetic mean value: D ±(5mm +3ppm) ±(0.02ft +3ppm) M.S.E. Fast tracking up to 4m/s (13ft/s) ▷ ±(10 - 20mm +5ppm) ±(0.03 - 0.07ft +5ppm) M.S.E **Note:** To obtain the highest accuracy when tracking a period of 90 seconds should elapse between switch-on and measurement.
Distance reading	▷ Standard measurement 1mm (0.005ft) ▷ Fast tracking 10mm (0.01ft) D Arithmetic mean value: 1mm (0.005ft)
Measuring time	Short range: 5s Long range: 7s Fast tracking: 0.4s
Light source	Infrared GaAs diode
Beam divergence	2.5mrad (0.25m/100m) (2.5ft/1000ft)
Atmospheric correction	–60 to +195ppm continuously
Offset	±0.999m
UNICOM (option)	100% modulation in ▷-position Range 1600m (1 mile) 30% modulation in other positions

ANGLE MEASUREMENT

Automatic reduction sensor	Adjustable to theodolite within 2.5cc (0.25mgon/1") Angle adjust resolution 5cc (0.5mgon/2")
Angle accuracy	6mgon M.S.E. within ±20gon (±20" within ±18°) 15mgon M.S.E. within ±30gon (±50" within ±27°) ±50mgon M.S.E. within ±50gon (±2.7' within ±45°)
Angle reading	5cc/0.5mgon (2") within ±7.5gon (6.7°) 20cc/2mgon (6" - 8") within ±30gon (27°) 40cc/4mgon (12" - 14") within ±50gon (45°)

GENERAL

Elevation	±50gon (±45°)
Data output	Two way data communication, direct connection to Geodat. Interfaces are available for connection to HP-IL and RS232/V24
Operating temperature range	–20°C to +50°C (–5°F to +122°F)
Storage temperature	–40°C to +70°C (–40°F to +158°F)
Power consumption	3 - 4W
Battery	Rechargeable NiCd battery internal 12V, 0.45Ah for 1.5h continuous operation External batteries 12V, 2Ah for 6h or 12V, 6Ah for 18h operating time
Dimensions	175 × 90 × 110mm excluding mounting adapter (6.9 × 3.5 × 4.3 inch)

STANDARD EQUIPMENT

Part No.	Description	Weight (kg)	Weight (lbs)
571 136 250	Geodimeter 220 The equipment comprises:		
571 136 252	Instrument unit	1.3	2.9
571 135 351	Front cover	0.05	0.1
571 136 420	Transport case with carrying straps	3.2	7.1
571 136 226	Internal batteries (2 pcs) × (0.25)	0.5	1.1
571 132 010	External battery 2Ah	1.0	2.2
571 136 264	Battery cable	0.05	0.1
571 125 016	Atmospheric Correction Disc	0.05	0.1
571 136 266	Tool kit	0.1	0.2
571 136 621	Operating Manual	0.05	0.1
571 136 631	Technical Manual	0.05	0.1
		6.35	14.0

