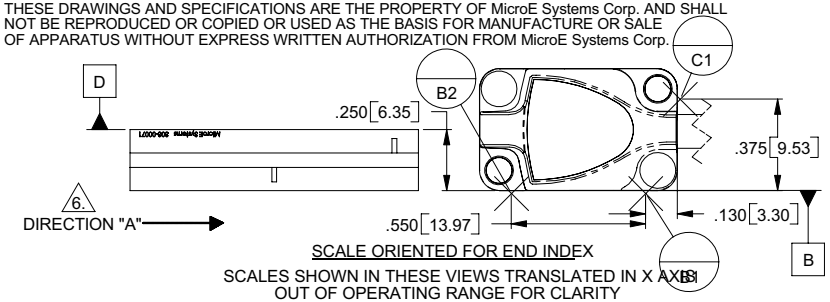
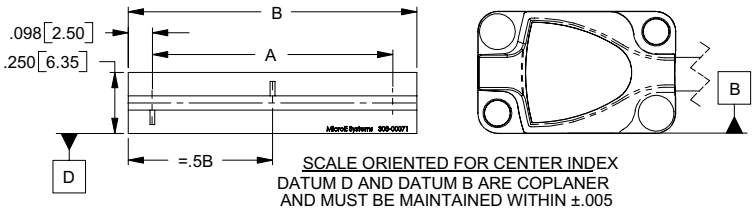
Mercury 1000 Encoder System
Interface Drawing: Short Linear Scales

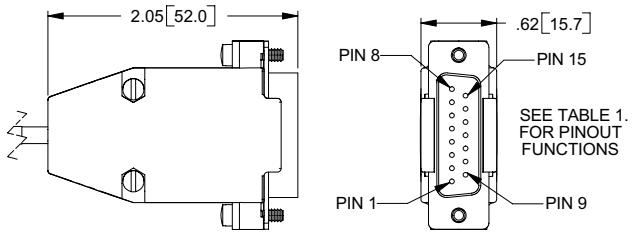


SCALE ORIENTED FOR END INDEX

SCALES SHOWN IN THESE VIEWS TRANSLATED IN X AXIS OUT OF OPERATING RANGE FOR CLARITY



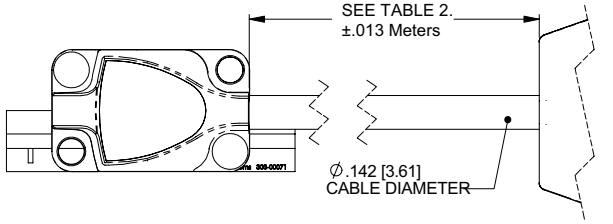
SCALE ORIENTED FOR CENTER INDEX
DATUM D AND DATUM B ARE COPLANER AND MUST BE MAINTAINED WITHIN ±.005

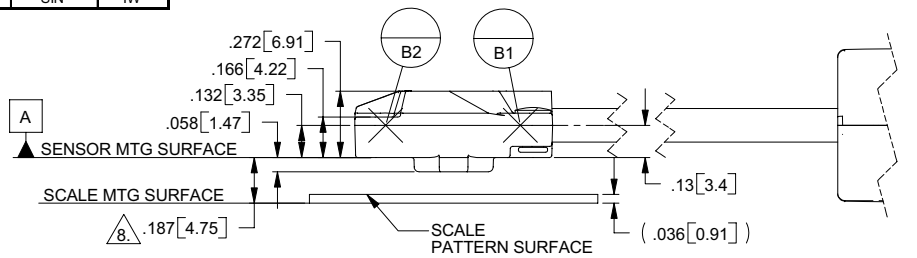


CABLE CONNECTOR END
SCALE: 1:1

TABLE 1.

15 Pin Interface Plug Pinouts		
Pin	Function (M1000)	Function (M1500S)
1	IW-	N/C
2	IW+	N/C
3	RESERVED	N/C
4	RESERVED	A-
5	RESERVED	A+
6	RESERVED	N/C
7	COS+	SIN+
8	SIN+	COS+
9	N/C	B-
10	N/C	B+
11	N/C	N/C
12	+5V	+5V
13	GND	GND
14	COS-	IW+
15	SIN-	IW-

