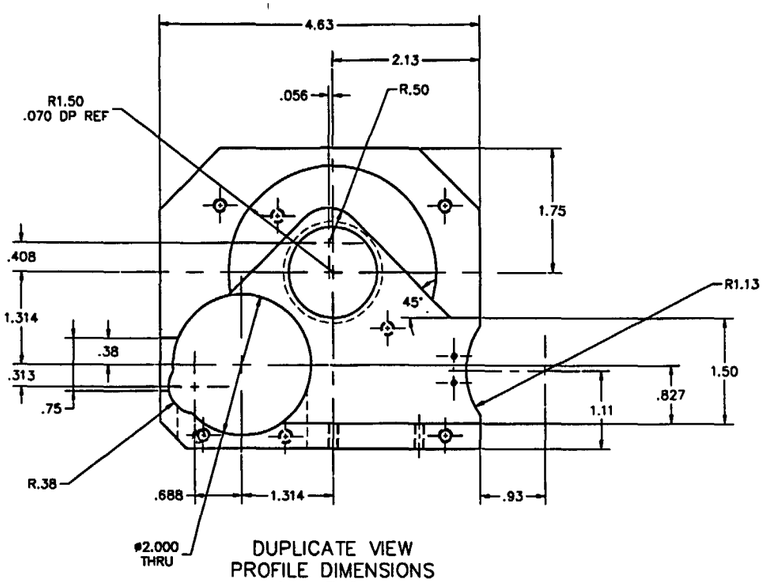
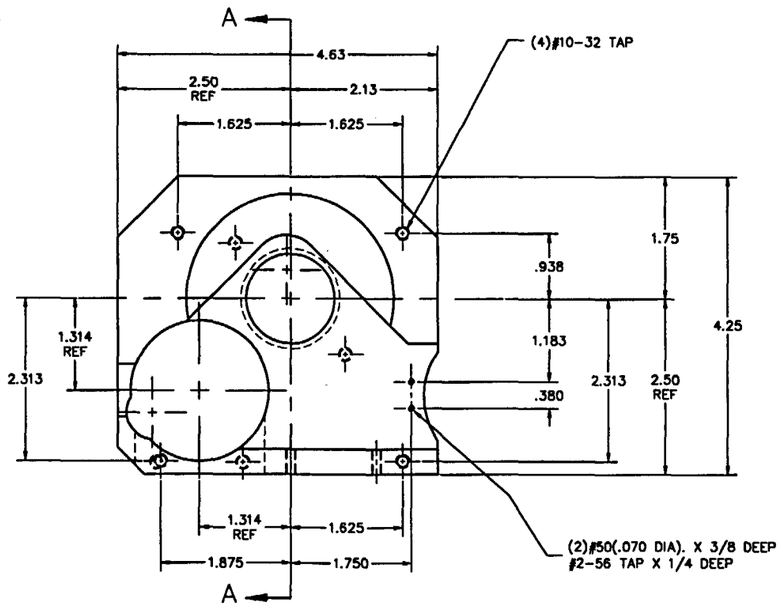
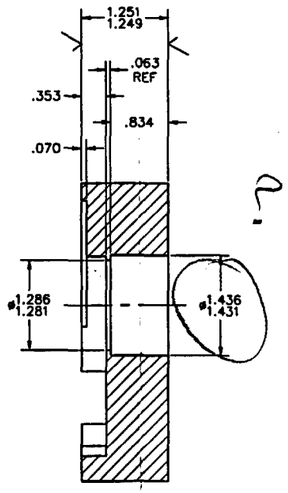
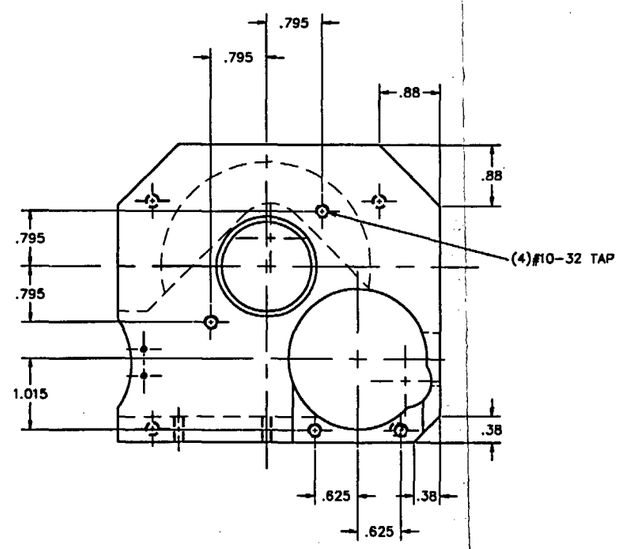


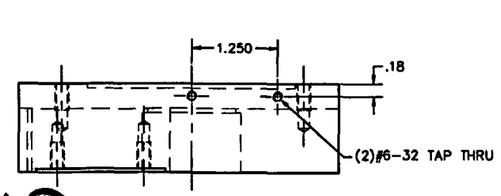
DUPLICATE VIEW
PROFILE DIMENSIONS
SCALE: FULL

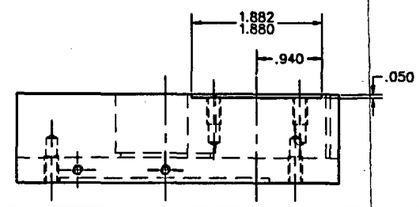




SECTION "AA"







NOTE:
DO NOT MODIFY THIS DRAWING !
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ALL MACHINED SURFACES TO BE 63 FINISH
1/32 MAX TOOL RAD. IN ALL CORNERS

Rev.	Date	By	Rel.	ECN No.	Description
A	07/16/01	RP	RS	-----	FIRST ISSUE
Design	07/02/01	R.PAGANO			
Drawn	07/02/01	R.PAGANO			
Ck'D	07/16/01	A.ARMACK			
Rel.	10/25/01	A.ARMACK			

Title: GAMMA GAUGE
3 CURIE SOURCE
HOUSING SHUTTER
INSIDE COVER DETAIL

Job. No:
Scale: FULL

INTERGRATED INDUSTRIAL SYSTEMS
473 MAIN STREET
YALESVILLE, CONNECTICUT 06492

Dwg. No 300-1456 Rev A

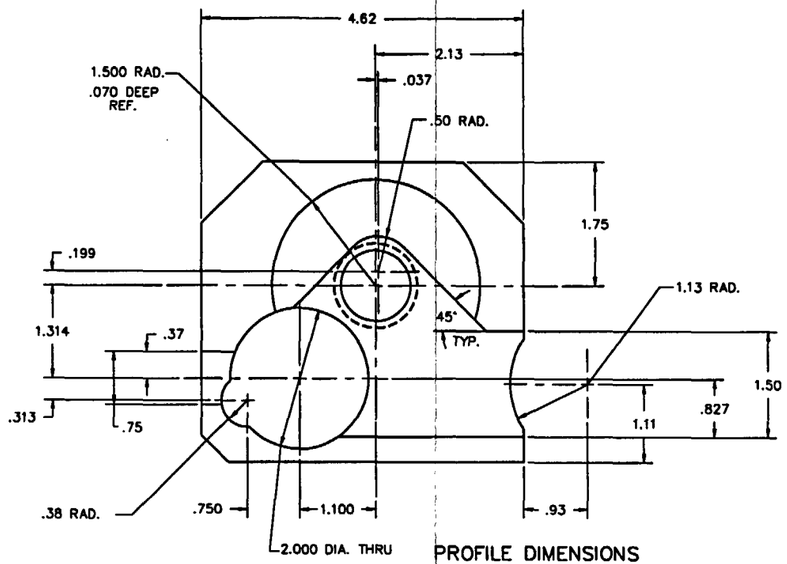
Sheet 1 of 1

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-145601	A	SHUTTER HOUSING INSIDE COVER
WT.(EACH)		MATERIAL
7.0 lbs		STAINLESS STEEL
REMARKS : SIMILAR TO 300-056101		

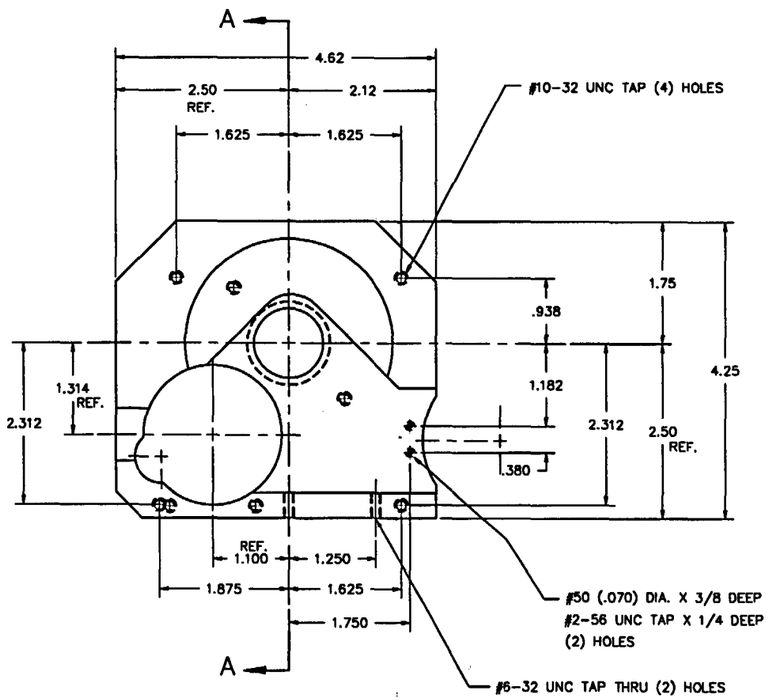
MACHINING DATA UNLESS OTHERWISE SPECIFIED		
SURFACE FINISH (MICROINCHES)	0.00	± 0.01
	0.000	± 0.005
125	FRACTIONS	± 1/16
	ANGLES	± 0.5°
PERPENDICULARITY	0.002	7/16
CONCENTRICITY	0.002 TIR	
FLATNESS	0.002	
PARALLELISM	0.002	

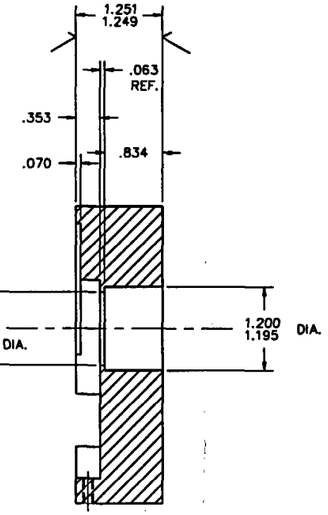
R.S.S. 12
PART 1

M:\Released\300\1456A-A.dwg, 04/03/2003 11:22:17 AM, rsantill

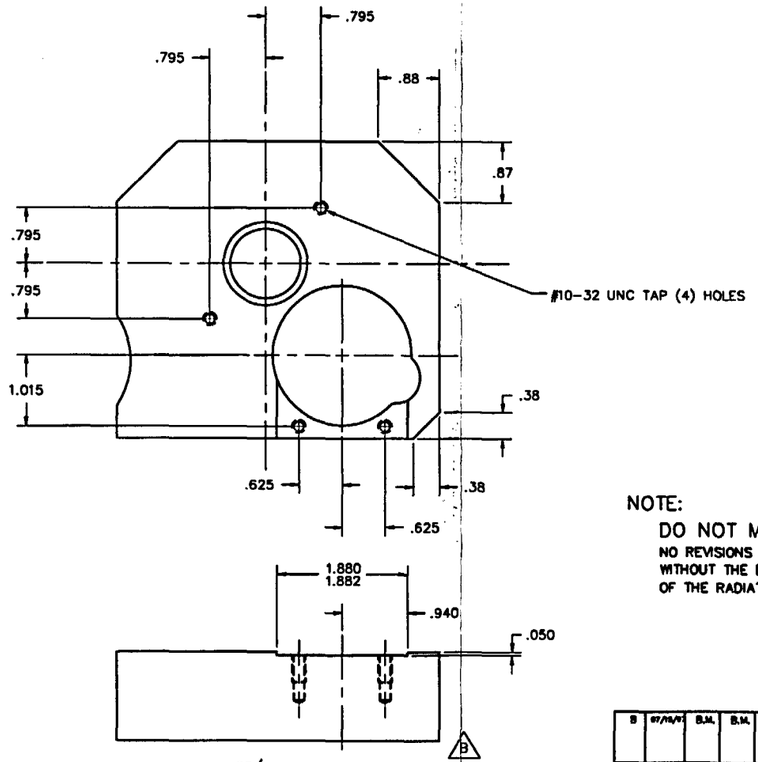


PROFILE DIMENSIONS
SCALE FULL





SECTION A – A



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ALL MACHINED SURFACES TO BE 63 FINISH
1/32 MAX TOOL RAD. IN ALL CORNERS

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-066101	B	SHUTTER HOUSING INSIDE COVER
WT./(EACH)	MATERIAL	
5.9 lbs	STAINLESS STEEL/B	
REMARKS :		

MACHINING DATA UNLESS OTHERWISE SPECIFIED		
SURFACE FINISH (MICROINCHES)	0.00	± 0.01
	0.000	± 0.005
	FRACTIONS	± 1/16
	ANGLES	± 0.5°
⊥ PERPENDICULARITY	0.002 / 10	
◎ CONCENTRICITY	0.002 TIR	
// FLATNESS	0.002	
// PARALLELISM	0.002	

REV.	DATE	BY	REL.	ECN No.	DESCRIPTION
B	07/15/97	B.M.	B.M.	3244	UPDATED DWG # TO COMPLY W/NEW DWG # SYSTEM ADD END VIEW SHOWING 1.880x.050 DP CUT MATL WAS GROUND FLAT STOCK
	DATE	NAME			
DESIGN	04/97	RSS/B.MATT			
DRAWN	04/17/97	B.MATT			
CH'D	05/02	RSS			
REL.	05/02	RSS			

TITLE :
GAMMA GAGE
SOURCE SHUTTER HOUSING
INSIDE COVER DETAIL

I²S

JOB. NO.: SCALE : FULL

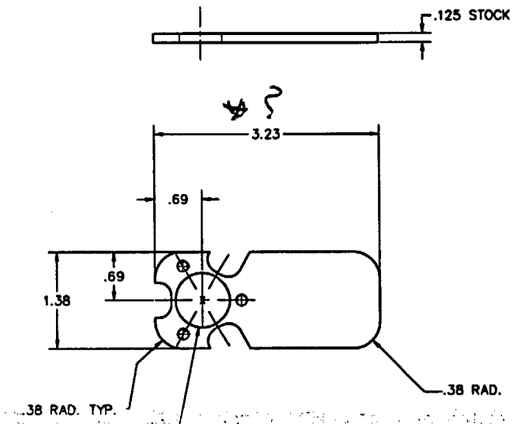
INTERGRATED INDUSTRIAL SYSTEMS
475 MAIN STREET
YALESVILLE, CONNECTICUT 06492

DWG. NO. 300-0661 ISSUE B

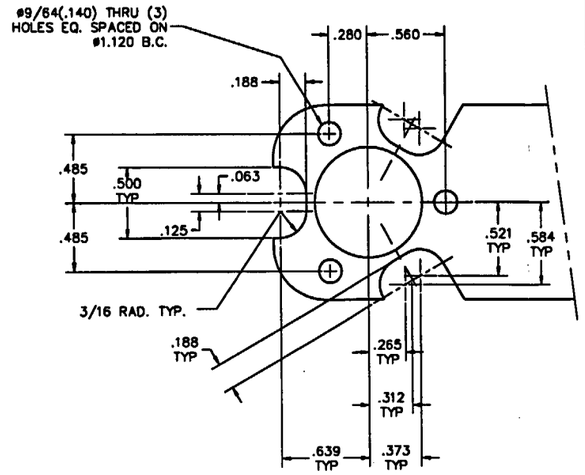
DWG Dwg: M:\RELEASED\300\0661A-B 12/01/97 15:09 RS

SHT 1 OF 1

RSS.06
PART 1



RSS.12
PART 2

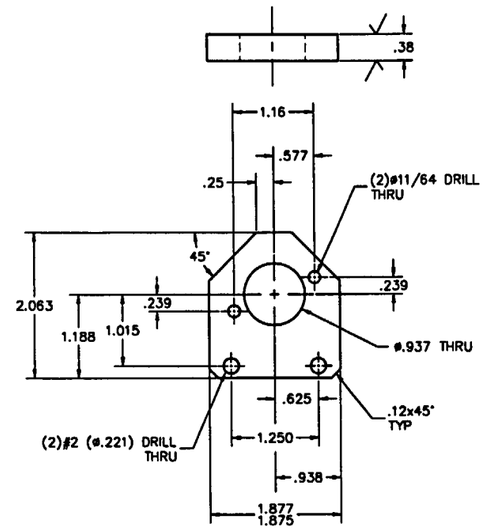


VIEW A
SCALE 2:1

FINISH ALL OVER
REMOVE ALL SHARP EDGES

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-145701	A	SOURCE HOUSING SHUTTER
WT.(EACH)	MATERIAL	
1.0 lb	C61300 BRONZE	
REMARKS :	SIMILAR TO 300-066201	

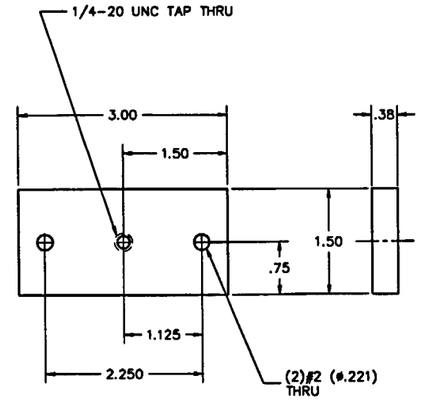
MACHINING DATA UNLESS OTHERWISE SPECIFIED		
SURFACE FINISH (MICROINCHES)	0.00	± 0.01
	0.000	± 0.005
√ = 125 √	FRACTIONS	± 1/16
	ANGLES	± 0.5°
⊥ PERPENDICULARITY	0.002	/ 10
◎ CONCENTRICITY	0.002	TIR
▱ FLATNESS	0.002	
// PARALLELISM	0.002	



FINISH ALL OVER
REMOVE ALL SHARP EDGES

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-145702	A	SOLENOID MOUNTING PLATE
WT.(EACH)	MATERIAL	
1 lb	STAINLESS STEEL	
REMARKS :	SIMILAR TO 300-066202	

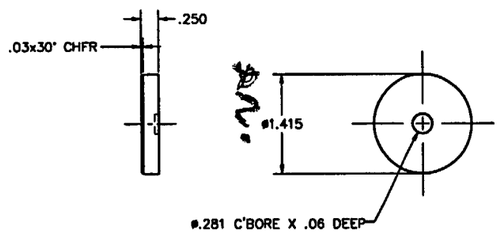
MACHINING DATA UNLESS OTHERWISE SPECIFIED		
SURFACE FINISH (MICROINCHES)	0.00	± 0.01
	0.000	± 0.005
√ = 125 √	FRACTIONS	± 1/16
	ANGLES	± 0.5°
⊥ PERPENDICULARITY	0.002	/ 10
◎ CONCENTRICITY	0.002	TIR
▱ FLATNESS	0.002	
// PARALLELISM	0.002	



FINISH ALL OVER
REMOVE ALL SHARP EDGES

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-145703	A	SOURCE COVER
WT.(EACH)	MATERIAL	
1 lb	STAINLESS STEEL	
REMARKS :	SAME AS 300-066203	

MACHINING DATA UNLESS OTHERWISE SPECIFIED		
SURFACE FINISH (MICROINCHES)	0.00	± 0.01
	0.000	± 0.005
√ = 125 √	FRACTIONS	± 1/16
	ANGLES	± 0.5°
⊥ PERPENDICULARITY	0.002	/ 10
◎ CONCENTRICITY	0.002	TIR
▱ FLATNESS	0.002	
// PARALLELISM	0.002	



RSS.12
PART 3

FINISH ALL OVER
REMOVE ALL SHARP EDGES

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-145704	A	SOURCE PLUG
WT.(EACH)	MATERIAL	
N/A	STAINLESS STEEL	
REMARKS :	SIMILAR TO 300-066204	

MACHINING DATA UNLESS OTHERWISE SPECIFIED		
SURFACE FINISH (MICROINCHES)	0.00	± 0.01
	0.000	± 0.005
√ = 125 √	FRACTIONS	± 1/16
	ANGLES	± 0.5°
⊥ PERPENDICULARITY	0.002	/ 10
◎ CONCENTRICITY	0.002	TIR
▱ FLATNESS	0.002	
// PARALLELISM	0.002	

? Removal of shutter stop and Sunte h spacer insolator

NOTE:
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Rev.	Date	By	Rel.	ECN No.	Description
A	07/10/01	RP	RS	------	FIRST ISSUE

	Date	Name
Design	07/10/01	R.PAGANO
Drawn	07/10/01	R.PAGANO
Ck'd	07/10/01	A.ARMACK
Rel.	10/23/01	A.ARMACK

Title: GAMMA GAUGE
3 CURIE SOURCE
HOUSING SHUTTER
DETAILS

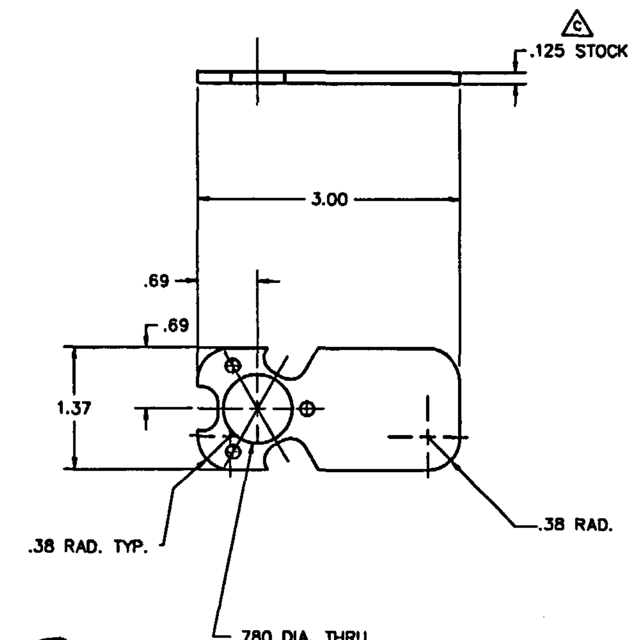
Job. No:
Scale: FULL

INTERGRATED INDUSTRIAL SYSTEMS
475 MAIN STREET
YALESVILLE, CONNECTICUT 06492

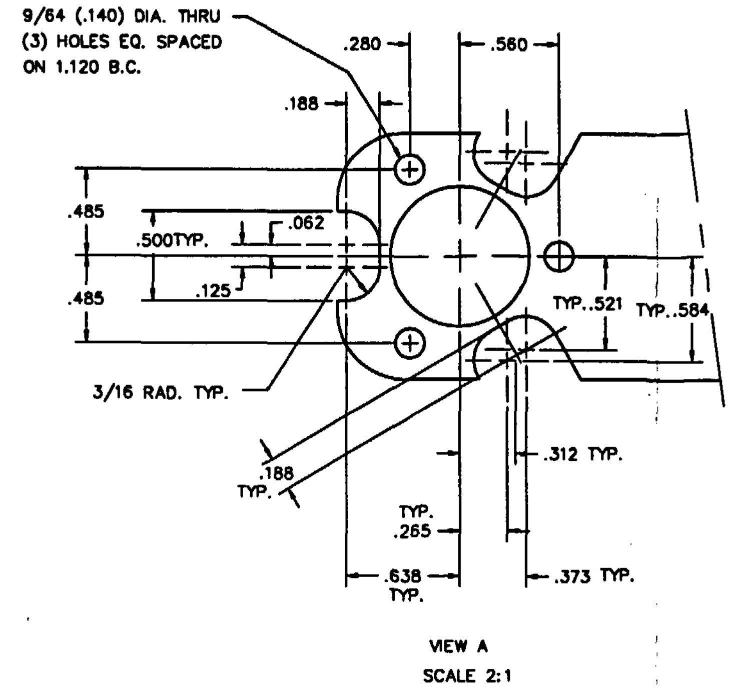
Dwg. No 300-1457 Issue A

CAD Data Stamp: M:\RELEASED\300\1457A-A 10/23/01 08:22 AA

Sheet 1 of 1

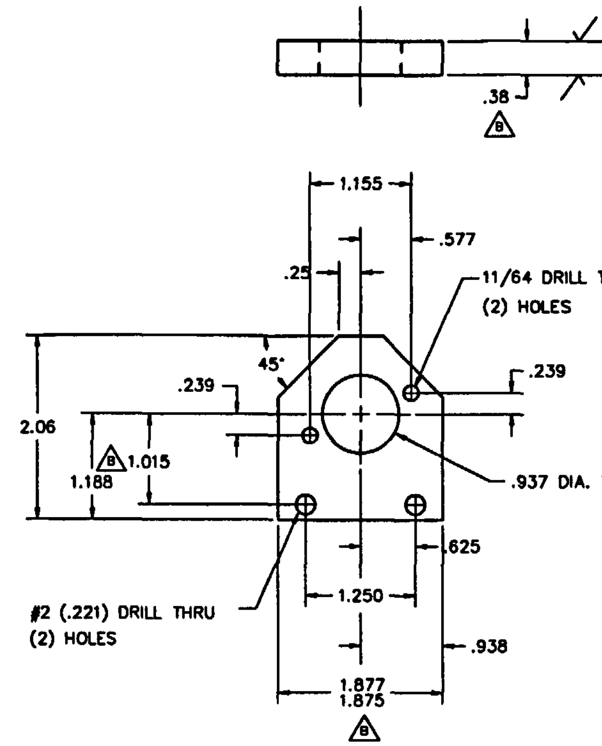


RSS. Ø6
PART 2



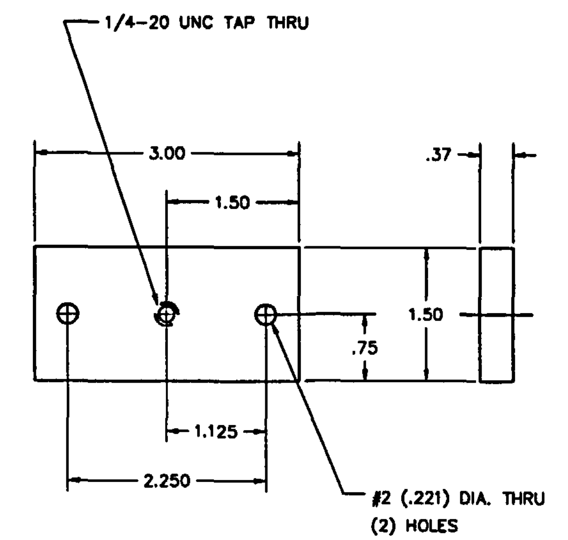
FINISH ALL OVER
REMOVE ALL SHARP EDGES

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-066201	C	SOURCE HOUSING SHUTTER
WT.(EACH)		MATERIAL
N/A		C61300 BRONZE
REMARKS :		