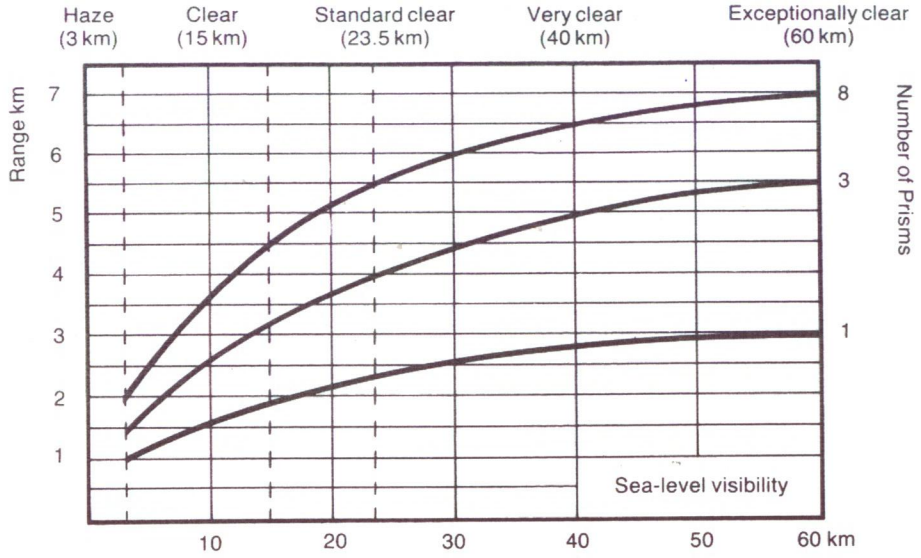


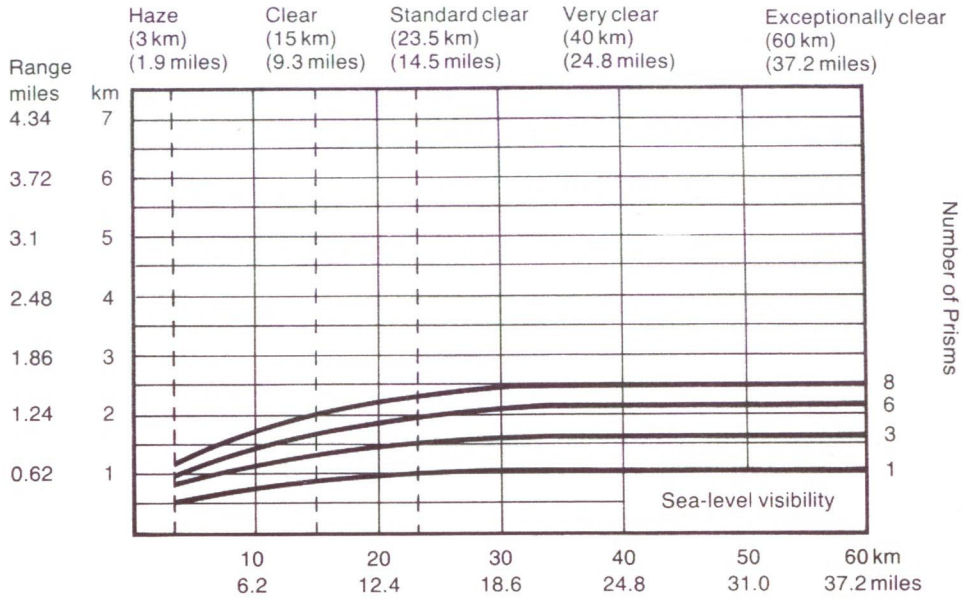
Fig. 1.5 Geodimeter 220 Visibility Specification Graph

Maximum range with Geodimeter prism (Part No. 571 125 021)
The range is also dependent on atmospheric conditions and background radiation.

TECHNICAL SPECIFICATION FOR GEODIMETER 216

DISTANCE MEASUREMENT

Range Standard Clear	1 prism – 1000m (0.6 miles) 3 prisms – 1600m (1.0 miles) 8 prisms – 2200m (1.4 miles)
Using Geodimeter Prisms 571 125 021	
Shortest possible range	0.2m (0.7ft)
Read-out	Liquid Crystal Display (LCD) Separate switches 400 gon or 360 degrees metres (m) or feet (ft)
Distance accuracy	Standard measurement: ▷ ± (5mm + 3ppm) ± (0.02ft + 5ppm) M.S.E. Fast tracking: ▷ ± (10.20mm + 5ppm) ± (0.03-0.07ft + 5ppm) M.S.E. **Note:** To obtain the highest accuracy, a period of 90 seconds should elapse between switch on and measurement



Maximum range with Geodimeter prism (Part No. 571 125 021)
The range is also dependent on atmospheric conditions and background radiation.

Fig. 1.6 Geodimeter 216 Visibility Specification Graph

Distance reading	▷ Standard measurement: 1mm (0.005ft) ▷ Fast tracking: 10mm (0.01ft)
Measuring time	Short range: 5s Long range: 7s Fast tracking: 0.4s
Light source:	Infrared GaAs diode
Beam divergance	2.5mrad (25cm/100m) (2.5ft/1000ft)
Atmospheric correction	−60 to 195ppm continuously over the entire measuring range of the instrument
Off set	± 999mm (3.3ft)
UNICOM:	100% modulation in ⌾ position. Range 1000m (0.6 miles) 30% modulation in other positions

ANGLE MEASUREMENT

Automatic reduction sensor	Angle adjust resolution 20cc (2mgon/6") Adjustable to theodolite within 10cc (1mgon/3")

