USER'S MANUAL

MODEL: 5451

UNIFORM FIELD ELECTROMAGNET

Date Sold: _____

Serial number: _____

File No: M5451d.407 Revision Date: April 6, 2004

GMW 955 Industrial Road, San Carlos, CA 94070 Tel: (650) 802-8292 Fax: (650) 802-8298
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Section 1
SPECIFICATIONS
Table 1. Model 5451 Specifications

Magnet Field @ max power (X,Y,Z=0.0)	54 mT **(**540 Gauss)
Magnet Inside Diameter:	300 mm (11.8 inch)
Magnet Length:	338 mm (13.3 inch)
Coils (series connection)	
coil Resistance (20°C)	0.32 Ohm
max resistance (hot)*	0.37 Ohm
max power (air cooled)	25A/9.3V (0.23 kW)
max power (water cooled)	70A/25V (1.81 kW)
Self Inductance	35mH
Calibration Factor (field versus current)	0.77mT/A
Field Uniformity D**B/B**	less than ±200ppm over a 30mm sphere
Water Cooling (18°C)	1.0 bar (15 psid), 2 liters/m (0.5 US gpm)
Overtemperature Interlock	Elmwood 3450G thermal sensor part number 3450G 611-1 L50C 89/16 mounted on each coil and wired in series. Contact rating 120Vac,0.5A. Closed below 50°C.
Dimensions	Drawing 11910040 500 mm W x 552 mm D x 427 mm H (19.7 inch W x 21.7 inch D x 16.8 inch H)
Mass	100 kg (220 lb)

***CAUTION - The value of maximum coil resistance given should not be exceeded. At this resistance the coils are at maximum safe temperature for continuous operation.**

Table 2. Model 5451 Electrical and Water Connections

DC Current (as seen from the front refer to Drawing 11910040)

Left hand terminal	Negative
Right hand terminal	Positive

Ground

An M4 screw (Part 14 on drawing 11910040) is provided near the coil current connections to enable the magnet frame to be grounded according to local safety regulations. It is normally appropriate to connect the magnet frame to the power supply ground.

Interlocks (refer to Drawing 11910040)

Overtemperature thermostats (part 9 on Drawing 11910040) are installed on each coil cooling plate. These are normally closed for temperatures of less than 50°C. All six thermostats are wired in series. The magnet power supply should be connected so that if any thermostat opens (goes overtemperature) the power supply current will be set to zero. User connections are made directly to the thermostat terminals.

Water (refer to Drawing 11910040)

outlet	1/4 inch NPT
inlet	1/4 inch NPT
	(mating couplings for 6.0 mm (1/4 inch) ID hose are provided)

CAUTION - Ensure that the high current connections are tight. Loose connections may lead to oxidation and overheating. The field stability may be degraded and the current terminations damaged.

Section 2

WARNINGS

REFER TO WARNINGS BELOW BEFORE OPERATING ELECTROMAGNET

1 Personnel Safety

The Model 5451 is a unshielded electromagnet. In operation the magnet fringing field can be in excess of 0.5mT(5G). This can cause malfunctioning of heart pacemakers and other medical implants. We recommend that the fringing field should be mapped and warning signs be placed outside the 0.5mT (5G) contour. Entry to this region of higher field should be restricted to qualified personnel.

2 Ferromagnetic Objects

During operation the magnet exerts strong magnetic attraction towards ferromagnetic objects in the near vicinity. Loose objects can be accelerated to sufficient velocity to cause severe personnel injury or damage to the coils. Keep ferromagnetic tools clear!

3 Arcing

This magnet stores considerable energy in its field during operation. Do not disconnect any current lead while under load or the magnetic field energy will be discharged across the interruption causing hazardous arcing.

4 Coil Hot Resistance

Do not exceed the maximum coil hot resistance given in the specifications or coil overheating and possible damage may occur.

5 Interlocks

These should always be connected if the magnet is operated unattended, to avoid the possibility of coil overheating caused by excessive power dissipation or inadequate cooling.

6 Watches, Credit Cards, and Magnetic Disks

Do not move magnetically sensitive items into the close vicinity of the magnet. Even some anti-magnetic watches can be damaged when placed in close proximity to the magnet during operation. Credit cards, and magnetic disks are affected by magnetic fields as low as 0.5mT (5G).

Section 3

INSTALLATION

Caution: This is a heavy system. All movement, lifting and installation of the 5451 Electromagnet must be under the supervision of an experienced person to prevent the possibility of serious injury or damage to the Electromagnet and associated equipment.

Unpacking Instructions and Damage Inspection

To unpack the electromagnet please use the following procedure.

1. First remove all of the "Hex Head Screws" located at the lower edge of all the side panels of the "Crate Top Cover".

2. Gently rock the "Crate Top Cover" to work it loose from the shipping crate base.

3. Use one person on each side of the shipping crate, grip the side panels of the Crate Top Cover. Lift "Crate Top Cover" high enough to clear top of electromagnet, walk cover sideways to clear area and place on floor.

4. Inspect the magnet to ensure that no damage has occurred to the magnet in shipment. If damage is evident report the damage in detail to the shipper for claim and simultaneously notify GMW in case assessment of the damage must be made. If no damage is found proceed with magnet unpacking and installation.

   With suitable lifting equipment (eg 150kg 330lb minimum safe lifting rating) lift magnet clear of the shipping crate.

   TAKE CARE THAT NO SIDE LOADS ARE PUT ON THE MAGNET MOUNTING LEGS, OR DAMAGE MAY OCCUR.

Siting Considerations

The Model 5451 has no magnetic shielding. Magnetic material in the vicinity of the magnet will modify the magnitude and uniformity of the central region magnetic field. As a general rule avoid magnetic material closer than approximately 1 meter of the central region.

Background fields such as the geomagnetic field and alternating field from 60Hz power sources are unshielded by the magnet and will add vectorially to the field produced by the magnet. If possible these background fields should be measured and their effects evaluated before the Model 5451 magnet is installed. It may be necessary to orient the Model 5451 axis to minimize the effects of external fields, to resite ac power sources or to install suitable magnetic shielding.

Section 3

INSTALLATION

Electrical Circuit

Never connect or remove cables from the magnet with the power supply connected. The stored energy in the magnet can cause arcing resulting in severe injury to personnel or equipment damage.

The magnet has two coils which are connected in series, (Refer to drawing 11910040). The power supply cables should be connected directly to the dc current terminals marked + and -. Recommended current cable for the 5451 is stranded copper of 16mm² cross section (4 AWG). Because the magnet stores a significant amount of energy in its magnetic field, special care should be taken to insure that the current terminations are secure and cannot work loose in operation. Local heating at the terminations can cause rapid oxidation leading to a high contact resistance and high power dissipation at the terminals. If left unattended this can cause enough local heating to damage the terminals and the coils.

The 5451 Interlocks

The Model 5451 has six thermostats, Elmwood 3450G Part Number 3450G611-1 L50C 89/16. They are located on the coil cooling plates and wired in series. User connections are made directly to the thermostat terminals.

Cooling

The Model 5451 can be operated to an average coil temperature of 70°C. Assuming an ambient laboratory temperature of 20°C and a temperature coefficient of resistivity for copper of 0.0039/°C, the hot resistance of the coil should not exceed 20% more than the ambient temperature "cold" resistance. The coil thermal thermostats will open when any coil cooling plate temperature exceeds approximately 50°C . Clean, cool (16°C - 20°C) water at 2 *l*/min and 1 bar (15 psid) should be used to cool the 5451 magnet.

The cooling copper tubes are electrically isolated from the coils to avoid electrochemical corrosion. A 50 micron filter should be placed before the input to the magnet to trap particulates.

For continuous operation of the magnet it may be appropriate to use a recirculating chiller to reduce water and drainage costs. The chiller capacity will depend on whether cooling is required for the magnet alone or magnet and power supply. For the Model 5451 Electromagnet alone a suitable chiller is the Bay Voltex Model: MC-50 Chiller. For the 5451 and 858-70A/30V Power Supply the required Chiller is Bay Voltex Model: MC-100. Use distilled or deionized water with a biocide to prevent bacterial growth and corrosion. Do not use corrosion inhibitors in high quality electrical systems since the water conductivity is increased which can result in increased leakage currents and electrochemical corrosion.

At currents of approximately 25A and below the Model 5451 can be operated safely without water cooling. However the coil temperature will vary with the power dissipation. This results in dimensional changes of the magnet and air cooling is not suitable when high field stability is required.

Cooling - continued

Freon, oil, ethylene glycol or other cooling mediums can be used. The flow required will be approximately inversely proportional to their specific heats. An experimental determination of the flow and pressure required will be necessary.

Avoid cooling the magnet below the dew point of the ambient air. Condensation may cause electrical shorts and corrosion.

During operation the resistance can be checked using a voltmeter across each coil. The voltage will rise to a constant value once thermal equilibrium has been reached. If it is desired to save water, the flow can be reduced until the hot resistance is approached. NOTE: This adjustment must be made slowly enough to allow for the thermal inertia of the coils.