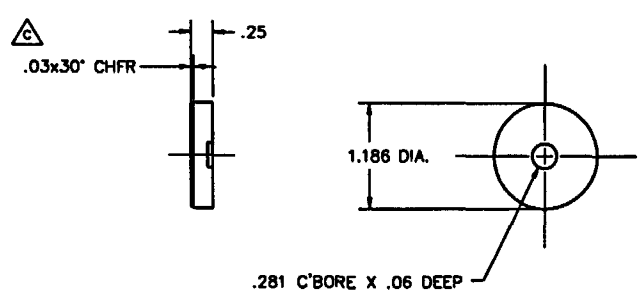
FINISH ALL OVER
REMOVE ALL SHARP EDGES

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-066202	B	SOLENOID MOUNTING PLATE
WT.(EACH)		MATERIAL
1 lb		STAINLESS STEEL
REMARKS :		



FINISH ALL OVER
REMOVE ALL SHARP EDGES

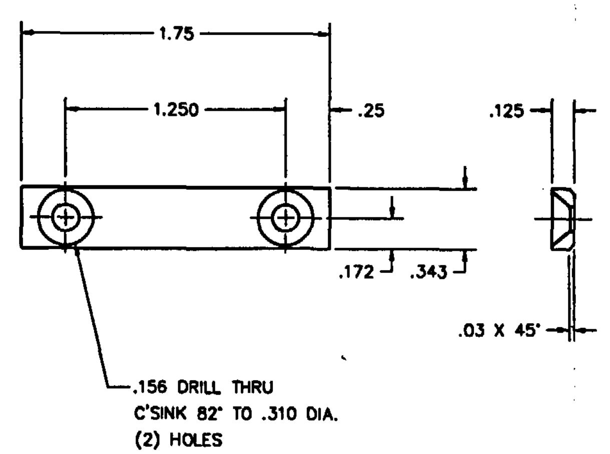
INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-066203	B	SOURCE COVER
WT.(EACH)		MATERIAL
1 lb		STAINLESS STEEL
REMARKS :		



RSS · Ø6 *? different in docket file drawing
Part 3

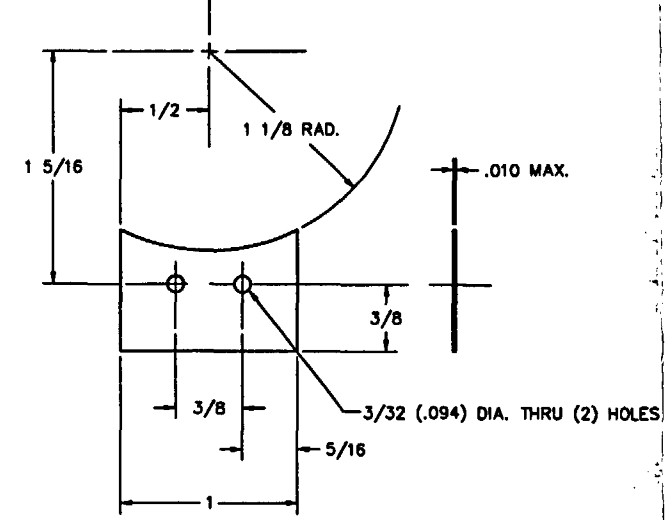
FINISH ALL OVER
REMOVE ALL SHARP EDGES

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: FULL
PART NUMBER	REV.	DESCRIPTION
300-066204	C	SOURCE PLUG
WT.(EACH)		MATERIAL
N/A		STAINLESS STEEL
REMARKS :		



FINISH ALL OVER
REMOVE ALL SHARP EDGES

INTERGRATED INDUSTRIAL SYSTEMS		SCALE: 2=1
PART NUMBER	REV.	DESCRIPTION
300-066205	B	SHUTTER STOP
WT.(EACH)		MATERIAL
N/A		ALUM.
REMARKS :		



INTERGRATED INDUSTRIAL SYSTEMS		SCALE: 2=1
PART NUMBER	REV.	DESCRIPTION
300-066206	B	SWITCH SPACER INSOLATOR
WT.(EACH)		MATERIAL
N/A		PLASTIC SHIM STOCK
REMARKS :		

MACHINING DATA (each part)
UNLESS OTHERWISE SPECIFIED

SURFACE FINISH (MICRONCHES) 125	0.00	± 0.01
	0.000	± 0.005
	FRACTIONS	± 1/16
	ANGLES	± 0.5°
PERPENDICULARITY	0.002	
CONCENTRICITY	0.002	TIR
FLATNESS	0.002	
PARALLELISM	0.002	

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OF THE RADIATION PROGRAM DIRECTOR

REV.	DATE	BY	REL.	ECN No.	DESCRIPTION
C	09/25/97	C.J.	C.J.	3408	-01 THK WAS .12" STOCK; -04 CHFR WAS .031"
B	07/16/97	B.M.	B.M.	3244	[illegible]

	DATE	NAME
DESIGN		RSS/B.MAT
DRAWN	4/22/97	B.MATT
CKD		RSS
REL		RSS

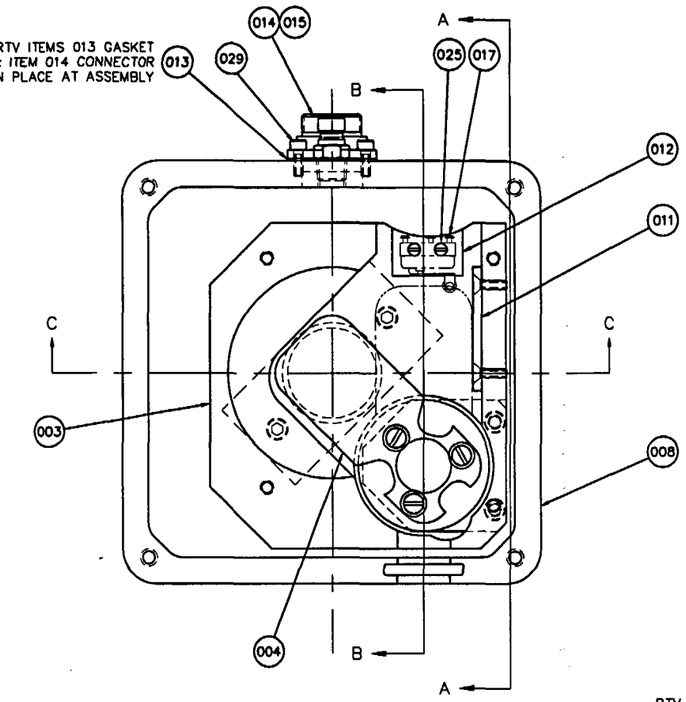
TITLE : GAMMA GAGE SOURCE HOUSING SHUTTER DETAILS

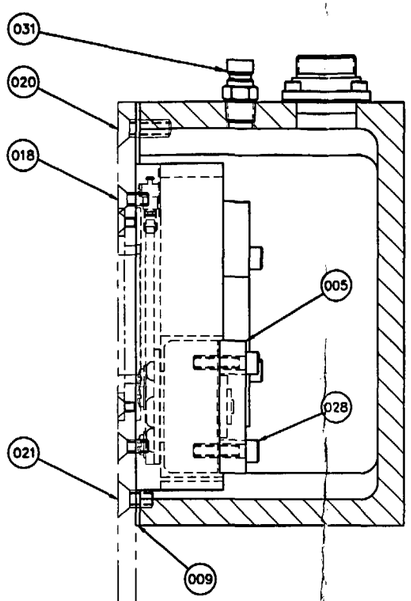
INTERGRATED INDUSTRIAL SYSTEMS
475 MAIN STREET
YALESVILLE, CONNECTICUT 06492

SCALE : FULL
DWG. NO. 300-0662
ISSUE C
SHT 1 OF 1

M:\RELEASED\300\0662A-C 12/01/97 15:11 RS

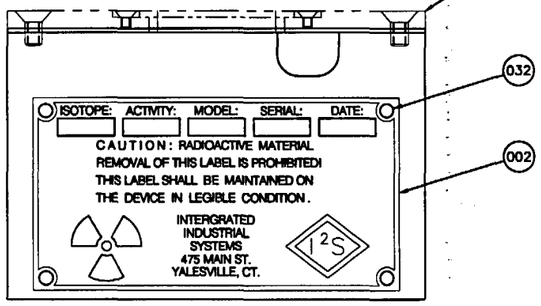
M:\Released\300\0662A-C.dwg, 04/03/2003 11:21:27 AM, rsantill

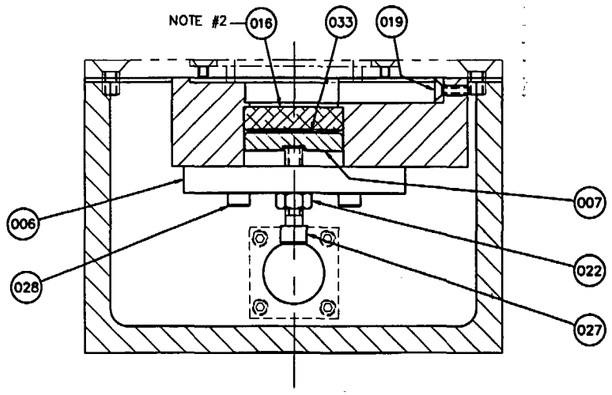




SECTION "AA"

RTV COVER IN PLACE AT ASSEMBLY
SEE 300-0664 FOR ITEM 001
SOURCE HOUSING TOP COVER
AND TARGET HOLDER ASSEMBLY





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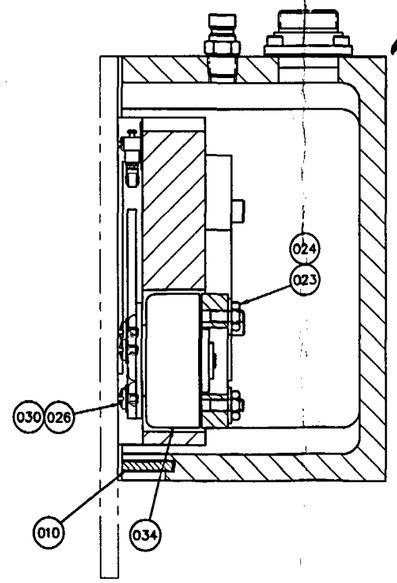


SECTION "BB"

RSS.12
PART 4 →

Assy. BOM Title: 3 CURIE SOURCE HOUSING SHUTTER ASSEMBLY				ASSY. BOM #: 300-1455			Page 1 of 2
Customer:		Lot #:		Spare BOM #:			Units Req'd: 1
Released By:		Released Date:		HP Date:		Rev: B	Job #:

Item	I²S Part No.	Qty.	Total Qty.	Description	ASR	Type	Order No.	Remarks
001	A300-0684	1		TARGET HOLDER ASSEMBLY		M		
002	M300-093301	1		GAMMA GAGE CAUTION LABEL		P		
003	M300-145601	1		SHUTTER HOUSING INSIDE COVER		M		
004	M300-145701	1		SOURCE HOUSING SHUTTER		M		
005	M300-145702	1		SOLENOID MOUNTING PLATE		M		
006	M300-145703	1		SOURCE COVER		M		
007	M300-145704	1		SOURCE PLUG		M		
008	M300-145801	1		SOURCE HOUSING		M		
009	M300-145802	1		COVER GASKET		M		
010	M300-145803	1		SIGHT GLASS		M		
011	M300-145901	1		SHUTTER STOP		M		
012	M300-145902	1		SWITCH SPACER INSOLATOR		M		
013	M300-145903	1		GASKET CONNECTOR		M		
014	ECON 17014M03	1		SPIRIT BACKSHELL SQ FLNG MOLEX#17014M03		P		
015	ECON 17102M03	1		FRONT SHELL RECEPTACLE MOLEX# 17102M03		P		
B 018	ELFE AMC.30	1		SOURCE 3000MCI AM241 #AMC.30 OR #AM1.055		PD		
017	ESW 1115M2-T	1		INTEGRAL LEAF SW MICROSWITCH#1115M2-T		P		
018	FFHSCS 10-32X0.43	4		FLAT HEAD SOC CAP SCREW #10-32 X 7/16		P		
019	FFHSCS 6-32X0.5	2		FLAT HEAD SOC CAP SCREW 6-32 X 1/2		P		
020	FFHSCSTP1/4-20X.75	2		FLAT HEAD SOC CAP TAMPER PRF1/4-20X3/4		P		
021	FFHSCSTP1/4-20X0.5	2		FLAT HEAD SOC CAP TAMPER PRF1/4-20X1/2		P		
022	FJAMNUT 1/4-20	1		JAM NUT 1/4-20		P		
023	FJAMNUT 8-32	2		JAM NUT #8-32		P		
024	FLW #8	2		SPLIT LOCKWASHER #8		P		
025	FPHMS 2-56X0.43	2		PAN HEAD MACH SCREW 2-56 X 7/16		P		

Substitutions Allowed Unless Otherwise Noted

Assy. BOM Title: 3 CURIE SOURCE HOUSING SHUTTER ASSEMBLY				ASSY. BOM #: 300-1455			Page 2 of 2
Customer:		Lot #:		Spare BOM #:			Units Req'd: 1
Released By:		Released Date:		HP Date:		Rev: B	Job #:

Item	I²S Part No.	Qty.	Total Qty.	Description	ASR	Type	Order No.	Remarks
026	FPHMS 6-32X0.18	3		PAN HEAD MACH SCREW 6-32 X 3/16		P		
027	FSHCS 1/4-20X1.12	1		SOC HEAD CAP SCREW 1/4-20 X 1 1/8		P		
028	FSHCS 10-32X0.75	4		SOC HEAD CAP SCREW 10-32 X 3/4		P		
029	FSHCS 6-32X0.37	4		SOC HEAD CAP SCREW 6-32 X 3/8		P		
030	FW #6	3		FLATWASHER #6		P		
031	HF PN251	1		FITTING QUICK DISC NIPPLE PK/PN251		P		
032	MHDWR 90081A078	4		#2 DRIVE SCREW 3/16 MCMASTER/90081A078		P		
033	MHDWR W1351-015	1		WAVE SPRING WASHER ASSOC SPRING/W1351-015		P		
034	ESOL 195-180-001	1		ROTARY SOL.55 12SVDC LL.#129-180-001		PD		

Substitutions Allowed Unless Otherwise Noted

NOTES:

1-DO NOT MODIFY THIS DRAWING !
NO REVISIONS ARE TO BE MADE TO THIS DRAWING
WITHOUT THE EXPRESSED WRITTEN CONSENT
OF THE RADIATION PROGRAM DIRECTOR

2-AMERSHAM AMC.30 AND BEBIG AM1.G55
SOURCE CAPSULES ARE INTERCHANGEABLE

Rev.	Date	By	Ref.	ECN No.	Description
B	04/02/03	ARM	RS	6832	IT#016 DESC was SOURCE 1000MCI
A	07/15/01	RP	RS	-----	FIRST ISSUE

	Date	Name
Design	07/09/01	RSS/RJP
Drawn	07/09/01	R.PAGANO
Ck'd	07/13/01	A.APMACK
Rel.	07/20/01	L.KINNEY

Title: GAMMA GAUGE 3 CURIE SOURCE HOUSING SHUTTER ASSEMBLY

Job. No:

Scale: FULL

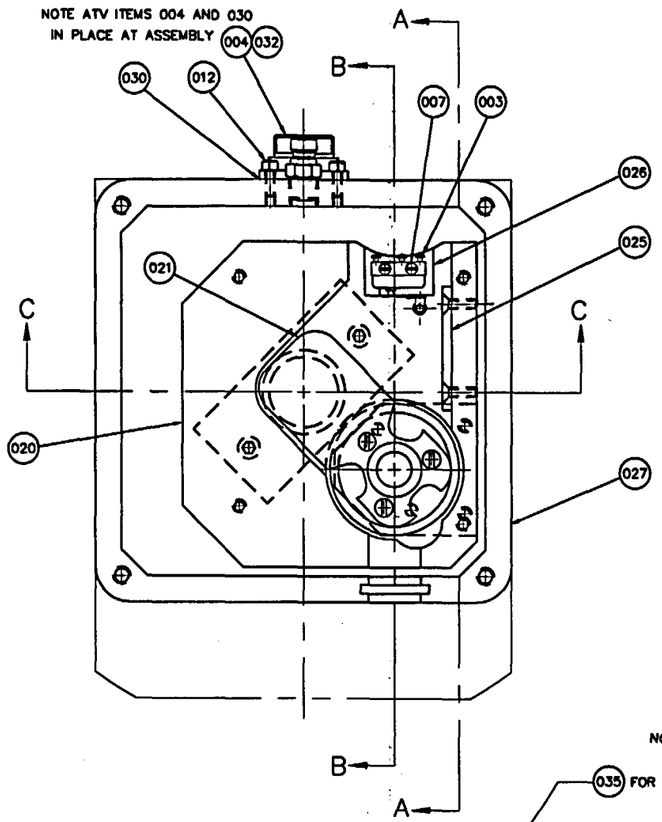
INTERGRATED INDUSTRIAL SYSTEMS
475 MAIN STREET
YALESVILLE, CONNECTICUT 06492

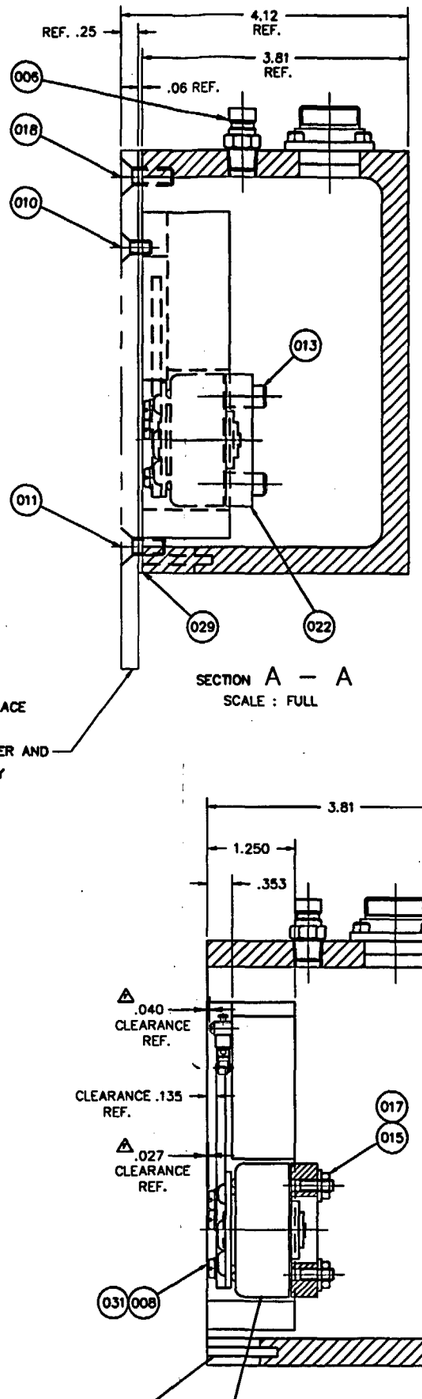
Dwg. No 300-1455 Issue B

CAD Data Drawing: M:\PENDING\300\1455A-B.dwg 04/02/03 12:07 AM

Sheet 1 of 1

M:\PENDING\300\1455A-B.dwg, 04/02/2003 12:50:38 PM, aarmack1

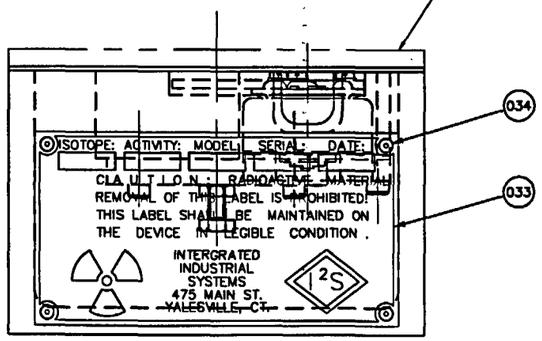


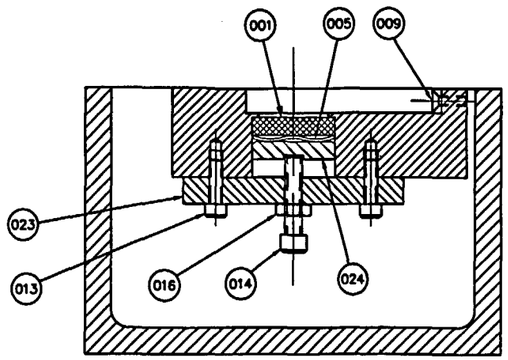


SECTION A – A
SCALE : FULL

RSS.06
PART 4

NOTE: ATV TOP COVER IN PLACE
AT ASSEMBLY
035 FOR SOURCE HOUSING TOP COVER AND
TARGET HOLDER ASSEMBLY
SEE DRAWING 300-0664





SECTION C – C
SCALE : FULL

SECTION B – B
SCALE : FULL

NOTE: AMERSHAM AMC.19 AND BEBIG AM1.G44
⚠ SOURCE CAPSULES ARE INTERCHANGEABLE

NOTE:
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OF THE RADIATION PROGRAM DIRECTOR

ASSY. B.O.M. TITLE : SOURCE HOUSING SHUTTER ASSEMBLY				B.O.M. # : 300-0660		PG. 1 OF 2
CUSTOMER :		LOT # :		SPARE B.O.M. # :		UNITS REQ'D: 1
RELEASED BY :		RELEASED DATE :		HP DATE : 04/20/98	REV.: G	JOB # :

ITEM	I2S PART NO.	QTY.	I. QTY.	DESCRIPTION	A.B.R.	TYPE	ORDER NO.	REMARKS
⚠ 001	ELFE AMC.19	1		SOURCE 1000MCI AM241 #AMC.19 OR #AM1.G44		P		
⚠ 002	ESOL 195-180-001	1		ROTARY SOL.9S 12VDC L.L.#129-180-001		PD		
003	ESW 111SM2-T	1		INTEGRAL LEAF SW MICROSWITCH#111SM2-T		P		
004	ECON 17014M03	1		SPIRIT BACKSHELL SQ FLNG MOLEX1#17014M03		P		
005	[illegible]	[illegible]		[illegible]		P		
006	HF PN251	1		FITTING QUICK DISC NIPPLE PK(#PN251		P		
007	FPHMS 2-56X0.45	2		PAN HEAD MACH SCREW 2-56 X 7/16		P		
008	FPHMS 6-32X0.16	3		PAN HEAD MACH SCREW 6-32 X 3/16		P		
009	FTHSCS 6-32X0.5	2		FLAT HEAD SOC CAP SCREW 6-32 X 1/2		P		
010	FTHSCS 10-32X0.43	4		FLAT HEAD SOC CAP SCREW #10-32 X 7/16		P		
⚠ 011	FTHSCSTP1/4-20X0.5	2		FLAT HEAD SOC CAP TAMPER PRF1/4-20X1/2		P		
012	FSHCS 6-32X0.37	4		SOC HEAD CAP SCREW 6-32 X 3/8		P		
⚠ 013	FSHCS 10-32X0.75	2		SOC HEAD CAP SCREW 10-32 X 3/4		P		
014	FSHCS 1/4-20X1.12	1		SOC HEAD CAP SCREW 1/4-20 X 1 1/8		P		
015	FJAMNUT 6-32	2		JAM NUT #6-32		P		
016	FJAMNUT 1/4-20	1		JAM NUT 1/4-20		P		
017	FLW #6	2		SPLIT LOCKWASHER #6		P		
⚠ 018	FTHSCSTP1/4-20X.75	2		FLAT HEAD SOC CAP TAMPER PRF1/4-20X3/4		P		
⚠ 020	M300-066101	1		SHUTTER HOUSING INSIDE COVER		M		
⚠ 021	M300-066201	1		SOURCE HOUSING SHUTTER		M		
⚠ 022	M300-066202	1		SOLENOID MOUNTING PLATE		M		
⚠ 023	M300-066203	1		SOURCE COVER		M		
⚠ 024	M300-066204	1		SOURCE PLUG		M		
⚠ 025	M300-066205	1		SHUTTER STOP		M		
⚠ 026	M300-066206	1		SWITCH SPACER INSULATOR		M		

ASSY. B.O.M. TITLE : SOURCE HOUSING SHUTTER ASSEMBLY				B.O.M. # : 300-0660		PG. 2 OF 2
CUSTOMER :		LOT # :		SPARE B.O.M. # :		UNITS REQ'D: 1
RELEASED BY :		RELEASED DATE :		HP DATE : 04/20/98	REV.: G	JOB # :

ITEM	I2S PART NO.	QTY.	I. QTY.	DESCRIPTION	A.B.R.	TYPE	ORDER NO.	REMARKS
⚠ 027	M300-066301	1		SOURCE HOUSING		M		
⚠ 028	M300-066302	1		SIGHT GLASS		M		
⚠ 029	M300-066303	1		GASKET COVER		M		
⚠ 030	M300-066304	1		GASKET CONNECTOR		M		
⚠ 031	FW #8	3		FLATWASHER #8		P		
⚠ 032	ECON 17102M03	1		FRONT SHELL RECEPTACLE MOLEX# 17102M03		P		
⚠ 033	M300-093301	1		GAMMA GAGE CAUTION LABEL		P		
⚠ 034	MNDWR 90081A078	4		#2 DRIVE SCREW 5/16 MCMASTER#90081A078		P		
035	A300-0664	1		TARGET HOLDER ASSEMBLY		M		

REV.	DATE	BY	REL.	ECN No.	DESCRIPTION
G	04/20/98	B.M.	R.S.	3934	ADDED INTERCHANGEABLE SOURCE NOTE, IT 001 WAS SOURCE 1000mCi AM241 AMERSHAM#AMC.19
F	09/22/97	C.J.	C.J.	3408	ITEM 013 QTY WAS 4, ITEM 031 WAS M300-066305 ITEM 002 WAS PT#195-242-001, CLEAR. WAS .040/.053, .012/.027
E	07/23/97	B.M.	B.M.	3244	DRAWING # UPDATED TO COMPLY WITH NEW DRAWING # SYSTEM
D	12/02/96	B.MATT	B.MATT	2709	ITEM 032 ECON 17102M03 WAS ECON 17103M03
C	06/24/96	B.M.	B.M.	2464	ITEM 032 ECON 17104M03 WAS ECON 17103M03 ITEM 011 1/4-20 X 1/2 WAS #10-32 X 1/2 ITEM 018 1/4-20 X 3/4 WAS #10 -32 X 3/4
B	11/28/95	B.MATT	B.MATT	2208	ITEM 033 300-093301 WAS 300-755 PART NO'S REASSIGNED NEW ITEM NO'S

	DATE	NAME
DESIGN	04/95	RSS/B.MAT
DRAWN	04/95/95	B.MATT
CHK'D	04/95	RSS
REL.	04/95	RSS

TITLE :
GAMMA GAGE
SOURCE HOUSING SHUTTER
ASSEMBLY

JOB NO.: SCALE : FULL

INTERGRATED INDUSTRIAL SYSTEMS
475 MAIN STREET
YALESVILLE, CONNECTICUT 06492

DWG. NO. 300-0660 ISSUE G

SHT 1 OF 1

Dwg Path: M:\RELEASED\300\0660A-G 04/20/98 14:58 PL

Leak Testing

Leak testing must be performed every six months. Remember to take the following to the job site:

1. Cotton swabs (one per gage).
2. Zip-lock bags for swabs (one per gage).
3. Leak test forms (one per gage).
4. Source on/off lamps (both switch and gage indicators).