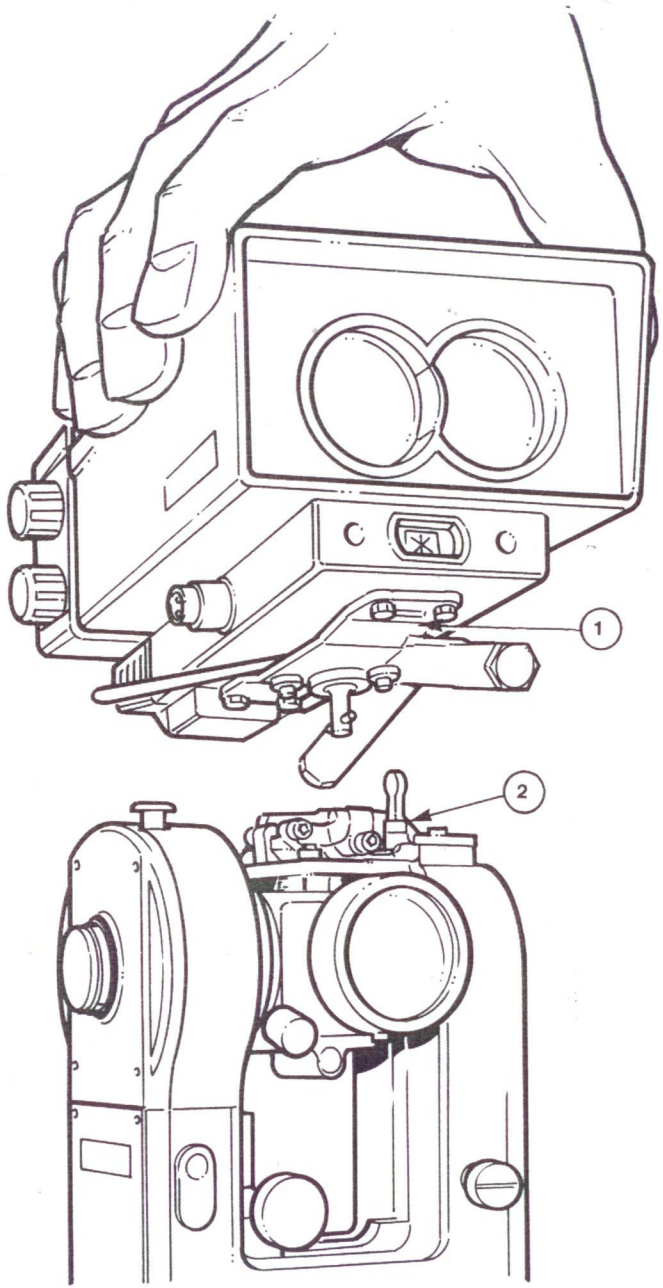


Fig. 2.1 Geodimeter 220 – General Mounting Detail

DESCRIPTION

Stable and easily adjusted adapters for assembling most common types of theodolites are available. Table 1 lists the most commonly used adapters.

The adapter consists of two main components: the instrument adapter (1) and the theodolite adapter (2). Fig. 2.1 details the general mounting detail.

Instrument Adapter

The instrument adapter, mounted beneath the instrument, is included in the standard equipment. The instrument adapter comprises a plate with locking function and a spring in a housing used to balance the instrument. Depending on the type of theodolite, the instrument can be positioned with the spring housing either to the right or to the left of the theodolite telescope. By loosening the four screws the adapter can be rotated 200g (180°). Both instrument balance springs can easily be changed by unscrewing the end plugs with a socket wrench (Fig. 2.2).

Theodolite Adapter

Mounting instructions accompany each theodolite adapter. The adapter comprises components, which vary in design depending on the theodolite with which they are to be used, and an adjustment plate which is the same for all adapters. The adjustment plate has two locking screws (marked with a dot) and two adjusting screws. Fig. 2.3 details the theodolite adapter.

In order to avoid parallax error, the adjustment plate should be kept free of dirt and grease.

IMPORTANT. Parallel alignment and adjustments should be checked regularly in order to obtain accurate measurements.

Table 1. Theodolite Adapter List

Theodolite	Part No.
Wild T1 and T16 (new)	571 125 042
Wild T2 (new)	571 125 044
Wild T1A and T16 (old)	571 125 046
Wild T2 (old)	571 125 048
Sokkisha T60d and TM-20 C	571 125 056
Sokkisha TM-1A	571 125 058
Zeiss Jena 010A/B, 015B and 020A/B	571 125 060
Kern DKM2A and DKM2AE	571 125 062
Kern K1-SE, K1M	571 125 064
Zeiss Th2	571 125 066
Zeiss Th42	571 125 078
Topcon TL-10F/TL-20E	571 125 142
Nikon NT-2A/NT-3A	571 125 162

Each adapter kit is delivered with complete mounting instructions. Alignment and adjustment details for the adapters are contained later in this Section.

Assembly can be carried out by an authorised Geodimeter servicing agent or by the user.

Parallel Alignment

a) Connect the battery cable or insert the internal battery.

b) Lock Geodimeter 220 onto the theodolite adapter.

c) Level the theodolite carefully.

d) Set up a reflector with target approximately 100 - 150 metres from the instrument.

e) Turn the MODE selector (4) to ▷ (standard measurement).

f) Turn the DISPLAY selector (11) to ◢ (slope distance).

g) Loosen the adjustment plate lock screws.

h) Aim the Geodimeter instrument at the reflector using the alignment sight (located beneath the instrument).

