

VLBA Technical Report No. 41

VLBA Data Acquisition Rack (DAR)

Alan E.E. Rogers
November 1988

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Drawing List:

Drawing Number	Title	Type
54100S007	VLBA Data Acquisition System	Block Diagram
54100D006	Rack Layout	Layout
54100D005	I/O pin allocations	Diagram
54100D004	Timing	Timing diagram
54100M008	I/O panel	Drilling plan
54100I009	I/O panel	Silk screen
54100M010	Power splitter mounting	Mechanical
54100M011	Bin connector	Mechanical
C53306M013	Front panels	Mechanical
C53306M014	Perforated covers	Mechanical
C53306M015	Rear panels	Mechanical
C53306M016	Bar supports	Mechanical
C53306M017	Side plates	Mechanical
C53306M030	Rear panel OSP	Mechanical
C53306M031	Blank panels	Mechanical

Power Supplies:

The DAR has the following power supplies:

Module	Voltage	Rating	Ripple	Comments
P101	+15	12 amp	1 mv max	
P101	-15	12 amp	1 mv max	
P105	+5	90 amp	-	for formatter
P103	+5	36 amp	1 mv	
P103	-5	36 amp	1 mv	

The power consumption is as follows:

	P103(+5v)	P103(-5v)	P101(+15v)	P101(-15v)
5MHz dist	-	-	0.27	-
32MHz dist	0.1	0.75	0.25	-
Sampler	0.35	2.4	-	-
I.F.distr.	0.60	-	0.18	0.02
BBConv	2.1	-	0.85	0.55
Formatter	-	10.0	-	-
Total(4BBC/R)	10.0	13.15	4.28	2.24
Total(8BBC/R)	18.7	15.55	7.68	4.44

Notes: 1] With 8 BBCs per rack 2 samplers are required

General Description:

The DAR houses the I.F. processing electronics in VLA modules and the formatter in a VME crate.

DAR checkout:

Checking out an entire DAR can proceed after all the module have been tested on the bench and the rack wiring has been checked using an ohm meter.

1] Power tests

Plug in only the power modules and check voltages on all connectors to the modules before inserting other modules.

2] Manual tests (do not require MCB)

Plug in 5 MHz distributor and verify that 5 MHz gets to all the connectors. Plug in 32 MHz distributor and verify distribution of 1 PPS and 32 MHz.

3] Initial tests using MCB

Plug in BBC and try to communicate with it using a PC or station computer. Move the converter through all the slots to verify that it picks up the correct address from the rack connectors. Plug in the IFDs and set IFD#2 to alternate input so that test signal can be injected into front panel - verify distribution of test signal.

4] Plug in all modules and run computer test routines.

5] 1 PPS test

If the 1 PPS doesn't get to the BBCs or IFDs the 1 PPS status bit will indicate its absence. But if the 1 PPS fails to reset the ECL logic in the BBC synthesizers this problem may go undetected and so to test this

feature observe the phase of the local oscillator, inject a random pulse into the 1 PPS input (you can just briefly connect the 1 PPS to +5v to generate a random pulse) and observe phase jump, re-inject 1 PPS at correct epoch and check that the phase returns to its original value. A more painfull way of conducting this test is to measure L.O. phases and then power down and power up the rack checking that the phases return following the power interruption.

I/O Connections and Power Levels:

The I/O connections are on a I/O panel at the base of the rack.

Connector Type	Function	Power Level
N	5 MHz Input	+13 dBm Nominal
N	I.F. A	-34 dBm Nominal
N	I.F. B	"
N	I.F. C	"
N	I.F. D	"
BNC	1 pps input	Pulse (greater than 2 volts) into 50 ohm
9-Pin D	MCB Input	See MCB Documentation
9-Pin D	MCB Output to next Rack or Termination	
40-Pin Data	Output to REC #1	
40-Pin Data	Output to REC #2	
20-Pin Monitor	Data From REC #1	
20-Pin Monitor	Data From REC #2	

Rack Weight, Power Consumption, Shipping Information:

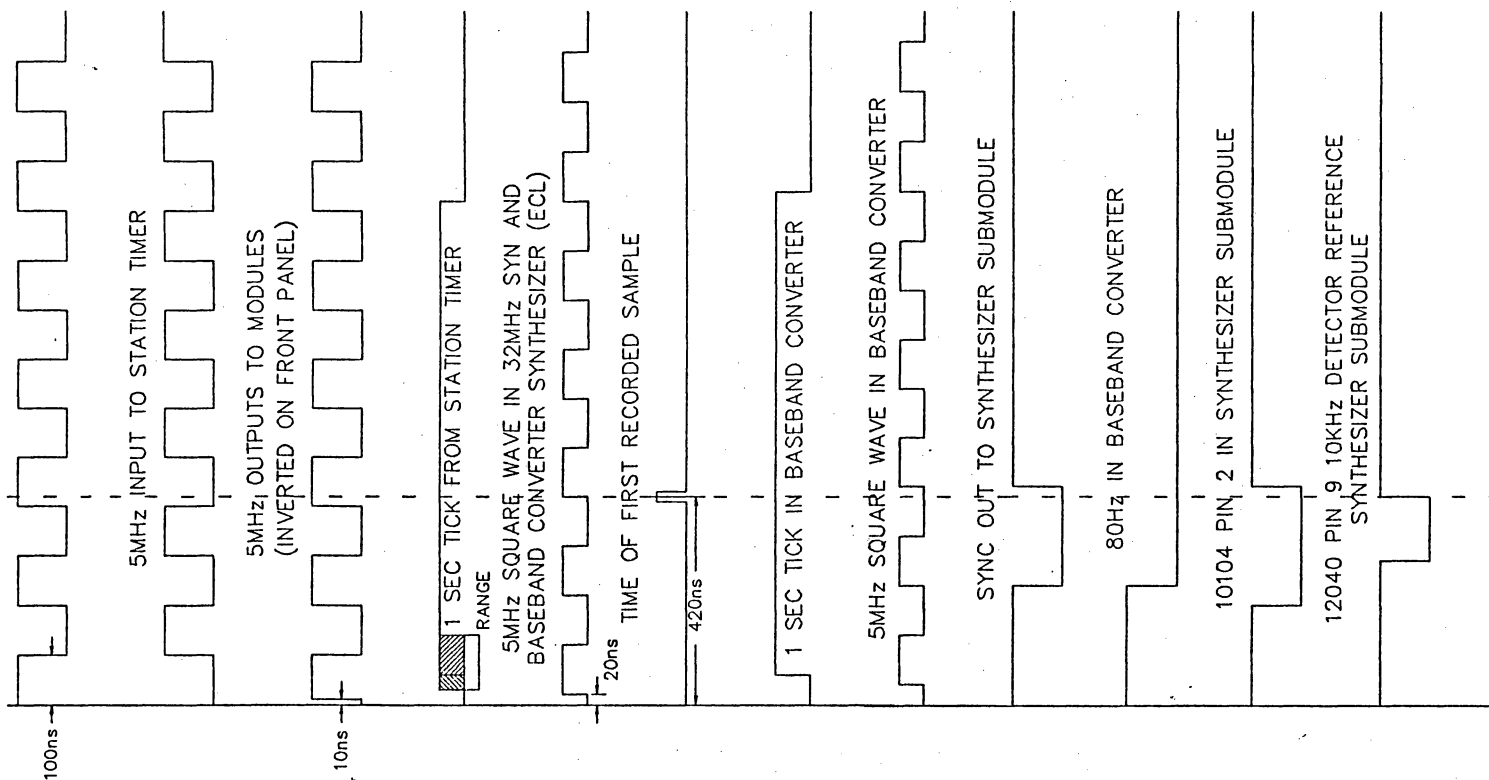
Rack Weight	800 Pounds
Power Consumption	500W with 4 Converters 700W with 8 Converters
Shipping	No Special Precautions

Rack Wire List: (file: rackw.wp)

Note: The flexible coax cabling in the rack is a special double shielded version of RG-188 that has about 105 dB isolation between cables as compared with 60 dB for standard RG-188.