Section 4

OPERATION

General

The magnet operates as a conventional electromagnet.

1. Adjust the cooling water flow to about 2 liters/min (0.5 USgpm). For operation at less than maximum power the water flow may be correspondingly reduced. Note that the inlet water temperature will determine the actual flow rate required. The above specified flow rates were determined with a water inlet temperature of approximately 18°C.

2. Turn on the power supply and increase the current until the desired field is reached.

Calibration

The Calibration factor may be used to estimate the field in the air gap to within one percent. More accurate field determination may be obtained by deriving experimentally a calibration curve.

Greater precision in setting up the calibration curve will be achieved with the use of a digital gaussmeter and by making a numerical table. This table used with an interpolation routine will eliminate the error associated with reading a graph.

In any event, three points need to be remembered:

1. A calibration curve or table is only as good as the precision employed in generating it.
2. The field is defined only at the point it is measured. It will generally be different at a different point in the magnet. For example, the induction curves refer to the field on the axis and at the center of the coil pair.
3. The field is most directly a function of the current in the magnet coils. Voltage across the coils is not a good measure of field since the electrical resistance of the coils depends on the temperature (about 0.4% per degree Celsius).

Field Control Operation

The necessity to use calibration curves can be avoided by using a field controller to sense the magnetic field and provide a corresponding power supply control signal through the power supply programming inputs. Contact GMW for suitable instrumentation.

Section 5

MAINTENANCE

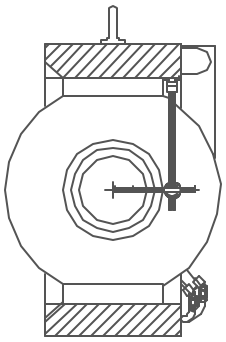
Check the cooling water circuit to ensure the water is clean and free of debris and bacterial growth. Ensure the in-line water filter is clean.

Section 6

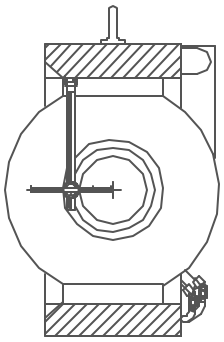
STANDARD OPTIONS

REVISIONS

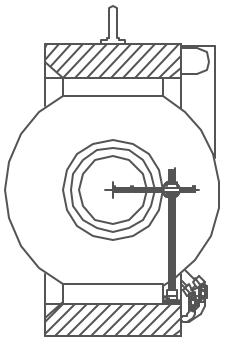
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		09/11/98	G.DOUGLAS



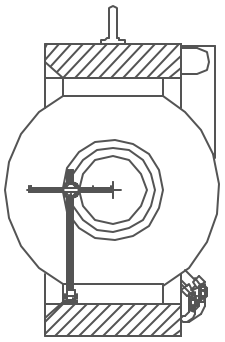
TOP/REAR INSTALLATION



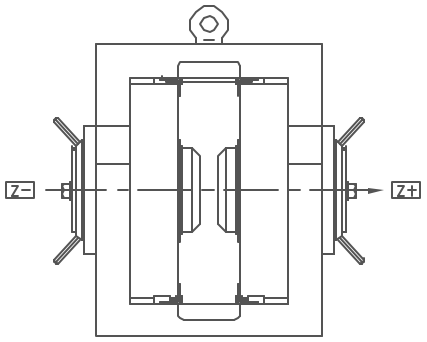
TOP/FRONT INSTALLATION



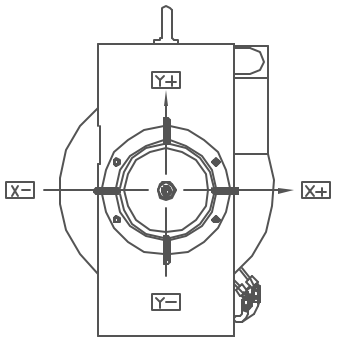
BOTTOM/REAR INSTALLATION



BOTTOM/FRONT INSTALLATION

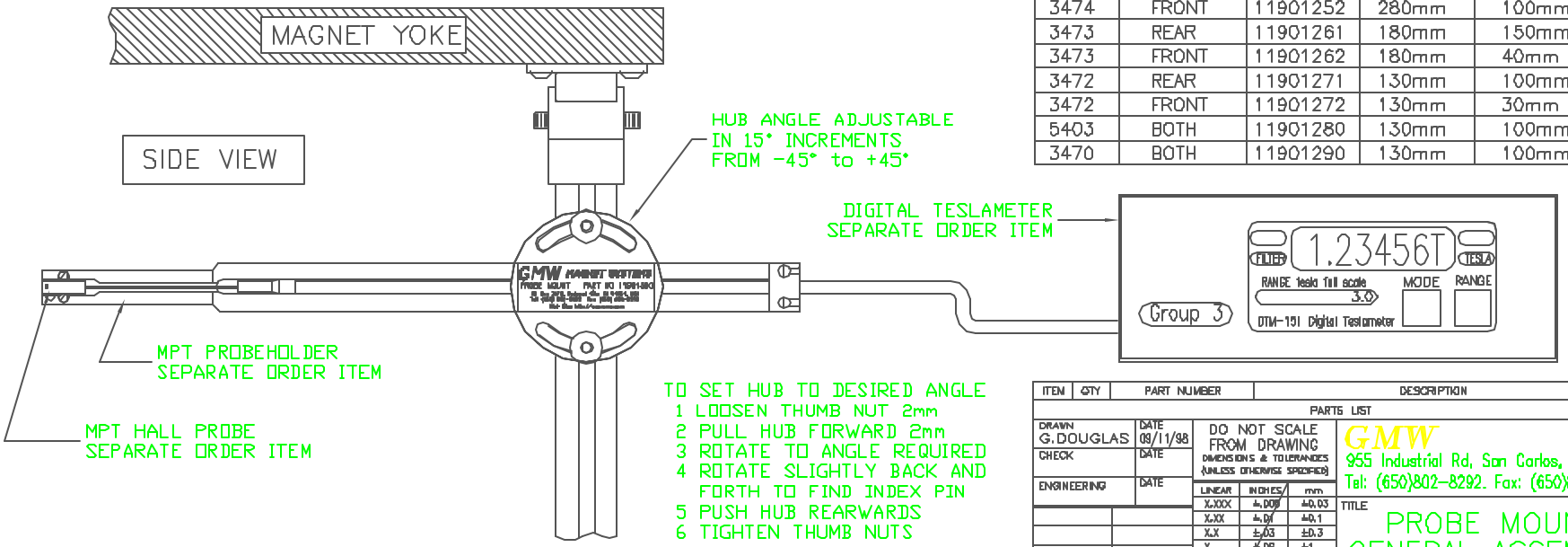


MAGNET FRONT VIEW



MAGNET SIDE VIEW

MAGNET MODEL	INSTALLATION POSITION	ASSEMBLY NUMBER	VERTICAL TRAVEL "Y"	HORIZONTAL TRAVEL "Z"
3474	REAR	11901251	280mm	200mm
3474	FRONT	11901252	280mm	100mm
3473	REAR	11901261	180mm	150mm
3473	FRONT	11901262	180mm	40mm
3472	REAR	11901271	130mm	100mm
3472	FRONT	11901272	130mm	30mm
5403	BOTH	11901280	130mm	100mm
3470	BOTH	11901290	130mm	100mm



TO SET HUB TO DESIRED ANGLE
1 LOOSEN THUMB NUT 2mm
2 PULL HUB FORWARD 2mm
3 ROTATE TO ANGLE REQUIRED
4 ROTATE SLIGHTLY BACK AND FORTH TO FIND INDEX PIN
5 PUSH HUB REARWARDS
6 TIGHTEN THUMB NUTS

NOTE: ABOVE PROBE MOUNT SHOWN INSTALLED ON MODEL: 3474 ELECTROMAGNET.
OTHER CONFIGURATIONS AND MOUNTINGS ARE AVAILABLE. CONSULT TABLE FOR GMW ELECTROMAGNETS.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS DATE 09/11/98
CHECK DATE
ENGINEERING DATE
NEXT ASSY SYSTEM
SOFTWARE AUTOCAD 13

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

	INCHES	mm
LINEAR		
X.XXX	±.003	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
PROBE MOUNT GENERAL ASSEMBLY

SIZE	DRAWING NO.	REV
A2	11901300	A

SCALE 1:1 | WT kg | SHEET 1 OF 1

Section 7

CUSTOM OPTIONS

Section 8

EXCITATION CURVES

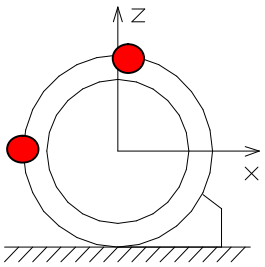
Section 9

TEST DATA

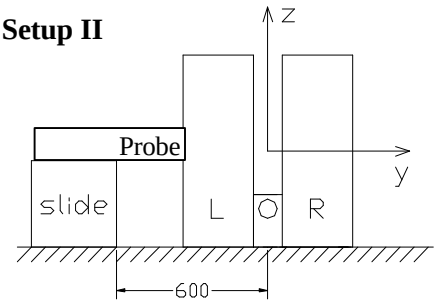
GMW MODEL 5451 ELECTROMAGNET

Ref: Drg 11910040 Serial No.: 001 Date: 10/5/1994
File No S5451ubc.007 Operator: Robert Yaus