Fine alignment is carried out by adjusting the theodolite's vertical and

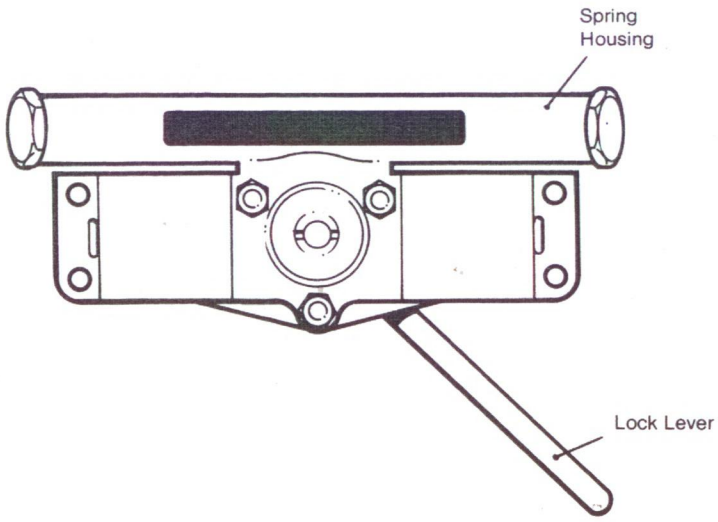


Fig. 2.2 Instrument Adapter

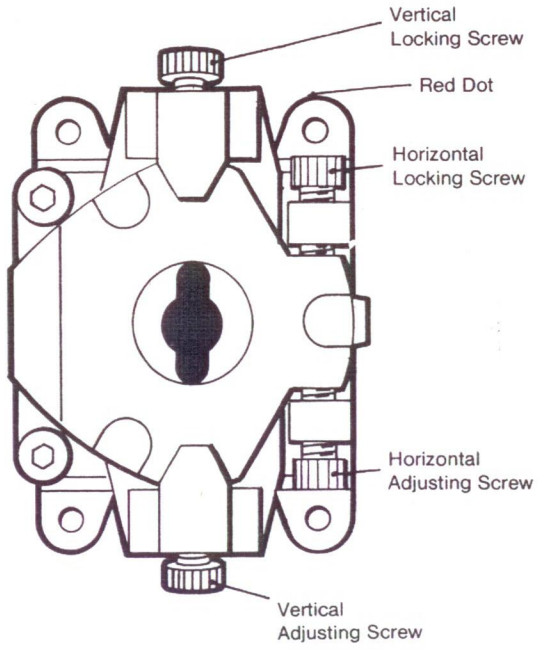


Fig. 2.3 Theodolite Adapter

horizontal adjusting screws. Establish the maximum signal strength by listening to the acoustic signal.

i) Use the theodolite to check the target location in relation to the cross-hairs.

k) Insert two Allen keys in the plate's horizontal adjustment and locking screws and make fine adjustments in the horizontal direction. Rotate the Allen keys carefully clockwise or counterclockwise, depending on whether the target is located to the right or to the left of the cross-hair. Continue turning until the acoustic tone fades.

l) Turn the theodolite's horizontal tangent screw until maximum signal strength is obtained once again.

m) Repeat this procedure until the vertical thread of the cross-hair is positioned at the centre of the target – coinciding with the acoustic tone maximum signal strength.

n) Insert the Allen keys in the plate's vertical adjustment and locking screws and make fine adjustments in the vertical direction. Repeat the above described procedure until the horizontal thread of the cross-hair is positioned at the centre of the target.

Note: Correct parallel alignment within 20mgon (1.1″) is achieved when maximum signal strength is obtained in both the vertical and horizontal direction, and when the theodolite cross hairs are situated at the centre of the target.

p) Carefully lock the adapter plate's adjustment screws using the Allen keys.

q) If possible check the parallel alignment at a longer distance and fine adjust if required.

Checking Parallel Alignment

a) Aim the telescope of the theodolite at the sight on the target. Move the cross-hair from the centre of the target until the acoustic tone disappears.

b) Rotate the screw slowly back to the borderline between silence and tone.

c) Note the theodolite's angular value and write down the result.

d) Repeat the procedure a) to c) on the opposite side of the target.

e) Average the two angular values.

f) Set the mean value on the theodolite's angle scale with the aid of the fine adjustment screw.

g) Check in the eyepiece that the cross-hair is in the centre of the target within ±20mgon (1.1').

This check should be carried out for both the horizontal and vertical axes.

h) Remove and replace Geodimeter 220 in the theodolite adapter and check that parallel alignment has not altered.

j) Adjust if necessary as previously described.

k) If desired, parallel alignment of Geodimeter 220 can be carried out by an authorised Geodimeter service shop.

CORRECTION FOR EARTH CURVATURE AND REFRACTION

If projected distances and heights are computed only by multiplying the measured slope distance by the sine and the cosine of the measured zenith angle, the errors can be considerable due to earth curvature and refraction. Therefore, the internal electronics have been designed to perform corrections for these errors according to the following equations:

$$VD = SD \cos Z + \frac{(SD)^2 \sin^2 Z}{2\,Re}(1 - K)$$

$$HD = SD \sin Z - \frac{(SD)^2 \sin 2Z}{2\,Re}\left(1 - \frac{K}{2}\right)$$

Definitions are shown in Fig. 3.1.

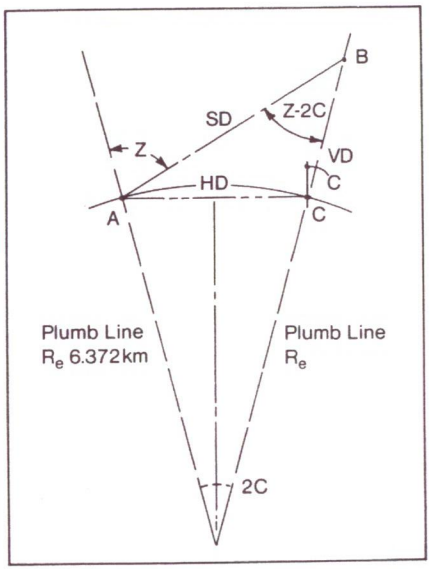


Fig. 3.1 Earth Curvature Correction

HD = Horizontal distance
VD = Vertical distance
SD = Slope distance
Re = Earth radius mean value 6372km
K = Refraction constant, mean 0.142

The corrections have been applied to both the horizontal and vertical distance when they are displayed.