Parts List: from PARTS.DBF

STATION : 5MHz FROM MASER (SINE WAVE - DRAWN AS SQUARE WAVE
TO EMPHASIZE ZERO CROSSINGS)



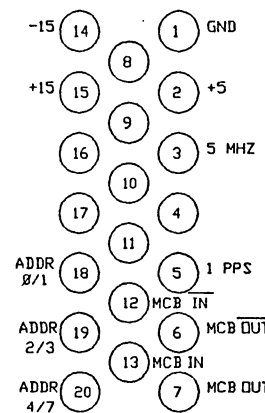
NOTES:

1. 5MHz BUFFER INVERTS 5MHz PHASE
2. RANGE OF ACCEPTABLE 1pps TIMING IS 30ns EARLIER TO 100ns LATER THAN NOMINAL

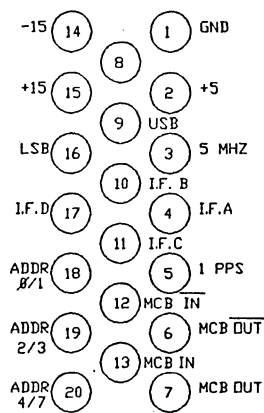
ELECTRONIC NOTES: UNLESS OTHERWISE NOTED: RESISTORS: CAPACITORS: INDUCTORS:	USED ON		DRAWN FOR: A.E. ROGERS		DATE: 1-87		NORTHEAST RADIO OBSERVATORY CORPORATION HAYSTACK OBSERVATORY WESTFORD, MASSACHUSETTS						
			DRAWN BY: A. PHILBROOK		1-87								
			CHECKED BY:						FIRST SAMPLE, 10KHz AND 80Hz SYNCHRONIZATION TIMING DIAGRAM				
	SCALE 200ns = 1 INCH		APPROVAL		PROJECT ENGINEER:								
CLASSIFICATION										AER\SYNCTIM	C	54100D004	

C- 54100D004

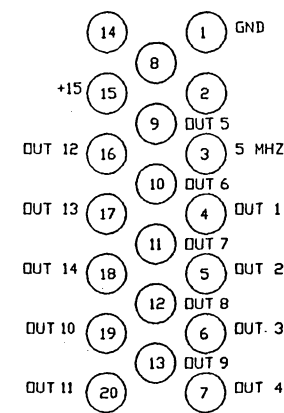
CHANGE LETTER	DWN BY	CHK'D BY	APP'D BY	DATE	D.C.N. & DESCRIPTION
A	APH			9/87	SEE ARCHIVED DISKS
B	APH			11/87	ADDED LABEL OF 5MHZ IN ON PIN 3 OF OUTPUT RATE SYNTHESIZER (1)
C	APH			1/88	ADDED LABELS ON OUTPUT RATE SYNTHESIZER PINS



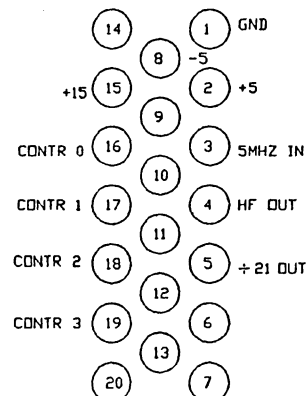
IFD(2)



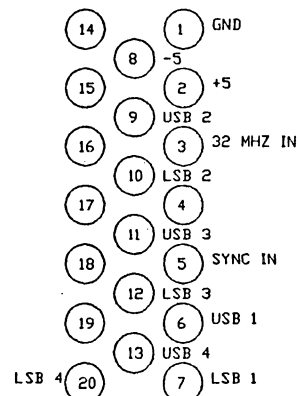
BBC(8)



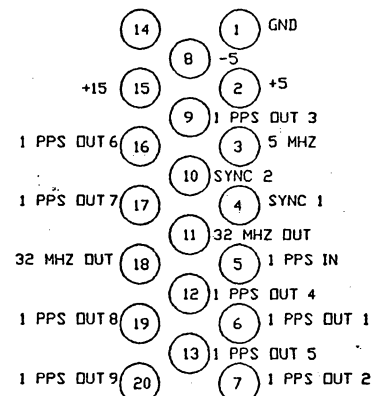
5 MHZ(1)



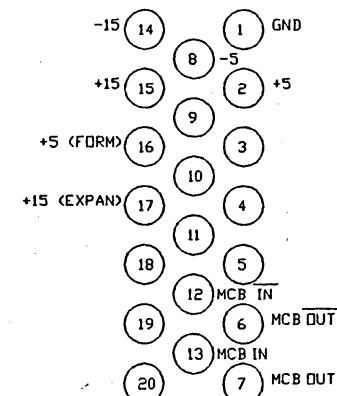
OUTPUT RATE
SYNTHESIZER (1)



SAMPLER(2)



32 MHZ(1)



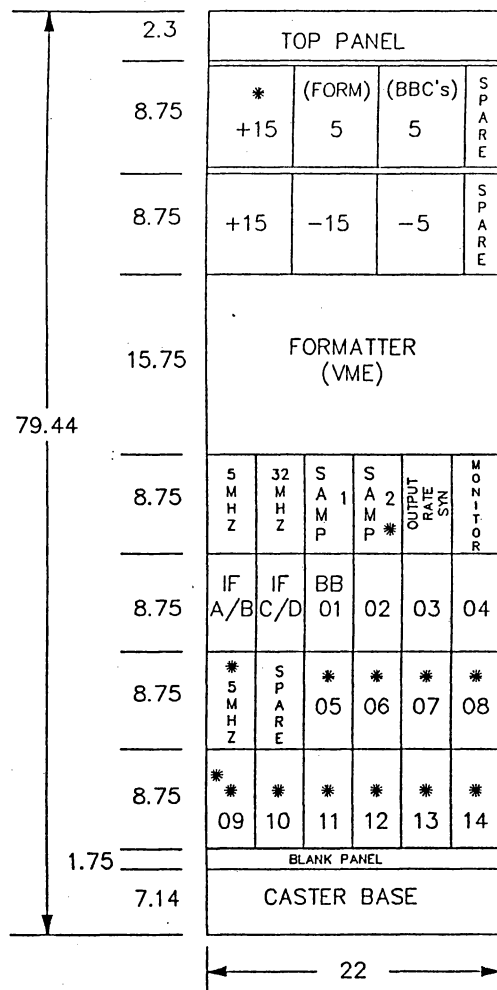
MONITOR (1)

NOTES:

ELECTRONIC NOTES: UNLESS OTHERWISE NOTED: RESISTORS: CAPACITORS: INDUCTORS:	USED ON	DRAWN FOR: A.E.ROGERS		DATE: 5-86	NORTHEAST RADIO OBSERVATORY CORPORATION HAYSTACK OBSERVATORY WESTFORD, MASSACHUSETTS			
		DRAWN BY: A.E.ROGERS		5-86	I/O PIN ALLOCATIONS FOR VLBA DAS MODULES			
		CHECKED BY:						
	SCALE	APPROVAL	PROJECT		AER\CONNECT C 54100D005 C			
CLASSIFICATION	ENGINEER:							

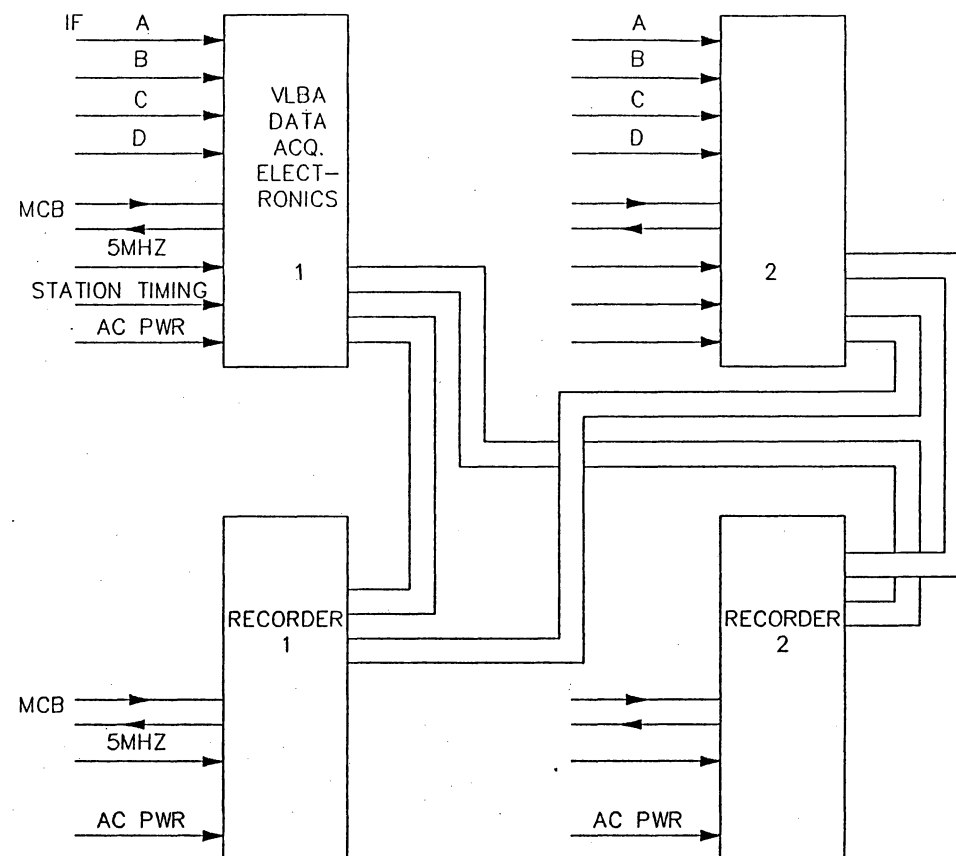
C-54100D005

CHANGE LETTER	DWN BY	CHK'D BY	APP'D BY	DATE	D.C.N. & DESCRIPTION
A	APH			9/87	SEE MARKED UP PRINT



* FOR EXPANSION

DATA ACQUISITION RACK LAYOUT



FULL VLBA CONFIGURATION

1. EACH ELECTRONICS RACK HAS 4 BB CONV. EXPANDABLE TO 8.
2. EACH FORMATTER HAS 32 DATA OUTPUTS BUFFERED TO EACH RECORDER MAX OUTPUT DATA RATE 256 MB/S PER FORMATTER (EXPANDABLE TO 512 MB/S PER FORMATTER).
3. RACKS ARE INDEPENDANT.