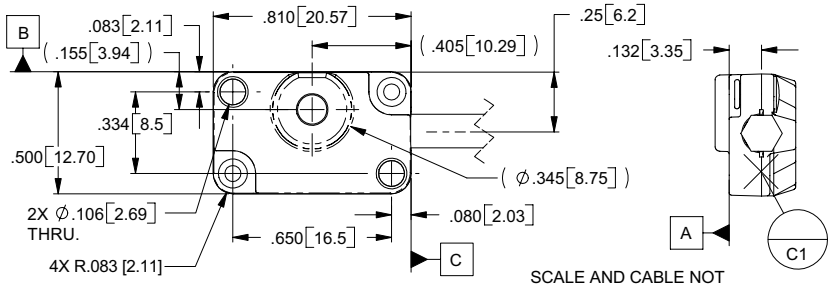




CONNECTOR NOT SHOWN IN THESE VIEWS FOR CLARITY.
SEE CABLE CONNECTOR END VIEW FOR DETAILS

TABLE 2.

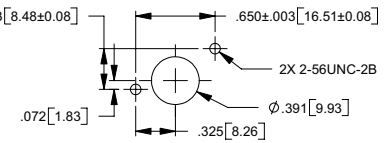
Cable Length	
(1000)	(1500S)
.5 Meter	1 Meter
1 Meter	2 Meter
2 Meter	5 Meter



SCALE AND CABLE NOT SHOWN FOR CLARITY

NOTE:

1. RECOMMENDED MOUNTING HARDWARE:
   2-56 OR M2 SCREWS w/ 4 FLAT WASHERS (2 ON EACH SCREW) (OD OF WASHER NOT TO EXCEED .150 [3.81]). MAX. TORQUE: 3.3 in. lbs
2. IF BENCHING PINS ARE TO BE USED, PINS MUST BE PLACED ALONG DATUM EDGES OF BOTH THE SENSOR AND THE SCALE FOR PROPER ALIGNMENT. (REFERENCE DATUMS B1,B2 AND C1 FOR SENSOR BENCHING PINS)
3. HEIGHT OF SENSOR BENCHING PINS MUST BE A MINUMUM OF .170 [4.32] IN HEIGHT FROM DATUM A.
4. HEIGHT OF SCALE BENCHING PINS NOT TO EXCEED THE THICKNESS OF THE SCALE.
5. RECOMMENDED SENSOR MOUNTING PLATE THICKNESS:
   MINIMUM- 4 SCREW THREADS
   MAXIMUM- ALLOW CLEARANCE TO SCALE AND SCALE MOUNTING HARDWARE (BENCHING SURFACES, CLAMPS, HUBS, ETC.)
6. WHEN SCALE MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY READHEAD OUTPUT SIGNAL COS+/B+ (PIN 7/PIN 10) LEADS OUTPUT SIGNAL SIN+/A+ (PIN 8/PIN 5).
7. DO NOT CONNECT TO "RESERVED" PINS. SEE TABLE 1. FOR RESERVED PINS.
8. FOR SCALES ATTACHED WITH ADHESIVE TAPE (LXX-T), THE SCALE MOUNTING SURFACE MUST BE .006" FURTHER AWAY FROM SENSOR MOUNTING SURFACE FOR NOMINAL Z HEIGHT. DIM = .193[4.90]



SENSOR MOUNTING PLATE RECOMMENDATION
SCALE: 1:1

SCALE IDENTIFICATION AND SIZE

Scale Identification #	Dim A. Measured Length	Dim B. Scale Length
LXX	XXmm-5mm	XXmm
L30	30mm-5mm = 25mm	30mm
(max) L130	130mm-5mm = 125mm	130mm

THESE ARE EXAMPLES

REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
A	----	RELEASE TO PRODUCTION	5/7/02	MF
B	879	ADDED M1000 TO DESC., UPDATED TABLE 1. SEE ECO	6/6/02	MF
C	900	UPDATED CABLE LENGTHS, ADD TABLE 2.	6/27/02	MF
D	907	UPDATED SIGNALS ON TABLE 1. SEE ECO	7/07/02	MF
E	946	UPDATED NOTE 1., ADDED MAX. TORQUE NOTE	8/14/02	MF
F	960	SNOUT DIMS TO REF., THK SCALE CORRECTED, REF.	9/24/02	MF
G	979	UPDATED TABLE 1. PIN 8 (COS+) WAS N/C. SEE ECO	11/19/02	MF
H	1426	UPDATED MODEL WITH SHRUNKEN HYBRID. ADDED NOTE 8.	5/31/05	SB

UNITS: .in [mm]