Note 1: Vertical angles and slope distances have no correction when displayed or recorded.

Note 2: If a different value from K is used, measurements should always be made initially in Slop Dist, then the calculation carried out on completion. It should also be noted that either Re or K can be changed dependent on the geographical location.

Example 1

Correction of Vertical Distance (VD) close to Horizontal Plane

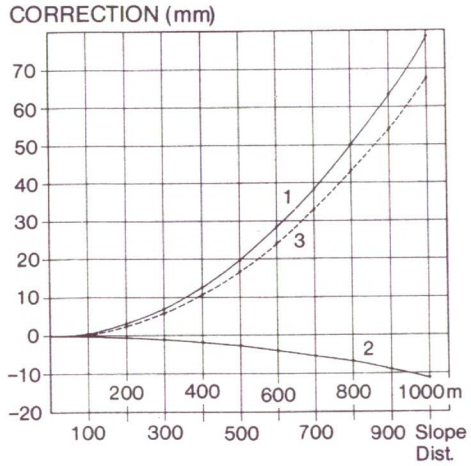


Fig. 3.2 Correction of Vertical Distance (example)

Curve 1 represents the earth curvature correction, curve 2 the correction for the refraction as a function of slope distance. Curve 3 is the resultant correction to be applied to the height obtained by multiplying the slope distance by cos Z.

This correction changes relatively slowly with the deviation from the horizontal plane. At 20^g deviation ($Z = 80^g$) the corrections will have decreased 10%.

Example 2

Correction of Horizontal Distance

The correction for earth curvature and refraction to be applied to the horizontal distance obtained by multiplying the slope distance by sin Z follows the curves shown in Fig. 3.3. The correction is proportional to the square of the slope distance and approximately directly proportional to the deviation from the horizontal plane for moderate elevations.

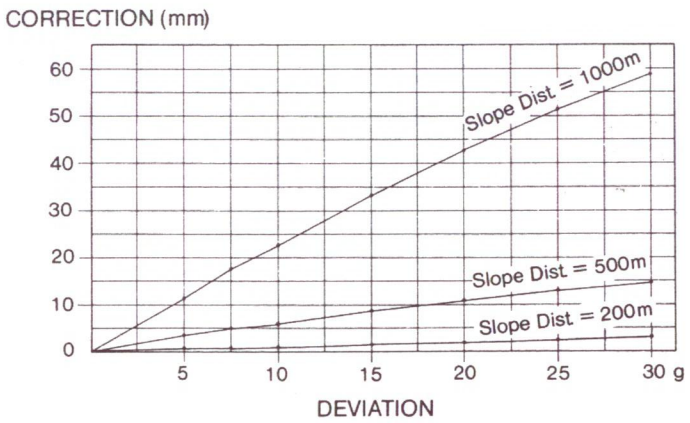


Fig. 3.3 Correction of Horizontal Distance (example)

ECCENTRICITY CORRECTION

Geodimeter 220 is mounted approximately 115mm above the centre of the theodolite's telescope.

In measurements using the setting-out reflector (part no. 571 125 198) and Prism Holder Assembly (part no. 571 125 012), eccentricity is automatically eliminated by computation within the microprocessor.

Eccentricity is eliminated when using a Tiltable Target (part no. 571 125 026). This is achieved using the coarse sight and aiming the target towards the instrument.

When Geodimeter 220 is used with other makes of reflectors eccentricity can occur and must be corrected.

Figs. 3.4 and 3.5 detail both types of reflector.