NOTES

MATERIAL

FINISH AND/OR HEAT TREATMENT

SHOP NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES
2. TOLERANCE ON DIMENSIONS
FRACTIONAL $\pm 1/64$
DECIMAL .XX $\pm .01$
DECIMAL .XXX $\pm .005$
ANGULAR $\pm 0/30$
3. SURFACE ROUGHNESS
PER MIL-STD-10
4. REMOVE BURRS AND BREAK SHARP EDGES $1/64$ MAX.
5. SCREW THREADS PER MIL-STD-9
6. ALL DIMENSIONS TO APPLY BEFORE PLATING OR CONVERSION COATING.

USED ON

NEXT ASSEMBLY

WEIGHT

SCALE

CLASSIFICATION

DRAWN FOR A.E. ROGERS

DRAWN BY A. PHILBROOK

CHECKED BY

PROJECT

ENGINEER

MATL. & PROCESS

STRUCTURES

THERMAL

MECH. ANALYSIS

DATE

3/87

3/87

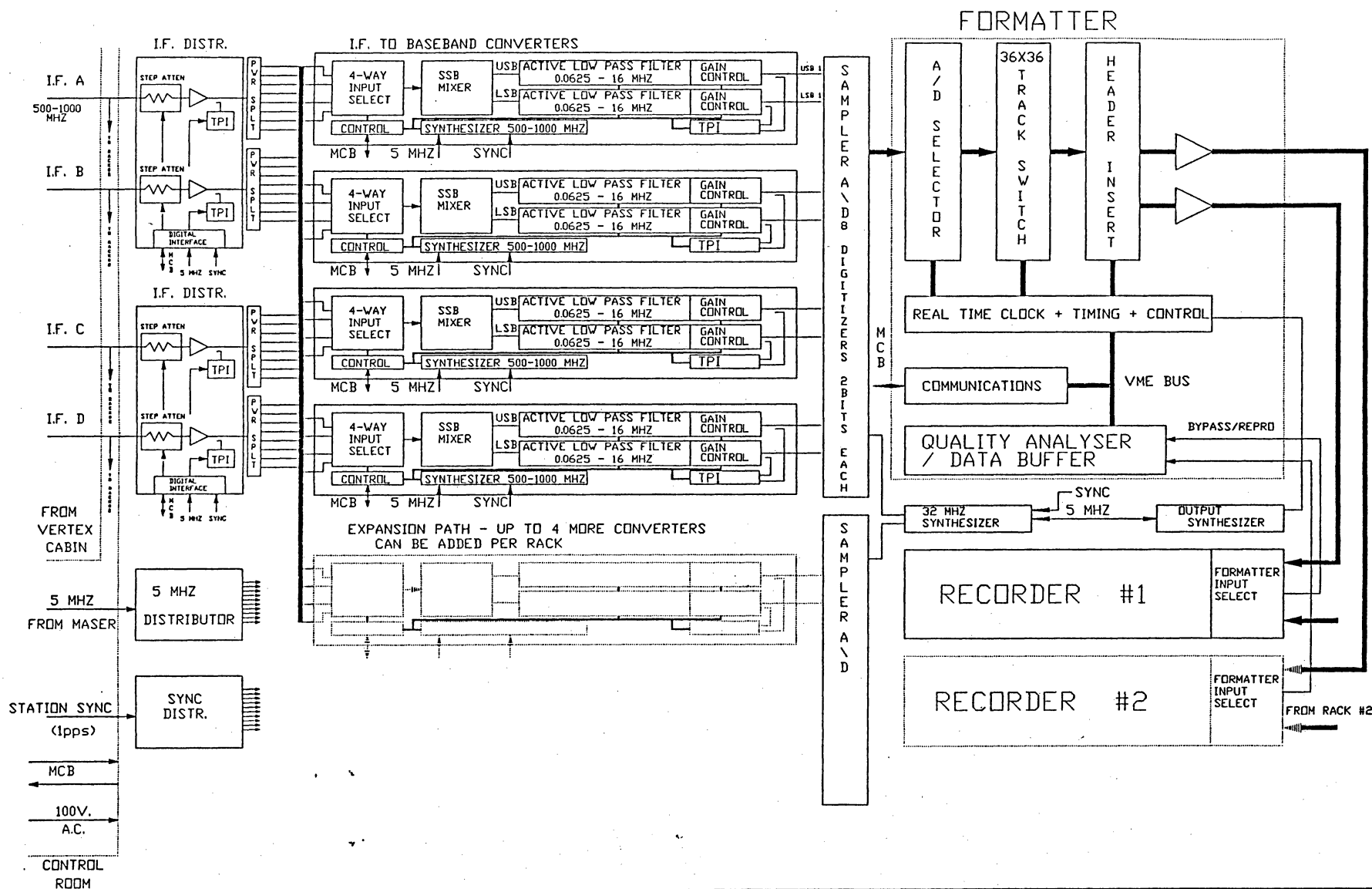
NORTHEAST RADIO OBSERVATORY CORPORATION
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS

DAR RACK CONFIGURATION

C 54100D006 A
AER/RACK DWG. SIZE DWG. NO. REV.

C-54100D006 A

CHANGE LETTER	DWN BY	CHK'D BY	APP'D BY	DATE	D.C.N. & DESCRIPTION



NOTES:

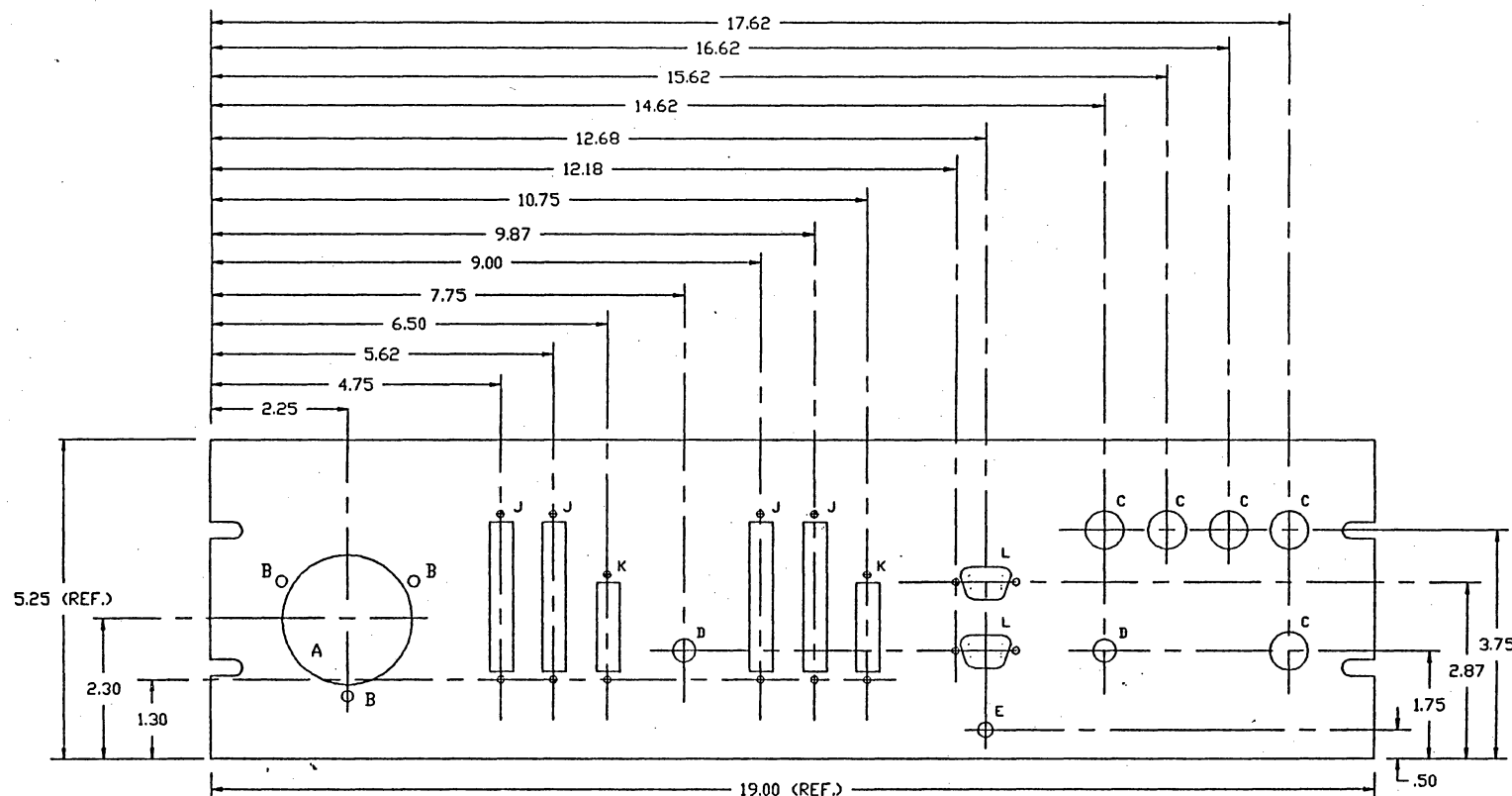
MCB = MONITOR AND CONTROL BUS.
 SYNC = STATION SYNC (1pps)