The steps to take are:

1. Fill out form with all heading information. Mark down all serial numbers: the one on the source, the one on the frame, the one on the head (put this one at the bottom of the form) and the $I^{2}S$ serial number (if there is one). Remember there is one form per gage.

2. Inspect source on/off indicator lamps and operation. Mark down results on form.

3. Wipe area around source window with wet cotton swab.

4. Put swab in zip-lock bag along with a note telling which gage the wipe came from.

5. Get purchase order number.

6. Give customer one of the customer copies (yellow). The other customer copy gets filled in at the shop and is then sent to the customer.

7. Back at the stop the swabs are to be tested.

8. Get a note pad, pencil, a calculator and the G.M. meter.

9. Calibrate the G.M. meter: find the meter efficiency (see below).

10. See if there is any reading from the swabs. Mark down the counts per minute read from the swabs on your note pad.

11. Divide the counts by the efficiency factor.

12. Divide the results of step 11 by 2.2×10^{12}. This number is the number of curies on the swab.

13. A source is considered to be leaking if the number of curies on the swab is greater than 5×10^{-9} curies. If there is any reading at all above background radiation contact Craig Godwin immediately.

14. If the swab is less than that (which it should be) mark on the form under Laboratory Inspection - Source that the reading is less than 5 nanocuries.

15. With this filled out on the form, the final customer copy can be sent to the customer. The other two copies should be given to Craig Godwin.

16. That's it.

NOTE: A more detailed description appears later in the manual.

GM Meter Calibration

This must be done before every leak test, and checked again after the test to make sure the number did not change. If they do change, start the calibration and leak test over again. You will need:

1. The GM meter.
2. A note pad, pencil and calculator.
3. The two check sources

NOTE: HANDLE THE TWO CHECK SOURCES ONLY BY THE EDGES AND RETURN THEM TO THEIR CASES AFTER USE.

The steps to take are:

1. Check the battery in the meter. Remove probe cover slow response.
2. Hold the 5 nanocurie check source up against the GM tube end so that it covers it completely. This is with the silver side facing the tube and with the writing away from it. Note: the five nanocurie source is the one made by IPL.

3. Read how many counts per minute are coming off of the source.

4. Divide this number by 4980.

5. This is the efficiency of the meter. If the meter was perfect it would read the number of counts that the source gives off and this would be equal to the number of curies in the source times the number of counts per curie. For our meter the efficiency should be about .5.

6. This efficiency factor is the one to use for the leak test.

NOTE: A more detailed description appears later in this manual.

Site Survey Procedure

A site survey is usually done once, when the gage is installed. It also must be repeated if the physical situation of the gage changes in such a way that people have closer and longer contact with it. We will perform the site survey when we do our first source wipe of a gage. Remember that each gage is a separate device, so if a mill has two gages there must be two surveys.

The things you need are:

1. Note pad, pencil and calculator.
2. Site survey forms, one per gage.
3. The survey meter
4. Tape measure.
5. Film badge.

The procedure is: (read them all before doing anything)

1. Wear your film badge.

2. With the source on and nothing in the gap, measure the mrems/hr from the gage at distances of 1, 2, 3, 5 and 10 feet.

3. Do the 10 foot measurement first. If there is a reading there is something wrong with the meter or you are too near another radiation source. Correct the situation if this occurs.

4. Do all of these measurements first with the beta shield in place. These are the body exposure readings. Then repeat these measurements with the shield off. These are the skin measurements. Mark all of the readings on the form.

5. With the mill in operation measure the time the operator and helper(s) are within 1, 2, 3, 5 feet of the gage. Calculate how many hours per shift they are at these distances.

6. Multiply these by 65 shifts per quarter.

7. Multiply each time by the mrems at each distance.

8. Add all these numbers up. This is the number of mrems received per quarter. Mark these numbers on the form at the bottom left.

9. The limit for a general licensee is 750 mrems per quarter for the skin, 125 mrems per quarter for the whole body and 1875 mrems per quarter for the hands. Mark these numbers on the bottom left of the form.

10. The numbers on the left should be less than the meters on the right by a good margin. If not check your math.

11. There is an example on the next page.

12. Make sure the rest of the form is filled out and give yellow copy to the customer. The other copies should go to Craig Godwin.

13. That's it.

EXAMPLE OF SITE SURVEY

This example follows the sample form on the next page.

The readings at the various distances are recorded on the form.

It was found that the most time anyone spent near the gage was the helper. He spent:

1/2 hour per shift at 1 foot from the gage.
1 hour per shift at 2 feet from the gage.
2 hours per shift at 3 feet from the gage.

So multiplying these by 65 shifts per quarter gives:

32.5 hours/quarter at 1 foot.
65 hours/quarter at 2 feet.
130 hours/quarter at 3 feet.

Multiplying each of these by the mrems/hr for the skin at each distance gives:

32.5 hours/quarter x 1.0 mrems/hr = 32.5 mrems/quarter
65 hours/quarter x .4 mrems/hr = 26 mrems/quarter
130 hours/quarter x .1 mrems/hr = 13 mrems/quarter

Adding all of these up gives a total of 71.5 mrems/quarter which is far less than the allowable amount.

The same procedure is followed for the whole body exposure.

MAINTENANCE AND REPAIR
OF DEVICE SHUTTER MECHANISM.

We intend to perform maintenance on the shutter actuating mechanism of the device. When shutter mechanism repairs are necessary at the customers'site, the following procedure shall be followed.

1. A film badge shall be worn.

2. Before turning off power, be sure shutter switch is off and green light on gauge is on, indicating shutter is closed.

3. Remove power from system and lock out.

4. Check window on left side of source housing with flashlight. If Shutter is closed, a green mark will be visible.

5. Measure radiation at top of preamp housing with surveyor meter. If shutter is closed, reading will be less than .6 mRem. (.3 mRem typical).

6. Remove device from frame.

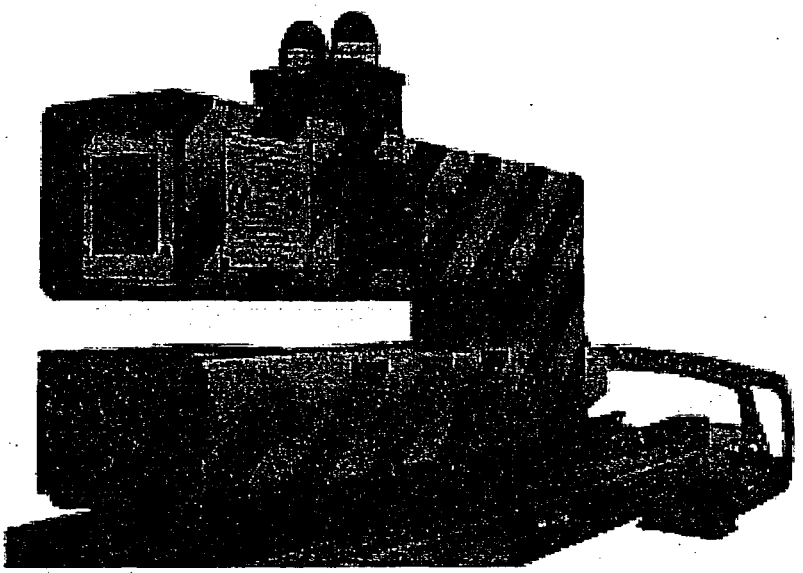
7. Remove 4 screws holding top plate on device.

8. Turn the top plate over so that it lays face down on a lead plate. This plate should measure six by six inches and one half inch thick. The top plate should be positioned to ensure that the source window is completely covered by the lead plate. Do not remove lead shield from source at any time.

NOTE: We have the attitude that "any exposure is too much." Therefore, take care not to point the source window in your direction or at any other personnel. Make sure that while working on the shutter mechanism, the window is always facing down, preventing unauthorized persons from exposure .

9. When reinstalling device, be sure that shutter mechanism operates properly and all indicators are working properly.

INTERGRATED INDUSTRIAL SYSTEMS
475 MAIN STREET, YALESVILLE, CT 06492 U.S.A.
TEL.: (203) 265-5684 FAX: (203) 284-1819



GAUGE SIGNAL PROCESSING UNIT MANUAL

VERSION V9804 - May 1998

!WARNING!

IMPORTANT NOTICE

Proper operation of all mill safety features are to be verified **<u>BEFORE</u>** operating equipment

TABLE of CONTENTS

1.0 FEATURES

The typical I2S Gamma Gauge system is shown in *Figure 1.*

The main parts of the system are 2 Gamma Gauge C-frames which are mounted on the mill or the processing line in such way that the measured material (sheet) passes through the measuring gap. The C-frames can be traversed *"On"* or *"Off"* the measured sheet.

The lower part of the C-frame contains the Americium source, the upper part houses the detector assembly.

The signal from the detector is processed by the Gauge Signal Processing Unit (GSP) which is designed to serve two gauges. The connection between the gauges and the GSP is facilitated by the Junction Box, which is typically mounted in proximity to both gauges. The GSP is connected to the junction box by 2 cables.

The GSP is based on an IBM compatible computer with 486DX-33 processor and the ISA bus. Besides the usual peripherals, floppy disks and hard disk drive, it is equipped with a touch screen CRT which serves as a display and the operator control panel. The touch screen CRT provides means of setting the composition and nominal value of the gauges, turning the sources *"On"* and *"Off"*, performing the standardization, setup and diagnostics. It also displays the actual thickness, deviation from the nominal and error messages.

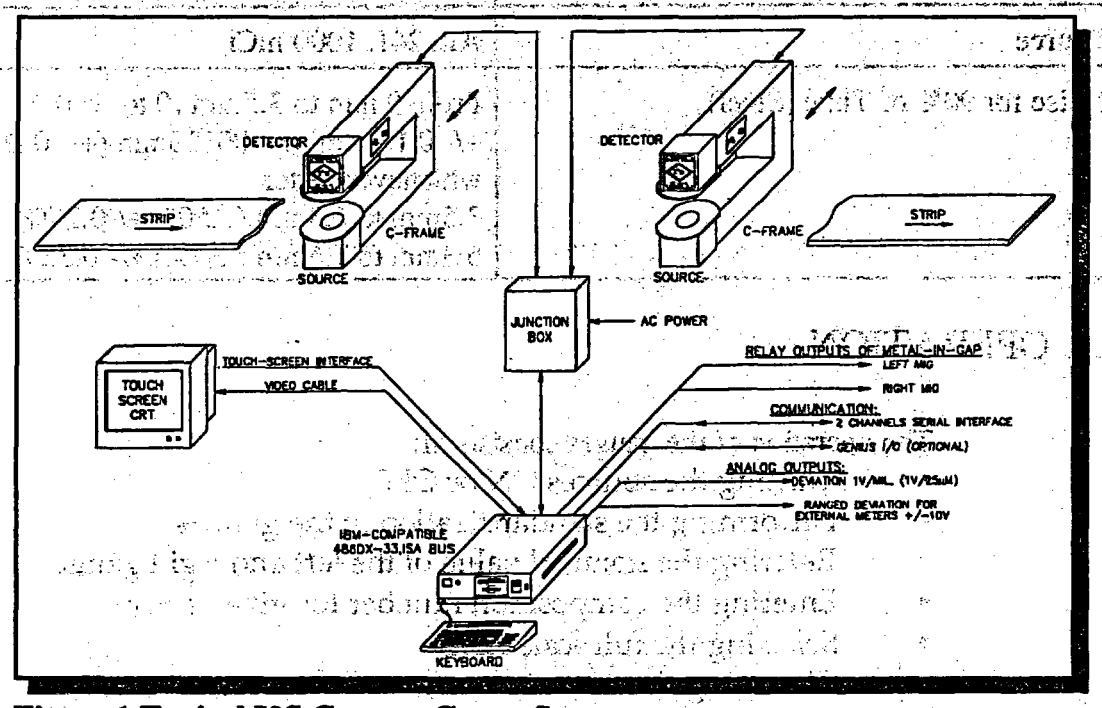


Figure 1 Typical I2S Gamma Gauge System

The GSP software is equipped with the **SETUP** screens to provide easy means of customizing and testing. The access to the **SETUP** screens is protected by a security code.

The setup of the GSP can be saved on disk, restored or printed out. The serial interface and the optional GE Fanuc GENIUS interface are provided to communicate with the host computer or other subsystems.

The deviation signal is provided in the analog form at the fixed scale factor of 1 Volt / mil
(1 Volt / 25 μm if the Metric operation is selected).

To accommodate the external deviation meters with 3 ranges, a ranged voltage output is provided.

2.0. I²S GAUGE SPECIFICATIONS

Power Requirements	115VAC - +/- 10% - 60Hz - 3 Amp.
Temperature	0 - 40 Degrees C
Range - Steel	7.6mm (.300")
Range - Copper	5mm (.200")
Air Gap	75mm (3")
Accuracy	+/- 0.20% or +/-0.00003, Whichever Greater
Source	Am 241, 1000 mCi
Noise for 90% of Time (Steel)	From 0 mm to 3.5mm (0 to .140") +/- 0.10% or +/- .00125mm (+/- 0.00005") whichever better 3.5mm to 6.3mm (.250") +/-0.25% 6.3mm to 7.6mm (.300") +/- 0.35%

3.0. OPERATION

The operation of the gauges consists of:

- Turning the sources ON or OFF
- Performing the standardization of the gauges
- Entering the nominal value of the left and right gauge
- Entering the composition number for given alloy
- Selecting the full scale range
- Observing the deviation meters and recorders

These steps are most often performed manually by the operator. It is also

possible to operate the gauges entirely from an external computer. This can be done by either a serial connection or optionally via the GE Fanuc Genius bus. This allows the host computer to read and write the set gauges for example.

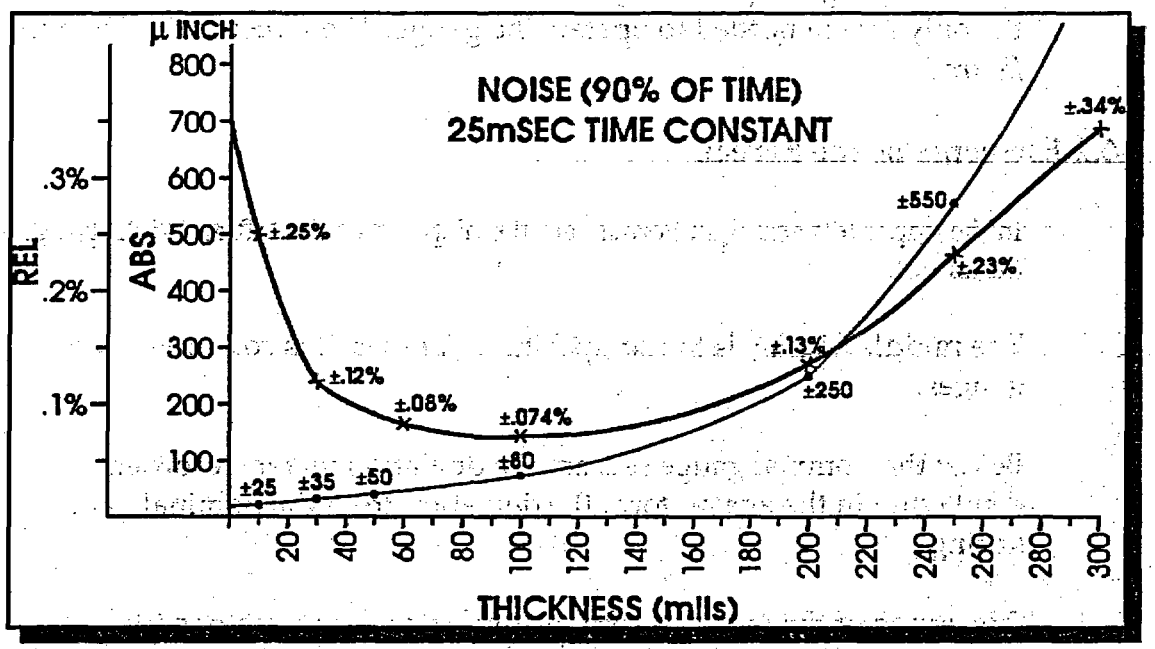


Figure 2 Noise vs. Thickness for Steel - English

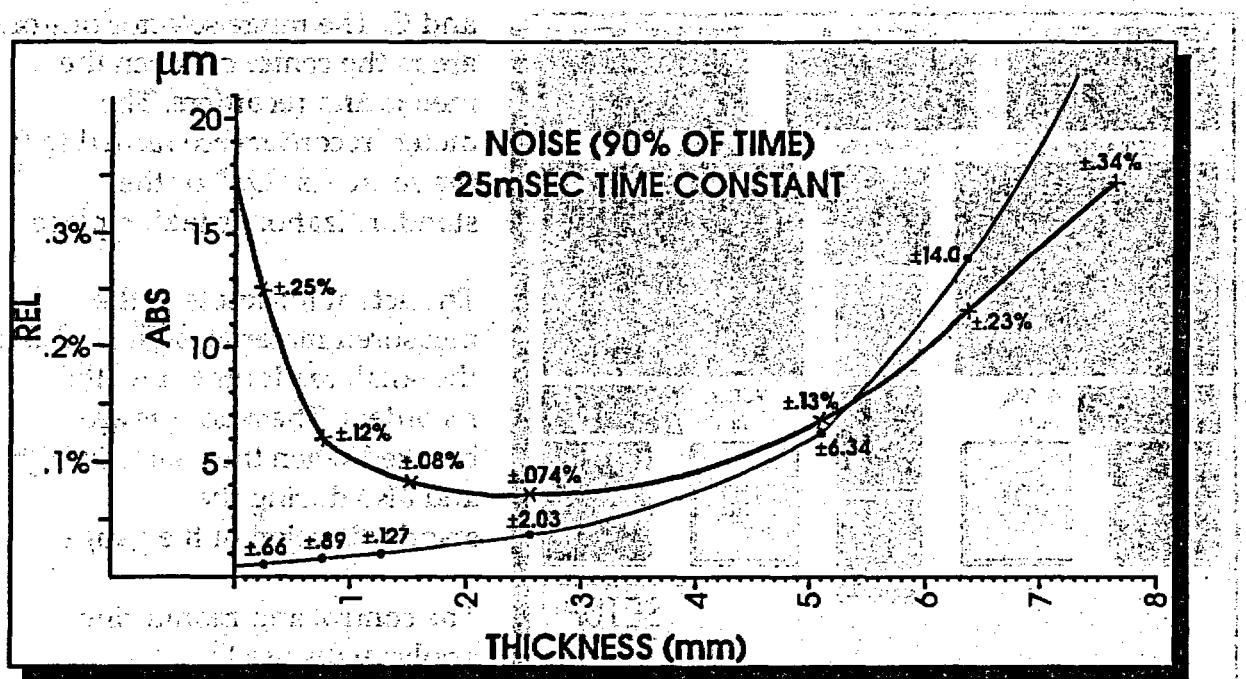


Figure 3 Noise vs. Thickness for Steel - Metric

4.0 MANUAL OPERATION

4.1 Operator Panel

The GSP program powers up in the OPERATOR PANEL screen. This is the only screen needed to operate the gauge. The screen is depicted in *figure 3.*

4.2 Elements of the Screen

In the upper left and right corners are the displays of the left and right gauge set (nominal).

The middle display is the composition number. It is common to both gauges.

Below the nominal gauge sets are the deviation meter/recorders displaying in the analog form the deviation from the nominal gauge setting.

The range of the meter/recorders is selectable. The meter scale graduations match the selected range.

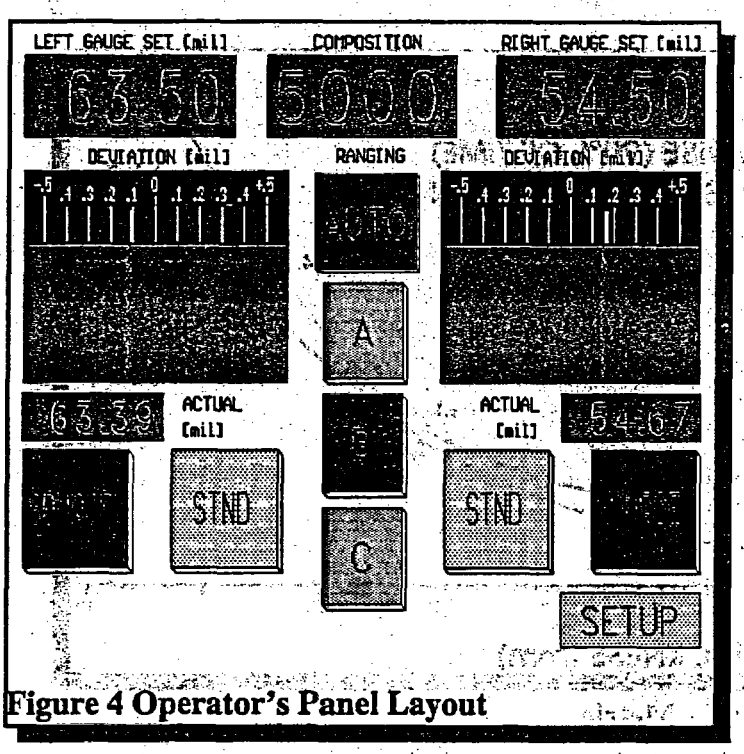


Figure 4 Operator's Panel Layout

There are 3 ranges labeled A, B and C. The range selector buttons are in the center between the meters and recorders. The meter/recorders are turned to 0 if the source is *"Off"* or the standardization is taking place.

The actual thickness of the measured material is displayed in the small readouts below the recorders. The readouts are blanked when the source is *"Off"* and also during the standardization of the gauge.

The control and monitoring applications use the nominal-deviation format of thickness rather than the single number representing the actual dimension. This is why the gauge set and deviation displays dominate the

screen, while the actual thickness is a relatively small item.