Magnet shimmed with 0.030"



Setup II

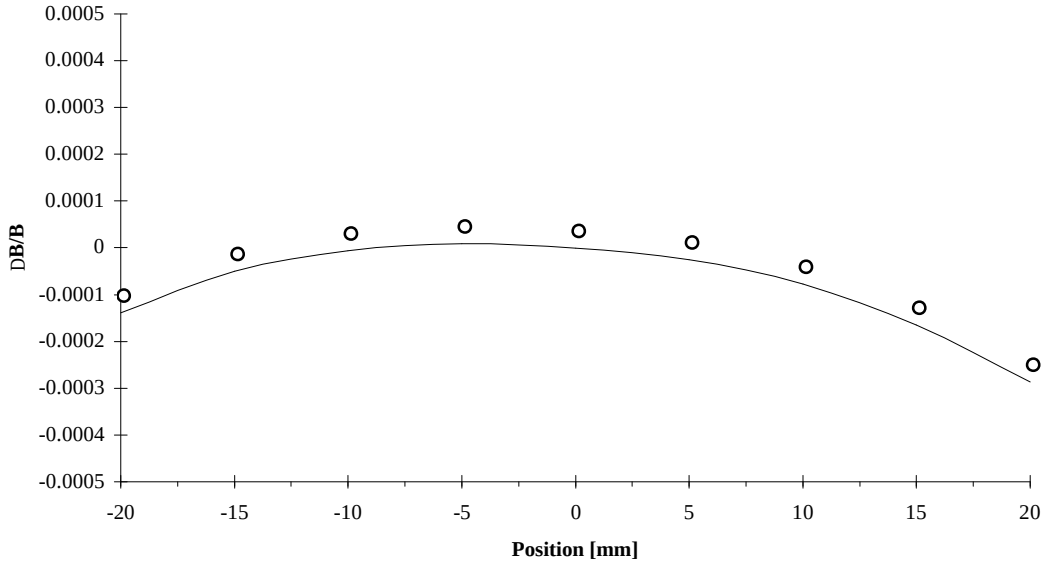


Earth-Field:
B(x): +0.1283G
B(y): -0.2026G
B(z): -0.4000G

Current: 60A

X VARIATION				
POSITION [mm]			B(NMR) [Gauss]	U(NMR) [mV]
x-Axis	y-Axis	z-Axis		
0	0	0	467.001	-90
-20	0	0	466.936	-90
-15	0	0	466.978	-90
-10	0	0	466.998	-90
-5	0	0	467.005	-90
0	0	0	467.001	-90
5	0	0	466.989	-90
10	0	0	466.965	-90
15	0	0	466.924	-80
20	0	0	466.867	-80
0	0	0	467.001	-90

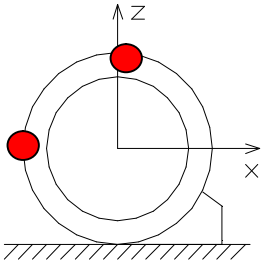
Uniformity Plot



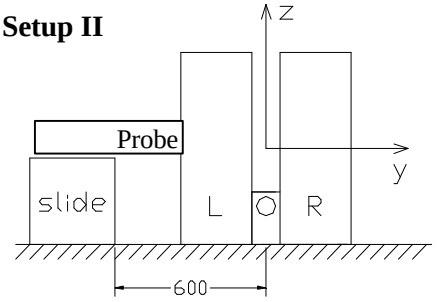
GMW MODEL 5451 ELECTROMAGNET

Ref: Drg 11910040 Serial No.: 001 Date: 10/5/1994
File No S5451ubd.007 Operator: Robert Yaus

Magnet shimmed with 0.030"



Setup II

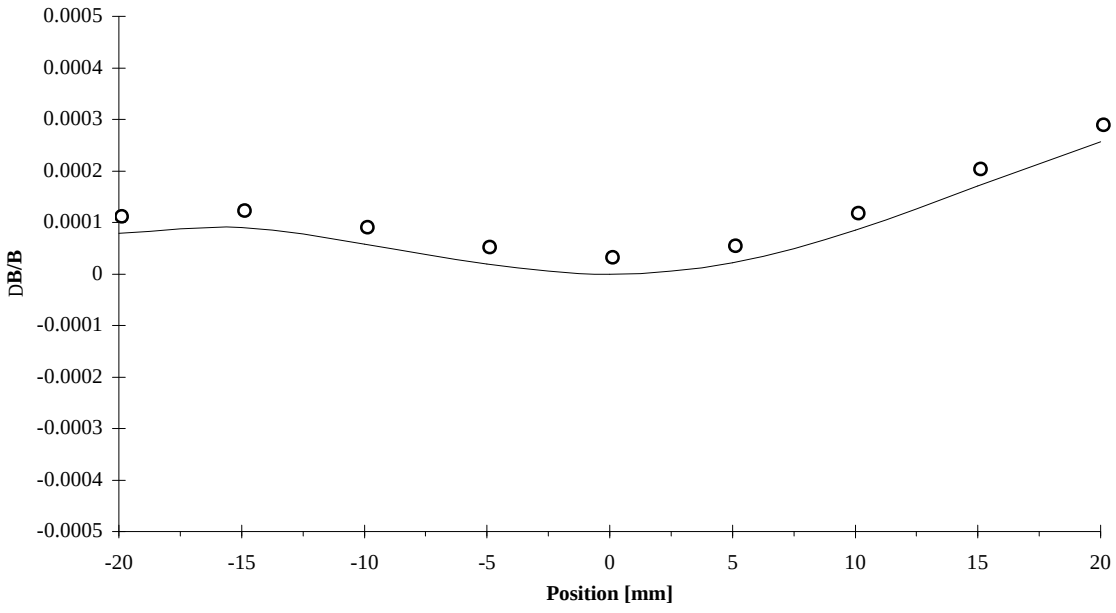


Earth-Field:
B(x): +0.1283G
B(y): -0.2026G
B(z): -0.4000G

Current: 60A

Y VARIATION				
POSITION [mm]			B(NMR) [Gauss]	U(NMR) [mV]
x-Axis	y-Axis	z-Axis		
0	0	0	467.003	-90
0	-20	0	467.040	-90
0	-15	0	467.045	-90
0	-10	0	467.030	-90
0	-5	0	467.012	-90
0	0	0	467.003	-90
0	5	0	467.013	-90
0	10	0	467.043	-90
0	15	0	467.083	-90
0	20	0	467.123	-90
0	0	0	467.003	-90

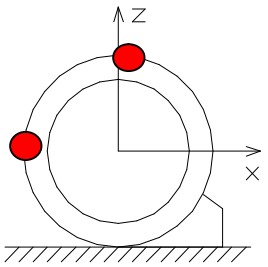
Uniformity Plot



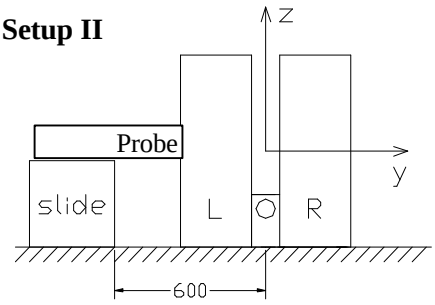
GMW MODEL 5451 ELECTROMAGNET

Ref: Drg 11910040 Serial No.: 001 Date: 10/5/1994
File No S5451ube.007 Operator: Robert Yaus

Magnet shimmed with 0.030"