IN FULL VLBA SYSTEM THERE ARE 2 RACKS,
 AND 2 RECORDERS PER STATION.
 EACH RACK HAS 4 CONVERTERS AND 1 FORMATTER.
 IN THIS CONFIGURATION:
 MAX # IF CHANNELS = 4 (EACH 500-1000MHz)
 MAX # BASEBAND CHANNELS = 16 (8 USB + 8 LSB)
 MAX DATA OUTPUT RATE = 512MB/S

ELECTRONIC NOTES: UNLESS OTHERWISE NOTED:	USED ON	DRAWN FOR: A.E. ROGERS	DATE: 7-87	NORTHEAST RADIO OBSERVATORY CORPORATION HAYSTACK OBSERVATORY WESTFORD, MASSACHUSETTS			
		DRAWN BY: A.E. ROGERS	7-87				
		CHECKED BY:		VLBA DATA ACQUISITION SYSTEM			
		APPROVAL	PROJECT ENGINEER:				
RESISTORS:	SCALE NONE			AER\ACQRACK	C	54100S007	
CAPACITORS:	CLASSIFICATION						
INDUCTORS:							

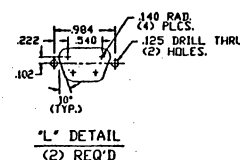
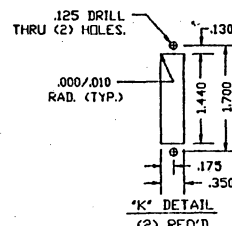
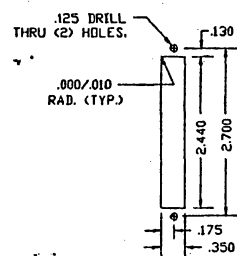
c-54100S007

DATE	APP'D	DATE	DESIGN	DESCRIPTION



HOLE DATA

- *A* 2.125 DIA. THRU HOLE.
- *B* .187 DIA. THRU, 3 HOLES 120° APART ON A 2.500 DIA. B.C.
- *C* .625 DIA. THRU, 5 HOLES.
- *D* .375 DIA. THRU, 2 HOLES.
- *E* .250 DIA. THRU.



MATERIAL:
19"X5.25"X.125"
ALUM. PANEL
BUD RADIO HPA-1133

FINISH AND/OR HEAT TREATMENT:
SEE SILK SCREENING
DWG D-541001009

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES
2. TO SURFACE OF UNLESS OTHERWISE SPECIFIED
3. DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED
4. SURFACE FINISH SHALL BE 125
5. SURFACE FINISH SHALL BE 125
6. SURFACE FINISH SHALL BE 125
7. SURFACE FINISH SHALL BE 125
8. SURFACE FINISH SHALL BE 125
9. SURFACE FINISH SHALL BE 125
10. SURFACE FINISH SHALL BE 125

DATE: 7-87
BY: P. J. CADDY
CHECKED: [Signature]
APPROVED: [Signature]

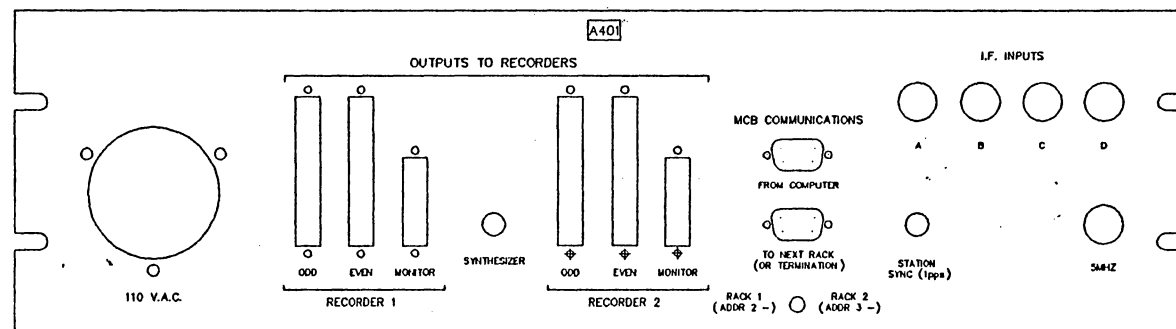
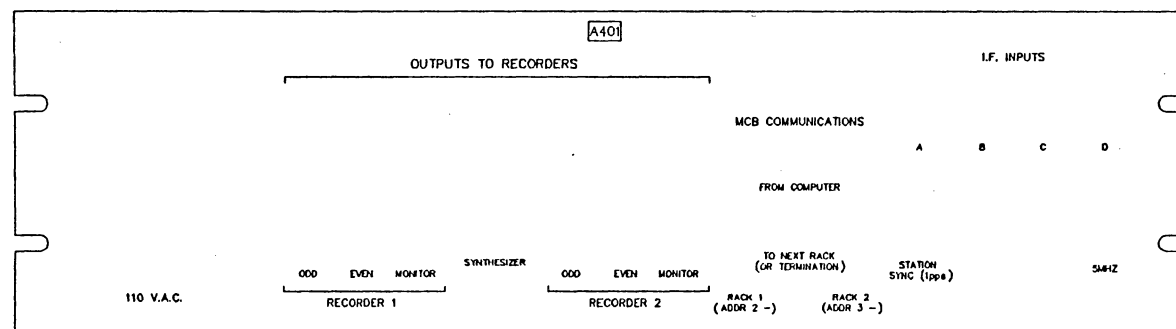
DESIGNED BY: P. J. CADDY
DRAWN BY: P. J. CADDY
CHECKED BY: [Signature]
APPROVED BY: [Signature]

NORTHEAST RADIO OBSERVATORY CORPORATION
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS

VLBA DAS
IND PANEL
DRILLING PLAN

AERNOPAN D 54100M008

D-54100M008



NOTES:

1. SILK SCREEN 10 PT., 14PT., AND 18PT. CHARACTERS AND LINES BLACK EPOXY INK.
2. LIGHT YELLOW CHROMATE CONVERSION.
3. BRACKET LOCATIONS MAY BE SCALED FROM PRINT.

MATERIAL:
SEE DRILLING PLAN
DWG D-54100M008

FINISH AND/OR HEAT TREATMENT:

SEE NOTES

SHOP NOTED UNLESS OTHERWISE SPECIFIED

- 1. DIMENSIONS ARE IN INCHES
- 2. TOLERANCE ON DIMENSIONS
FRACTIONAL 3/16"
- DECIMAL .01 & .05
- DECIMAL .001 1/16"
- ANGULAR ± 30°
- 3. SURFACE FINISHES ✓
PER MIL-STD-10
- 4. REMOVE BURRS AND BREAK
SHARP EDGES 1/64 MAX.
- 5. SLEEV IMPOSES PER MIL-STD-9
- 6. ALL DIMENSIONS TO APPLY
BEFORE PLATING OR COATING
UNLESS OTHERWISE SPECIFIED

WEEK ON NEXT ASSIGNED VERIFIED SCALE FULL CLASSIFICATION
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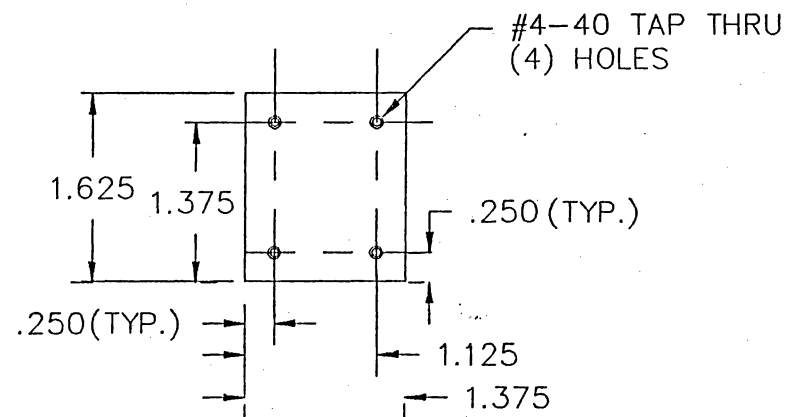
APPROVED BY	ISSUED FOR	A.E. ROGERS	7-
	ISSUED BY	APHIL BROOK	7-
	CHECKED BY	R. J. CADDY	7-
	PROJECT		
	ENGINEER		
	WORK & MATERIALS		
	STRUCTURE		
	DETAILS		