SOURCE and *STND* buttons form the horizontal row of large buttons at the bottom of the screen.

The SETUP field in the lower right corner is the entry into the MENU screen. If touched, the message line below will prompt for the security code. The acceptance or rejection of the code will be acknowledged. If the code was accepted, the subsequent touch of the SETUP field will open the MENU screen.

4.3 Selecting the Entries

The gauge set and composition displays can be selected for entry of new quantity by simply touching the values you wish to change. The frame of the selected display will be highlighted and a large numeric keypad will pop out in the middle of the screen. *See Figure 4.*

The principal means of selecting and entering the numbers is the touch screen, though everything can also be done using the computer keyboard. To use the keyboard:

- the selection of the display is done by means of the cursor control keys
- to toggle the selection *"On"* and *"Off"*, use the *SPACE* key
- to enter numbers, use numerical keys of the main keyboard (not the number keypad)
- 's' key is for entry to the setup screens
- 'r' key is for return from the setup screen

NOTE: ***The ACTUAL thickness displays of the OPERATOR PANEL screen cannot be selected, they serve strictly as the outputs.***

See the *Figure. 4* for the layout of the OPERATOR PANEL screen with a display selected for entry.

4.4 Entering the Numbers

The numbers are entered by touching the numeric keys and the decimal point. Limited editing is provided by the *BSP* (back-space) key. The selected numeric value can also be jogged up and down by touching the *INC* (increase) and *DEC* (decrease) buttons.

The process of number entry will be aborted if one touches a different display. The original number will be restored in the old one, and the new

display will be selected, highlighted and ready for the entry.

Pressing the *ENTER* key will enter the new quantity, terminate the selection, restore the display in normal colors and remove the keypad from the screen.

4.5 Entering Nominal Gauge Set

The units are mils (0.001 inches) in the English and mm in the Metric system.

If more decimal places are entered, the result is rounded to the display resolution.

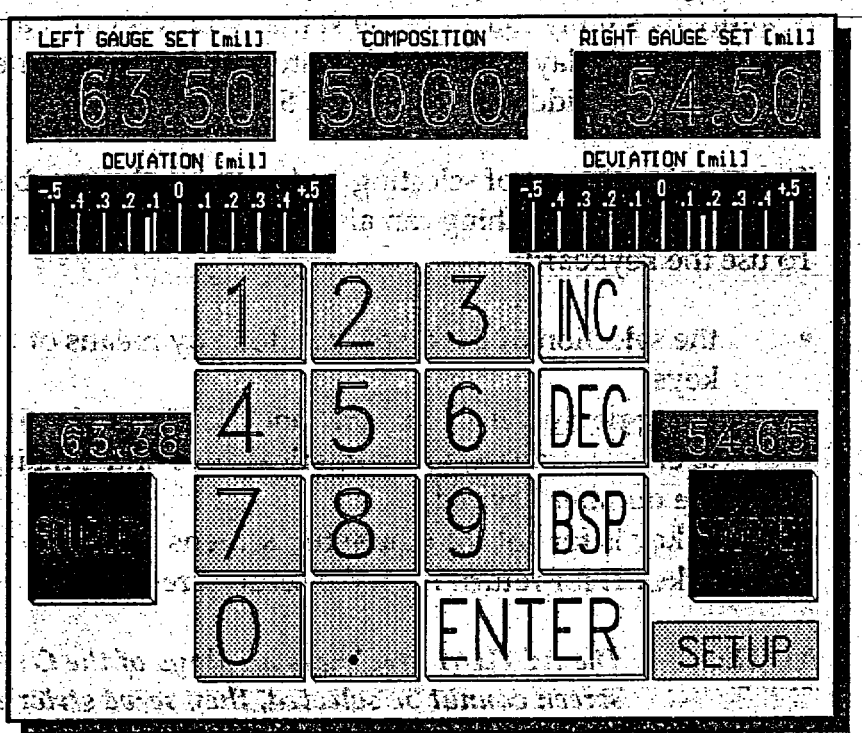


Figure 5 Operator's Screen Numeric Entry

Negative numbers cannot be entered.

The lowest number is 0.

The highest number is 299.99 mils in English and 7.600 mm in the Metric system.

4.6 Entering Composition Number

Composition number is an integer in range from 0000 to 9999. It is common to both gauges.

Materials with heavy absorption require low composition numbers, lighter metals require higher composition numbers.

4.7 Turning Source *ON/OFF*

SOURCE buttons toggle *"On"* and *"Off"*. One push turns the source *"On"*, next push turns it *"Off"* The color of the button top indicates the current state. (*Red is On*)

If using a keyboard, control of the sources is done by pressing **F9** for left side and **F10** for the right side.

NOTE: ***The SOURCE button displayed "On" (with the lit top) means only that the power was turned "On" to the shutter solenoid circuit. The actual state of the shutter is indicated by the lights on the C-frame. If there is no metal in the gauge gap, the source will turn itself "Off" after certain amount of time. For the definition of the metal in gap state and the selection of the source timeout interval, see the SETUP section.***

4.8 Performing Standardization

Standardization is performed to eliminate the influence of the:

- DC offsets in the circuitry
- changes of the scale factors of the components
- oil film on the source and detector windows
- individuality of the pre-amp.

New zero offsets and scale factors are established by this process.

STND buttons toggle *"On"* and *"Off"*. One push turns it *"On"*, next push turns it OFF. The color of the button top indicates the current state.

If using a keyboard, control of the standardization is done by pressing **F7** for left side and **F8** for the right side.

The standardization will not start if the source is *"Off"*. Standardization will terminate if the source is turned *"Off"* during its course.

If the standardization was not successful, the *STND* button will blink and

the message line below will give a brief description of the problem.

Subsequent push of the *STND* button will terminate the unsuccessful standardization and clear the message line. The gauge will require maintenance to solve the problem.

4.9 Changing Ranges Manually

Ranges are changed to display the deviation variations with reasonable magnitude within the meter/recorder span. It is up to the operator to decide what is suitable for current conditions.

A is the most sensitive and the C is the least sensitive range.

A touch on A, B or C will do the following:

- Redraw the button pushed-in and highlight it
- Other range buttons will pop out and be displayed in the *"Off"* state (dark)
- Iif the *AUTO* mode was *"On"*, the button will be popped out and turned *"Off"*
- The meter/recorder scale will be redrawn to match the new range

Keyboard control of the ranges:

- A range **F4** key
- B range **F5** key
- C range **F6** key

The full scale ranges associated with the A, B and C buttons can be customized. See the *SETUP* section.

4.10 Selecting Autoranging

The deviations are typically larger on the thicker material and smaller on the thinner. This primitive relationship is put to use by the *AUTORANGING.*

Two switchpoints are defined, *LOW* and *HIGH*. The range switching is always based on the smaller of the 2 gauge sets.
If the smaller gauge set is:

- Below the LOW pointrange A is selected,

- Between the LOW and HIGH, range B is selected,
- Above the HIGH point, range C is selected.

Touching the *AUTO* button pushes it in, lightens the button top and turns the autoranging *"On"*. The A, B and C buttons pop out, but their button top colors still indicate which range is currently active.

Keyboard control of the autoranging is done by the F3 key.

The switchpoints are easily customized. See the *SETUP* section of this manual

4.11 Remote Operation

4.11.1 Serial Communication

The basic serial ports *COM1* and *COM2* are located on the *CPU* card. *COM1* is used for the touch screen interface, *COM2* is reserved.

There are two additional serial channels used for the communication with a host or outside devices. These are based on the separate interface card, and are configured as *COM3* and *COM4*. The setup for buad rates and the like is done from the autoexec.bat during the power-up of the GSP computer.

Only the parameters needed for the operation of the GSP are accessible by the communication commands.

The commands consist of:

- Processing of the command will not start until the <<cr>> is received.
- Received characters are normally NOT echoed, unless the "Serial comm, echo" in the *MISC* screen is set to 1. This feature is intended only for troubleshooting.

The read command consists only of the prefix character and the <<cr>>.
in Metric

Command I<<cr>> returns Id[ddd]<<cr>><<lf>>

where d[ddd] is 1 up to 4 decimal digits representing the COMPOSITION.
units: none

Command J<<cr>> returns Jh[hhh]<<cr>><<lf>>

where the h[hhh] is 1 up to 4 hex digits representing the bit pattern of the gauge status word.

Bit Number	Description
15	Reserved
14	RIGHT standardization FAULT
13	LEFT standardization FAULT
12	active SIO commands BLOCKED
11	active PCIM commands BLOCKED
10	measurement units ENGLISH
9	RIGHT standardization ON
8	LEFT standardization ON
7	AUTORANGE ON
6	RIGHT metal-in-gap is TRUE
5	LEFT metal-in-gap is TRUE
4	RIGHT source ON
3	LEFT source ON
2	range C is selected
1	range B is selected
0	range A is selected

Gauge Status Word Table

command K<<cr>> returns Kd[dddd]<<cr>><<lf>>

where d[dddd] is 1 up to 5 decimal digits representing the current full scale range.

units: 10 μinch in English, 1 μm in Metric

command L<<cr>> returns Ld[dddd]<<cr>><<lf>>

where d[dddd] is 1 up to 5 decimal digits representing the *PSEUDO* gauge set. See the Section V.VIII.N for more on this topic.

4.11.2 Writing

The external device sends the command string consisting of the prefix character, followed by at least one digit and <<cr>>.

command Gd[dddd]<<cr>>

d[dddd] is 1 to 5 decimal digits representing the new value of the LEFT gauge set.

units: 10 μinch in English, 1 μm in Metric

command Hd[dddd]<<cr>>

d[dddd] is 1 to 5 decimal digits representing the new value of the RIGHT gauge set.

units: 10 μinch in English, 1 μm in Metric

command Id[ddd]<<cr>>

d[ddd] is 1 up to 4 decimal digits representing the COMPOSITION.

units: none

command Jh[hhh]<<cr>>

h[hhh] is 1 up to 4 hex digits representing the bit pattern of the gauge STATUS word.

See the *Data Bits Table* on the following page for the bits that accept the written information. Data written into the other bits will be ignored.

Bit Number	Description	Write
15	Reserved	
14	RIGHT standardization FAULT	
13	LEFT standardization FAULT	
12	active SIO commands BLOCKED	
11	active PCIM commands BLOCKED	
10	measurement units ENGLISH	
9	RIGHT standardization ON	YES
8	LEFT standardization ON	YES
7	AUTORANGE ON	YES
6	RIGHT metal-in-gap is TRUE	
5	LEFT metal-in-gap is TRUE	
4	RIGHT source ON	YES
3	LEFT source ON	YES
2	range C is selected	YES
1	range B is selected	YES
0	range A is selected	YES

DATA BITS TABLE

command Ld[dddd]<<cr>>

d[dddd] is 1 up to 5 decimal digits representing the *PSEUDO* gauge set. See Section V.VIII.N for more on this topic.

units: 10 uinch in English, 1 um in Metric.

4.12 GE Fanuc Genius Interface

The *GENIUS* interface is based on the *PCIM* module, which is a general purpose I/O Controller for the *GENIUS I/O* system. It is designed to be integrated into the user-developed *IBM PC* microprocessor-based systems.

BROADCAST DATA TABLE

TYPE	VARIABLE	METRIC	ENGLISH
Float	Left Gauge Set	mm	Mil
Float	Right Gauge Set	mm	Mil
Float	Composition		
Unsigned long	Status		
Float	Left Actual Thickness	mm	Mil
Float	Right Actual Thickness	mm	Mil
Float	Full Scale of Dev. Meters	mm	Mil
Float	Pseudo Gauge Set	mm	Mil

Note: The last variable, pseudo gauge set, is broadcast only when pseudo gauge set is selected in the MISC screen. See the section V.VIII.N for more on this topic.

DATAGRAM CONFIGURATION TABLE

TYPE	VARIABLE	METRIC	ENGLISH
Float	Left Gauge Set	mm	Mil
Float	Right Gauge Set	mm	Mil
Float	Composition		
Unsigned long	Status		
Unsigned long	Change Flags		
Float	Pseudo Gauge Set	mm	Mil

The *"Change Flags"* variable indicates which portion of the datagram needs attention of the *GSP* program.

Bit Number	Description
0	Left Gauge Set
1	Right Gauge Set
2	Composition
3	Status
4	Pseudo Gauge Set

Note: The last variable in both tables, pseudo gauge set, exists only when pseudo gauge set is selected in the MISC screen. See the section V.VIII.N for more on this topic.

5.0 OPTIONAL FEATURES

5.1 Strip Profile

5.1.1 Purpose

The purpose of this feature is to gather the distribution of the thickness deviation across the width of the strip. The result is plotted on the screen and can also be printed out.

5.1.2 Description

The gauge C-frames must be large enough to move across the full width of the strip. The C-frame carriages are equipped with the position transducers so the thickness measurements can be properly related to the location in the strip.

The traversing motion of the C-frames is done by hydraulics. Each gauge has two (2) limit switches. One must turn on when the gauge is off the strip. The other must turn on when the gauge reaches the center of the strip. The hydraulic power is controlled by the solenoids.

The interface to the limit switches and solenoids is provided by an OPTO 22 unit and "IP-Digital 24" module in the position #3 of the IP Carrier circuit card.

The profile sequence of C-frame motions starts by getting into the position on the far side of the strip. The thickness and the position data are then read while the gauge moves forward. The data gathering is

finished when the C-frame passes over the edge of the strip. The C-frame returns to the center of the stip or to the *OFF STRIP* position, depending on where the motion sequence started.

5.1.3 Limitations

The measurement in proximity of the strip edges is not accurate. As the gauge passes over the edge of the strip, only a part of the radiation goes through the metal, the rest misses it. This distorts the readings and the samples laying in the area influenced by the edge must be rejected from the plot. The width of the rejection band can be adjusted from the setup screen. The remaining strip width, referred to as *"Clipped"* width corresponds to the width of the profile plot.

5.1.4 Operation

The profiling option must be selected in the *MISCELLANEOUS* screen by turning the item "Strip Profiling Selection" from 0 to 1. See *Figure 5.*

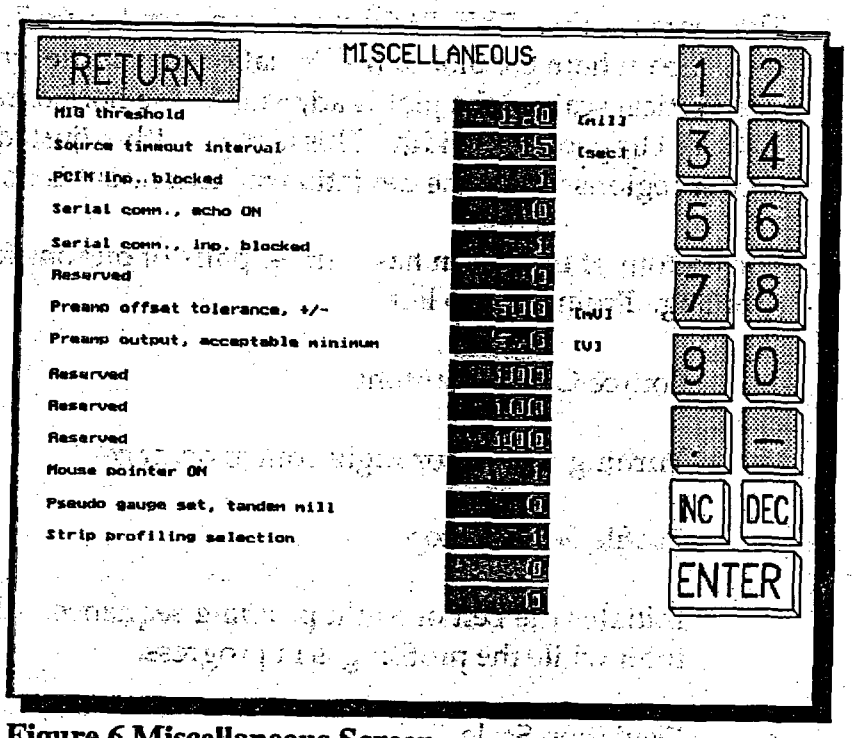


Figure 6 Miscellaneous Screen

As shown in figure 6,on the next page, with the profiling option on the *OPERATOR PANEL* screen is slightly modified. It includes the buttons for bringing the gauges on and off the strip during normal operation.

The profile operation is performed from the *STRIP PROFILE* screen. This screen can be entered any time directly from the *OPERATOR PANEL.*

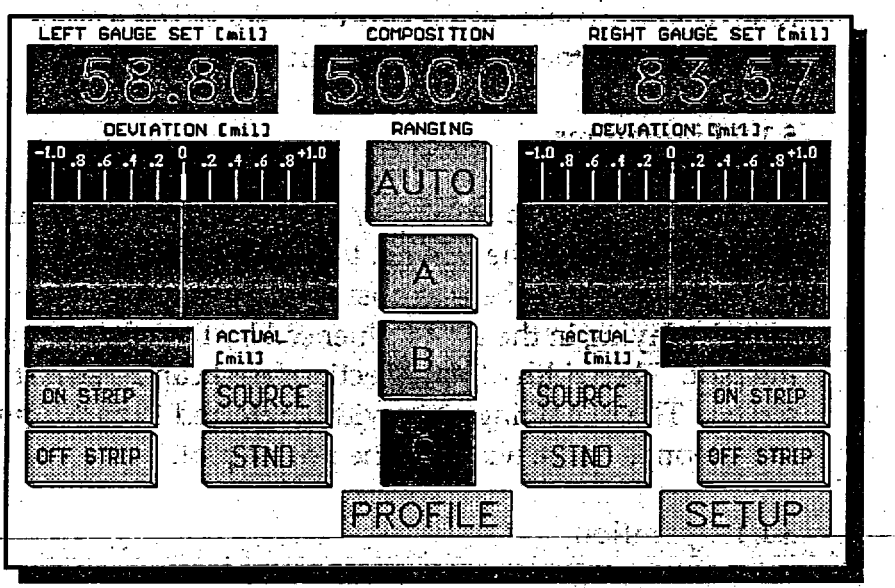


Figure 7 Operator Panel Screen with Profiling Option On

The center of the *STRIP PROFILE* screen , see Figure 7, is taken by the large area where the plot of the deviation across the strip is displayed. The vertical scale of the plot is adjustable, the horizontal is fixed to 0... 100% of clipped strip width. This is the width adjusted by removing the border regions where the deviation measurement is not accurate.

The bottom of the screen has four (4) pairs of buttons for control of the profiling. From right to left:

- Source Control Buttons

  Turning the Left or Right source on or off

- Profile Start or Stop

  Initiates the Left or Right profiling sequence. Aborts the sequence if hit while the profiling is in progress.

- Deviation Scale

  Allows the selection of finer or coarser vertical scale of the deviation plot.

- Get Printout Buttons

  Starts the printout of the profile record. Lower or density printing can be selected. Aborts the printout if hit while printing is in progress.

Each side of the screen has three (3) status indicators and a pair of jog buttons.

- MIG

  Indicator displays the Metal-In-Gap status as seen by the gauge.

- ON SW

  Indicator displays the status of the On-Strip limit switch. This is the switch that turns ON when the C-frame is in the middle of the strip.

- OFF SW

  Indicator displays the status of the Off-Strip limit switch. This is the switch that turns ON if the gauge is in removed off the strip.

- JOG ON and JOG OFF

  Momentary switches allow the jogging of the gauge in both directions by direct control of the hydraulic solenoid. This is provided mainly for the gauge setup for verification of the limit switch function.

At the top of the graph is a display of:

- Position of each gauge in % of total C-frame travel
- Number of samples taken in the current profile scan

At the bottom of the display is the table listing the following variables:

- Front Edge Thickness
- Rear Edge Thickness
  Deviations at the clipped edges averaged over an adjustable width. See the Profile Setup Screen.

- Wedge: as Front Edge - Rear Edge
- Crown. as: Center ((front edge + rear edge)/2)
- Gauge Set: Nominal Gauge Set
- State: Logical state of the profile sequencer, to be used only during trouble shooting.

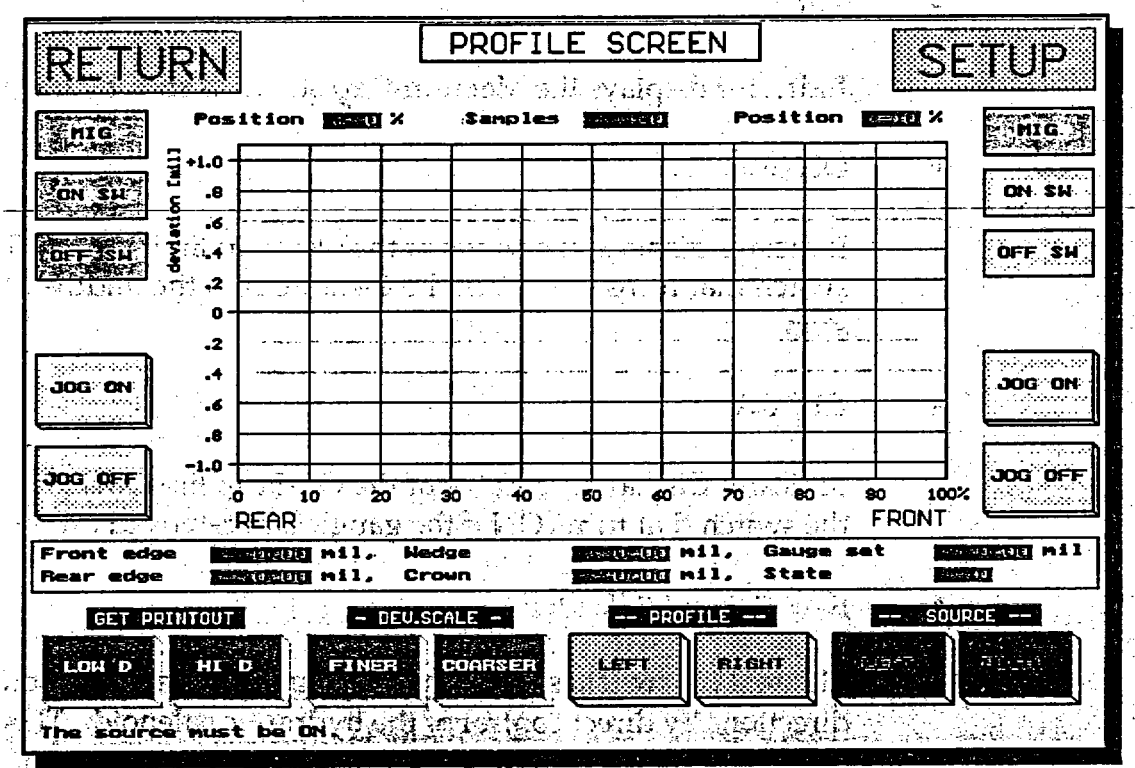


Figure 8 Strip Profile Screen

5.2 Profile Setup Screen

A separate Profile Setup Screen exists for the purpose of setting up the profiling operation. See Figure 8.

The following are items of the Profile Screen Setup:

- Time Based Graph

The X-axis of the profile plot is normally based of the displacement signal provided by the position transducer. In the absence of the position transducer the time base may be used. A constant-speed traverse motion of the C-frame is assumed.

0.....Position Transducer Based Plot, Default Setting

1.....Time-Based Plot

- Rear Margin

- Front Margin

The thickness measurement close to the strip edge is not accurate. This Portion of the plot has to be clipped off. These variables select the width (% strip width) to be removed on front and rear of the strip. The graph is normalized to the remaining width.

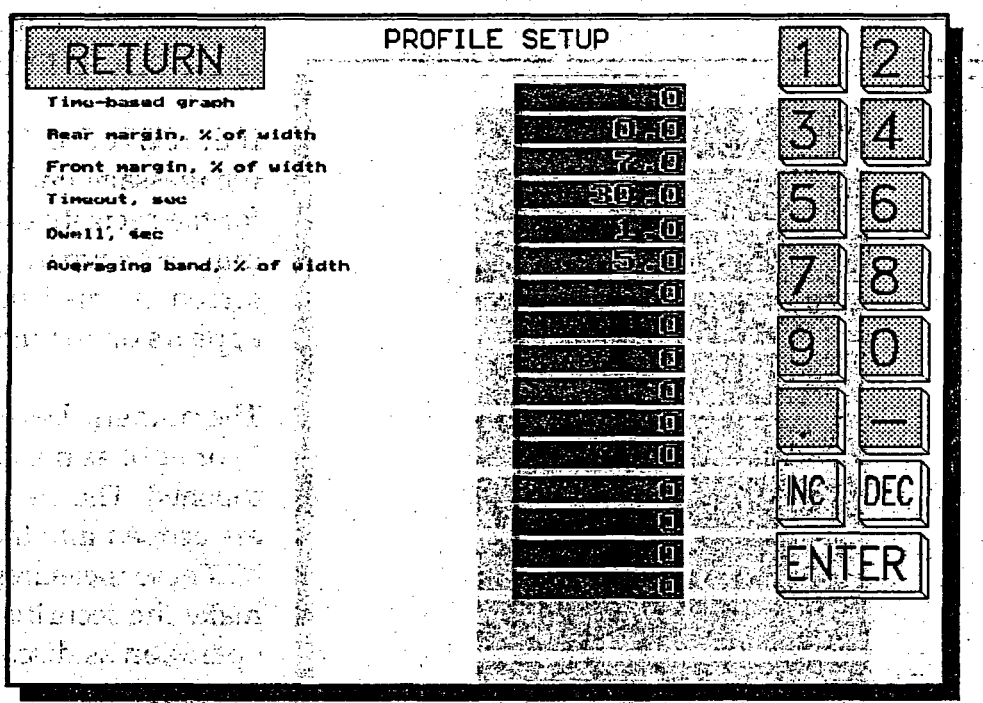


Figure 9 Profile Set-up Screen

- Time Out

Any motion in the profiling sequence must be completed within this time interval or the profiling will be aborted. Units are in seconds.