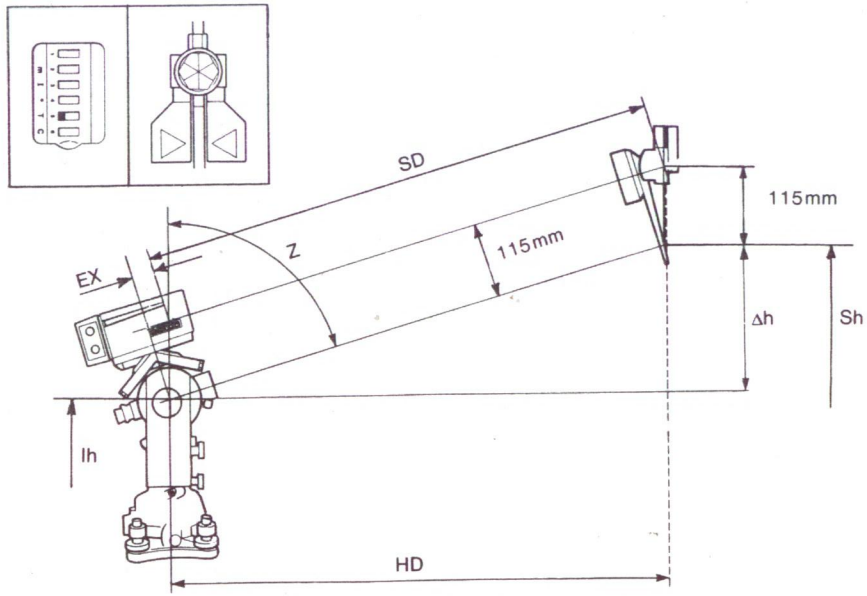


Fig. 3.4 Geodimeter 220 using the Setting Out Reflector

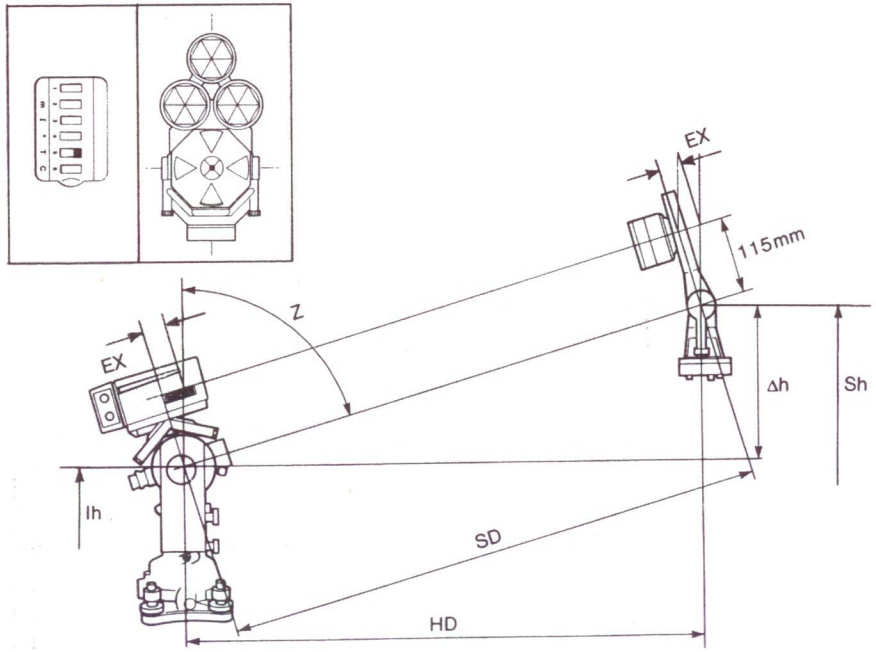


Fig. 3.5 Geodimeter 220 using the Tiltable Target

Adjustments for different types of Theodolites and Measurement Systems

A set of switches under the rubber cover on the left side of the instrument is used to adapt Geodimeter 220 to various measurement systems (see Fig. 3.6). The switches can be set by means of a pen, pencil or pointed object. Care should be exercised when changing the switch position.

Calibration of the Vertical Angle Sensor

Calibration of the Vertical Angle Sensor is carried out at the factory before delivery.

Changes in gravity caused by changes in altitude and latitude affect the automatic reduction sensor. When the instrument is transported over distances in excess of 1000km in a north/south direction or approximately 500m in altitude between two measurements it should be recalibrated.

a) Check that the theodolite adapter is adjusted correctly by aiming the instrument at a reflector with target to establish that the maximum signal strength is obtained (within ±20mgon) (see Section 2).

b) Set switch no. 6 under the rubber cover to C position (see Fig. 3.6).

c) Ensure that CAL 20 is displayed.

d) Tilt the theodolite telescope 20g (20°) above horizontal level (e.g. 320g) and press the A/M button.

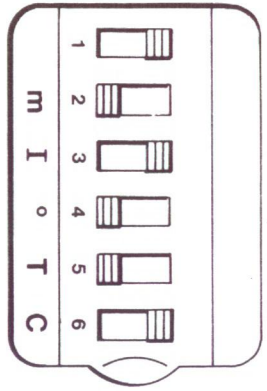
e) CAL-20 will be displayed.

f) Tilt the theodolite telescope 20g (20°) below the horizontal level (e.g. 280g) and press the A/M button.

g) CAL END will be displayed.

h) Set switch 6 to the normal position (see Fig. 3.6). The above adjustment is normally carried out at the factory and should therefore only be checked periodically.

Note: Normal adjustment instructions for the vertical sensor prior to measurement can be found in Section 2 of the Operating Manual.



Switch Positions			
1	–	Not used	
2	m	Metre	Feet
3	I	Face 1 (left)	Face 2 (right)
4	o	Degrees	Grads
5	T	Setting out reflector	Tiltable Target
6	C	Angle sensor calibration	Measurement (normal)

Fig. 3.6 Geodimeter 220 Switch Positions

Offset

Reference to the Operating Manual, page 2-2, details the offset function. This function allows pre-setting other prism constants if prisms of other makes than Geodimeter are used.