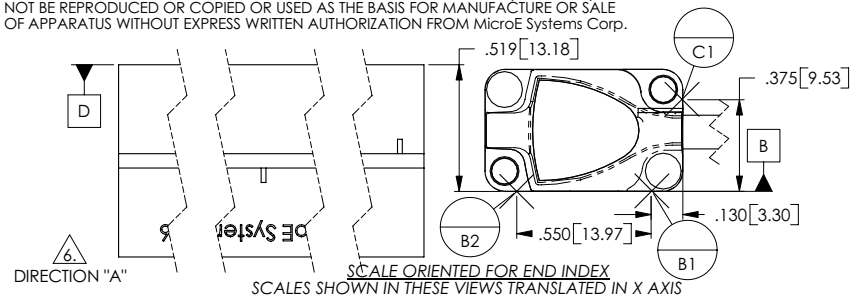
UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES [millimeters]
DIM. APPLY AFTER PROCESSING
INTERPRET ALL GEOMETRIC TOLS. PER ANSI Y14.5M-1994
TOLERANCES ARE:
DECIMALS: ANGULAR:
.XX [.X] ± .01 [.25] ±30 MIN.
.XXX [.XX] ± .005 [.13]

APPROVALS	DATE
DRAWN S.BUTURLIA	5/1/02
CHECKED	
ENGRG. DON GRIMES	5/6/02
MFG ENG MIKE SKWIRA	5/6/02
QA JACK FARNAM	5/6/02

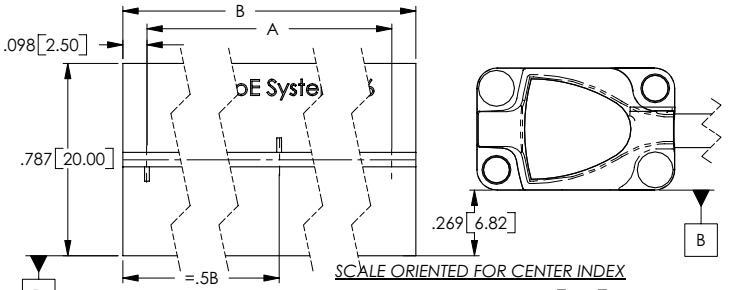
MicroESystems
DESCRIPTION:
INTERFACE, ENCODER, 20um SHORT LINEAR, MERCURY 1000/1500S SENSOR

SIZE B | DWG. NO. ID-00231 | REV. H
SCALE: 2:1 | CAD FILE: | 3rd ANGLE PROJECTION | SHEET 1 OF 1

Mercury 1000 Encoder System
Interface Drawing: Long Linear Scales



SCALE ORIENTED FOR END INDEX
SCALES SHOWN IN THESE VIEWS TRANSLATED IN X AXIS OUT OF OPERATING RANGE FOR CLARITY



SCALE ORIENTED FOR CENTER INDEX

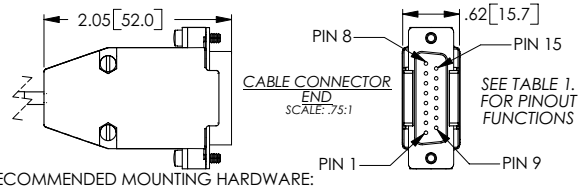


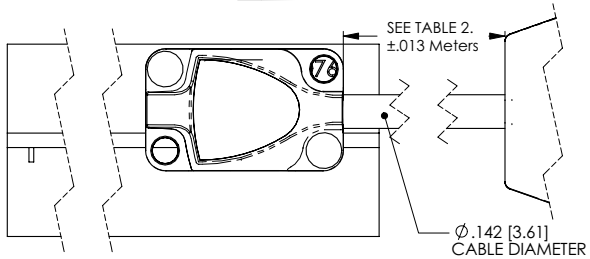
TABLE 1.