- Dwell

The motion is stopped for this time interval before starting to move in the reverse direction. Units are seconds.

- Averaging band

The reported values of the thickness at the edges and in the middle are derived by averaging the readings in the band of this width. The width is expressed in the % of the clipped strip width.

6.0 SETUP

6.1 How to Get Into Setup Screens

The SETUP field in the lower right corner of the OPERATOR PANEL screen provides the access to the SETUP screens. The SETUP screens are protected from unauthorized tampering by the security code.

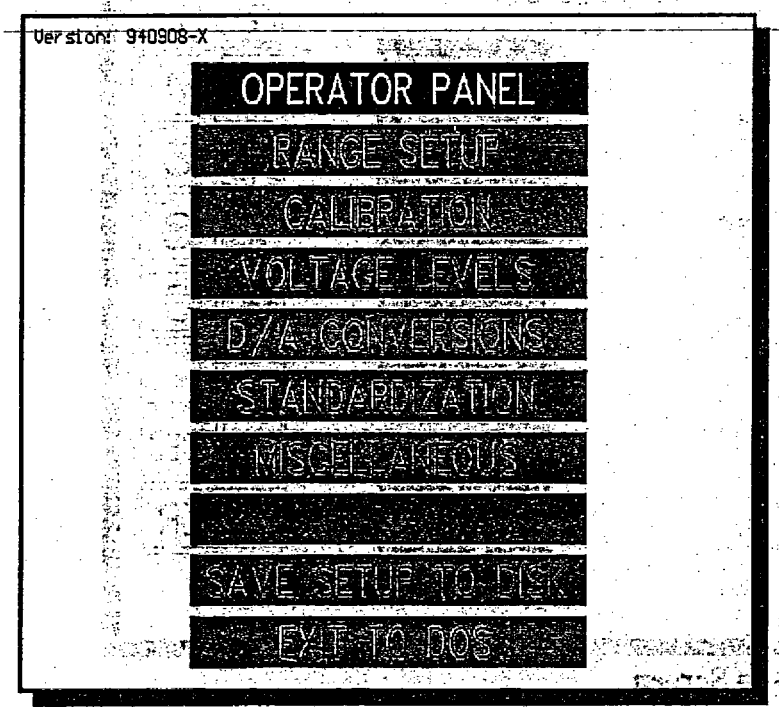


Figure 10 Menu Selections

If the SETUP field is touched, the message line below prompts for the security code and the numeric keypad pops on the screen. A small entry box also appears on the message line.

The numeric keys do not move in or light as the keys are touched. The entered characters are echoed into the entry box as '*'. These measures are taken to make the security code entry operation as discrete as possible.

Back-spacing is allowed if an error is made during the entry of the code.

The keyboard entry into setup screen is done by pressing the 's' key, the code is entered using the numeric keys of the keyboard and the keyboard ENTER button.

The acceptance or rejection of the code is acknowledged on the message line. If the code was accepted, the subsequent touch of the SETUP field will open the MENU screen.

Once unlocked, the access stays free for one hour. This allows good measure of freedom in screen switching during the setup procedures but automatically re-locks the setup screen.

The default security code is 2655684 (I^2S phone number) and the unlocked time interval is 60 minutes. They cannot be changed from within the GSP program.

Editing of the *POINTS.DAT* file is the only way to change these 2 variables.

6.2 Menu Screen

6.2.1 List of Screens

See figure 8 on page 19 for the available selections for the setup and troubleshooting of the GSP.

The top item performs the return back to the *OPERATOR PANEL* screen. It is followed by the following selections:

- RANGE SETUP Screen
- CALIBRATION Screen
- VOLTAGE LEVELS Screen
- D/A CONVERSIONS Screen
- STANDARDIZATION Screen
- MISCELLANEOUS Screen

6.2.2 Selecting Items

Selection of the items is provided by touching of the appropriate box. It can also be done from the keyboard.

Highlight the desired item using the cursor movement keys, then press *RETURN*.

6.2.3 Software Version

Software version identification code is in the left top part of the screen.

6.3 Range Setup Screen

See the Figure 10 for the layout of the *RANGE SETUP* screen.

6.3.1. English / Metric Selection

Toggling between the *ENGLISH* and *METRIC* system of units is accomplished by touching the field labeled *ENGLISH* or *METRIC* in the top right portion of the screen. The label displays current measuring system of units.

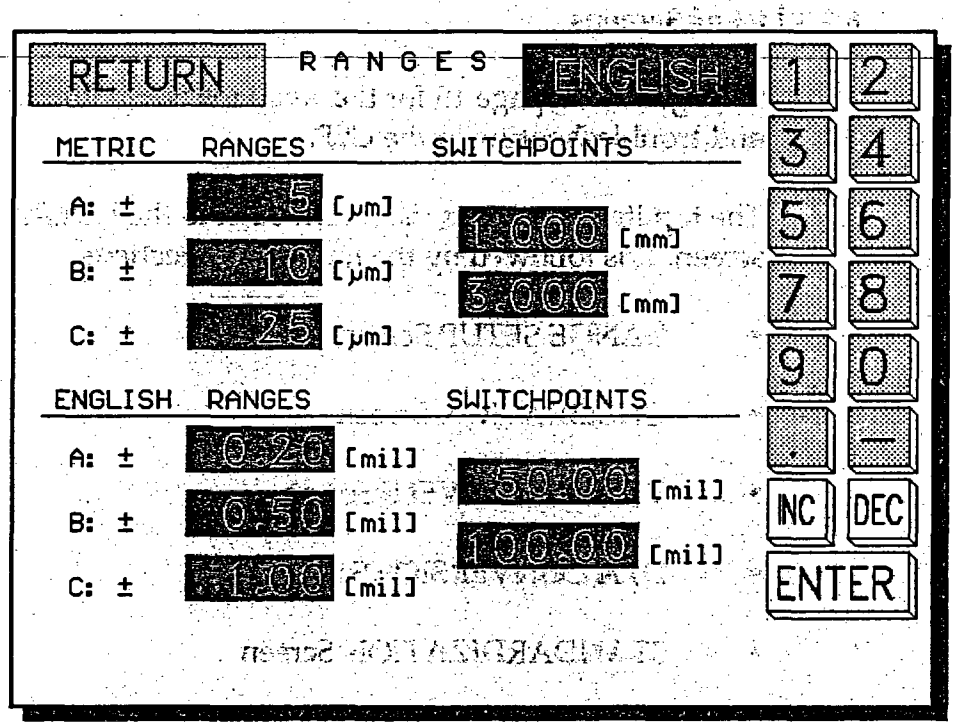


Figure 11 Range Setup Screen

The keyboard equivalent is hitting of the 'e' key.

The switching is possible only when the *SOURCE* on both gauges is *OFF*. If this condition is not met, a reminder is displayed in the message box at the bottom of the screen.

During the switch, the present gauge set values are recalculated into the other system of units and the deviations are displayed in the new units.

A touch on the RETURN field will close this screen and return back to the MENU screen.

Upon return to the OPERATOR PANEL screen, the scales of meter/recorders will be redrawn to correspond with the new definition of the ranges. The labels of all readouts will be updated to the current units.

6.2.2 Setup of Ranges and Switchpoints

Each system, *Metric* and *English* has its own definition of the ranges and the switchpoints for autoranging.

The center portion of the screen contains the table of these items. The first column contains the range settings, the second the settings of the switchpoints. Notice the slight vertical offset of the switchpoint column. So the vertical position of the switchpoint indicates which 2 ranges it serves.

Touching of the display will select it for entry. The message box will be updated to show a brief description of the variable. Use the keypad to enter the new quantity, do not forget to finish with the *RETURN* key.

Keyboard selection is done using the cursor keys. Use the keyboard numeric keys for entering of the number. Finish the entry with the keyboard *RETURN*.

There is only limited number of ranges available.

English:

0.1, 0.2, 0.25, 0.3, 0.5, 1.0, 2.0, 2.5, 3.0 and 5.0 mil.

Metric:

3, 5, 10, 20, 25, 30, 50, 100, 200 and 250 um.

If the number entered is not in the list above, the entry will snap to the nearest available range.

When entering new value, please:

- Pay attention to the units of the variable,
- keep the entries it each column monotonic, A as the lowest and C the highest number.

7.0 CALIBRATION SCREEN

The *CALIBRATION* screen groups the variables intimately associated with the gauging and thickness calculation. It sets up proper scaling and the numerical match of the measured thickness with selected engineering units.

See the Figure 11 for the layout of the *CALIBRATION* screen.

It has following components:

- Digital Readouts
- Numeric Keypad
- Message Window
- RETURN Field
- 8 Function Buttons

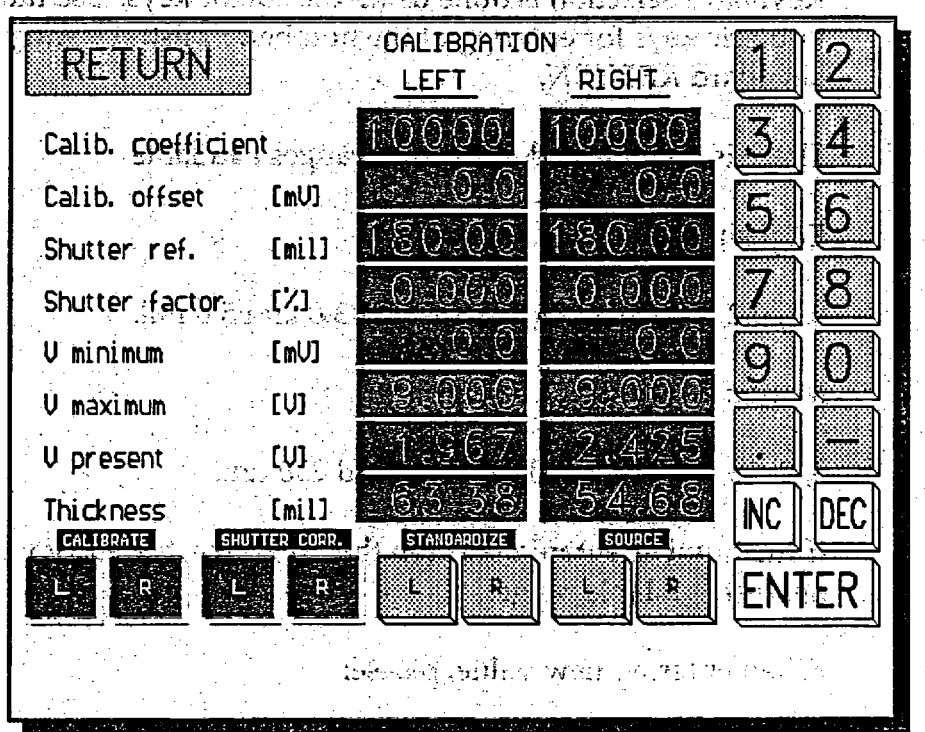


Figure 12 Calibration Screen

7.1 Variables Displayed

The variables are arranged in 2 columns for *LEFT* and *RIGHT* gauges.

Calibration Coefficient - Dimension: none. Description: The *PRIMARY* calibration adjustment. Adjust to get true reading of the calibration sample at desired composition number.

Calibration Offset - Dimension: mV. Description: The *SECONDARY* calibration adjustment. Use to calibrate the thick sample at the end of the application range.

Shutter Reference - Dimension: mil or mm. Description: The Reference reading of the apparent thickness of the shutter, taken on the first standardization following the enable of the *SHUTTER*.

CORR. Used to improve the long-term stability.

Shutter Factor - Dimension: %. Description: The Scale factor change since the "Shutter ref." reading was taken.

V Minimum - Dimension: Volt. Description: The conditioned* output of the pre-amp with the source OFF. The value was established during the last standardization.

V Maximum - Dimension: Volt. Description: The conditioned* output of the pre-amp with the source ON and no metal in the measuring gap. The value was obtained during the last standardization.

V Present - Dimension: Volt. Description: The conditioned* output of the pre-amp.

Thickness - Dimension: mil, mm. Description: The calculated thickness.

*Note: ***The "conditioned" output of the pre-amp. The conditioning involves the offset and magnitude adjustment of the pre-amp output signal. See the VOLTAGE LEVELS screen for the unadjusted pre-amp output.***

7.2 Elements of Standardization

The standardization determines the voltage level at the end points of the measuring range.

V Minimum is determined during the standardization. It is the conditioned* pre-amp voltage, measured with the ion chamber disconnected from the pre-amp. This is the condition that would be encountered with the infinitely thick sample in the measuring gap.

V Maximum is determined during the standardization. It is the conditioned* pre-amp voltage, measured with the source ON and no sample in the measuring gap.

V Present is the present reading of the conditioned* pre-amp voltage.

Note:* ***The "Conditioned" output of the pre-amp. The conditioning involves the offset and magnitude adjustment of the pre-amp output signal. See the VOLTAGE LEVELS screen for the unadjusted pre-amp output.*

7.3 Calibrating the Gauge Manually

1. Get two (2) good samples of the material most commonly used. If the material is steel, the first sample should have thickness of about 100 mil, the second one should be the maximum thickness that will be encountered, but less than 300 mils. If other materials are used, the samples should be proportionally thicker or thinner, depending on the absorption coefficient.

2. Decide what composition number you want to use for the sample material. Get into the *OPERATOR PANEL* screen and enter the composition number.

3. Verify that there is nothing in the gap of the gauge.

4. Standardize the gauge. Make sure the standardization was successful. There should be no blinking of STND button, no messages on the message line. The *THICKNESS* reading should be 0.

5. Turn the source *OFF*.

6. Insert the first (thin) sample.

7. Turn the source *ON*.

8. Get into the *CALIBRATION* screen.

9. Select the "Calib. coefficient" item on the screen and adjust it to get the "Thickness" item display the desired thickness in proper engineering units.

10. Turn the source *OFF*.

11. Remove the first sample and insert the second (thick) one.

12. Turn the source *ON*.

13. Adjust the "*Calibration Offset*" display to get the proper thickness reading in the "*Thickness*" readout window.

14. Turn the source *OFF*.

15. Go back to step 6 and the repeat the sequence until no adjustments are necessary.

16. You may want to verify the operation on the low end by getting a thin sample and measuring it. There is nothing to adjust at this point. An error may indicate inconsistency in the samples: Either one of the thicknesses is improperly marked or, possibly, the composition is not the same among the samples.

17. Move back into the MENU screen and touch the "*SAVE SETUP TO DISK*"

7.4 Calibrating the Gauge Automatically.

This procedure simplifies step 9 of the sequence above.

Adjusting of the "Calibration Coefficient" to get the proper reading of the thickness is done automatically. In order for it to work, the thickness of the first sample must be entered in the OPERATOR PANEL screen into the Gauge SET readout of the gauge being calibrated.

Here is the complete listing of the new sequence.

1. Get 2 good samples of the material most commonly used. If the material is steel, the first sample should have thickness of about 100 mil, the second one should be the max thickness that will be encountered, but less than 300 mils. If other materials are used, the samples should be proportionally thicker or thinner, depending on the absorption coefficient.

2. Enter the thickness of the first sample into the *L/R Gauge SET* window on the *OPERATOR PANEL* screen.

3. Decide what composition number you want to use for the sample material. Get into the *OPERATOR PANEL* screen and enter the composition number.

4. Verify that there is nothing in the gap of the gauge.

5. Standardize the gauge. Make sure the standardization was successful. There should be no blinking of STND button, no messages on the message line. The *THICKNESS* reading should be 0.

6. Turn the source *OFF*.

7. Insert the first (thin) sample.

8. Turn the source *ON*.

9. Get into the *CALIBRATION* screen.

10. Touch the *L/R CALIBRATE* button in the lower left portion of the *CALIBRATION* screen. The button will light up and after a few seconds the new value will appear in the "Calibration Coefficient" readout and the "Thickness" reading will match the thickness of the sample (entered as the *L/R Gauge SET* before in the *OPERATOR PANEL* screen). The *CALIBRATE* button will go *OFF* at the end of this step.

11. Turn the source *OFF*.

12. Remove the first sample and insert the second (thick) one.

13. Turn the source *ON*.

14. Adjust the "Calibrate Offset" display to get the proper thickness reading in the "Thickness" readout window.

15. Turn the source *OFF*.

16. Go back to step 7 and the repeat the sequence until no adjustments are necessary.

17. You may want to verify the operation on the low end by getting a thin sample and measuring it.

There is nothing to adjust at this point. An error may indicate inconsistency in the samples: Either one of the thicknesses is improperly marked or, possibly, the composition is not the same among the samples.

18. Move back into the *MENU* screen and touch the *"SAVE SETUP TO DISK"*.

7.5 Shutter Correction

The thickness of the source shutter is equivalent to about 180 mils of steel. It can be used as an additional calibration point. This improves the long term stability of the gauge.

This feature is turned *ON* or *OFF* by the *L/R SHUTTER CORR.* buttons. Turning *ON* should be only done after the gauge has been calibrated to full satisfaction by following the procedures above.

The Shutter Correction follows the normal standardization sequence with extra steps:

The *SOURCE* is turned *OFF*, *STND* button will stay lit to indicate the standardization is still active.

The thickness of the shutter is measured by averaging a large number of readings.

a) if this is the first standardization following the turning *ON* of this feature, the result of the averaging is saved as "Shutter Reference".

b) on all subsequent standardizations the result of the averaging is compared with the "Shutter ref." value. The ratio will appear in the box labeled "Shutter factor". It represents the gain change that occurred since the reference reading was taken. This gain change is taken into consideration in the thickness calculation.

the value of "*Shutter Factor*" is tested against reasonable limits. If the limits are exceeded, the error is generated. *STND* button will be flashing and an error message will appear.

NOTE: ***With the Shutter Correction ON, the successful standardization finishes with both SOURCE and STND buttons OFF.***

With the Shutter Correction OFF, the SOURCE will be *ON* and the *STND* button *OFF*.

8.0 Voltage Levels Screen

The *VOLTAGE LEVELS* screen displays the status of the power supplies in the junction box, pre-amps and the A/D converter card.

See the *Figure 12* for the screen layout. Notice the absence of the keypad, this is strictly a read-only screen.

The readouts can be selected by touching or by using the cursor keys, but only to display the brief description of the parameter.

SOURCE and *STND* buttons are also provided. They can be controlled by touching or by the function keys from the keyboard.

F7 toggles the left standardization *ON/OFF*

F8 toggles the right standardization *ON/OFF*

F9 toggles the left source *ON/OFF*

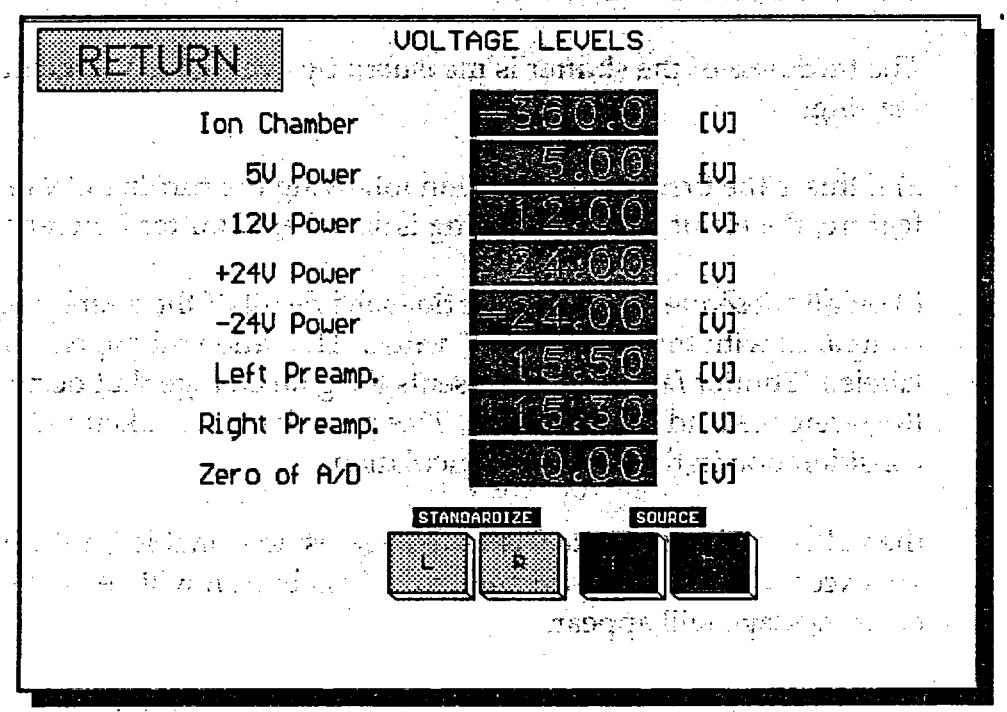


Figure 13 Voltage Levels Screen

F10 toggles the right source *ON/OFF*

The touch of the *RETURN* field or typing of 'r' will result in the return to the *MENU* screen.

8.1 Variables Displayed

1. Ion Chamber

Nominal value is -360V, tolerance 10%. This is the high voltage power supply. It is a DC-DC modular converter operating from 12V DC and located in the junction box. It provides the bias of the ionization chamber. The loss of voltage would result in 0 output of the pre-amp. High noise or ripple on this power supply would degrade the signal of the pre-amp.

2. 5V Power

Nominal value is 5V, tolerance 5%.
This is 5V used locally in the junction box. It is derived by the 12V power supply by the on-board regulator. Important for several logic functions performed on the signal card of the junction box.

3. 12V Power

Nominal value is 12V, tolerance 5%.

Power supply is located in the junction box, operates the relays of the pre-amplifier.

4. +24V Power

5. -24V Power

Nominal value is 24V, tolerance 5%.

This a dual-voltage power supply located in the junction box. It supplies power to the analog section of the pre-amplifiers. 15V for analog circuits is derived by the local regulators.

6. Left Pre-amp

7. Right Pre-amp

Outputs of the pre-amplifiers. 12 to 16 Volts on the typical gauge.

Note: ***Do not confuse with the CALIBRATION screen display of the variables "V minimum", "V maximum" and "V present". These are based on the "conditioned" pre-amp output, and cannot be readily related with the levels displayed here.***

8. Zero of A/D

Nominal value is 0.00, tolerance +/- 0.02 Volt.

Zero of the A/D converter card.

9.0 D/A CONVERSIONS SCREEN

9.1 Purpose

The standard GSP system has total of 8 D/A converters. Each converter has a pair of registers associated with it. The GSP program writes the into the data register, the zero-trim registers serve as the offset adjustment. This screen allows these values to be observed.

The registers are arranged in 2 columns with data in the first and the trim registers the second.

See Figure 13 for the screen layout.

9.2 Gauge Bias D/A's

The two 16-bit D/A converters are located on the National Instruments Data Acquisition card. Their range is +/- 10V. They are meant to be used as the bias for the summing amplifier located on the Signal card of the junction box.

The standard gauge software does not use this function, therefore the data and zero-trim values should both be left at the default setting of 0.

9.3 Other D/A's

The IP-DAC module on the Industry Pack Carrier board provides six 12-bit D/A converters. They are configured for +/- 10 V output.

The "Left deviation" and the "*Right Deviation*" D/A's are used to produce the analog voltage proportional to the gauge deviation. The scale factor is, in English units, 1V per mil or Metric 1 V per 25.4 um. The output is zero during the standardization or when the SOURCE is OFF. The output range of the analog deviation is +/- 10 mils or +/- 254 um

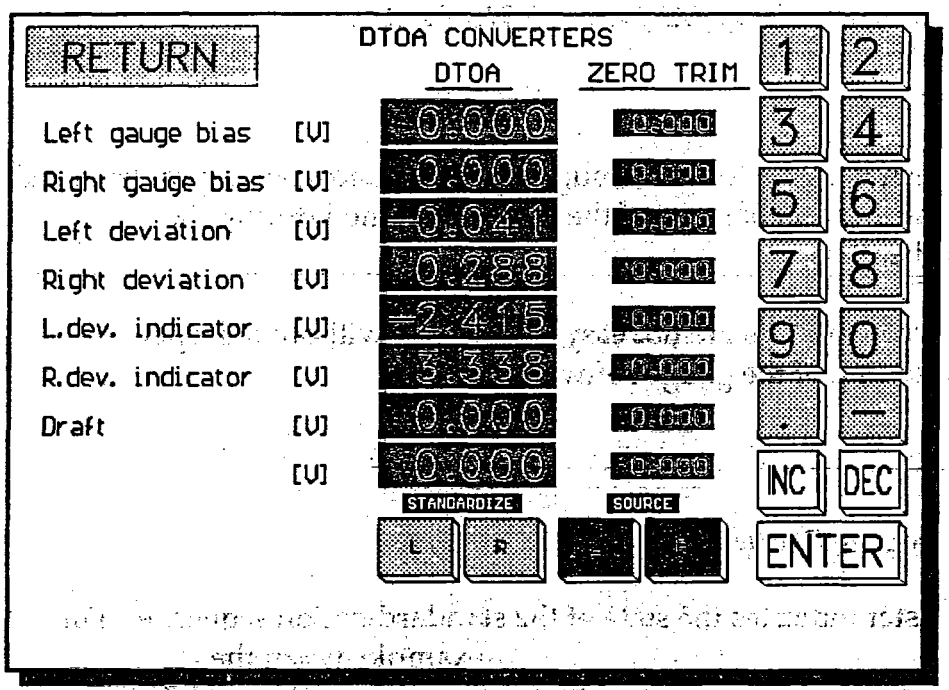


Figure 14 D/A Conversions Screen

The "*L.Dev. Indicator*" and "*R.Dev. Indicator*" D/A's are used to generate voltage for driving the external meter with the +/- 10 V span. This can be used as deviation display with 3 ranges operating in parallel with the deviation meters on the *OPERATOR PANEL* screen of the GSP.