Setup II

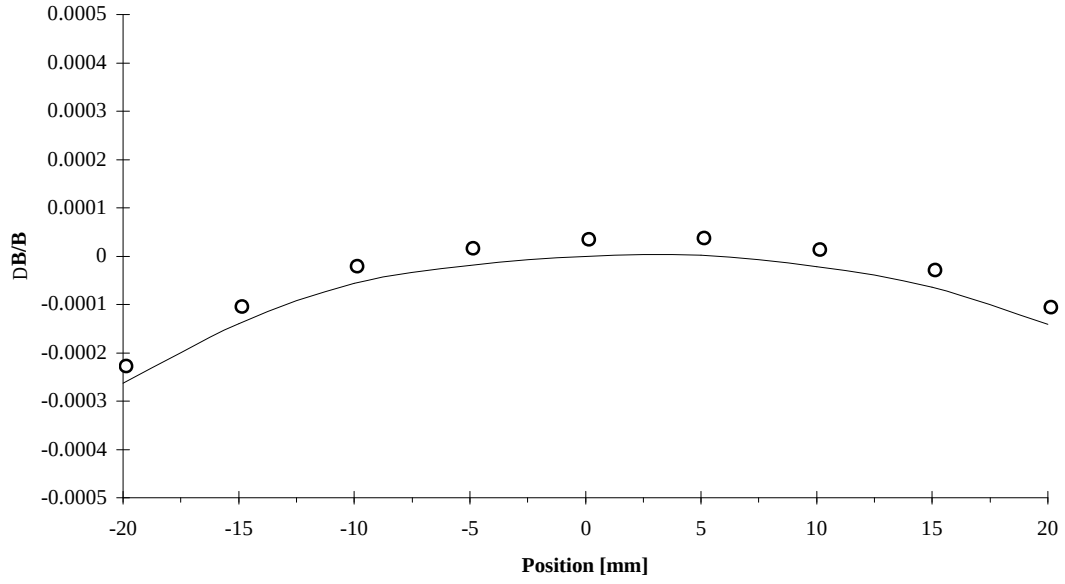


Earth-Field:
B(x): +0.1283G
B(y): -0.2026G
B(z): -0.4000G

Current: 60A

Z VARIATION				
POSITION [mm]			B(NMR) [Gauss]	U(NMR) [mV]
x-Axis	y-Axis	z-Axis		
0	0	0	467.003	-90
0	0	-20	466.880	-90
0	0	-15	466.938	-90
0	0	-10	466.977	-90
0	0	-5	466.994	-90
0	0	0	467.003	-90
0	0	5	467.004	-90
0	0	10	466.993	-90
0	0	15	466.973	-90
0	0	20	466.937	-90
0	0	0	467.003	-90

Uniformity Plot



Section 10

DRAWINGS

SERIES 3450/3450R/3455R/3455RBV 15 AMP THERMOSTATS

Typical Applications:

Power Supplies

Communication Equipment

Medical Equiopment

Computers (Where High AMP Loads are Present)

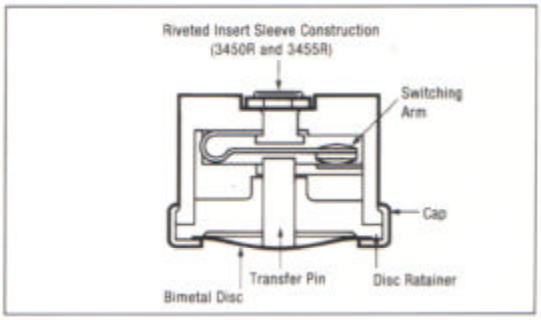
The Series 3450/3455R is a snap-acting, non-adjustable precision thermostat especially suited for industrial and electrical equipment.

The 3450 (.390" or 10mm overall) is ideal for applications that require precision control of high electric loads to 8 Amp resistive.

The 3450R and 3455R have a patented metal insert rivet construction.

The 3455R (.484" or 12.5mm) overall, has higher spacing as required by European approval agencies. Model 3455RBV is an epoxy overmold version of the 3455R, specifically designed for electrical insulation or protection in a high humidity environment. Consult factory for performance qualifications.

To insure that a safe combination of thermostat and application is achieved, the purchaser must determine product suitability for their individual requirements.



***Series 3450/3450R/3455R/3455RBV**

MODEL	ELECTRIC LIFE CYCLES	120 VAC	240 VAC	277VAC
3450	100,000	8.0A	-	-
3450R/	100,000	15A	8.3A	7.2A
3455R	100,000	4.4FLA 26.4LRA	2.2FLA 13.2LRA	-
	6,000	5.8FLA 34.8LRA	2.9FLA 17.4LRA	-
3455RBV	100,000	15A	8.3A	-
	6,000	5.8A 34.8LRA	2.9A 17.4LRA	-

A: Amps
FLA: Full Load Amps
LRA: Locked Rotor Amps
Contacts are available for millivolt and milliamp applications.
*Includes UL and CSA ratings.
Consult Elmwood Sensors for additional ratings.

Key Features:

- *Electric Rating to 15 Amp 120 VAC Resistive*
- *Environmental Exposure 0° to 350° F (–18° to 177° C)*
- *UL recognized and CSA certified and European Approved*
- *Single-Pole, Single-Throw (SPST)*
- *Pre-set and Tamperproof*
- *Variety of Mounting Brackets and Terminals Available*

SERIES 3450/3450R/3455R/3455RBV 15 AMP THERMOSTATS

Standard Temperature Characteristics

Operating Temperature Range The tightest specification determines the group	Tolerance Allowable* ± at mean temperature set points				Standard Mean Differential Nominal degrees between opening and closing points		Price Group*
	Open		Close				
	±°F	±°C	±°F	±°C	°F	°C	
32° to 79°F **0° to 25°C**	5	2.8	8	4.4	30-50	16-28	I
	5	2.8	7	3.9	25-29	14-16	II
	5	2.8	6	3.3	20-24	11-13	III
	5	2.8	6	3.3	15-19	8-11	IV
80° to 200°F **25° to 95°C**	5	2.8	8	4.4	30-50	16-28	I
	5	2.8	7	3.9	25-29	14-16	II
	5	2.8	6	3.3	20-24	11-14	III
	6	2.2	5	2.8	15-19	8-11	IV
201 to 250°F **96° to 120°C**	6	4.4	8	4.4	30-50	16-28	I
	6	3.9	7	3.9	25-29	14-16	II
	6	3.3	6	3.3	20-24	11-14	III
	6	2.8	6	2.8	15-19	8-11	IV
251 to 302°F **121.7° to 148.9°C**	7	3.9	8	4.4	30-50	16-28	I
	7	3.9	7	3.9	30-50	16-28	II
	7	3.9	7	3.9	20-29	11-16	III
	6	3.3	7	3.9	15-19	8-11	IV

*Grouped according to level of accuracy required. Group I with greatest latitude is less expensive than Group II, etc.
Please consult factory for temperature ranges, tolerances and differentials not noted. The operating temperature ranges include tolerances.
The ± tolerances shown have been established after careful review of many thermostat applications. Attempts should be made to establish the widest acceptable tolerance possible. For example, the chart may list a tolerance of ±5°F (±2.8°C); however, ±6°F (±3.3°C) may be acceptable for the application at reduced cost.
Note: Temperature checking methods may be slightly different, and allowance for a 1.8°F (1°C) variance should be considered.
See Section B of the Terminal and Bracket Guide for dimensional characteristics.

Operating Parameters

Dielectric Strength	Mil-STD-202 Method 301 -2000 VAC 60 Hz - Terminal to Case
Insulation Resistance	Mil-STD-202 Method 302 Cond. B - 500 Megohms - 500 Volts DC applied
Environmental Exposure	0° to 350°F (–18° to 177°C)
Operating Temp. Range	32° to 302°F (0° to 150°C)
Contact Resistance	Mil-STD-202, Method 307 - 50 Milliohms
Marking	Mil-STD-1285
Weight	6 Grams (Brackets and wire leads not included)
Materials	Base: Phelonic Terminals: Plated Brass or Steel Closure: Aluminum, Stainless Steel, or Brass Brackets: Aluminum, Stainless Steel, or Brass Contacts: Silver

UL and CSA Listings

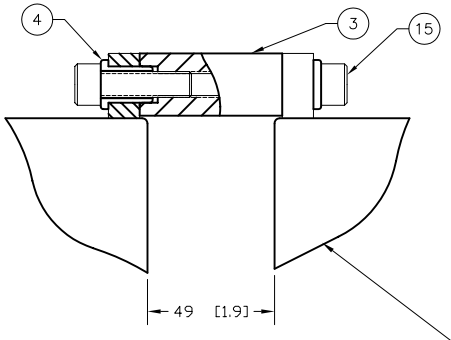
UL and CSA Listings are for use in equipment where the acceptability of the combination of the thermostat and equipment is determined by Underwriters' Laboratories, Inc. and/or the Canadian Standards Association.

UL File E36103, UL File SA4469 (3455RBV only), UL File MH8267 (3455R only), CSA File 21048.

REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		08/22/94	H.GLAVISH
B	ADD ITEMS 20 to 32, CHG ITEMS 16 to 18		10/06/03	G.DOUGLAS

SCALE 2:1

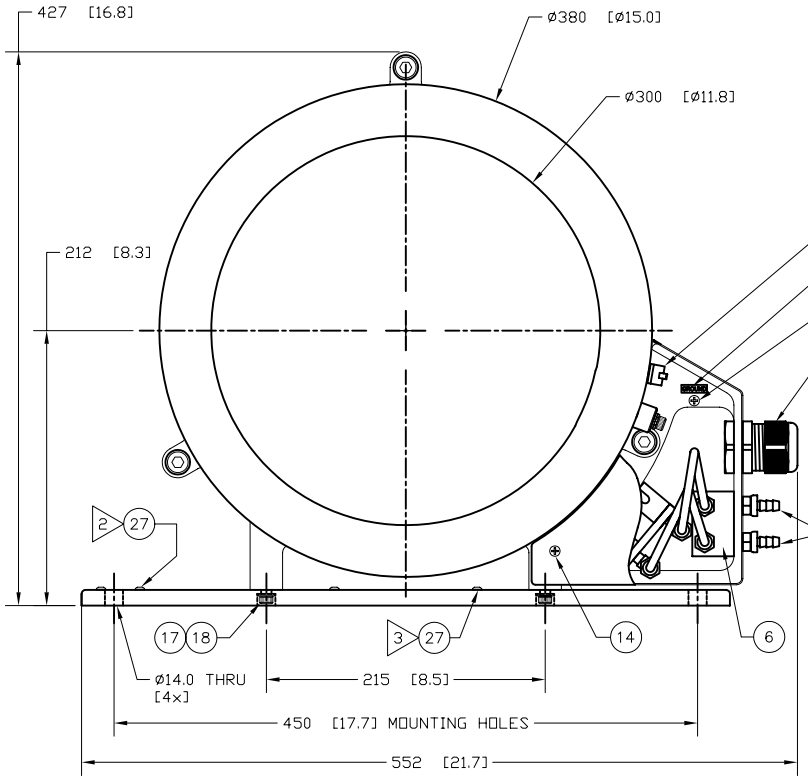


MAGNET SPECIFICATIONS

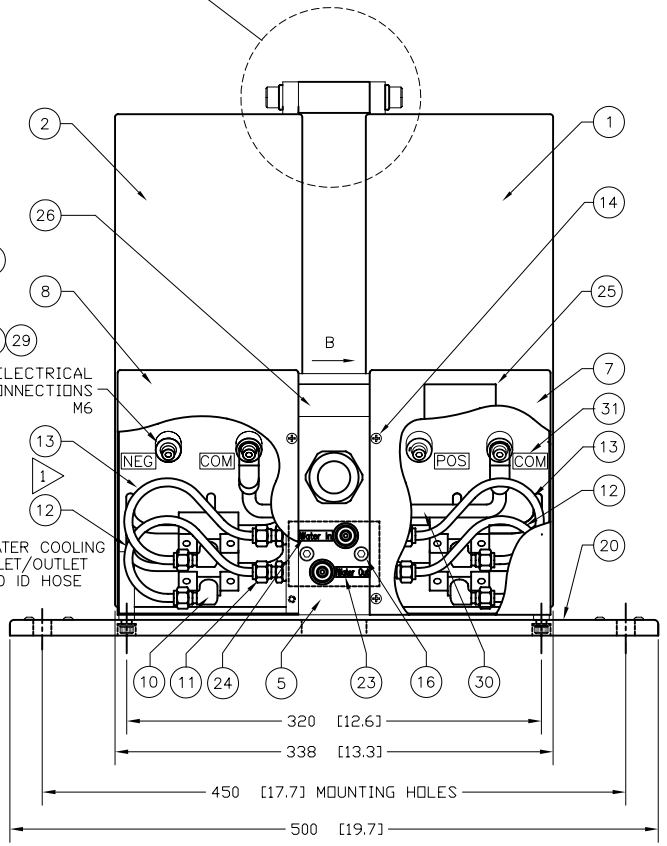
FIELD [at X, Y, Z = 0.0]	54 mT [540 G]
AXIAL UNIFORMITY [over ø30 mm sphere]	±200 ppm
COILS [series connected]	
MAX RESISTANCE	0.37 Ohm
MAX POWER [air]	25A/9.3V (0.23 kW)
MAX POWER [water]	70A/25.9V (1.81 kW)
COOLING:	2 l/min [0.6 GPM] @ 1.0 BAR [15 PSID]
THERMAL INTERLOCK	OPEN CIRCUIT ABOVE 50°C [122°F]
MASS	100 kg [220 lbs]

NOTE: DO NOT EXCEED THE MAXIMUM SPECIFIED COIL RESISTANCE OR COIL OVERHEATING AND POSSIBLE DAMAGE MAY OCCUR.

END VIEW



FRONT VIEW



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
32	6		WASHER, NEOPRENE 16x4x4 THK	
31	4		LABEL, + − C	
30	1	16900270	CURRENT LINK	
29	1		WASHER, FLAT M4 BRASS	
28	1	289-679	WASHER, M4 CRINKLE BERYLLIUM COPPER RS	
27	12		M4x8 SHCS BUTTON HD S/S	
26	1	10901200	LABEL, SPECIFICATION	
25	1	10901210	LABEL, CAUTION	
24	1	10901220	LABEL, WATER INLET	
23	1	10901230	LABEL, WATER OUTLET	
22	1	10900720	LABEL, GROUND [same as used on 3470]	
21	2	KA04-04MB	HOSE CONNECTOR,1/4"ID BRASS 1/4NPT	
20	1	17904610	MOUNTING PLATE	
19	1		CABLE CLAMP, 32mm THREAD PLASTIC	
18	4		WASHER, FLAT M6 S/S	
17	4		SHCS M6x12 S/S	
16	2		SHCS, M6x12 BUTTON HEAD S/S	
15	8		SHCS M10x35 S/S	
14	7		PH PHILLIPS M4x6 S/S	
13	A/R		SWAGELOK TUBE PFA-T4-062	
12	A/R		COPPER WATER TUBE - ASTM B-88 6.35 OD x 0.76 WALL	
11	4		SWAGELOK MALE CONN. B-400-1-4	
10	4		SWAGELOK MALE ELBOW B-400-2-4	
9	6	3450G611-1	SENSOR ELMWOOD 50°, WITH STUD	
8	1	17910191	COVER LEFT	
7	1	17910190	COVER RIGHT	
6	1	17910220	I/O COOLING MANIFOLD	
5	1	17910180	SERVICE BLOCK	
4	8	17910240	SLEEVE	
3	2	17910230	SPACER	
2	1	11910051	COIL LEFT	
1	1	11910050	COIL RIGHT	

PARTS LIST

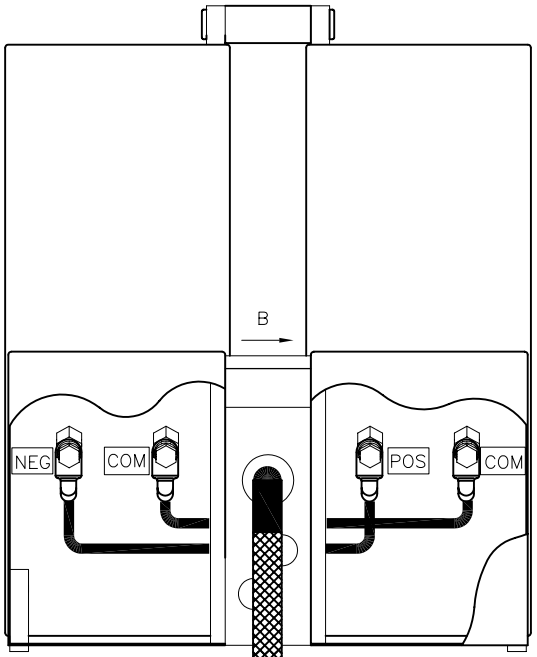
NOTES
1. HAND FIT ITEMS 12 AND 13.
2. PROBE HOLDER/MOUNT [RADIAL] LOCATION, SEE DWG NO: 11901720 FOR DETAILS
3. PROBE HOLDER/MOUNT [AXIAL] LOCATION, SEE DWG NO: 11901730 FOR DETAILS
4. SEE DRG NO: 11901740 FOR DETAILED MAGNET WIRING

DRAWN H.GLAVISH	DATE 08/22/94	DO NOT SCALE FROM DRAWING DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)	GMW 955 Industrial Rd, San Carlos, CA 94070 Tel: (650)802-8292. Fax: (650)802-8298.
CHECK	DATE		
ENGINEERING	DATE	LINEAR: INCHES X.XXX ±.005 / X.XX ±.02 / X.X ±.03 / X ±.06 — mm ±0.03 / ±0.1 / ±0.3 / ±1	TITLE: GENERAL ASSEMBLY MODEL: 5451
		ANGULAR: DEG. ±.5 — ±0.5	
		FINISH 63 / 1.6	
	5451		
NEXT ASSY	SYSTEM	THIRD ANGLE PROJECTION	SIZE A1 — DRAWING NO. 11910040 — REV B
SOFTWARE AUTOCAD 2000			SCALE 1:2 — WT kg — SHEET 1 OF 1