Note: Geodimeter prisms always have a constant of zero.

Atmospheric Correction

Due to the fact that the speed of light varies slightly when passing through different air pressures and temperatures, an atmospheric correction must be applied in order to achieve the correct distance.

The atmospheric correction factor is calculated according to the formula.

$$ppm = 275 - 79.55 \cdot \frac{p}{273 + t}$$

Where p = pressure in millibars
t = air temperature in °C

1013 millibars corresponds to 760mm Hg or 29.9 in Hg

For Example an atmospheric correction of −6ppm indicates that the displayed distance has been reduced by 6mm per kilometre (or 0.6mm per 100m).

Reference for Atmospheric Correction is also contained in the Operating Manual, page 2-1.

SECTION 4

Power Supplies

ERROR INFORMATION

The following information details errors that will be displayed in the event of incorrect operation or instrument faults.

Error	Description	Possible Reason
Error 5	Incorrect mode of operation	This error is displayed when trying to operate R.O.E. in setting other than ▰ or using 100% modulation ⊙ when measuring in $\bar{D}$
Error 7	Overrange	This error is displayed when:- The instrument is tilted in excess of $\pm 50^{g}$ (45°). If the angle adjust value differs by more than $\pm 0.2^{g}$ (10.8′), when entered by the SET control or from Geodat. A setting out distance or a height value exceeding 99,999.999 or –9999.999 metres or feet is entered into the instrument.
Error 8	Calibration Error	This error is displayed when the vertical angle sensor is calibrated at an angle differing by more than 0.2^{g} (10.8′) from specified angle.
Error 20	For authorised service only	Error 20 and above indicates an instrument error.

Note: The list of errors are common for other Geodimeter instruments, the errors listed above are applicable to Geodimeter 220.