15 Pin Interface		
Plug Pinouts		
PIN	Function (M1000)	Function (M1500S)
1	IW-	N/C
2	IW+	N/C
3	RESERVED	N/C
4	RESERVED	A-
5	RESERVED	A+
6	RESERVED	N/C
7	COS+	SIN+
8	SIN+	COS+
9	N/C	B-
10	N/C	B+
11	N/C	N/C
12	"+5V	"+5V
13	GND	GND
14	COS-	IW+
15	SIN-	IW-

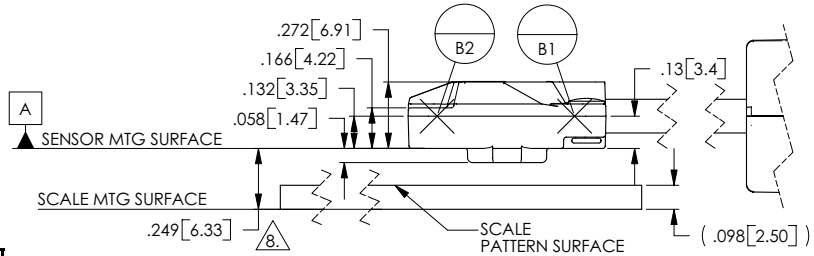
TABLE 2.

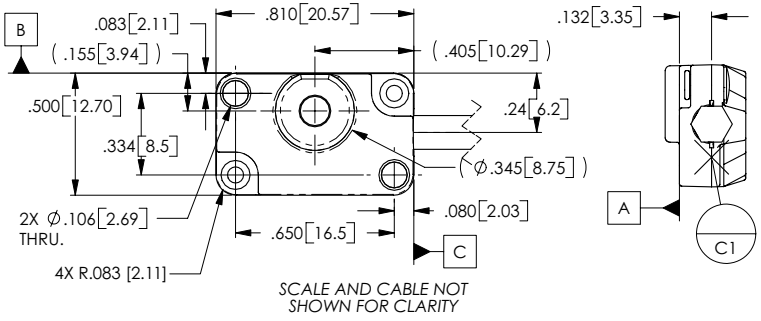
Cable Length	
(M1000)	(1500S)
.5 Meter	1 Meter
1 Meter	2 Meter
2 Meter	5 Meter

REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
A	---	RELEASE TO PRODUCTION	5/7/02	MF
B	879	ADDED M1000 TO DESC., UPDATED TABLE 1. SEE ECO	6/5/02	MF
C	900	UPDATED CABLE LENGTHS, ADDED TABLE 2.	6/27/02	MF
D	907	UPDATED SIGNALS IN TABLE 1. SEE ECO	7/07/02	MF
E	946	UPDATED NOTE 1. ADDED MAX TORQUE NOTE	8/14/02	MF
F	960	SNOUT DIMS TO REF., SCALE THK TO REF.	9/24/02	MF
G	979	UPDATED TABLE 1. PIN 8 (COS+) WAS N/C. SEE ECO	11/19/02	MF
H	1426	UPDATED MODEL WITH SHRUNKEN HYBRID. ADDED NOTE 8.	5/25/05	SB
I	1498	REVERSED PINS 9 & 15 IN CABLE CONNECTOR DETAIL.	10/28/05	SB

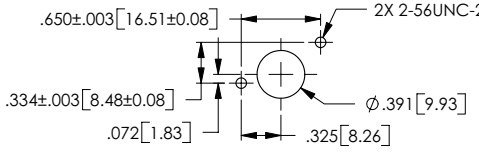


CONNECTOR NOT SHOWN IN THESE VIEWS FOR CLARITY
SEE CABLE CONNECTOR END VIEW FOR DETAILS





SCALE AND CABLE NOT SHOWN FOR CLARITY



SENSOR MOUNTING PLATE RECOMMENDATION
SCALE: 1:1

NOTES:

1. RECOMMENDED MOUNTING HARDWARE:
   2-56 OR M2 SCREWS w/ 4 FLAT WASHERS (2 ON EACH SCREW)
   (OD OF WASHER NOT TO EXCEED .150 [3.81])
   MAX TORQUE: 3.3 in. lbs
2. IF BENCHING PINS ARE TO BE USED, PINS MUST BE PLACED ALONG DATUM EDGES OF BOTH THE SENSOR AND THE SCALE FOR PROPER ALIGNMENT. (REFERENCE DATUMS B1, B2 AND C1 FOR SENSOR BENCHING PINS)
3. HEIGHT OF SENSOR BENCHING PINS MUST BE A MINIMUM OF .170 [4.32] IN HEIGHT FROM DATUM A.
4. HEIGHT OF SCALE BENCHING PINS NOT TO EXCEED THE THICKNESS OF THE SCALE.
5. RECOMMENDED SENSOR MOUNTING PLATE THICKNESS:
   MINIMUM- 4 SCREW THREADS
   MAXIMUM- ALLOW CLEARANCE FOR SCALE AND SCALE MOUNTING HARDWARE (BENCHING SURFACES, CLAMPS, HUBS, ETC.)
6. WHEN SCALE MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY READHEAD, OUTPUT SIGNAL COS+/B+ (PIN 7/PIN 10) LEADS OUTPUT SIGNAL SIN+/A+ (PIN 8/PIN 5).
7. DO NOT CONNECT TO "RESERVED" PINS. SEE TABLE 1. FOR RESERVED PINS.
8. FOR SCALES ATTACHED WITH ADHESIVE TAPE (LXX-T), THE SCALE MOUNTING SURFACE MUST BE .006" FURTHER AWAY FROM SENSOR MOUNTING SURFACE FOR NOMINAL Z HEIGHT. DIM = .255[6.48]