The "*Draft*" D/A serves as an analog output of the draft.

The draft is the ratio of the lower gauge set to the higher gauge set expressed in %.

9.4 Zero Trims

The zero-trim registers serve as the offset adjustment. They can be manually manipulated and are saved as the part of the gauge setup.

The zero trim registers cover the full range of the D/A. This makes them useful for testing of the D/A converters.

Ideally, in properly functioning converter outputs, the voltage is the sum of data and zero-trim registers.

10.0 Standardization Screen

See the *Figure 14* for the layout of the *STANDARDIZATION* screen.

10.1 Purpose

This screen is useful for the debugging of standardization problems and for the verification of some of the steps performed during the standardization.

Most of the variables are not easy to interpret without a deeper understanding of the gauge software.

10.2 Items

- Program Counter.

This register indicates the state of the standardization sequencer. For example, when the standardization is OFF, the sequencer is at 0. The standardization starts with the sequencer forced into the state 1. The finishing and closing down occurs at the state 100. This is not a register to be casually tampered with.

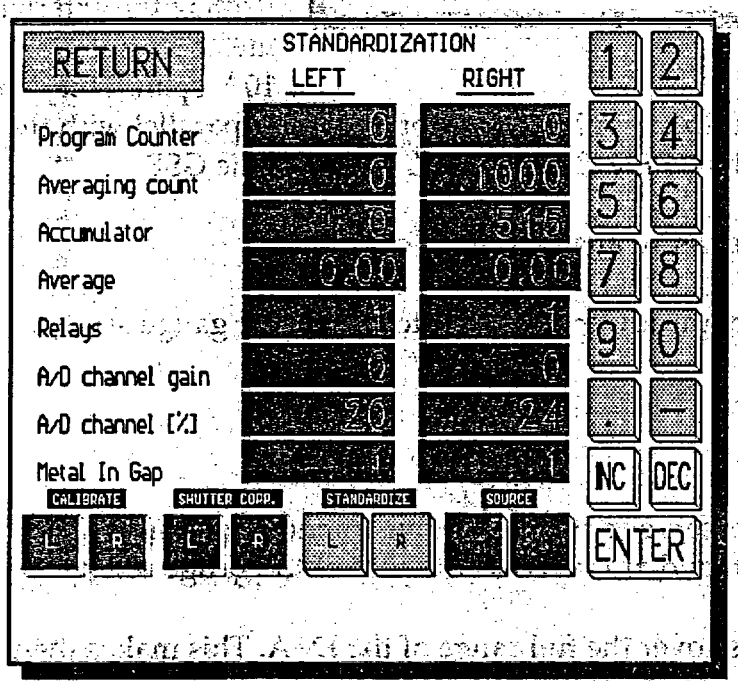


Figure 15 Standardization

The accurate standardization depends on averaging multiple readings. The averaging process is made visible by displaying the number of samples to be taken, contents of the summing accumulator and the result of the averaging. This is what the next 3 variables are.

- Averaging count - Number of samples to take during this averaging.
- Accumulator - Contents of the summing accumulator.
- Average - Result of the averaging.
- Relays - The state of the pre-amp relays is visible in this register. The relays can also be set to particular configuration from here.

See the table below for the meaning of the relay configurations and the corresponding value of the "*Relays*" variable.

Relay State : 1...On 0...Off

STATE	KH4	KH3	KH2	KH1	"RELAYS"
Measure	0	0	0	1	0001
Z1	1	0	0	0	0010
Z2 Precharge	0	1	0	1	1001
Z2					0101
Comment	Precharge filter	Filter On	Disconn. Ion Chamber	Unground Ion Chamber	"Relays" Variable

- A/D channel gain - The default value of 0 should be left here. Changing of the gain is not supported by the standard gauge software.
- A/D channel [%] - The default value of 0 should be left here. This item is associated with the variable above which is not supported by the standard gauge software.
- Metal In Gap - This variable displays the status of the Metal-In-Gap (MIG) signal. Logical variable, 0 means *FALSE*, 1 means *TRUE*.

See the *MISCELLANEOUS* screen for setting of the *MIG* threshold.

11.0 MISCELLANEOUS SCREEN

11.1 Purpose

The variables in this screen are not directly associated with the gaging. They perform important selections, error threshold settings, etc. for both gauges. See the screen layout in the *Figure 15* on the next page.

The screen has room for 16 variables, not all are assigned and used.

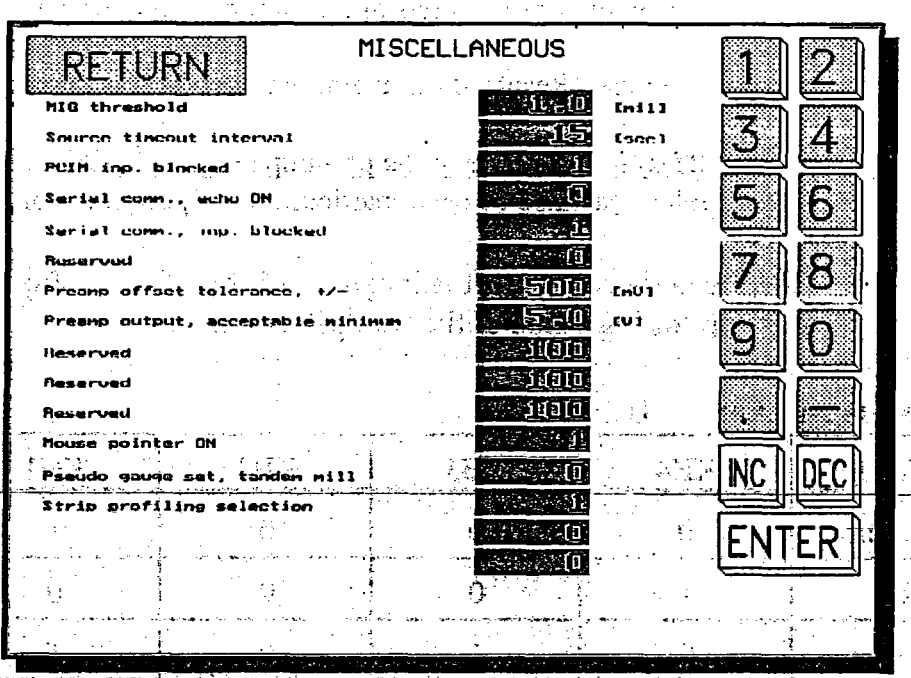


Figure 16 Miscellaneous Screen

n g listing will discuss the meaning of each item.

11.2 MIG Threshold

Dimension: mil or mm depending on the English / Metric.

If the English / Metric selection changes, the threshold is recalculated, so the physical dimension remains unchanged. The Metal-In-Gap signal is 0 (FALSE), if the measured thickness is below this threshold, and it is 1 (TRUE), if the measured thickness is above.
This variable is saved as the part of the gauge setup.

11.3 Source Time-out

Dimension: seconds.

With the Metal-In-Gap *FALSE* and no standardization taking place, the shutter will close after the time determined by this variable.

This variable is saved as the part of the gauge setup.

11.4 PCIM Blocking

This logical variable pertains to the operation of the PCIM card, which provides the optional interface with the GE Fanuc GENIUS I/O system.

If 1 (*TRUE*), this variable blocks any changes caused by the commands from the PCIM datagrams. This is convenient during the start up, setup or debugging. This does not stop the broadcasting of the global data from the GSP.

The 0 (*FALSE*) will let the commands be executed as designed.

This variable is saved as the part of the gauge setup.

11.5 Serial Comm. Echo

This logical variable pertains to the operation of the serial interface.
If 1 (ON), the received characters are echoed as they are received. This feature is useful during troubleshooting. The gauge behaves and responds like a terminal.
The change will not take effect until the GSP program restarts.
This variable is saved as the part of the gauge setup. The default value is 0 (OFF).

11.6 Serial Comm. Blocking

This logical variable pertains to the serial interface.

If 1 (*TRUE*), this variable blocks any changes caused by the commands received by the serial interface. This is convenient during the start up, setup or debugging. This does not stop the replies to the inquiries directed to the DSP.

The 0 (*FALSE*) will let the commands execute normally.

This variable is saved as the part of the gauge setup.

11.7 Reserved

11.8 Pre-amp Offset Tolerance

Dimension: mV.

This variable sets the limits of the acceptable offset of the gauge pre-amplifier. Large offset of the pre-amp may be an indication of the serious problems.

If the "*V Minimum*" in the *CALIBRATION* screen falls outside of this limits, the standardization error will be indicated.

This variable is saved as the part of the gauge setup.

The default value is 500mv.

11.9 Pre-amp Output Tolerance

Dimension: V.

This variable sets the minimum acceptable level of the pre-amp output. Low pre-amp voltage (with no metal in the gap) indicates problems with the pre-amp, source or ion chamber.

If the "V maximum" in the *CALIBRATION* screen falls below this limit, the standardization error will be indicated.

This variable is saved as the part of the gauge setup.

The default is 5 volts

11.10 Reserved

11.11 Reserved

11.12 Reserved

11.13 Mouse Pointer

This logical variable makes the mouse pointer visible.

This is needed when operating the gauge with the mouse. It may be useful during the troubleshooting of the touch screen operation. The arrow marks the position where the touch was recognized.

1 turns the pointer *ON*, 0 turns the pointer *OFF*.

The change will not take effect until the GSP program restarts.

This variable is saved as the part of the gauge setup.

11.14 Pseudo Gauge

The nominal gauge set is frequently used to determine the reduction ratio which is used to set up the speed relations between the electrical drives of the mill.

The special case of a 3-stand mills operating with only 2 gauges requires the nominal gauge setting even for the gauge that is not present, the pseudo-gauge.

When a pseudo gauge is used the *OPERATOR PANEL* changes to include it.

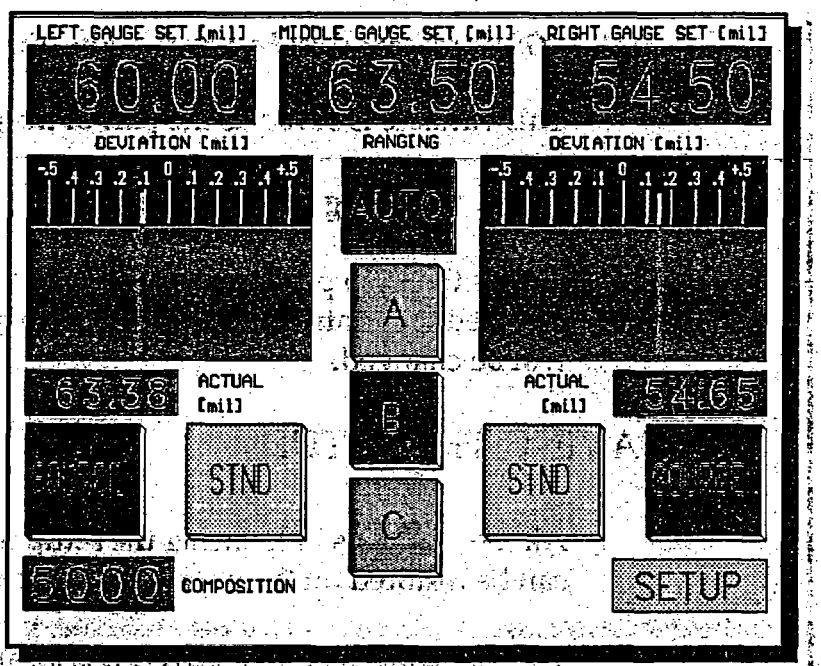


Figure 17 Pseudo Gauge Screen

The pseudo gauge set readout is located in the upper row of the main readouts of the *OPERATOR PANEL* screen. The composition readout is in the lower left corner of the screen.

See the *Figure 16* for the layout of the screen with the pseudo gauge in the middle.

This variable provides the selection of the pseudo gauge set:

- 0 ... no pseudo gauge set, normal screen,
- 1 ... pseudo gauge left,
- 2 ... pseudo gauge center,
- 3 ... pseudo gauge right.

NOTE: GSP program must be restarted after the change.

This variable is saved as the part of the gauge setup.

11.15 Strip Profiling Selection

Selects the strip profile operation. The *"IP Digital 24"* module must be installed for control of the *On/Off* strip motion. The main screen layout will be changed.

12.0 SAVING THE SETUP

All the variables influencing the setup need to be saved in a file, so they can be restored on the power-up or the *GSP* program restart.

The file name is *POINTS.DAT*. It is located in the *.\DAT* subdirectory which must be created for this purpose during the gauge installation.

If the *GSP* program is running with the "-d" command line option (Demo mode of operation), the *POINTS.DAT* file that is created will be the current directory on the first save command.

If the file does not exist, or was deleted, the gauge restarts with the default parameters.

The command for saving of the setup is issued by touching the "*SAVE SETUP TO DISK*" bar in the MENU screen. By keyboard it can be done by selecting the bar using the cursor keys and pressing the *ENTER*.

The old *POINT.DAT* file is renamed to *POINTS.BAK* before the new *POINTS.DAT* is created.
When editing, the care has to be observed to edit only the numerical data and to keep the original formatting.

12.1 Sample File

```
Program Version:     Version 940913-b
COMMAND LINE OPTIONS
Demo Run:    -d
PCIM Port:   -pxxx Default is 0x3e0
PCIM Mem:    -Pxxxx Default is 0xc800
IPAC Port:   Default is 0x610
IPAC Mem:    -Ixxxx Default is 0xe000
"X' is Hex Digit
```

12.2 Manual Editing

The file is in readable form and can be easily viewed and edited with any editor program.

variables that are not accessible from the *GSP* program for any changes.

By default the security code is 2655684.0 and the time-out interval is 60.0. If the change is desired, these 2 entries must be edited.

13.0 EXITING TO DOS

13.1 Purpose

During the setup or startup the *GSP* program needs to be exited in order to run utilities or any other programs.

The orderly exit is in the MENU screen, the bottom bar labeled "*EXIT TO DOS*". Touching it will stop the *GSP* operation and the familiar *DOS* prompt will appear.

13.2 Restarting the GSP Program

The *GSP* program name is GAUGE.EXE. Typing the GAUGE.EXE at command prompt will restart the program.

13.3 Command Line Options

There are several command line options available.

NOTE: 'x' below is a hex digit and '-' can be substituted by '/'

- -d is the demonstration version that will run on any *IBM AT* compatible computer with the *VGA* adapter and the mouse. It bypasses checking for some key peripherals, simulates the *A/D* outputs etc.
- -pxxx sets *PCIM I/O* port address, xxx are hex digits
- -Pxxxx sets *PCIM* memory segment, xxxx hex digits
- -ixxx sets the *IP* carrier board port address, xxx are hex digits
- -Ixxxx sets the *IP* carrier board memory segment.
- -? prints following help message:

APPENDIX A

APPENDIX A - Gauge Signal Processing Unit Test Procedure

This procedure describes the steps required to get the gauge up and running for the first time. It is assumed that the associated desk is powered and *PROPERLY GROUNDED.*

The following documents should be referenced during this procedure.

- **Gauge Signal Processing Unit Manual**
- **Gauge Interconnect Drawings**

STEPS	TASKS
1. Initial System Check	a. Check **ALL** cables, wiring and connections. An error in wiring can cause costly damage to system ports. b. Check and configure the option jumpers and/or switches on the following cards: • National Instruments Multifunction I/O Card • SeaLevel Systems Serial I/O Card (if used) • Industry Pack ATC40 Carrier Board • Industry Pack IP-Opto Driver Module • Industry Pack IP-DAC Module • PC Interface Module (PICM) (if used) c. Disconnect cables to the National Instruments Multifunction card and the IP0 Opto driver Module before proceeding. d. Before installing the source capsule into the source head assembly, check shutter operation with the shop testing fixture.
2. External Voltage Check	a. Check for presence of +24 volt power on the Phoenix terminal block for the Opto Driver Module: *NOTE: This is the Desk +24V supply, not the power supply in the junction box.* b. Apply power to the gauge computer.
3. Gauge Software and Touch-Screen Verification	a. Be sure that the software for gauge operation is properly loaded and the touch screen is calibrated. b. Turn off power to the gauge computer. c. Connect the cable to the IP-Opto Driver Module.
4. System Power and Voltage Check	a. Apply power to the gauge computer. b. Check that the gauge junction box has powered up, as indicated by the power *LED's* located in the junction box. c. The green "*Source Off*" lamps on the C-Frames should be on, and the red "*Source On*" lamps should be off.

Touch Screen Gamma Gauge
Entering and Editing Alloy Compensation Numbers

1. From the "Operators Panel" touch the **"SETUP"** box in the lower left –hand corner. A keyboard will appear and you will be asked to enter the security code to unlock the screens. Type in the security code, which is 2655684, then touch **"ENTER"**. This unlocks the test screens for a period of 1 hour.

2. Touch the **"SELECT ALLOY"** box located in the middle of the "Operators Panel" above the composition number. This will open up the **"COMPENSATION TABLE"**.
   Note: "SELECT ALLOY" is the boot up name. This name will change to the name of the alloy you select or entered into the **"COMPENSATION TABLE".**

3. To enter a new alloy select any empty box in the **"COMPENSATION TABLE"** and then touch the **"EDIT"** box in the top right hand corner. This opens the **"COMPENSATION TABLE EDITOR"** screen.

4. The **"COMPENSATION TABLE EDITOR"** has a touch keyboard with three columns for alloy information:
   - **"ALLOY NAME" :** Enter the name of the alloy
   - **"COMPOSITION":** Enter the composition number that you determined is needed for this particular alloy.
   - **"COMMENTS":** Enter any notes or comments you might deem necessary.

5. When finished touch the **"SAVE"** box and then **"RETURN"** to get back to the **"OPERATORS PANEL".**

You will notice that the new composition number is displayed and that the **"SELECT ALLOY"** box now is displaying the name of the new alloy. You can toggle between the **"OPERATORS PANEL"** and the **"COMPENSATION TABLE"** without entering the security code. The security code is only needed to add or change alloys in the table.

ILLUSTRATIONS

I²S AGC

GENERAL COMMENT:

ROLL ECCENTRICITY WILL LIMIT ANY AGC PERFORMANCE. GOOD ROLL GRINDING PROCEEDURES MUST BE EMPLOYED. HOWEVER THE I2S AGC CORRECTS AT INTERVALS AS SHORT AS 2". ANY ECCENTRICITY RESULTS IN AN IMMEDIATE CHANGE IN MEASURED LENGTH OUT (Lout). THUS THE AGC WILL REACT QUICKLY TO MAINTAIN CONSTANT EXIT THICKNESS.

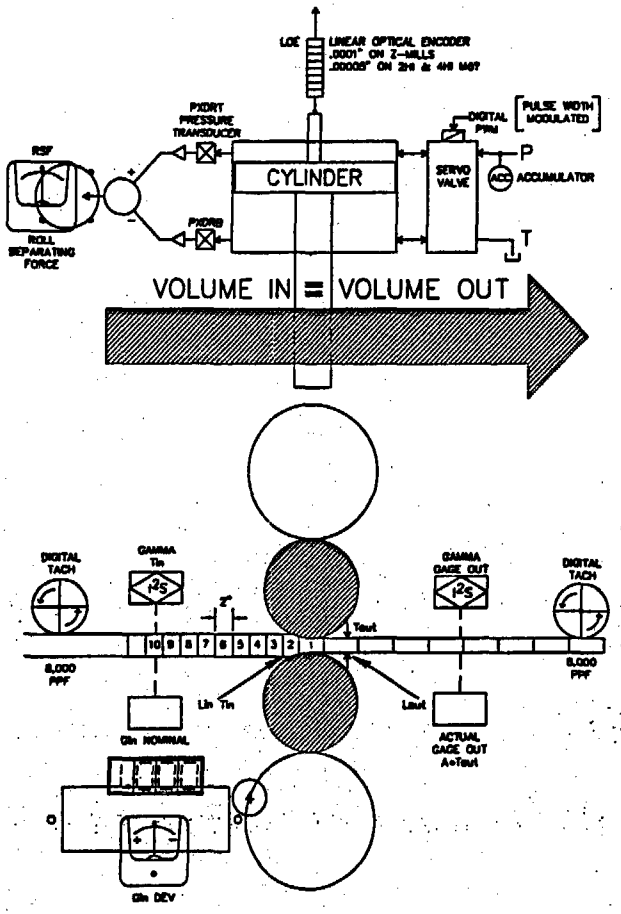
NONUNIFORM HARDNESS IN THE MATERIAL WILL RESULT IN AN IMMEDIATE CHANGE IN LENGTH OUT. THE AGC WILL DETECT THIS IN THE FIRST 2" LENGTH AND OUTPUT A PROPORTIONAL CORRECTION TO THE HYDRAULIC SCREWDOWN.

EXAMPLES

Lin	X [Gin NOM + Gin DEV]	=	Lout	X	Tout?	Tout RESULT	SCREWDOWN CORRECTION
1000	.1000" .0000"	=	2000		.0500"	.0000"	0
1000	.1000" +.0004"	=	2000		.0502"	+.0002"	DOWN 2
1000	.1000" −.0006"	=	2000		.0497"	−.0003"	UP 3
1000	.1000" .0000"	=	1992		.0502"	+.0002"	DOWN 2
1000	.1000" .0000"	=	2012		.0497"	−.0003"	UP 3
1000	.1000" +.0004"	=	2008		.0500"	.0000"	0
1000	.1000" −.0002"	=	2000		.0504"	+.0004"	DOWN 4
1000	.1000" +.0003"	=	1998		.0502"	+.0002"	DOWN 2
1000	.1000" +.0010"	=	2088		.0484"	−.0016"	UP 16
1000	.1000" +.0005"	=	1930		.0521"	+.0021"	UP 21

NOTE: THICKNESS AND LENGTH VALUES ARE EXAGGERATED FOR EXAMPLE ONLY

TOTAL Lin=10000=20 INCHES OF STRIP AND 10 PROPORTIONAL CORRECTIONS HAVE BEEN MADE!



US–JAPAN–EUROPE PATENTS

I²S PATENTED HYDRAULIC SCREWDOWN

100% DIGITAL
VERY FAST – TYP .001" in .02 SEC.
ACCURATE – .00005" RESOLUTION 2HI–4HI
.000005" RESOLUTION Z MILL
HIGH YEILDS – TIGHT TOLERANCE

AGC PRIMARY LOOP VOLUME EQUATION

VOLUME IN = VOLUME OUT

$LENGTH_{in} \times THICK_{in} \times WIDTH_{in} = LENGTH_{out} \times THICK_{out} \times WIDTH_{out}$

$Lin \times Tin \times \cancel{Win} = Lout \times Tout \times \cancel{Wout}$

$Lin \times Tin = Lout \times Tout$

$Tin = Gin\ NOM \pm Gin\ DEV$

$Lin \times [Gin\ NOM \pm Gin\ DEV] = Lout \times Tout$

$$\therefore Tout = \frac{Lin \times [Gin\ NOM \pm Gin\ DEV]}{Lout}$$

DIGITAL TACHS OUTPUT 8,000 PPF
TO CORRECT EVERY 2" Li = 1000

$$\frac{Li}{Lo} = \frac{ENTRY\ LENGTH}{EXIT\ LENGTH}$$

AGC SECONDARY LOOP EXIT GAGE AVERAGING

THE HIGH SPEED PRIMARY LOOP DOES NOT REQUIRE OR USE EXIT DEVIATION (GAGE) HOWEVER IF STRIP WIDTH CHANGES DURING REDUCTION; OR IF SLIGHT ERRORS IN TACH WHEEL SIZES, OR DIFFERENCES IN GAGE CALIBRATION THE SYSTEM WILL AUTOMATICALLY COMPENSATE.

THE SECONDARY AGC LOOP CONTINUOUSLY AVERAGES THE EXIT GAGE DEVIATION. IF THE AVERAGE IS NOT ZERO THE COMPUTER WILL PROPORTIONALLY MODIFY THE PRIMARY LOOP ENTRY LENGTH COUNT TO BRING THE EXIT GAGE AVERAGE TO EXACTLY ZERO.

ALSO THE AGC HAS AUTOMATIC MATERIAL HARDNESS COMPENSATION SOFTWARE WHICH COMPARES ACTUAL THICKNESS OUT (ATout) WITH CALCULATED (Tout) AFTER THE CORRECTION.

REV.	DATE	NAME	COMMENT
	2/96	TOM O.	

I²S AGC ENGLISH — SCALE

INTERGRATED INDUSTRIAL SYSTEMS — DWG. NO. 140-110 — REV.