REVISIONS

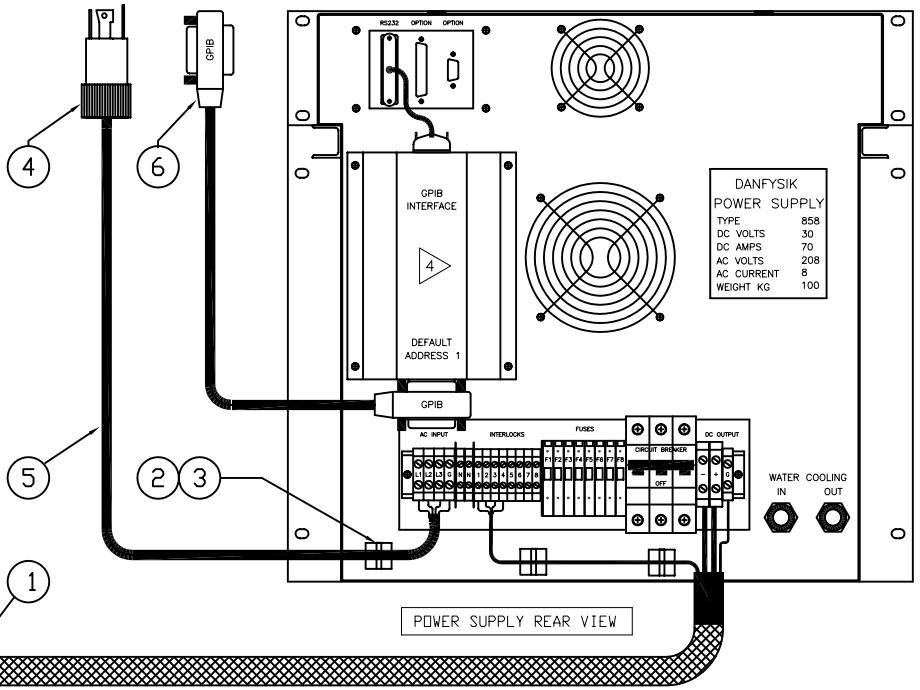
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		08/12/97	G.DOUGLAS

MODEL: 5451 ELECTROMAGNET



ELECTROMAGNET REAR VIEW

DANFYSIK MODEL: 858 30V/70A POWER SUPPLY



POWER SUPPLY REAR VIEW

DANFYSIK MODEL: 858 GPIB SWITCH SETTINGS

POWER SUPPLY MOTHER BOARD DIP SWITCH SW4		GPIB INTERFACE BOARD DIP SWITCH SW1		DIP SWITCH SW2	
1	OPEN	1	OFF	1	OFF
2	OPEN	2	ON	2	OFF
3	OPEN	3	ON	3	ON
4	OPEN	4	ON	4	OFF
5	OPEN	5	ON	5	ON
6	OPEN	6	OFF	6	ON
7	CLOSED	7	OFF	7	ON
8	OPEN	8	OFF	8	ON

NOTE

1. POWER SUPPLY SHOWN WITH US 3 PHASE 208V AC INPUT
2. GPIB INTERFACE IS OPTIONAL EQUIPMENT
3. REFER TO TABLE ON DWG 13900320 FOR AC INPUT RATINGS OTHER THAN 3 PHASE 208V AC
4. GPIB INTERFACE FITTED INTERNALLY ON LATER MODELS OF 858

N/S=NOT SUPPLIED

*** WARNING ***
CHECK AC POWER VOLTAGE AND FREQUENCY MATCH POWER SUPPLY SPECIFIED REQUIREMENTS BEFORE APPLYING AC INPUT POWER

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
6	1	L900 001-1-3	GPIB INTERFACE CABLE	N/S
5	1	4A-1204	POWER CORD, TYPE SO 4 CORE 12AWG	N/S
4	1	L15-20P	PLUG 3PHASE/20A, NYLON. BRYANT	N/S
3	3	08461	CABLE TIE ADHESIVE MTG, NYL BAR-LOK	
2	3	10364	CABLE TIE, NYLON 5mm WIDE. BAR-LOK	
1	1	16900280	CURRENT & INTERLOCK CABLE 80A	

PARTS LIST

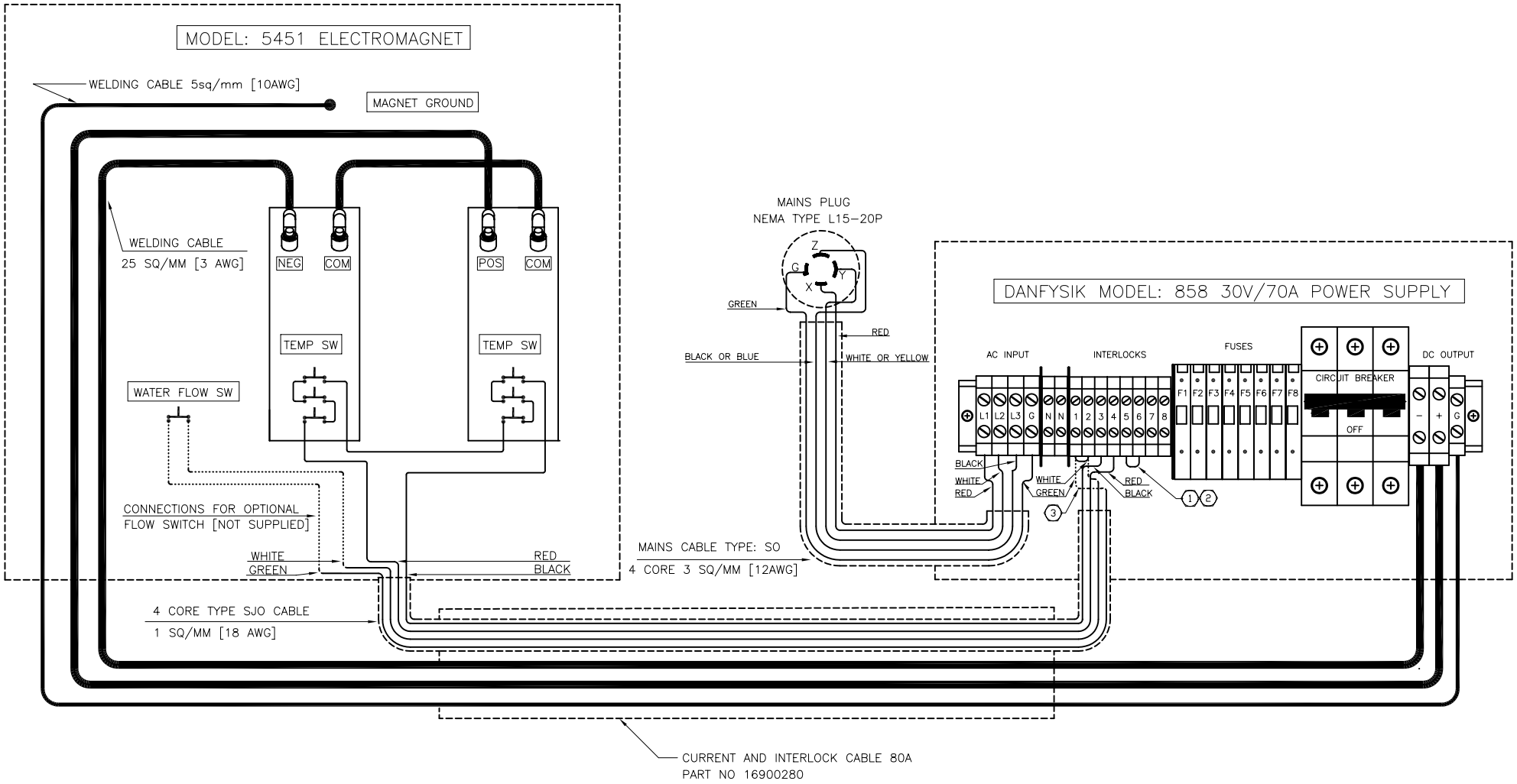
DRAWN G.DOUGLAS 08/12/97
CHECK
ENGINEERING
DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)
LINEAR: INCHES / mm
X.XXX ±.005 ±0.03
X.XX ±.01 ±0.1
X.X ±.03 ±0.3
X ±.06 ±1
DEG. ±.5 ±0.5
FINISH 63 1.6
NEXT ASSY 5451 SYSTEM
SOFTWARE AUTOCAD 2000
THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
ELECTRICAL ASSY
5451/DF858

SIZE A1 | DRAWING NO. 11900920 | REV A
SCALE NTS | WT kg | SHEET 1 OF 1

REVISIONS				
REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		08/12/97	G.DOUGLAS



NOTE:

1. REMOVE LINK BETWEEN TERMINAL3 AND TERMINAL 4 ON POWER SUPPLY AND CONNECT INTERLOCKS WIRES AS SHOWN
2. DO NOT REMOVE LINK BETWEEN TERM 5 & TERM 6 UNLESS EMERGERGY STOP CONTROL IS CONNECTED TO THESE TERMINALS.
3. TO CONNECT WATER FLOW SWITCH INTERLOCK. REMOVE LINK BETWEEN TERMINAL 1 AND TERMINAL 2 ON POWER SUPPLY. CONNECT WATER FLOW INTERLOCK WIRES AS SHOWN OPTIONAL EQUIPMENT [NOT SUPPLIED]