SCALE IDENTIFICATION AND SIZE

Scale Identification #	Dim. A Measured Length	Dim. B Scale Length
LXX	XXmm-5mm	XXmm
L155	155mm-5mm=155mm	155mm
(max)	2025mm-5mm=2020mm	2025mm

THESE ARE EXAMPLES

UNITS: .in [mm]

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
DIM. APPLY AFTER PROCESSING
INTERPRET ALL GEOMETRIC TOLS.
PER ANSI Y14.5M-1994
TOLERANCES ARE:
DECIMALS: .XX ±.01 .XXX ±.005
ANGULAR: ±30 MIN.

APPROVALS	DATE
DRAWN S.BUTURLIA	5/3/02
CHECKED	
ENGRG. DON GRIMES	5/6/02
MFG ENG MIKE SKWIRA	5/6/02
QA JACK FARNAM	5/6/02

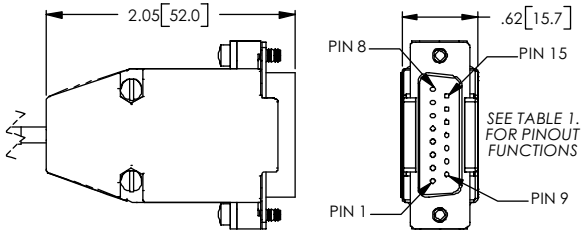
FINISH: | MAKE FROM:

GSI MicroE Systems
MicroE Systems Division of GSI
8 Erie Drive
Natick, MA 01760

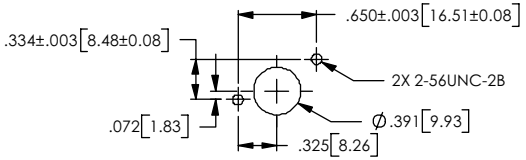
DESCRIPTION:
INTERFACE, ENCODER,
20um LONG LINEAR,
MERCURY 1000/1500S SENSOR

SIZE B | DWG. NO. ID-00232 | REV. I
SCALE: 2:1 | CAD FILE: | 3rd ANGLE PROJECTION | SHEET 1 OF 1

Mercury 1000 Encoder System
Interface Drawing: Rotary Scale with Hub



CABLE CONNECTOR END
SCALE: 1:1



SENSOR MOUNTING PLATE RECOMMENDATION
SCALE: 1:1

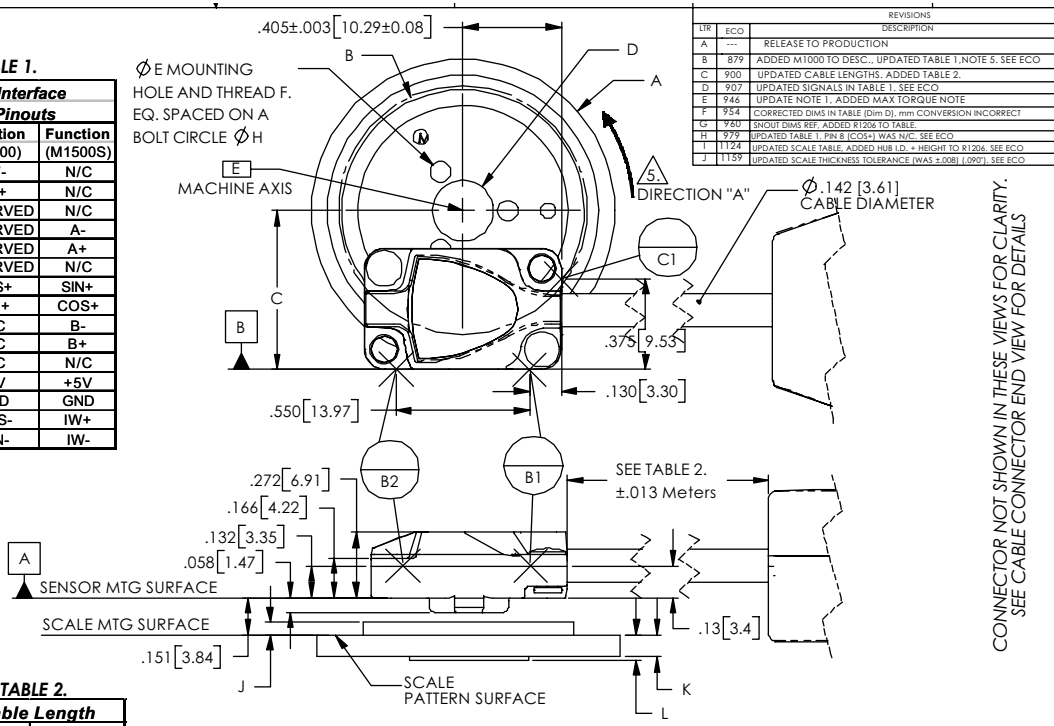
NOTE:
1. RECOMMENDED MOUNTING HARDWARE:
   2-56 OR M2 SCREWS w/ 4 FLAT WASHERS (2 ON EACH SCREW)
   (OD OF WASHER NOT TO EXCEED .150 [3.81])
   MAX TORQUE: 3.3 in. lbs
2. IF BENCHING PINS ARE TO BE USED, PINS MUST BE PLACED ALONG DATUM EDGES OF SENSOR FOR PROPER ALIGNMENT. (REFERENCE DATUMS B1, B2 AND C1).
3. HEIGHT OF SENSOR BENCHING PINS MUST BE A MINIMUM OF .170 [4.32] IN HEIGHT FROM DATUM A.
4. RECOMMENDED SENSOR MOUNTING PLATE THICKNESS:
   MINIMUM- 4 SCREW THREADS
   MAXIMUM- ALLOW CLEARANCE FOR SCALE AND SCALE MOUNTING HARDWARE (BENCHING SURFACES, CLAMPS, HUBS, ETC.)
5. WHEN SCALE MOVES IN DIRECTION "A" WITH RESPECT TO A STATIONARY READHEAD, OUTPUT SIGNAL COS+/B+ (PIN 7/PIN 10) LEADS OUTPUT SIGNAL SIN+/A+ (PIN 8/PIN 5).
6. DO NOT CONNECT TO "RESERVED" PINS. SEE TABLE 1. FOR RESERVED PINS.

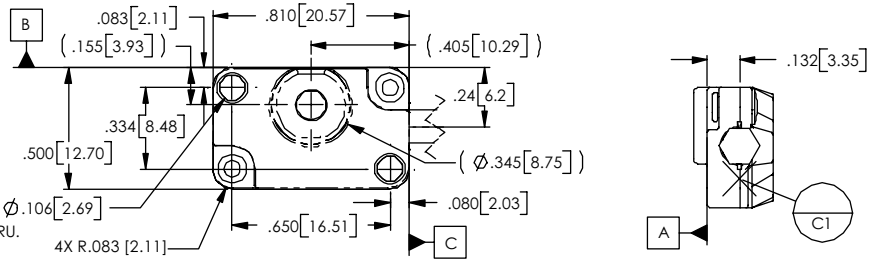
TABLE 1.

15 Pin Interface Plug Pinouts		
Pin	Function (M1000)	Function (M1500S)
1	IW-	N/C
2	IW+	N/C
3	RESERVED	N/C
4	RESERVED	A-
5	RESERVED	A+
6	RESERVED	N/C
7	COS+	SIN+
8	SIN+	COS+
9	N/C	B-
10	N/C	B+
11	N/C	N/C
12	+5V	+5V
13	GND	GND
14	COS-	IW+
15	SIN-	IW-

TABLE 2.