87	NORTHEAST RADIO OBSERVATORY CORPORATION
87	HAYSTACK OBSERVATORY
87	WESTFORD, MASSACHUSETTS

VLBA DAS
I/O PANEL
SILK SCREENING ARTWORK

AERVISILK	D	541001009
-----------	---	-----------

CHANGE LETTER	D'WN BY	CHK'D BY	APP'D BY	DATE	D.C.N. & DESCRIPTION



MATERIAL:
.125 ALUM. 6061-T6

SHOP NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES
2. TOLERANCE ON DIMENSIONS
FRACTIONAL $\pm 1/64$
DECIMAL .XX $\pm .01$
DECIMAL .XXX $\pm .005$
ANGULAR $\pm 0.30^\circ$
3. SURFACE ROUGHNESS
PER MIL-STD-10 ✓
4. REMOVE BURRS AND BREAK
SHARP EDGES 1/64 MAX.
5. SCREW THREADS PER MIL-STD-9
6. ALL DIMENSIONS TO APPLY
BEFORE PLATING OR CON-
VERSION COATING.

USED ON

NEXT ASSEMBLY

WEIGHT

SCALE FULL

CLASSIFICATION

DRAWN FOR A.E. ROGERS DATE 7-87

DRAWN BY A. PHILBROOK 7-87

CHECKED BY

PROJECT

ENGINEER

MATL. & PROCESS

STRUCTURES

THERMAL

MECH. ANALYSIS

NORTHEAST RADIO OBSERVATORY CORPORATION
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS

POWER SPLITTER MOUNTS
VLBA RACK

B

54100M010

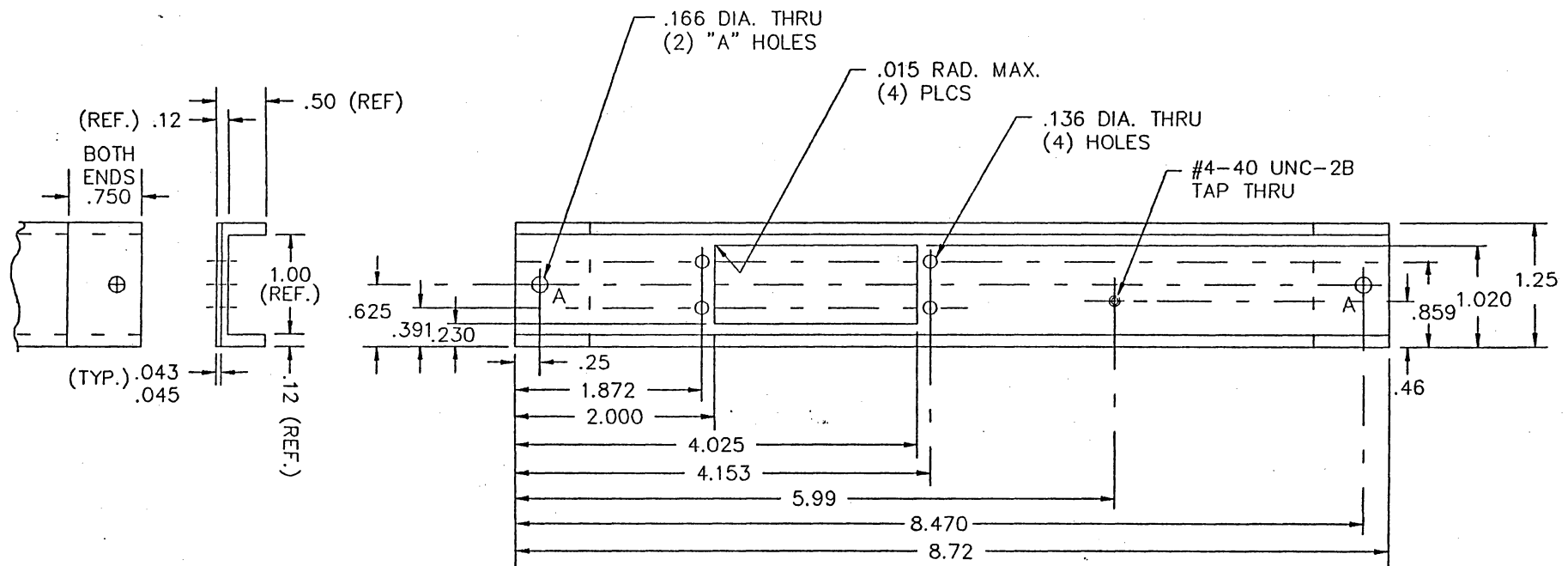
AER\PSMVLBA

DWG. SIZE

DWG. NO.

REV.

CHANGE LETTER	D'WN BY	CHK'D BY	APP'D BY	DATE	D.C.N. & DESCRIPTION



NOTES:

1. MATERIAL: .50" X 1.25" X .50" X .12" THICK ALUMINUM CHANNEL EXTR.
2. FINISH: ALQDINE

SHOP NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS ARE IN INCHES
2. TOLERANCE ON DIMENSIONS
FRACTIONAL $\pm 1/64$
DECIMAL .XX $\pm .01$
DECIMAL .XXX $\pm .005$
ANGULAR $\pm 0.30^\circ$
3. SURFACE ROUGHNESS
PER MIL-STD-10
4. REMOVE BURRS AND BREAK
SHARP EDGES 1/64 MAX.
5. SCREW THREADS PER MIL-STD-9
6. ALL DIMENSIONS TO APPLY
BEFORE PLATING OR CON-
VERSION COATING.

125

USED ON

NEXT ASSEMBLY
WEIGHT
SCALE FULL
CLASSIFICATION

DRAWN FOR A.E.E. ROGERS DATE 9/87

DRAWN BY A.P. HEBERT 9/87

CHECKED BY

PROJECT

ENGINEER

MATL. & PROCESS

STRUCTURES

THERMAL

MECH. ANALYSIS

NORTHEAST RADIO OBSERVATORY CORPORATION
HAYSTACK OBSERVATORY
WESTFORD, MASSACHUSETTS

PANEL, 42 PIN POWER
CONNECTOR
BIN ASSEMBLY

B

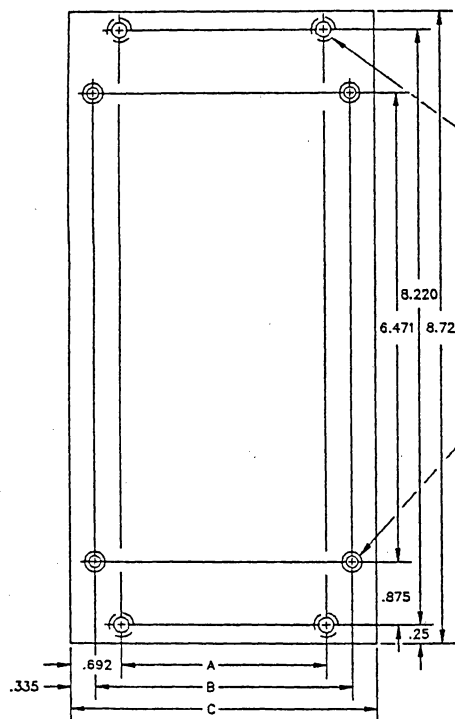
54100M011

AER\42POWCON

DWG. SIZE

DWG. NO.

REV.