SHT 2 OF 2

I^2S AGC

GENERAL COMMENT:

ROLL ECCENTRICITY WILL LIMIT ANY AGC PERFORMANCE. GOOD ROLL GRINDING PROCEEDURES MUST BE EMPLOYED. HOWEVER THE I2S AGC CORRECTS AT INTERVALS AS SHORT AS 50 MM. ANY ECCENTRICITY RESULTS IN AN IMMEDIATE CHANGE IN MEASURED LENGTH OUT (Lout). THUS THE AGC WILL REACT QUICKLY TO MAINTAIN CONSTANT EXIT THICKNESS.

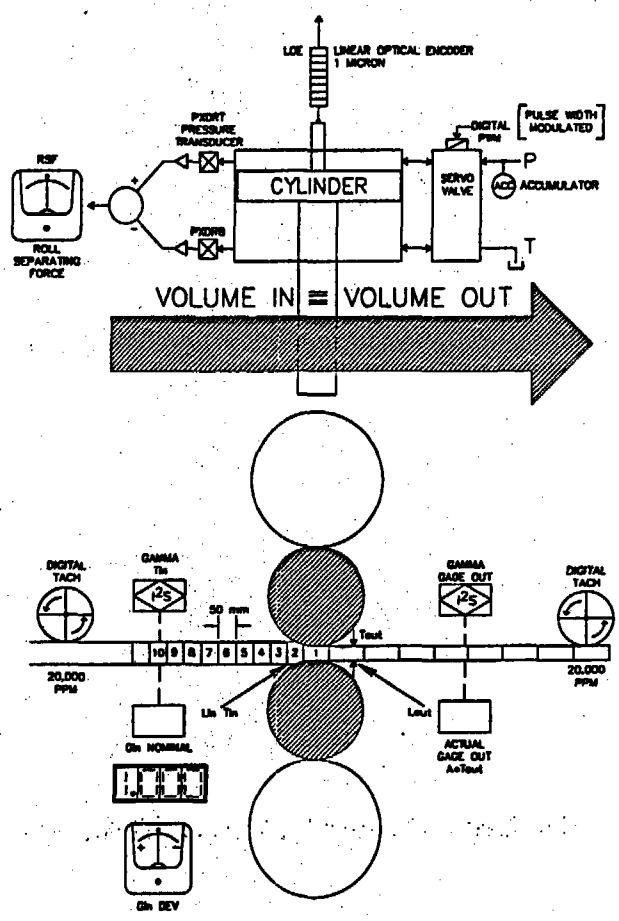
NONUNIFORM HARDNESS IN THE MATERIAL WILL RESULT IN AN IMMEDIATE CHANGE IN LENGTH OUT. THE AGC WILL DETECT THIS IN THE FIRST 50 MM LENGTH AND OUTPUT A PROPORTIONAL CORRECTION TO THE HYDRAULIC SCREWDOWN.

EXAMPLES

Lin	X [Gin NOM + Gin DEV]		=	Lout	X Tout?	Tout RESULT	SCREWDOWN CORRECTION
1000	1.000mm	0mm	=	2000	.500mm	0mm	0
1000	1.000mm	+.008mm	=	2000	.504mm	+.004mm	DOWN 4
1000	1.000mm	-.006mm	=	2000	.497mm	-.003mm	UP 3
1000	1.000mm	0mm	=	1990	.502mm	+.002mm	DOWN 2
1000	1.000mm	0mm	=	2012	.497mm	-.003mm	UP 3
1000	1.000mm	+.010mm	=	2020	.500mm	0mm	0
1000	1.000mm	-.030mm	=	1980	.490mm	-.010mm	UP 1
1000	1.000mm	+.021mm	=	1998	.511mm	+.011mm	DOWN 11
1000	1.000mm	+.051mm	=	2088	.503mm	+.003mm	DOWN 3
1000	1.000mm	-.081mm	=	1930	.478mm	-.024mm	UP 24

NOTE: THICKNESS AND LENGTH VALUES ARE EXAGGERATED FOR EXAMPLE ONLY

TOTAL Lin=10000=.5 METERS STRIP AND 10 PROPORTIONAL CORRECTIONS HAVE BEEN MADE!



US-JAPAN-EUROPE PATENTS

I^2S PATENTED HYDRAULIC SCREWDOWN

100% DIGITAL
VERY FAST - TYP 25 MICRON in .02 SEC.
ACCURATE - 1 MICRON RESOLUTION 2HI-4HI
.1 MICRON RESOLUTION Z MILL
HIGH YEILDS - TIGHT TOLERANCE

AGC PRIMARY LOOP VOLUME EQUATION

VOLUME IN = VOLUME OUT

$LENGTH_{in} \times THICK_{in} \times WIDTH_{in} = LENGTH_{out} \times THICK_{out} \times WIDTH_{out}$

$Lin \times Tin \times \cancel{Win} = Lout \times Tout \times \cancel{Wout}$

$Lin \times Tin = Lout \times Tout$

$Tin = Gin\ NOM \pm Gin\ DEV$

$Lin \times [Gin\ NOM \pm Gin\ DEV] = Lout \times Tout$

$$\therefore Tout = \frac{Lin \times [Gin\ NOM \pm Gin\ DEV]}{Lout}$$

DIGITAL TACHS OUTPUT 20,000 PPM TO CORRECT EVERY 50 MM LI = 1000

$$\frac{LI}{Lo} = \frac{ENTRY\ LENGTH}{EXIT\ LENGTH}$$

AGC SECONDARY LOOP EXIT GAGE AVERAGING

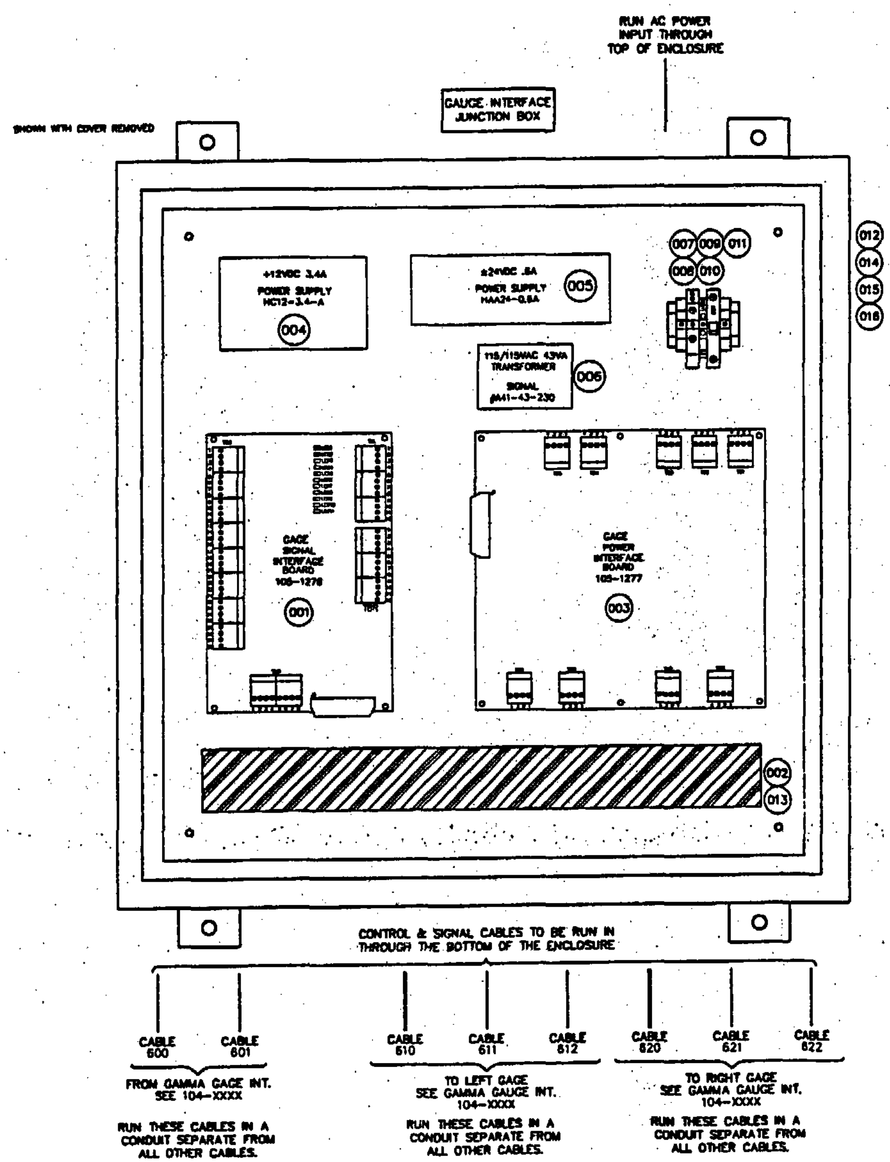
THE HIGH SPEED PRIMARY LOOP DOES NOT REQUIRE OR USE EXIT DEVIATION (GAGE) HOWEVER IF STRIP WIDTH CHANGES DURING REDUCTION, OR IF SLIGHT ERRORS IN TACH WHEEL SIZES, OR DIFFERENCES IN GAGE CALIBRATION THE SYSTEM WILL AUTOMATICALLY COMPENSATE.

THE SECONDARY AGC LOOP CONTINUOUSLY AVERAGES THE EXIT GAGE DEVIATION. IF THE AVERAGE IS NOT ZERO THE COMPUTER WILL PROPORTIONALLY MODIFY THE PRIMARY LOOP ENTRY LENGTH COUNT TO BRING THE EXIT GAGE AVERAGE TO EXACTLY ZERO.

ALSO THE AGC HAS AUTOMATIC MATERIAL HARDNESS COMPENSATION SOFTWARE WHICH COMPARES ACTUAL THICKNESS OUT (ATout) WITH CALCULATED (Tout) AFTER THE CORRECTION.

			I^2S AGC
INTEGRATED INDUSTRIAL SYSTEMS		DWG. NO. 140-110	REV.

K:\Released\120\0658A-A.DWG Wed Jun 07 13:42:57 2000 I2S Electrical - Tom O'Donnell



ASSY. B.O.M. TITLE: Gamma Gauge Interface Junction Box — B.O.M. #: 120-XXXX — PG. 1 OF 1
CUSTOMER: — LOT #: 1 — SPARE B.O.M. #: — UNITS REQ'D: 1
RELEASED BY: — RELEASED DATE: — MP DATE: — REV.: A — JOB #:

ITEM	I2S PART NO.	QTY.	U/M	DESCRIPTION	A.B.R.	TYPE	ORDER NO.	REMARKS
001	B 105-1276	1		GAUGE SIGNAL INTERFACE 105-1276		M		
002	EDUCT EDC2DG6	1		WIRING DUCT DARK GRAY PANDUIT #E2X3DG6		P		
003	B 105-1277	1		GAUGE POWER INTERFACE 105-1277		M		
004	EPWRSUP HC12-3.4-A	1		12VOLT 3.4AMP PWRSUP POWERONE#HC12-3.4-A		P		
005	EPWRSUP HAA24-0.6A	1		PWR SUP +or-24v0.6A POWERONE HAA24-0.6A		P		
006	EXFMR A41-43-230	1		115/115VAC 43VA XFMR SIGNAL#A41-43-230		P		
007	EHDWR 35 DINRAIL	1		35x7.5mm PLATED STEEL DIN MNT'G RAIL		P		
008	ETERM VUPE3-10	1		10MM EARTH TERM W/END PLATE #VUPE3-10		P		
009	ETERM VU4-4	1		4mm TERMINAL 25A 600V SP+SCHUM#VU4-4		P		
010	ECBKR S271-K10	1		MINI DIN RAIL MNT 1P 10A CB ABB#S271-K10		P		
011	ETERM VA4-2.5/4	1		END PLATE(4mm TERMINAL)SP+SCHUM#VA4-2.5/4		P		
012	EENCL A24P24	1		21X21 PANEL HOFFMAN#A24P24		P		
013	EDUCTCVR C2DG6	1		WIRING DUCT COVER PANDUIT#C2DG6		P		
014	EENCL A3L24H2408LP	1		24X24X8 ENCLOSURE HOFFMAN#A-3L24H2408LP		P		
015	EENCL DLMFK	1		MTG FOOT KIT HOFFMAN#D-LMFK		P		
016	EENCL DL36	1		WING KNOB LATCH KIT HOFFMAN#D-L36		P		

SUBSTITUTIONS ALLOWED UNLESS OTHERWISE NOTED

NOTES:

1. MOUNT "GAUGE INTERFACE JUNCTION BOX" TAG ON OUTSIDE OF COVER.
2. SEPARATE SIGNAL AND POWER WIRING AS SHOWN.
3. SEE DWG. 104-XXXX/1 & /2 FOR INTERCONNECTION WIRING.

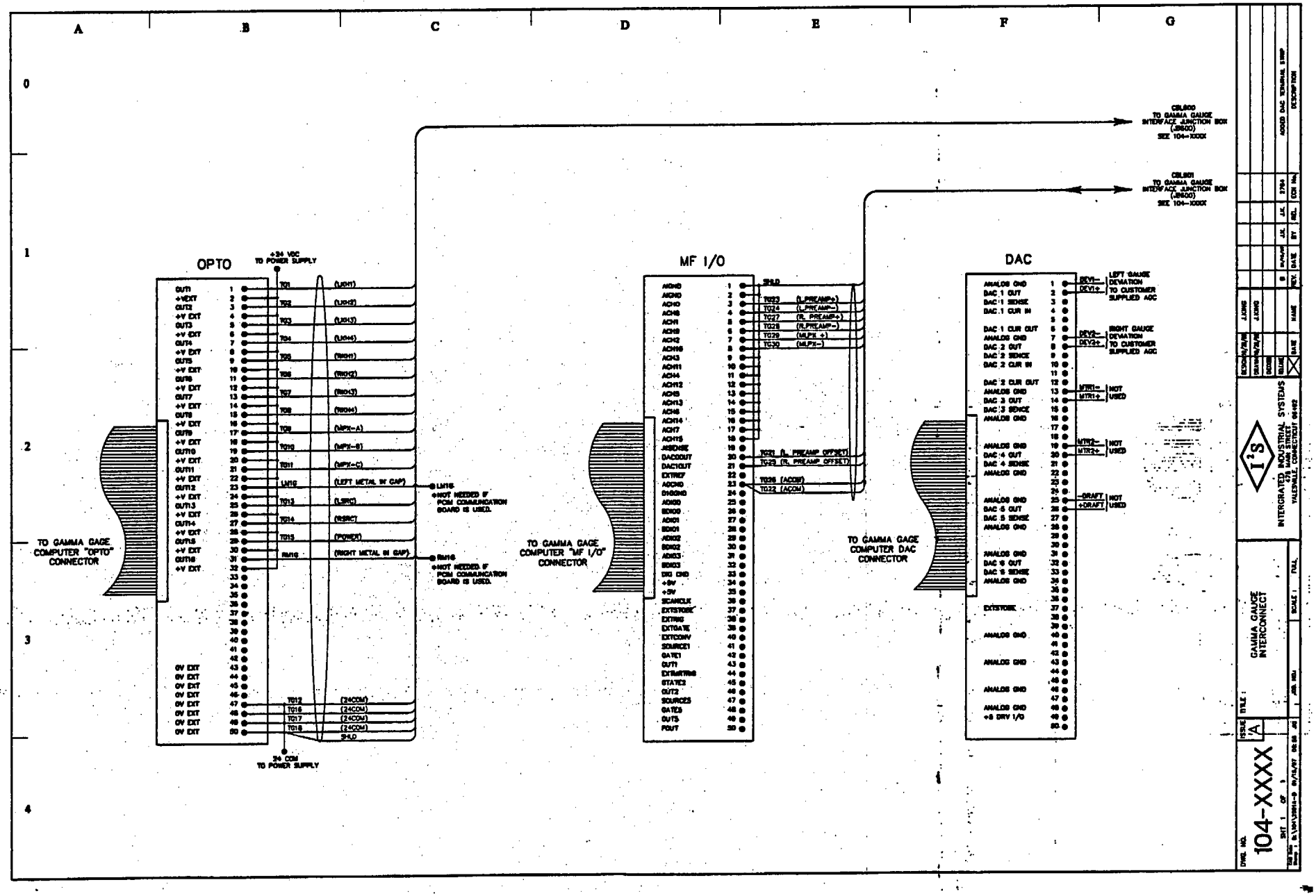
REV.	DATE	BY	REL.	ECN No.	DESCRIPTION

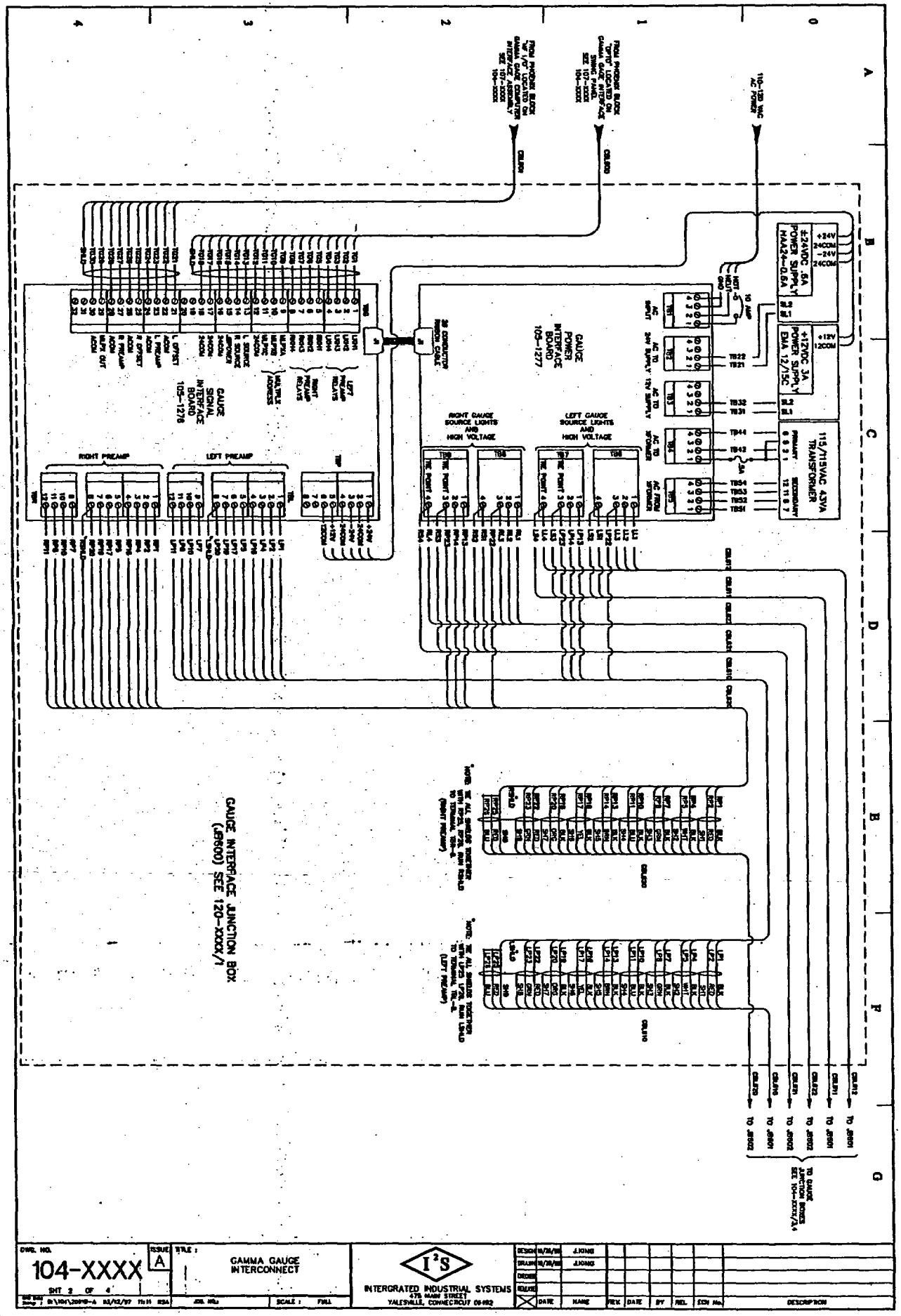
DESIGN S.P. — DRAWN R.S. — CHECKED — RELEASE

I2S
INTERGRATED INDUSTRIAL SYSTEMS
475 MAIN STREET
YALESVILLE, CONNECTICUT 06492

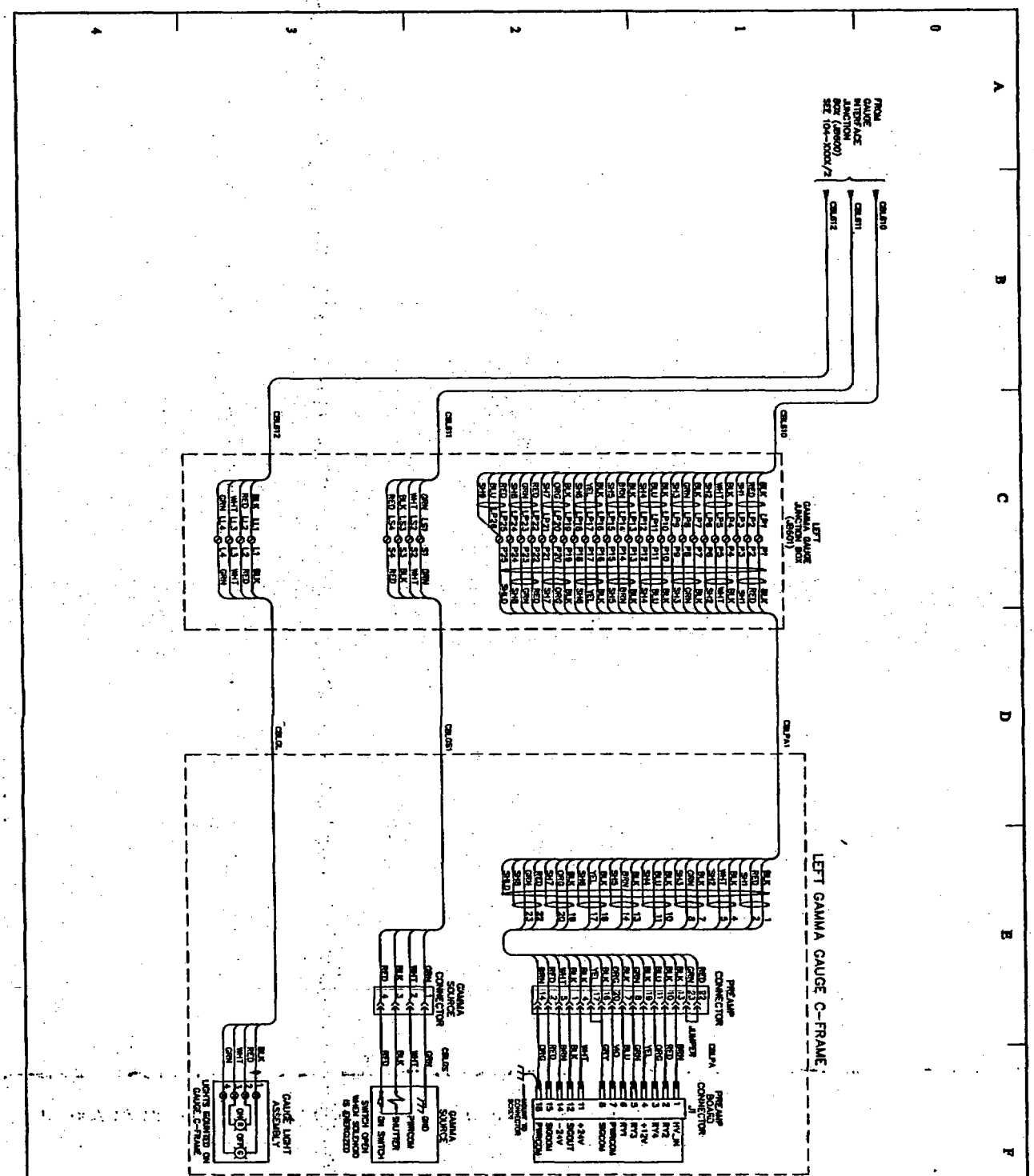
TITLE: GAMMA GAUGE INTERFACE JUNCTION BOX

DWG. NO. 120-XXXX — ISSUE A — SHT 1 OF 1 — SCALE: 1/4 — JOB NO.:



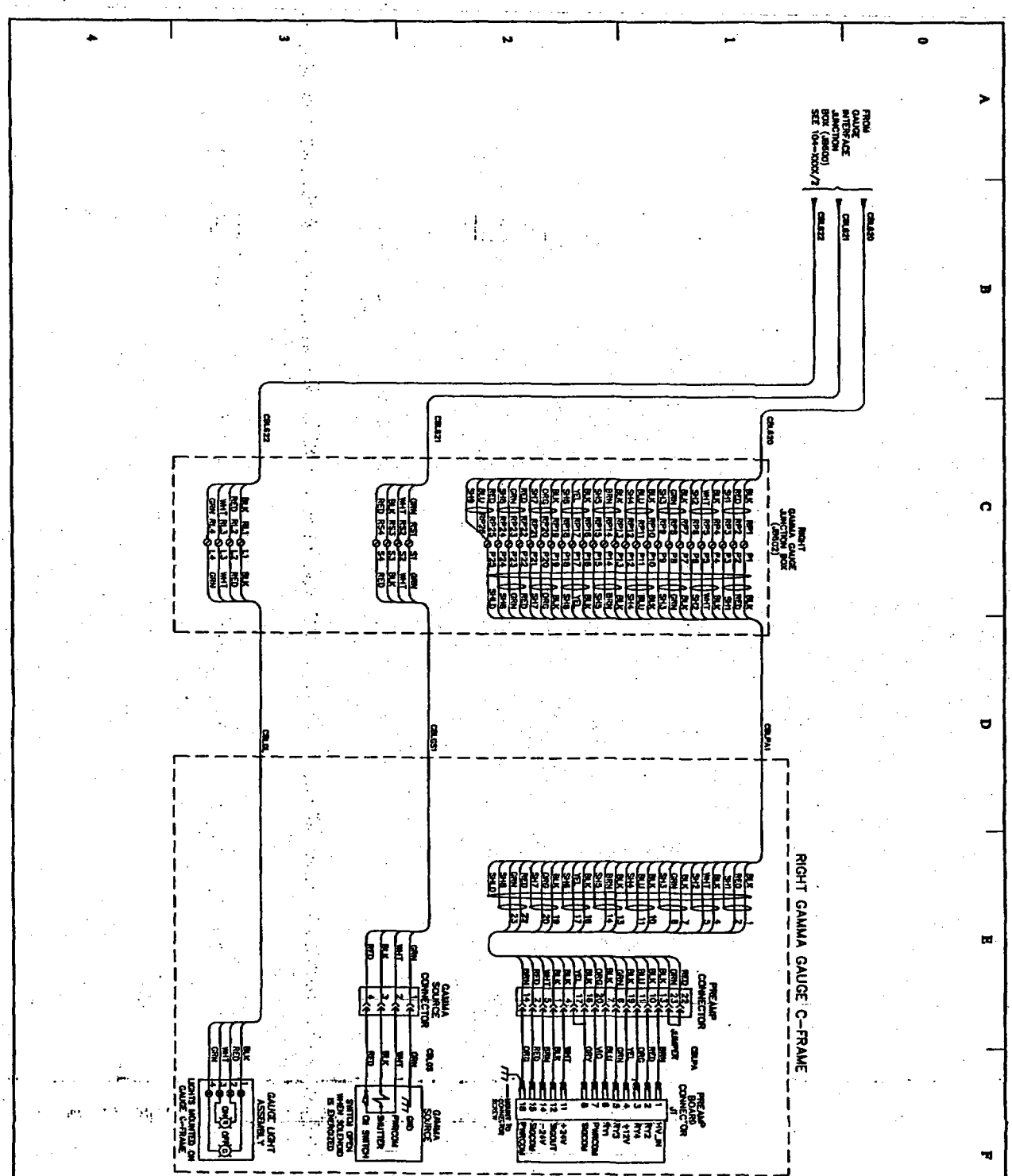

GAUGE INTERFACE JUNCTION BOX (JB600) SEE 120-XXXX/1
GAUGE SIGNAL INTERFACE BOARD 105-1278
GAUGE POWER INTERFACE BOARD 105-1277
RIGHT PREAMP
LEFT PREAMP
RIGHT GAUGE SOURCE LIGHTS AND HIGH VOLTAGE
LEFT GAUGE SOURCE LIGHTS AND HIGH VOLTAGE
110-120 VAC AC POWER
115/115VAC 43VA TRANSFORMER
GAMMA GAUGE INTERCONNECT
INTERGRATED INDUSTRIAL SYSTEMS
DWG. NO. 104-XXXX
ISSUE A
SHT 2 OF 4

M:\Released\104\2091C-A.DWG Wed Jun 07 13:58:13 2000 I2S Electrical - Tom O'Donnell



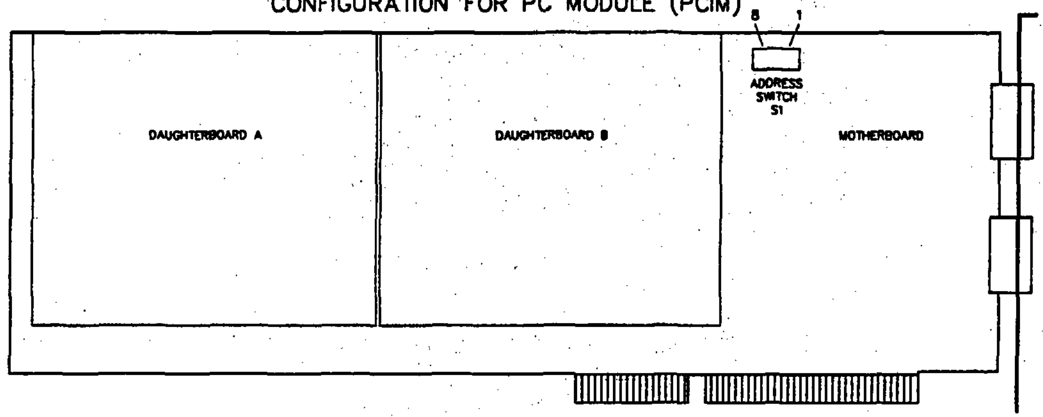
DWG. NO. 104-XXXX SHT 3 OF 4	ISSUE A	TITLE : GAMMA GAUGE INTERCONNECT		INTERGRATED INDUSTRIAL SYSTEMS 476 MAIN STREET YALESVILLE, CONNECTICUT 06492	DESIGN	11/15/00	J.KING						
					DRAWN	11/15/00	J.KING						
					CHECKED								
					RELEASED								
						DATE	NAME	REV.	DATE	BY	REL.	ECN No.	DESCRIPTION
JOB NO.:		SCALE : FULL											

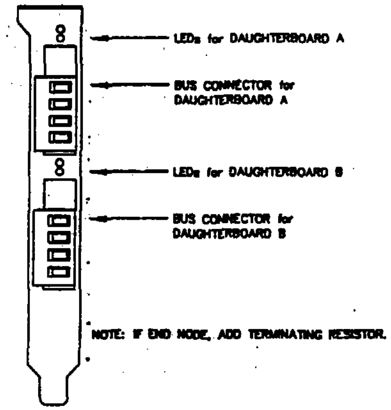
M:\Released\104\2091D-A.DWG Wed Jun 07 13:56:02 2000 I2S Electrical - Tom O'Donnell



DWG. NO.	ISSUE	TITLE :												
104-XXXX	A	GAMMA GAUGE INTERCONNECT												
SHT 4 OF 4		ADE NO.:	SCALE : FULL	INTERGRATED INDUSTRIAL SYSTEMS 476 MAIN STREET VALLEYVILLE, CONNECTICUT 06492	DESIGN	05/31/00	J.KING							
					DRAWN	05/31/00	J.KING							
					CHECKED									
					RELEASE									
						DATE	NAME	REV.	BASE	BY	REL.	ECN No.	DESCRIPTION	

CONFIGURATION FOR PC MODULE (PCIM)

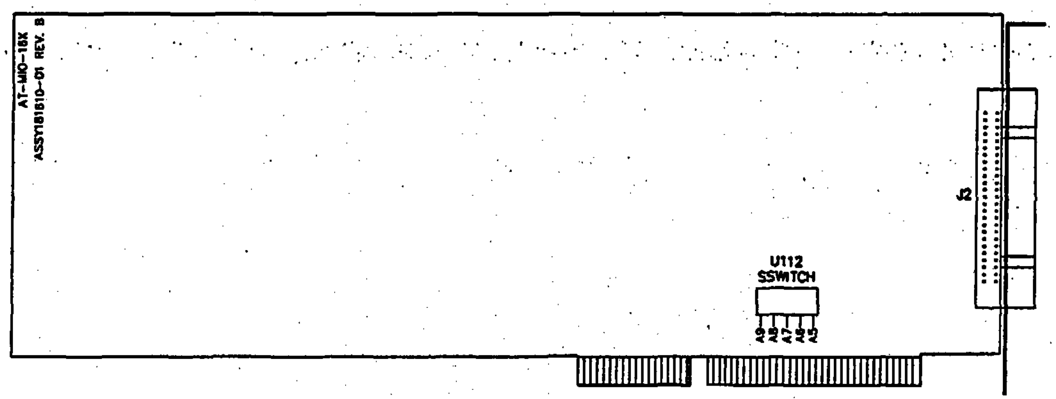




HIGH DIGIT	MIDDLE DIGIT		LOW DIGIT
1 2	3 4 5 6		7 8
C C = 0	C C C C = 0	O C C C = 8	*C C = 2
C O = 1	C C C O = 1	O C C O = 9	C O = 6
*O C = 2	*C C O C = 2	O C O C = A	O C = A
O O = 3	C C O O = 3	O C O O = B	O O = E
	C O C C = 4	O O C C = C	
	C O C O = 5	O O C O = D	
	C O O C = 6	O O O C = E	
	C O O O = 7	O O O O = F	

C = CLOSED = DOWN TOWARD BOARD
O = OPENED = UP AWAY FROM BOARD
* = DEFAULT SETTING = 222 (hex)

CONFIGURATION FOR NATIONAL INSTRUMENTS MULTIFUNCTION I/O



SWITCH SETTINGS					BASE I/O ADDRESS (hex)	BASE I/O ADDRESS SPACE (used hex)
A9	A8	A7	A6	A5		
1	0	0	0	0	200	200-21F

INTERGRATED INDUSTRIAL SYSTEMS
475 MAIN STREET
YALESVILLE, CONNECTICUT 06492

TITLE: GAMMA GAUGE COMPUTER ASSEMBLY
ISSUE: A
SCALE: FULL
DWG. NO. 133-XXXX
SHT 3 OF 4

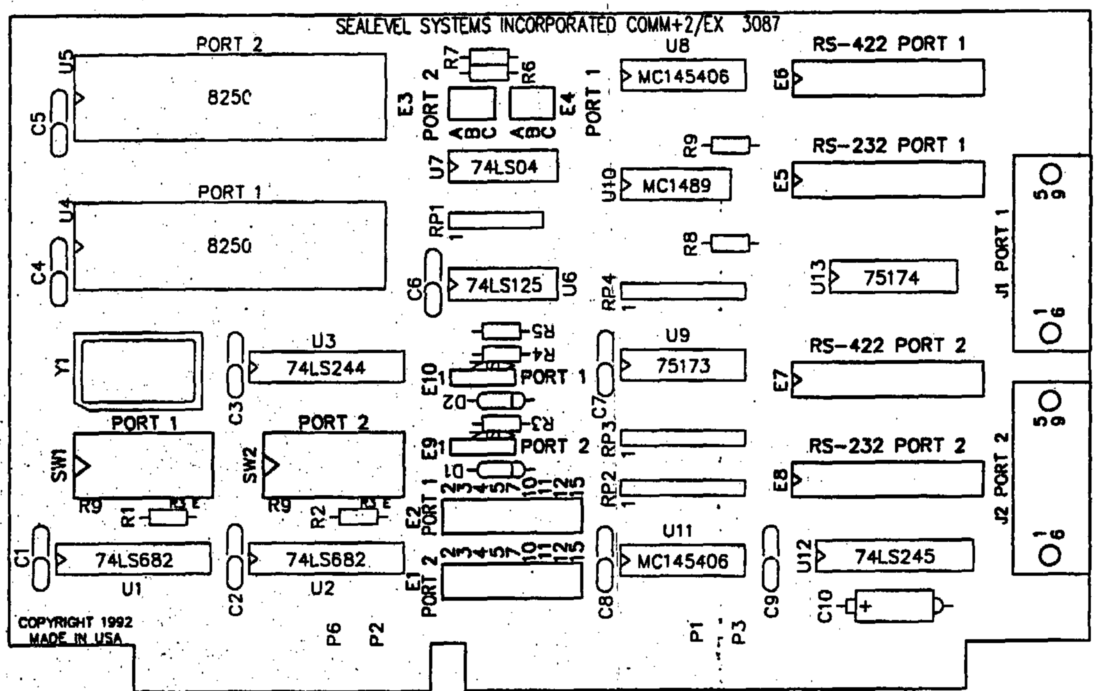
K:\Working\133\0283C-A.DWG Wed Jun 07 13:50:21 2000 I2S Electrical - Tom O'Donnell

CONFIGURATION FOR COMM+2/EX SERIAL I/O BOARD

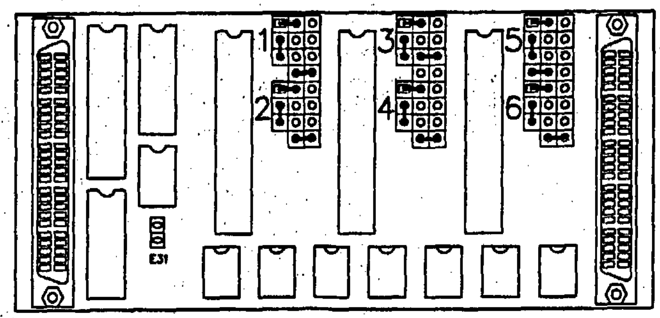
SW1
1- OFF
2- OFF
3- OFF
4- OFF
5- OFF
6- ON
7- OFF
8- ON

SW2
1- OFF
2- ON
3- OFF
4- OFF
5- OFF
6- ON
7- OFF
8- ON

OPTION JUMPERS
JUMPER E1=IRQ11
JUMPER E2=IRQ10
JUMPER E3=B
JUMPER E4=B
JUMPER E5=ALL
JUMPER E6=NONE
JUMPER E7=NONE
JUMPER E8=ALL
JUMPER E9=1 & 2
JUMPER E10=1 & 2



CONFIGURATION FOR INDUSTRYPACK IP-DAC MODULE



GAMMA GAUGE COMPUTER ASSEMBLY

INTERGRATED INDUSTRIAL SYSTEMS

133-XXXX

A

TABLE OF CONTENTS

I²S Radiation Safety Program

OVERVIEW

This I²s Radiation Training Program is designed to help you, the customer, to understand the basic operation and safety procedures.

First and foremost, **SAFETY** is our primary concern. The gage itself is a very safe device and is virtually impossible to damage in such a way as to pose a radiation hazard. This does **NOT** mean that untrained personnel are allowed to do anything they want to.

This is **NOT** a maintenance manual, only an Operations and Regulations Manual.

This does **NOT** allow you to perform any maintenance on the gage itself, with the exception of changing indicator lights with power off.

If, after completing the material in this manual, you have unresolved questions or desire more in-depth training, please contact us at (203) 265-5684. Your inquiries are always welcomed.

2. SAFETY

Congratulations on receiving your I²S Gamma Radiation Gauge. Our company has many years of experience with these gauges and is extremely proud of our safety record. While the gauges we produce are low level, our companys' primary concern is the continued safety of all our customers. It is therefore appropriate to establish some guidelines on how to conduct yourself in the areas where these gauges are in use.

Our gauge, physically, looks like an elongated "C". In the open end of the C-Frame is where the radioactive source housing is located. **DO NOT** place any part of your body in this open air gap.

Mounted on top of the C-Frame are two (2) lights, one *Green*, one *Red*. With the gauge system powered, the *Green* light indicates the source is covered (shutter closed) and the gauge is not active. The *Red* light indicates that the source is exposed (shutter open) and radiation is present. When the *Red* light is lit, stay at least three (3) feet away from the gauge. To physically verify the position of the gauge shutter a glass peep hole has been installed on the front of the source housing. *Green* and *Red* strips have been painted on the shutter to correspond to the C-Frame lights. On the outboard side of the C-Frame is a label containing the **"3 Foot Warning"**. This label must be maintained on the C-Frame in legible condition.

There are three (3) factors that should be used to minimize your exposure to radiation: **Time, Distance,** and **Shielding.**

Time: The less time a person remains in the area of radiation, the less of a radiation dose that person will receive.

Distance: The intensity of radiation and it's effects fall off sharply as you move further away from the source. For example, by moving twice (2x) as far away from a radioactive source, you are exposed to *One-Quarter* the amount of radiation, moving three (3x) times as far away means One-Ninth the exposure and so on.

Shielding: Protective material placed between you and the source reduces the level of radiation passing thru, and thus the amount to which you will be exposed. In nuclear gauges, this protection is provided in the source housing.

It is appropriate to mention a word about **ALARA**. **ALARA** is an acronym. It's meaning is: **As Low As Reasonably Achievable.**

ALARA refers to the exposure level for those who work with radiation. It must be emphasized that **ALARA** is not a dose limit, it is a method of work. It is the responsibility of management and the individual worker to continuously strive to lower exposure levels. This joint commitment to a continued safe work environment *Can Not Be Over Emphasized*.

To summarize, if the shutter is open and it is not necessary to be in the direct vicinity of the gauge, **DON'T**. If you do need to work in that area, minimize you time, when possible close the shutter. If involved in a long term project, turn off the system power.

REMEMBER - The most important step in any procedure, is your personal saftey.

3. U.S. NUCLEAR REGULATORY COMMISSION REGULATIONS

I^2S has two (2) licenses from the U.S. Nuclear Regulatory Commission. They are the following:

License #06-21253-01

1) Installation, relocation, repair and servicing of the gauge, including the leak testing of sealed sources and radiation surveys of devices for other persons.

2) Instruction and training of individuals in the use of the gauging device.

License #06-21253-02G

The licensee (I^2S) is authorized to redistribute the devices containing sealed sources specified in this license to persons generally licensed pursuant to section 31.5, 10CFR part 31 (copy enclosed) or equivalent provisions of the regulations of any Agreement State.

Unless you, our customer, are specifically licensed by the U.S. Nuclear Regulatory Commission or an equivalent Agreement State, you are considered to be a general licensee. As such, you have certain responsibilities as regards to I^2S Gamma Radiation Gauge. Title 10, code of Federal Regulations (10CFR) defines conditions for use of the gauge. The sections that pertain to you (copies enclosed), the general licensee are:

- Section 20.2201, 10CFR20
  Reports of theft or loss of licenced material.

- Section 20.2202, 10CFR20
  Notification of incidents.

- Section 30.34, 10CFR30
  Terms and conditions of licenses.

- Section 30.51, 10CFR30
  Records.

- Section 30.52, 10CFR30
  Inspections.

- Section 30.53, 10CFR30
  Tests.

- Section 30.61, 10CFR30
  Modification and revocation of licenses.

- Section 30.62, 10CFR30
  Right to cause the witholding of recall of by-product material.

- Section 30.63, 10CFR30
  Violations.

- Section 31.5, 10CFR31
  Certain measuring, gauging or controlling devices.

* **Special Note:** *Section 31.5, 10CFR31, is the authorization for the issuing of a general license. There is no official document that is issued for general licenses.*

At the time of the initial installation, for the gauges, a Radiation Site Survey and Leakage Test will be performed for each gauge. Their purpose is as follows:

Radiation Site Survey:

The survey is performed to determine the level of exposure to radiation that your workers will receive. This is done to insure that this exposure level is below those levels permitted by Federal regulations. The survey is performed with a sensitive, calibrated ion chamber meter, designed to simulate exposure to the human body. The measurements taken will be recorded (sample form enclosed) and exposure levels determined. A copy of this report will be given to you along with an explanation as to how the exposure levels were determined. This report must be maintained on permanent file. A separate copy will also remain on permanent file at I²S.

Leakage Testing:

It is a U.S. Nuclear Regulatory Commission requirement that your gauge be examined at least every six (6) months for signs of leakage and/or contamination. The initial test is performed by I²S at the same time of installation (sample form enclosed). Thereafter the test must be performed at no more than six (6) month intervals by persons specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State to perform this service. I²S can provide this service, if so desired. The responsibility for having this service performed and maintaining a permanent record of the test results, rests with you, the general licensee. A permanent record of those tests performed by I²S will also be maintained on file at I²S.

You should be aware that the warning label, mounted on the gauge, cannot be removed. You are also required to maintain these labels in legible condition.

After reading the enclosed sections of Title 10, Code of Federal Regulations if you should have any questions that cannot be answered by our field representative, contact I²S Radiation Safety Officer at (203) 265-5684.

4. OPERATION OF GAUGE

To operate the gauge, turn on the power switch on the back of the gauge electronics rack. Allow at least ten (10) minutes for the system to "Warm Up". To open and close the gauge source shutter press the source *"On/Off"* pushbutton. When the pushbutton is lit the source shutter is open, when the pushbutton is not lit the source shutter is closed.

It is very important to understand exactly how the gauge lights operate, so that an unsafe condition can be recognized. Light combinations are:

1. Source *On/Off* pushbutton not lit, *Green* light on gauge lit, source shutter is closed.

2. Source *On/Off* pushbutton lit, *Red* light on gauge lit, source shutter is open and radiation is present.

3. Source *On/Off* pushbutton not lit, no light on gauge lit. Source shutter is probably closed. Remove gauge system power, use the sight glass to physically verify the position of shutter. Repair *Green* light on gauge.

4. Source *On/Off* pushbutton not lit, no light on gauge lit. Source shutter is probably closed. Remove gauge system power, use the sight glass to physically verify the position of shutter. Repair *Red* light on gauge.

5. Both, *Green* light and *Red* light, on gauge lit regardless of source On/Off pushbutton indication. There is a shutter problem and the source gauge must be serviced. This service must be performed by persons specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State. Since there is no valid indication to the correct position of the shutter it is necessary to use the sight glass to physically verify the actual position. If the shutter is stuck open refer to the ***Emergency Procedure*** section of this manual.

PLEASE NOTE:

The I²S Gamma Radiation Gauge has been designed so that when the system power is removed the shutter automatically closes (fail safe). This can be demonstrated by opening the source shutter and turning off the system power or by simply pulling the power cord. Use the sight glass to physically verify that the source shutter is indeed closed.

5. MAINTENANCE

The purpose of this section is to clearly define the maintenance that is permitted for the I²s Gamma Radiation Gauge. All areas, not specifically addressed by this section, are restricted and no customer maintenance is allowed for these areas. It should, also, be mentioned that the gauge, itself, cannot be removed from the gauge track. Any removal, relocation or shipment of the gauge must be performed by persons specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State.

WARNING:

Before performing any gauge maintenance procedure, REMOVE gauge system power and lockout. Failure to do so will result in a shock hazzard. In addition, damage may occur to sensitive system electronics. Also, physically verify the source shutter is in the closed position.

Maintenance Items:

Shutter Indicator Lights

1. The light bulbs may be replaced by unscrewing the receptacle lens cap
2. The receptacle may be replaced by opening the top of the Hoffman enclosure. The mounting screws are now accessible.

Gauge Receiver Head

1. Facing the front of the gauge, on the upper half of the C-Frame, is the receiver head. There are eight (8) bolts that are visible. The four (4) in the front, secure the front cover to the receiver head. The four (40 in the back (2 per side) secure the receiver head to the C-Frame. Remove the four (4) bolts in the back.
2. Lift the receiver head straight out. Disconnect preamplifier cable on the back of the receiver head. Receiver head can now be placed on workbench.
3. Remove four (4) bolts on front cover. Remove cover. Preamplifier printed circuit board, its connector and ion chamber are now accessible for service.
4. To re-assemble, reverse the order.

REMINDER: NO service, by the customer, is permitted on the gauge source head.

6. EMERGENCY PROCEDURE

First, and foremost, **SAFETY** is our primary concern. The I²S Gamma Radiation Gauge has been designed for the mill environment and is virtually impossible to damage in such a way as to pose a radiation hazard. In the event that an emergency involving a radiation gauge should occur, the following steps should be taken.

1. Cease work immediately.

2. Do not attempt to work on the gauge yourself.

3. If the gauge has been partially damaged or destroyed, keep all personnel at least twenty (20) feet away, until the source has been repaired or shielded or until radiation levels are known.

4. Notify the I²S Radiation Safety Officer as soon after the incident as possible. Our company's main telephone number (203) 265-5684 also serves as a **24 Hour Emergency Number.**

5. Have leakage tests performed after any incident that may have resulted in damage to the source.

6. In case of accident or fire, do not use the gauge until any danger from or damage to the source has been assessed.

7. Inform the U.S. Nuclear Regulatory Commission within 24 hours of any theft, accident or incident involving the gauge. Full explanation of notification requirements are contained in the following regulations:

a. 10CFR20-2201 Reports of thefts or loss of licensed materials
b. 10CFR20-2202 Notification of incidents. Copies of these regulations are contained in this manual. In the event that notification is required , contact the nearest U.S. Nuclear Regulatory Commission regional office. They are:

U.S.N.R.C. Region I
475 Allendale Road
King of Prussia, Pa. 19406-1415
Tel. (215) 337-5000

U.S.N.R.C. Region II
101 Marietta Street, N.W., Suite 2900
Atlanta, Ga. 30323
Tel. (404) 331-4503

U.S.N.R.C. Region III
799 Roosevelt Road
Glen Ellyn, Il. 60137
Tel. (708) 790-5500

U.S.N.R.C. Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, Tx. 76011-8064
Tel. (817) 860-8100

U.S.N.R.C. Region V
1450 Maria Lane, Suite 210
Walnut Creek, Ca. 94596-5368
Tel. (510) 975-0200

CUSTOMER ACKNOWLEDGMENT FORM

On behalf of my company I acknowledge that we have received a copy of the **"I²S Gamma Radiation Gauge Radiation Safety Program"**. The contents of the program have been reviewed with me. It is understood that we are responsible for the information contained within this program.

_____

Company (please print)

_____

Customer Representative (signature)

_____

Customer Representative (please print)

_____

Date

Customer Copy

CUSTOMER ACKNOWLEDGMENT FORM

On behalf of my company I acknowledge that we have received a copy of the **"I²S Gamma Radiation Gauge Radiation Safety Program"**. The contents of the program have been reviewed with me. It is understood that we are responsible for the information contained within this program.

_____

Company (please print)

_____

Customer Representative (signature)

_____

Customer Representative (please print)

_____

Date

I²S Copy