Cable Length	
(1000)	(1500S)
.5 Meter	1 Meter
1 Meter	2 Meter
2 Meter	5 Meter





SCALE AND CABLE NOT SHOWN FOR CLARITY

SCALE IDENTIFICATION AND SIZE. DIMENSIONS IN INCHES [MILLIMETERS]

Scale Identification	Counts/ Rev	Dim. A Scale O.D.	Scale I.D.	Dim. B Optical Dia.	Dim. C Mounting Dim.	Dim D. Hub I.D.	Dim E. Mounting Hole Dia.	Thread F	Dim H. Bolt Circle	Dim. J Hub Height	Dim. K Scale Thickness	Dim. L Hub Relief
R1206	1,650	0.472	.250+/-.005	0.413	0.348+/-.002	0.1253+.0005/-.0000	N/A	N/A	N/A	0.040	.036+/-.002	0.045
		[12.00]	[6.35+/-.13]	[10.50]	[8.84+/-.05]	[3.182+.013/-.000]				[1.02]	[.91+/-.05]	[1.14]
R1910	2,500	0.750	.375+/-.005	0.627	0.454+/-.002	0.1253+.0005/-.0000	0.047		0.250	0.040	.090+/-.004	0.105
		[19.05]	[9.53+/-0.13]	[15.92]	[11.53+/-.05]	[3.182+.013/-.000]	[1.19]	0-80	[6.35]	[1.02]	[2.29+/-.10]	[2.67]
R3213	4,096	1.250	.500+/-.005	1.027	0.654+/-.002	0.2503+.0005/-.0000	0.070		0.370	0.050	.090+/-.004	0.105
		[31.75]	[12.70+/-0.13]	[26.08]	[16.62+/-.05]	[6.357+.013/-.000]	[1.78]	2-56	[9.40]	[1.27]	[2.29+/-.10]	[2.67]
R5725	8,192	2.250	1.000+/-.005	2.053	1.168+/-.002	0.5003+.0005/-.0000	0.136		0.750	0.060	.090+/-.004	0.105
		[57.15]	[25.40+/-0.13]	[52.15]	[29.66+/-.05]	[12.707+.013/-.000]	[3.45]	8-32	[19.05]	[1.52]	[2.29+/-.10]	[2.67]
R10851	16,384	4.250	2.000+/-.005	4.106	2.194+/-.002	1.0003+.0005/-.0000	0.136		1.375	0.080	.090+/-.004	0.105
		[107.95]	[50.80+/-0.13]	[104.30]	[55.73+/-.05]	[25.408+.013/-.000]	[3.45]	8-32	[34.93]	[2.03]	[2.29+/-.10]	[2.67]

REVISIONS				
LTR	ECO	DESCRIPTION	DATE	APPROVED
A	---	RELEASE TO PRODUCTION	5/7/02	MF
B	879	ADDED M1000 TO DESC., UPDATED TABLE 1,NOTE 5. SEE ECO	6/5/02	MF
C	900	UPDATED CABLE LENGTHS. ADDED TABLE 2.	6/27/02	MF
D	907	UPDATED SIGNALS IN TABLE 1. SEE ECO	7/07/02	MF
E	946	UPDATE NOTE 1. ADDED MAX TORQUE NOTE	8/14/02	MF
F	954	CORRECTED DIMS IN TABLE (Dim D), mm CONVERSION INCORRECT	8/29/02	MF
G	960	SNOUT DIMS REF. ADDED R1206 TO TABLE.	9/24/02	MF
H	979	UPDATED TABLE 1: PIN 8 (COS+) WAS N/C. SEE ECO	11/19/02	MF
I	1124	UPDATED SCALE TABLE. ADDED HUB I.D. + HEIGHT TO R1206. SEE ECO	6/26/03	MF
J	1159	UPDATED SCALE THICKNESS TOLERANCE (WAS ±.008) (.090"). SEE ECO	3/8/04	MF

UNITS: .in [mm]

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES [millimeters]
DIM. APPLY AFTER PROCESSING
INTERPRET ALL GEOMETRIC TOLS. PER ANSI Y14.5M-1994
TOLERANCES ARE:
DECIMALS: .XX [.X] ±.01 [.25] .XXX [.XX] ±.005 [.13]
ANGULAR: ±30 MIN.

APPROVALS	DATE
DRAWN S.BUTURLIA	5/6/02
CHECKED	
ENGRG. DON GRIMES	5/6/02
MFG ENG MIKE SKWIRA	5/6/02
QA JACK FARNAM	5/6/02

MicroESystems

DESCRIPTION: INTERFACE, ENCODER, 20um ROTARY w/HUB, MERCURY 1000/1500S SENSOR

SIZE B | DWG. NO. ID-00233 | REV. J

SCALE: 2:1 | CAD FILE: | SHEET 1 OF 1