.213 DIA. THRU
90° C'SINK TO .062 DEEP
FROM OPP. SIDE.
4 PLACES

DASH #	MODULE	A	B	C
-1	2UA	1.395	2.110	2.780
-2	3UA	2.790	3.505	4.175
-3	4UA	4.185	4.900	5.570
-4	6UA	6.976	7.690	8.360

.166 DIA. THRU
82±2° C'SINK
TO .284 DIA.
4 HOLES

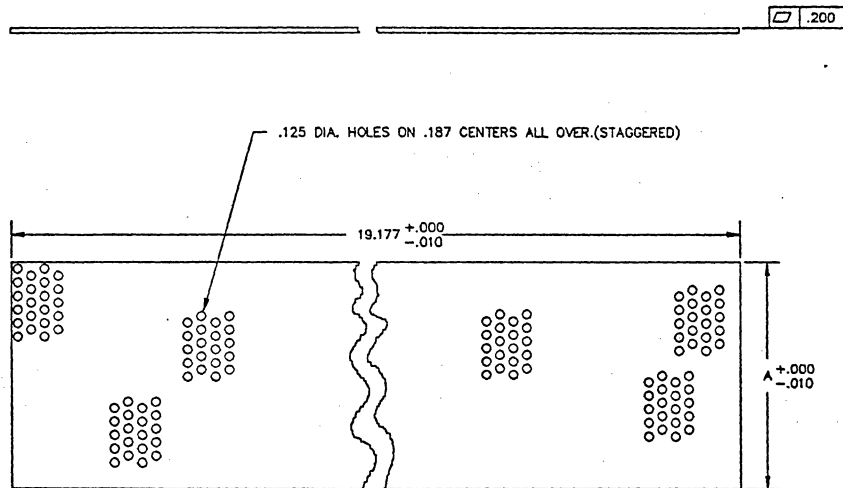
NOTES:

1. REMOVE ALL BURRS AND SHARP EDGES.
2. 125 FINISH ALL OVER.
3. FINISH: YELLOW CHROMATE CONVERSION ALL OVER.
4. BASED ON VLA B13050M19.
5. PAINT FRONT AND 4 EDGES MINT GRAY PER NRAO SPEC. A53306N002.

NATIONAL RADIO ASTRONOMY OBSERVATORY CENTRAL DEV. LAB - CHARLOTTESVILLE, VA.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES: 3 PLACE DEC. ± .005 2 PLACE DEC. ± .010 1 PLACE DEC. ± .010	PROJ: RACKS, BINS AND STANDARD MODS.	TITLE: PANEL, FRONT (XUA)	
	MATERIAL: .125 THK. ALUMINUM	DRAWN BY: G. MORRIS	DATE: 5-86
	FINISH: SEE NOTES	DESIGNED BY:	DATE:
		APPROVED BY:	DATE:
	SHEET NUMBER	DRAWING NUMBER C53306M013	REV. SCALE: 1:1

REV. A BY GM 5-5-87 ADDED HOLE PATTERN INFO.



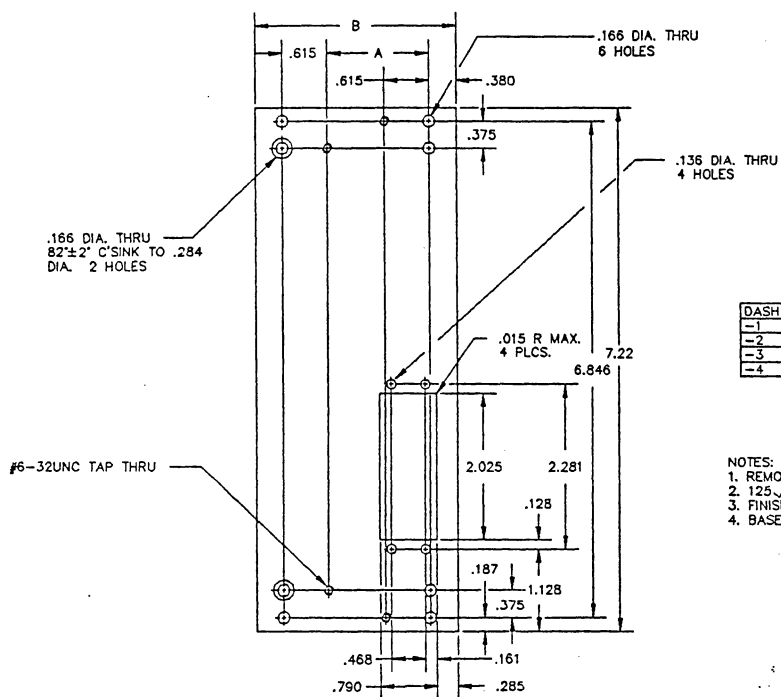
DASH NO.	MODULE	A
-1	2UA	1.745
-2	3UA	3.140
-3	4UA	4.535
-4	6UA	7.325

NOTES:

1. MATERIAL: PERFORATED ALUMINUM .063 THK 3003-H14 AS PURCHASED FROM: McNICHOLS CO. 4889 E. 154 TH. STREET CLEVELAND, OHIO 44128
2. REMOVE ALL BURRS AND SHARP EDGES.
3. SHEARED EDGES MAY BE IRREGULAR DUE TO THE PERFORATED PATTERN.

UNLESS OTHERWISE
SPECIFIED DIMENSIONS
ARE IN
INCHES
TOLERANCES
ANGLES:
3 PLACE DEC. ± .005
2 PLACE DEC. ± .010
1 PLACE DEC. ±

NATIONAL RADIO ASTRONOMY OBSERVATORY			
CENTRAL DEV. LAB - CHARLOTTESVILLE, VA			
PROJECT: RACKS, BINS AND STANDARD MODS.	TITLE: PERFORATED COVER (XUA)		
MATERIAL: SEE NOTE 1	DRAWN BY: G. MORRIS	DATE: 8-86	
FINISH: YELLOW CHROMATE	DESIGNED BY:	DATE:	
SHEET NUMBER	DRAWING NUMBER C53306M014	REV: A	SCALE: 1:1

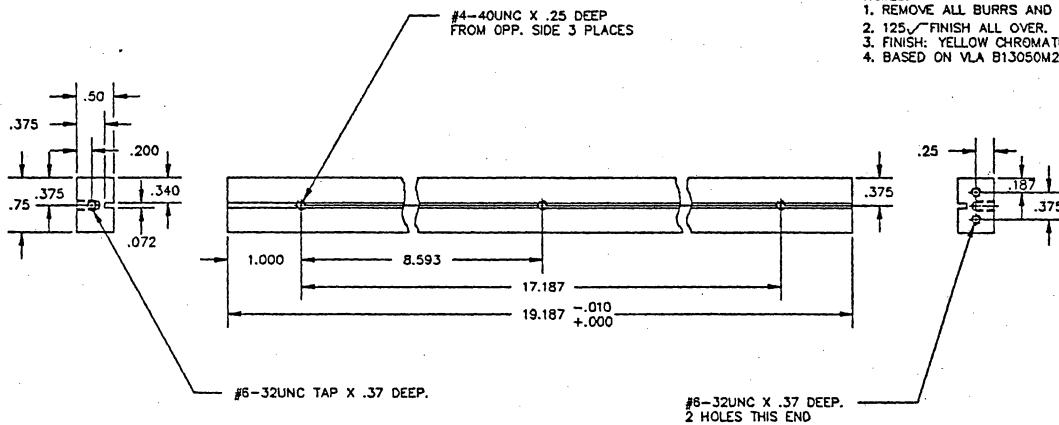


DASH#	MODULE	A	B
-1	2UA	1.395	2.755
-2	3UA	2.790	4.150
-3	4UA	4.185	5.545
-4	6UA	5.975	8.335

- NOTES:
1. REMOVE ALL BURRS AND SHARP EDGES.
 2. 125 $\sqrt$ FINISH ALL OVER.
 3. FINISH: YELLOW CHROMATE CONVERSION ALL OVER.
 4. BASED ON VLA B13050M024.

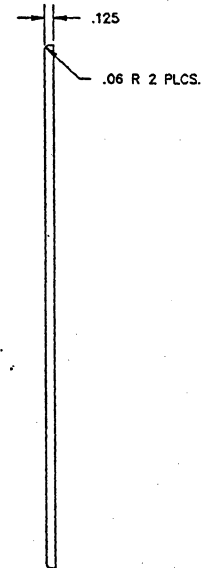
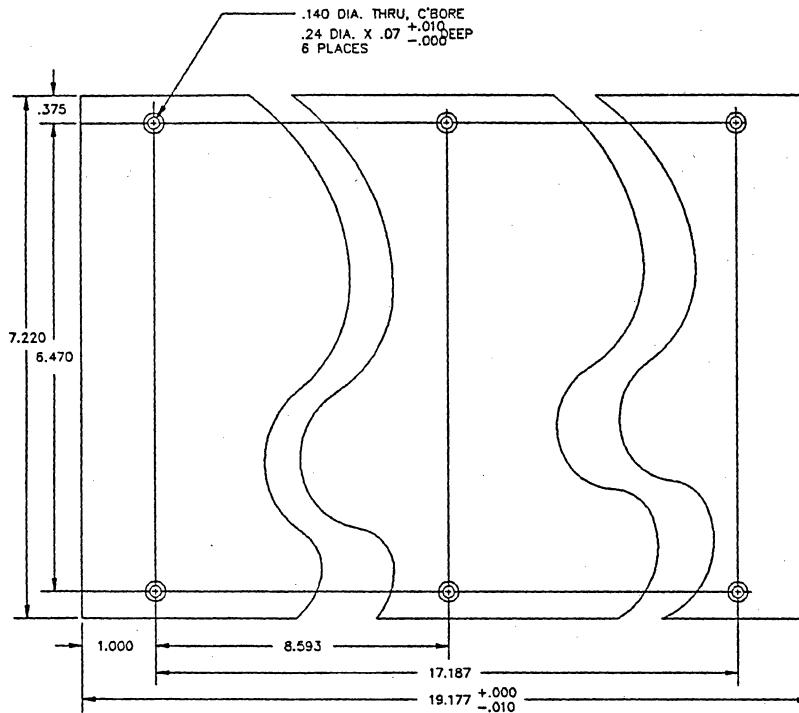
NATIONAL RADIO ASTRONOMY OBSERVATORY			
CENTRAL DEV. LAB - CHARLOTTESVILLE, VA.			
PROJ: RACKS, BINS AND STANDARD MODS.		TITLE:	
MATERIAL: .125 THK. ALUMINUM		DESIGNED BY: G.MORRIS	DATE: 8-86
FINISH: SEE NOTES		APPROVED BY:	DATE:
SHEET NUMBER	DRAWING NUMBER C53306M015	REV:	SCALE: 1:1