ELECTROMAGNET SYSTEM ELECTRICAL REQUIREMENTS			
AC INPUT POWER 3 PHASE, 48 to 62HZ	208V	400V	440V
AC INPUT FULL LOAD CURRENT	8A	4A	3.5A
RECOMMENDED MAIN AC BREAKER	15A	10	10
RECOMMENDED AC POWER OUTLET	L15-20R	–	–
RECOMMENDED AC CABLE SIZE	2.0 SQ/MM	1.5 SQ/MM	1.5 SQ/MM
NOTE: DRAWING SHOWS POWER SUPPLY FOR US 3 PHASE 208V AC POWER			

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
PARTS LIST				

DRAWN G.DOUGLAS 08/12/97
CHECK
ENGINEERING
5451
NEXT ASSY | SYSTEM
SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

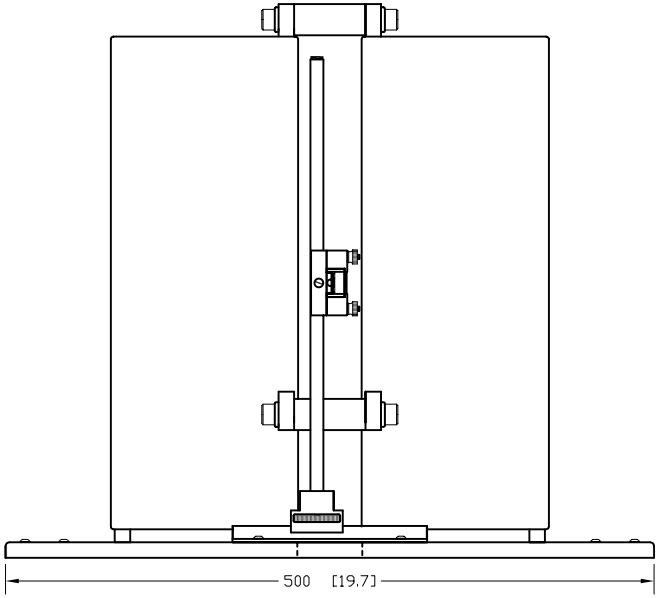
TITLE
ELECTRICAL WIRING
5451/DF858

SIZE A1 | DRAWING NO. 13900320 | REV A
SCALE NTS | WT kg | SHEET 1 OF 1

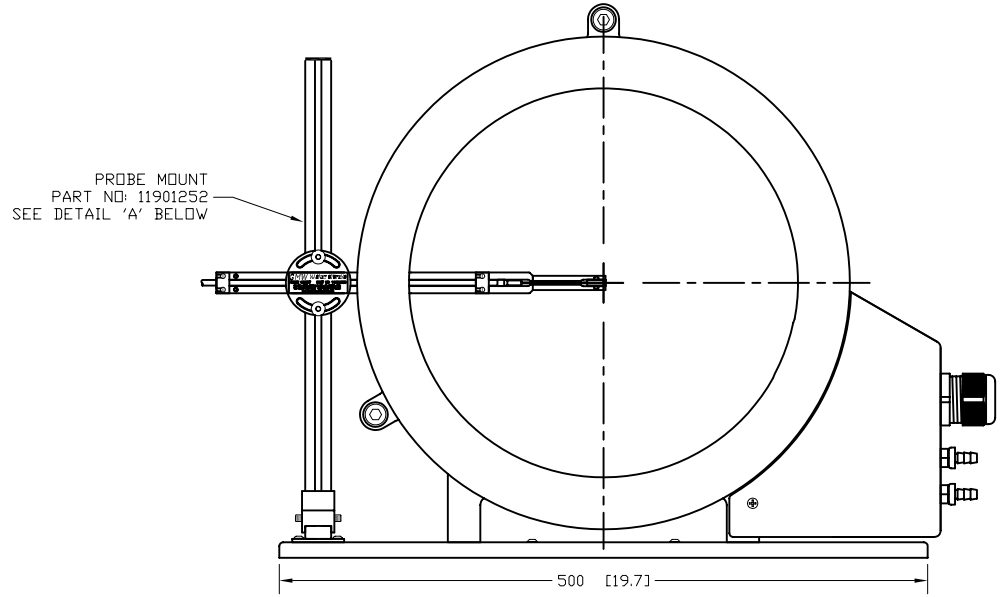
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		10/06/03	G.DOUGLAS

REAR VIEW

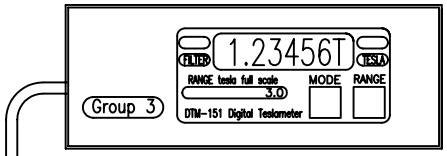


END VIEW



DETAIL 'A' SCALE 2:1

DIGITAL TESLAMETER
SEPARATE ORDER ITEM



TO SET HUB TO DESIRED ANGLE

1 LOOSEN THUMB NUT 2mm
2 PULL HUB FORWARD 2mm
3 ROTATE TO ANGLE REQUIRED
4 ROTATE SLIGHTLY BACK AND FORTH TO FIND INDEX PIN
5 PUSH HUB REARWARDS
6 TIGHTEN THUMB NUTS

NOTE:

1. THIS DRAWING SHOWS GROUP3 HALL EFFECT TESLAMETER AND PROBE. OTHER MAGNETIC MEASURING INSTRUMENTS, AND CONFIGURATIONS ARE AVAILABLE. CONSULT GMW FOR DETAILS
2. RADIAL PROBE MOUNT SHOWN SEE DRAWING NO 11901730 FOR AXIAL MOUNT.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN	G.DOUGLAS
DATE	10/06/03
CHECK	
DATE	
ENGINEERING	
DATE	
NEXT ASSY	5451
SYSTEM	
SOFTWARE	AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

LINEAR	INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
PROBE.MOUNT.[Radial]
MODEL: 5451

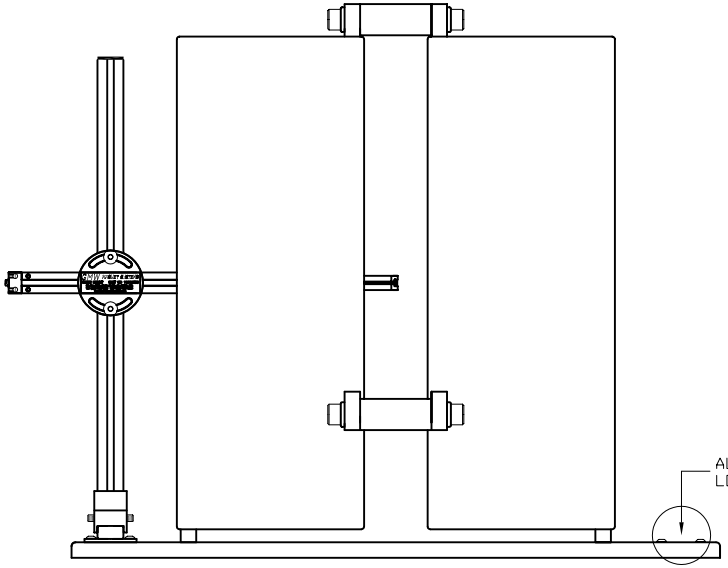
SIZE	DRAWING NO.	REV
A1	11901720	A

SCALE 1:2 | WT kg | SHEET 1 OF 1

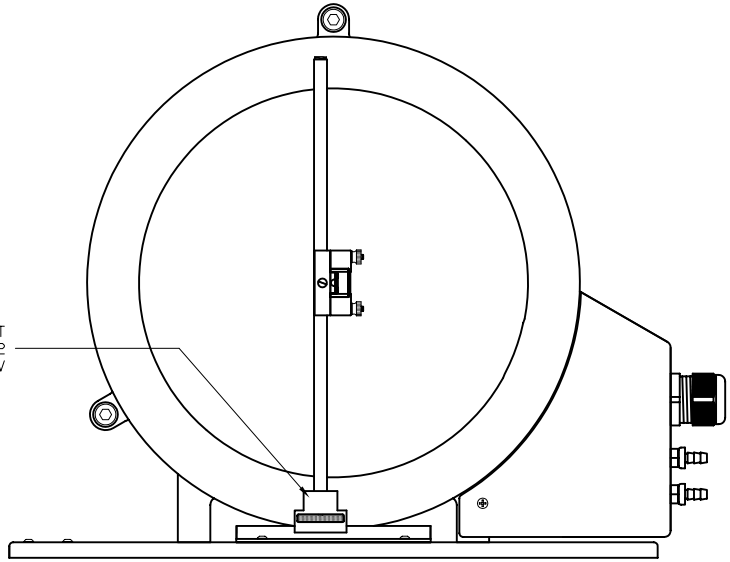
REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		10/06/03	G.DOUGLAS

REAR VIEW

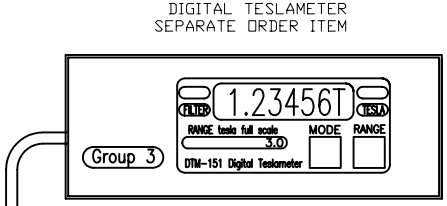


END VIEW



DETAIL 'A' SCALE 2:1

DIGITAL TESLAMETER
SEPARATE ORDER ITEM



TO SET HUB TO DESIRED ANGLE

1 LOOSEN THUMB NUT 2mm
2 PULL HUB FORWARD 2mm
3 ROTATE TO ANGLE REQUIRED
4 ROTATE SLIGHTLY BACK AND FORTH TO FIND INDEX PIN
5 PUSH HUB REARWARDS
6 TIGHTEN THUMB NUTS

NOTE:

1. DRAWING SHOWS GROUP3 HALL EFFECT TESLAMETER AND PROBE. OTHER MAGNETIC MEASURING INSTRUMENTS, AND CONFIGURATIONS ARE AVAILABLE. CONSULT GMW FOR DETAILS
2. AXIAL PROBE MOUNT SHOWN SEE DRAWING NO 11901720 FOR RADIAL MOUNT.