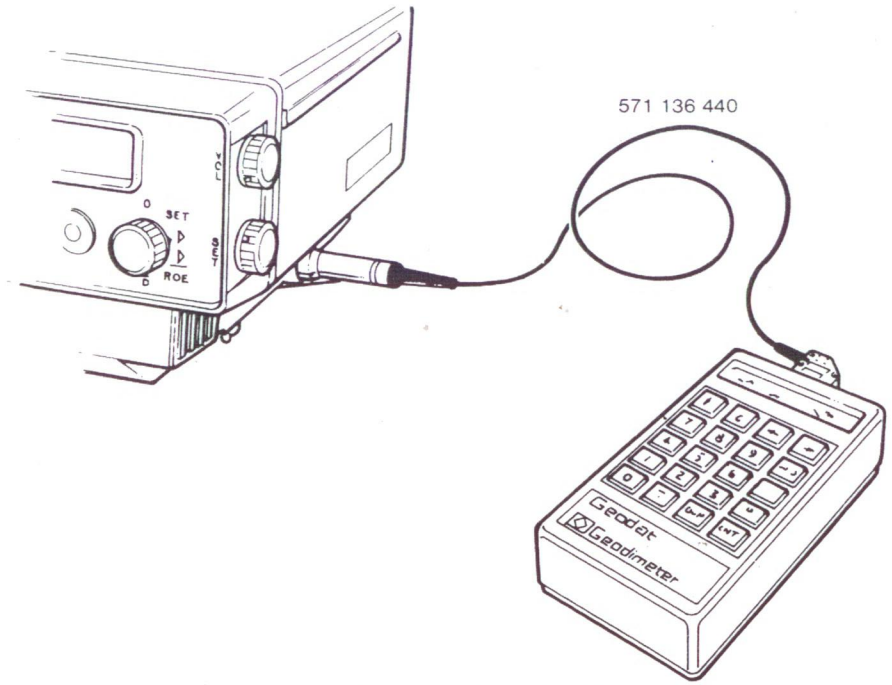


Fig. 6.1 Geodat connected with Cable and Internal Battery

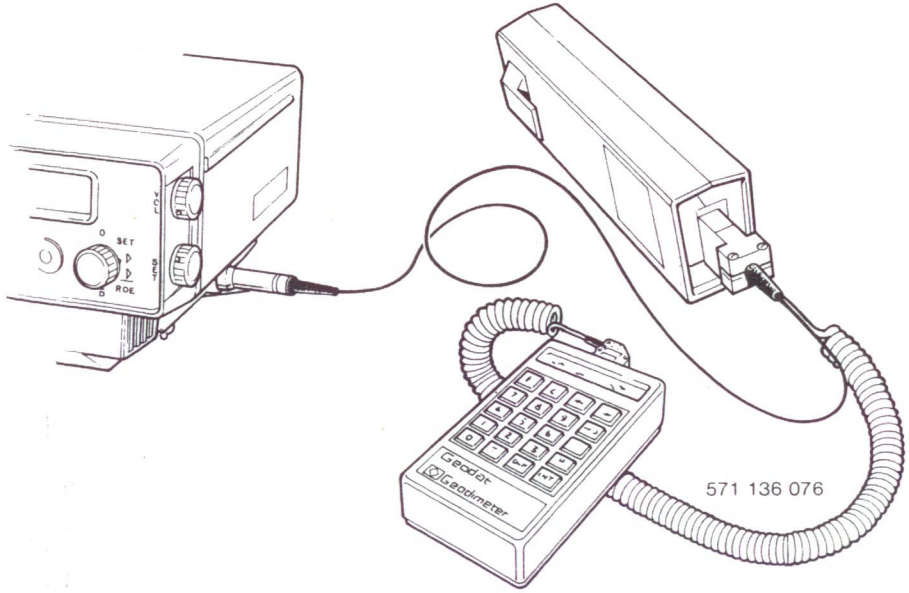


Fig. 6.2 Cable Connections for External Battery and Geodat

GEODAT INFORMATION

An essential component of the Geodimeter system is the Geodat (option) recording unit. Connected to Geodimeter it automatically records and stores up to 1000 points. Geodat can be connected to various types of computer equipment for further processing of the measurement data. Detailed information can be obtained from the Geodat Operating Manual.

Information can also be transmitted from Geodat to Geodimeter 220 using the following functions.

Operation

f20 ENT	Offset/Prism Constant. Up to a maximum ±0.999m can be transmitted and added to the measured slope distance. Transmission can only take place when the instrument is in SET mode and OFS is displayed. The constant entered will be stored in the continuous memory.
f28 ENT	Setting Out Distance. Horizontal distance to be set out can be entered. The difference between entered and measured distance is displayed and calculated down to zero when the setting out point is reached. The distance entered will be erased when the instrument is switched off.
f30 ENT	Atmospheric Correction. The PPM value calculated with the atmospheric correction disc can be transmitted when the instrument is in SET mode and P is displayed. The PPM limits are between −60 and +195ppm. The PPM value will be stored in the continuous memory.
f31 ENT	Vertical Angle Adjust. The vertical angle of the instrument can be set to the theodolite value, by entering the Theodolite angle value, when both the angle and Angle Adjust is displayed. The entered value will be stored in the continuous memory.
f34 ENT	Height (Z) of station point.
f35 ENT	Instrument Height (IH).
f36 ENT	Signal Height (SH).

When entering f34, f35 and f36, the absolute height of a measured point will be displayed by Geodimeter 220 with the display selector set to

Absolute height = ΔH measured + Z + IH − SH

The heights can be entered in aim mode, when displaying vertical angle, or when measuring heights in tracking or R.O.E. Entered heights are erased when the instrument is switched off.

Note: In the R.O.E. position the signal height (SH) is not taken into the calculation (but can be entered). As height measurements are normally made to points without a reflector, only Z and IH are added. The signal height is used only when measuring to a Geodimeter target.

Note: The list of entries are common for other Geodimeter instruments, the entries listed above are applicable to Geodimeter 220.

Geodat Cables

Two special cables for data communication between Geodimeter 220 and Geodat are available. Cable (part no. 571 136 440) can be used when Geodimeter 220 is used with the internal battery (see Fig. 6.1). Cable (part no. 571 136 076) connects the Geodimeter instrument with Geodat and the external battery, see Fig. 6.2 (this cable can also be used with the internal battery). When connected Geodat is powered either by the internal or the external battery.

Temperature Fluctuation

The automatic reduction sensor can be affected by large temperature fluctuations.

When Geodimeter 220 is moved from a high ambient temperature environment to low or vice versa, the instrument must be given time to adapt in order to perform efficiently and according to specification.

Measurement in Turbulence

The range and accuracy given in the specification apply under normal atmospheric conditions.

In turbulent air, both the range and accuracy are reduced.

In order to improve accuracy of such measurements, the MODE selector can be set to position $\overline{D}$. This minimises random error.

Background

Under unfavourable conditions, strong background light can affect Geodimeter 220. In order to overcome this problem the instrument and reflector positions should be reversed.

Never point the instrument and the theodolite through glass, this causes a disturbing glare. Avoid making measurements where glass, road signs made of reflecting material etc. are located immediately behind the reflector.

Control Measurements with Geodimeter Instruments

When control measurements are carried out, bases with a minimum length of 80 metres should be used in order to achieve satisfactory results. For maximum accuracy in control measurement, the MODE selector should be set to position $\overline{D}$.
Cyclical error is checked by measuring intervals of 2.5 metres over a total distance of 10 metres. Always carry out measurements using maximum signal strength.

Simple Fault Tracing

If the signal is too weak, this could be due to one of the following factors:

a) The Geodimeter instrument is not securely mounted on the adapter.

b) Lenses and/or reflectors are dirty, dusty or covered with condensation.

c) Excessive distance, visibility too poor or turbulence is weakening the signal.

d) The light beam is being interrupted by some obstacle.

e) Parallel alignment is poor, which results in both poor range and false aiming.

If the instrument is inoperative when the MODE selector is rotated to SET, one of the following factors could be the cause.

a) Incorrect battery connection.

b) The battery is discharged or defective.

c) The display selector is set in the ▷ position.