UNLESS OTHERWISE
SPECIFIED DIMENSIONS
ARE IN
INCHES
TOLERANCES
ANGLES $\pm$
3 PLACE DEC: $\pm$.005
2 PLACE DEC: $\pm$.010
1 PLACE DEC: $\pm$

NATIONAL RADIO ASTRONOMY OBSERVATORY
CENTRAL DEV. LAB - CHARLOTTESVILLE, VA.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES: 3 PLACE DEC: ± .005 2 PLACE DEC: ± .010 1 PLACE DEC: ±	PROF. RACKS, BINS AND STANDARD MODS.	TITLE: BAR SUPPORT (XUA)	
	MATERIAL: 6061-T6 ALUMINUM	DRAWN BY: G. MORRIS	DATE: 5-86
	FINISH: SEE NOTES	DESIGNED BY:	DATE:
		APPROVED BY:	DATE:
	SHEET NUMBER	DRAWING NUMBER C53306M016	REV: A SCALE: 1:1

REV. A BY WW 9-26-86 C0860926-27

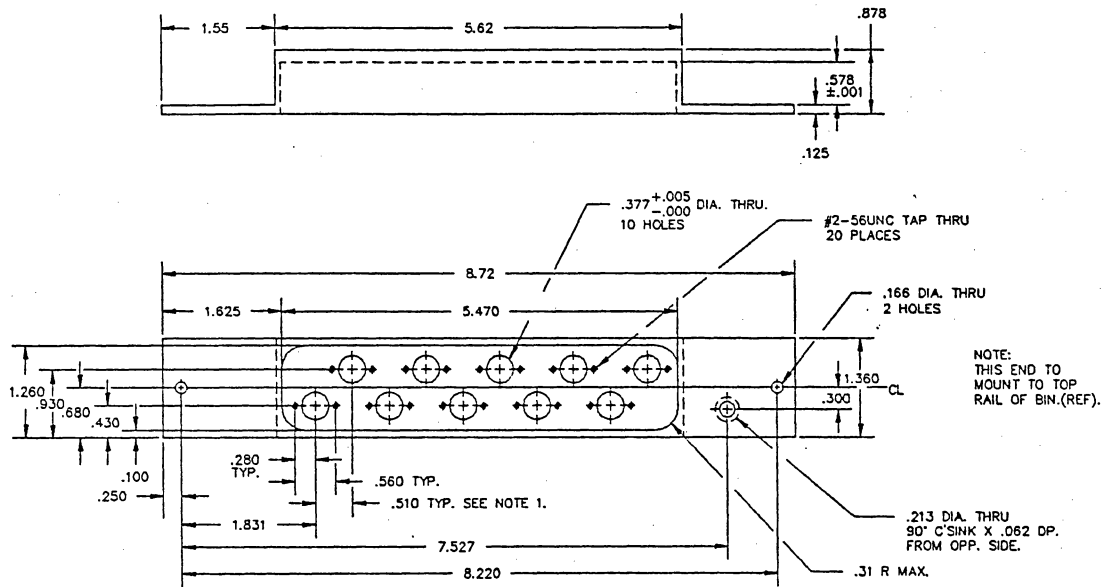


- NOTES:
1. REMOVE ALL BURRS AND SHARP EDGES.
 2. 125 FINISH ALL OVER.
 3. FINISH: YELLOW CHROMATE CONVERSION ALL OVER.
 4. BASED ON VLA B13050M18.

UNLESS OTHERWISE
SPECIFIED DIMENSIONS
ARE IN
INCHES
TOLERANCES
ANGLES:
3 PLACE DEC: ± .005
2 PLACE DEC: ± .010
1 PLACE DEC: ±

NATIONAL RADIO ASTRONOMY OBSERVATORY			
CENTRAL DEV. LAB - CHARLOTTESVILLE, VA.			
PROJ: RACKS, BINS AND STANDARD MODS.	TITLE: SIDE PLATE (XJA)		
MATERIAL: .125 THK. ALUMINUM	DRAWN BY: G. MORRIS	DATE: 5-86	
FINISH: SEE NOTES	DESIGNED BY:	DATE:	
	APPROVED BY:	DATE:	
SHEET NUMBER	DRAWING NUMBER C53306M017	REV: A	SCALE: 1:1

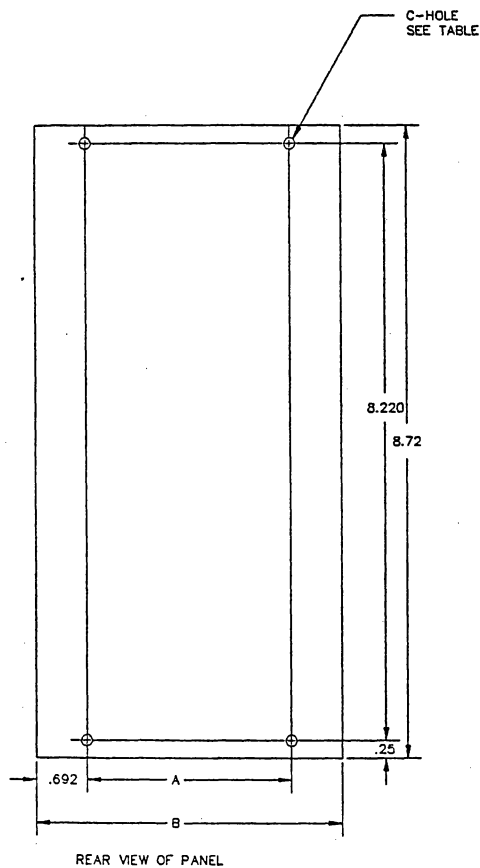
REV. A BY GM 5-20-86 C0860520-15
 REV. B BY GM 6-18-86 C0860618-17
 REV. C BY GM 7-17-86 C0860717-18



- NOTES:
 1. TOLERANCES ARE NON-ACCUMULATING.
 2. REMOVE ALL BURRS AND SHARP EDGES.
 3. FINISH: YELLOW CHROMATE CONVERSION ALL OVER
 4. BASED ON VLA B13165M03.

NATIONAL RADIO ASTRONOMY OBSERVATORY			
CENTRAL DEV. LAB - CHARLOTTESVILLE, VA.			
PROJ: RACKS, BINS AND STANDARD MODS.		TITLE: REAR PANEL OSP	
MATERIAL: 6061-T6 ALUMINUM		DRAWN BY: G. MORRIS	DATE: 5-88
FINISH: SEE NOTES		DESIGNED BY:	DATE:
		APPROVED BY:	DATE:
SHEET NUMBER	DRAWING NUMBER C53306M030	REV: C	SCALE: 1:1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES
 3 PLACE DEC: $\pm .005$
 2 PLACE DEC: $\pm .010$
 1 PLACE DEC: $\pm .020$



DASH #	MODULE	A	B	C-HOLE	FINISH
-1	1UA	1.385	1.385	.157 DIA. THRU 2 HOLES	NOTE 3 ONLY
-2	2UA	1.395	2.780		
-3	3UA	2.790	4.175	.157 DIA. THRU 4 HOLES	
-4	4UA	4.185	5.570		
-5	6UA	6.976	8.360		
-6	1UA	SEE -1		.213 DIA. THRU C'SINK 90° TO .062 DP. 2 HOLES	NOTE 3 AND 4
-7	2UA	SEE -2			
-8	3UA	SEE -3		.213 DIA. THRU C'SINK 90° TO .062 DP. 4 HOLES	
-9	4UA	SEE -4			
-10	6UA	SEE -5			

- NOTES:
1. REMOVE ALL BURRS AND SHARP EDGES.
 2. $125\sqrt{\text{F}}$ FINISH ALL OVER.
 3. FINISH: YELLOW CHROMATE CONVERSION ALL OVER.
 4. PAINT FRONT AND FOUR EDGES PER NRAO SPEC. A53306N002 FOR PANELS.