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE

PARTS LIST

DRAWN G.DOUGLAS DATE 10/06/03
CHECK DATE
ENGINEERING DATE
5451
NEXT ASSY SYSTEM
SOFTWARE AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

	LINEAR INCHES	mm
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

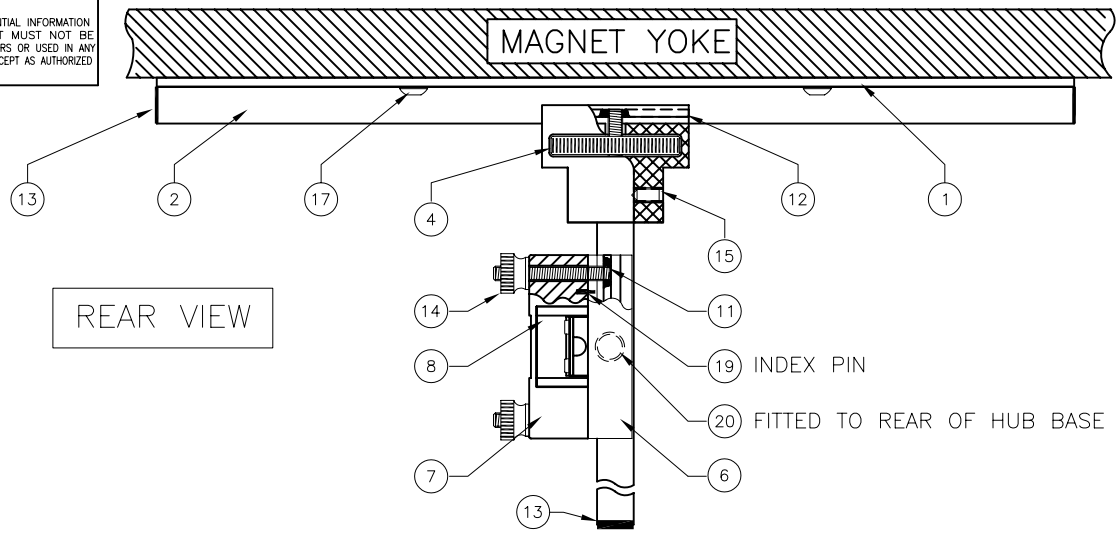
THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
PROBE MOUNT [Axial]
MODEL: 5451

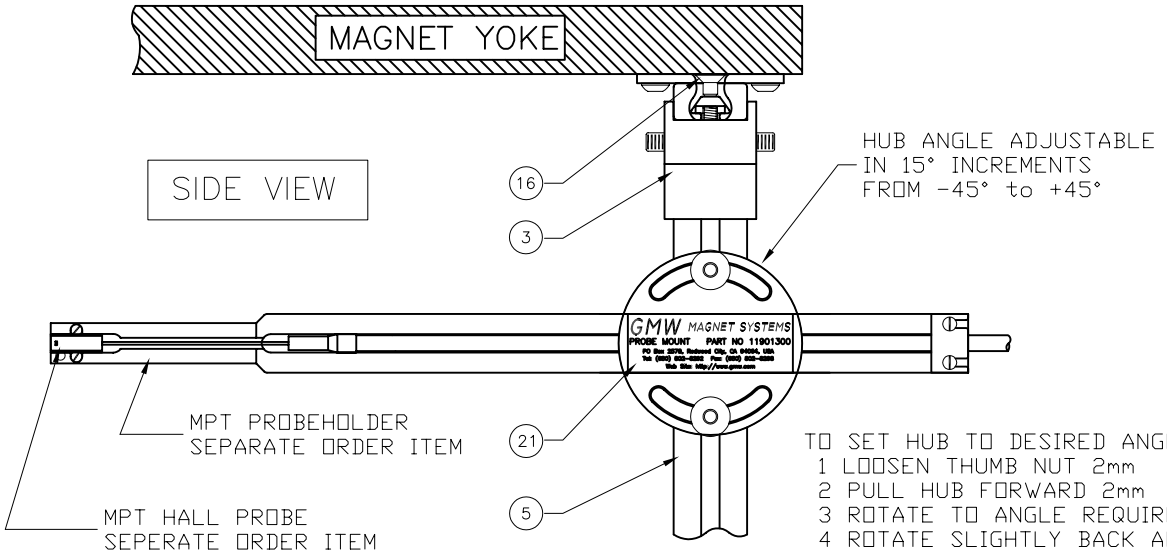
SIZE	DRAWING NO.	REV
A1	11901730	A

SCALE 1:2 | WT kg | SHEET 1 OF 1

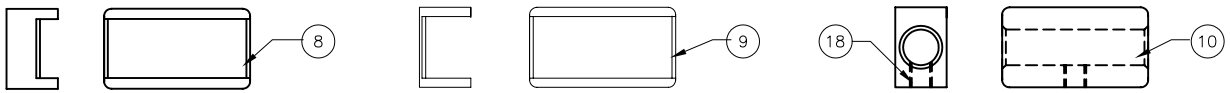


REAR VIEW

NOTE: THIS DRAWING SHOWS FRONT INSTALLATION OF PROBE MOUNT
FOR REAR INSTALLATION OF PROBE MOUNT SEE DRAWING NO 11901251



TO SET HUB TO DESIRED ANGLE
1 LOOSEN THUMB NUT 2mm
2 PULL HUB FORWARD 2mm
3 ROTATE TO ANGLE REQUIRED
4 ROTATE SLIGHTLY BACK AND
FORTH TO FIND INDEX PIN
5 PUSH HUB REARWARDS
6 TIGHTEN THUMB NUTS



REVISIONS

REV	DESCRIPTION	DRAFT	DATE	APPROVED
A	RELEASE		08/26/98	G.DOUGLAS

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
21	1	10900320	LABEL, INDENTIFICATION	
20	1	SBMH8	BALL PLUNGER, M8 S/S VLIER	
19	2	VSM 12771B	DOWEL PIN M1 X 5 S/S [Index Pin]	
18	1	BN 1073	SET SCREW, M6 X 5 SLOTTED HD NYLON	
17	4	ISO 7380	SHCS M4 X 8 BUTTON HD S/S	
16	5	DIN 7991	SHCS, M4 X 6 FLAT HEAD S/S	
15	2	DIN 917	SHSS M4 X 8 CONE POINT S/S	
14	2	08M040070TN	THUMB NUT, NYLON	
13	3	18-830	ITEM PRODUCTS, END CAP, PLASTIC	
12	1	17902010	BASE STUD	
11	1	17902000	HUB STUD	
10	1	17901990	HUB INSERT [For Sentron Hall Probes]	
9	1	17901980	HUB INSERT [For Metrolab NMR probes]	
8	1	17901970	HUB INSERT [for Grp3 MPT Hall Probes]	
7	1	17901960	HUB COVER	
6	1	17901950	HUB BASE	
5	1	17901946	VERTICAL MOUNTING EXTRUSION [350mm long]	
4	1	17901930	BASE NUT	
3	1	17901920	BASE SUPPORT [150mm long]	
2	1	17901890	BASE MOUNTING EXTRUSION [150mm long]	
1	1	17901880	BASE MOUNTING PLATE	

PARTS LIST

DRAWN	G.DOUGLAS	DATE 08/17/98
CHECK		DATE
ENGINEERING		DATE
NEXT ASSY		SYSTEM

SOFTWARE
AUTOCAD 2000

DO NOT SCALE FROM DRAWING
DIMENSIONS & TOLERANCES (UNLESS OTHERWISE SPECIFIED)

	INCHES	mm
LINEAR		
X.XXX	±.005	±0.03
X.XX	±.01	±0.1
X.X	±.03	±0.3
X	±.06	±1
DEG.	±.5	±0.5
FINISH	63	1.6

THIRD ANGLE PROJECTION

GMW
955 Industrial Rd, San Carlos, CA 94070
Tel: (650)802-8292. Fax: (650)802-8298.

TITLE
PROBE MOUNT
MODEL: 3474/5451

SIZE	DRAWING NO.	REV
A2	11901252	A

SCALE 1:1 | WT kg | SHEET 1 OF 1