NATIONAL RADIO ASTRONOMY OBSERVATORY CENTRAL DEV. LAB - CHARLOTTESVILLE, VA.			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ANGLES 3 PLACE DEC.: ± .005 2 PLACE DEC.: ± .010 1 PLACE DEC.: ±	PROJ: RACKS, BINS AND STANDARD MODS.	TITLE: BLANK PANELS (XUA)	
	MATERIAL: .125 THK. ALUMINUM	DRAWN BY: G. MORRIS	DATE: 6-86
	FINISH: SEE NOTES	DESIGNED BY:	DATE:
	SHEET NUMBER	DRAWING NUMBER C53306M031	REV: SCALE: 1:1

RACK CABLING NOTATION

MODULES:

MODULES: +15V- P101 SUPPLY FOR +15 VOLTS
 -15V- P101 SUPPLY FOR -15 VOLTS
 +5V- P103 SUPPLY FOR +5 VOLTS FOR I.F.PROCESSING
 -5V- P103 SUPPLY FOR -5 VOLTS
 +5LOGIC P105 90 AMP SUPPLY FOR FORMATTER
 5M- 5MHZ DISTRIBUTOR
 IF1- I.F. DISTR #1
 IF2- I.F. DISTR #2
 BB1- TO BB8- BASEBAND CONVERTERS
 32M- 32 MHZ SYNTHESIZER
 SA1- SAMPLER
 SA2- OPTIONAL ADDITIONAL SAMPLER
 FORM FORMATTER
 RATE OUTPUT RATE SYNTHESIZER

I/O CONNECTIONS:

IO5M 5 MHZ BNC
 1PPS 1 PPS BNC
 IFA I.F. "A" INPUT TYPE N
 IFB I.F. "B" INPUT TYPE N
 IFC I.F. "C" INPUT TYPE N
 IFD I.F. "D" INPUT TYPE N
 RATEOUT OUTPUT RATE SYNTHESIZER OUTPUT BNC
 MCBOUT MONITOR AND CONTROL OUTPUT TO NEXT RACK OR TERM
 MCBIN MONITOR AND CONTROL INPUT
 SWITCH1 CLOSED TO GND FOR RACK #1
 SWITCH2 OPEN TO GND FOR RACK #1
 (USES SINGLE POLE DOUBLE THROW MINI-SWITCH)

COLOR CONVENTIONS:

+5V YELLOW
 +5V LOGIC FOR FORMATTER ORANGE
 -5V BROWN (VIOLET IN DARS 1&2)
 +15V RED
 -15V YELLOW (BLUE IN DARS 1&2)
 +6V ORANGE (INSIDE BASEBAND CONV)
 -6V GREY (INSIDE BASEBAND CONV)
 GND GREEN OR BLACK
 A.C. LIVE BLACK
 A.C. NEUTRAL WHITE

GROUND ON BIN:

GND

FROM TO CABLE

POWER WIRING:

+15V-5	BB1-15	#16 RED
	BB2-15	#16
	BB3-15	#16
	BB4-15	#16
	BB5-15	#16
	BB6-15	#16
	BB7-15	#16

	BB8-15	#16	
+15V-5	IF1-15	#16	
	IF2-15	#16	
+15V-5	5M-15	#16	
+15V-5	32M-15	#16	
	RATE-15	#16	
-15V-7	BB1-14	#16	BLUE
	BB2-14	#16	
	BB3-14	#16	
	BB4-14	#16	
	BB5-14	#16	
	BB6-14	#16	
	BB7-14	#16	
	BB8-14	#16	
-15V-7	IF1-14	#16	
	IF2-14	#16	
+5V-6,39	BB1-2	#14	YELLOW
+5V-6,39	BB2-2	#14	
+5V-6,39	BB3-2	#14	
+5V-6,39	BB4-2	#14	
+5V-6,39	BB5-2	#14	
+5V-6,39	BB6-2	#14	
+5V-6,39	BB7-2	#14	
+5V-6,39	BB8-2	#14	
+5V-6,39	IF1-2	#16	
	IF2-2	#16	
+5V-6,39	SA1-2	#16	
+5V-6,39	SA2-2	#16	
+5V-6,39	32M-2	#16	
+5V-6,39	RATE-2	#16	
+5VLOGIC	FORM		MULTIPLE #10s
-5V-7,40	SA1-8	#16	VIOLET
-5V-7,40	SA2-8	#16	
-5V-7,40	32M-8	#16	
-5V-7,40	RATE-8	#16	
-5V-7,40	FORM	#16	
+15V-7	GND	#16	
-15V-5	GND	#16	
+5V-7,40	GND	#14	
-5V-6,39	GND	#16	
ALL-1	GND	#16	GROUND PIN 1 OF ALL MODULES WITH 20 PIN CONN
POWER SUPPLY VOLTAGE SENSE:			
+15V-9	+15V BUS		
+15V-8	GND		
-15V-8	-15V BUS		
-15V-9	GND		
-5V-8	-5V BUS		
-5V-9	GND		
+5V-9	+5V BUS		
+5V-8	GND		
I.F. WIRING:			
IFA	IF1-OSP-1	0.141	SEMI-RIGID

IFB	IF1-OSP-2	0.141	SEMI-RIGID
IFC	IF2-OSP-1	0.141	SEMI-RIGID
IFD	IF2-OSP-2	0.141	SEMI-RIGID
IF1-OSP-3	PWRSPA	0.141	SEMI-RIGID
IF1-OSP-4	PWRSPB	0.141	SEMI-RIGID
IF2-OSP-3	PWRSPC	0.141	SEMI-RIGID
IF2-OSP-4	PWRSPD	0.141	SEMI-RIGID
PWRSPA	BB1-4	RG-188	(USE 188 DOUBLE SHIELDED)
PWRSPA	BB2-4	RG-188	
PWRSPA	BB3-4	RG-188	
PWRSPA	BB4-4	RG-188	
PWRSPA	BB5-4	RG-188	
PWRSPA	BB6-4	RG-188	
PWRSPA	BB7-4	RG-188	
PWRSPA	BB8-4	RG-188	
PWRSPB	BB1-10	RG-188	
PWRSPB	BB2-10	RG-188	
PWRSPB	BB3-10	RG-188	
PWRSPB	BB4-10	RG-188	
PWRSPB	BB5-10	RG-188	
PWRSPB	BB6-10	RG-188	
PWRSPB	BB7-10	RG-188	
PWRSPB	BB8-10	RG-188	
PWRSPC	BB1-11	RG-188	
PWRSPC	BB2-11	RG-188	
PWRSPC	BB3-11	RG-188	
PWRSPC	BB4-11	RG-188	
PWRSPC	BB5-11	RG-188	
PWRSPC	BB6-11	RG-188	
PWRSPC	BB7-11	RG-188	
PWRSPC	BB8-11	RG-188	
PWRSPD	BB1-17	RG-188	
PWRSPD	BB2-17	RG-188	
PWRSPD	BB3-17	RG-188	
PWRSPD	BB4-17	RG-188	
PWRSPD	BB5-17	RG-188	
PWRSPD	BB6-17	RG-188	
PWRSPD	BB7-17	RG-188	
PWRSPD	BB8-17	RG-188	
5MHZ WIRING:			
IO5M	5M-3	RG-188	
5M-4	BB1-3	RG-188	
5M-5	BB2-3	RG-188	
5M-6	BB3-3	RG-188	
5M-7	BB4-3	RG-188	
5M-9	BB5-3	RG-188	
5M-10	BB6-3	RG-188	
5M-11	BB7-3	RG-188	
5M-12	BB8-3	RG-188	
5M-13	32M-3	RG-188	
5M-16	RATE-3	RG-188	
5M-19	IF1-3	RG-188	

5M-20 IF2-3 RG-188
 STATION SYNC (1 PPS) WIRING:
 1PPS 32M-5 RG-188
 32M-6 BB1-5 RG-188
 32M-7 BB2-5 RG-188
 32M-9 BB3-5 RG-188
 32M-12 BB4-5 RG-188
 32M-13 BB5-5 RG-188
 32M-16 BB6-5 RG-188
 32M-17 BB7-5 RG-188
 32M-19 BB8-5 RG-188
 32M-20 IF1-5 RG-188

USE SMC TEE

32M-4 SA1-5 RG-188
 32M-10 SA2-5 RG-188

32MHZ WIRING:

32M-11 SA1-3 RG-188
 32M-18 SA2-3 RG-188

OUTPUT RATE WIRING:

RATE-4 RATEOUT RG-188
 RATE-5 FORM X21 IN
 RATE-16 FORM CONTR 0 OUT
 RATE-17 FORM CONTR 1 OUT
 RATE-18 FORM CONTR 2 OUT
 RATE-19 FORM CONTR 3 OUT

BASEBAND WIRING:

BB1-9 SA1-6 RG-188
 BB1-16 SA1-7 RG-188
 BB2-9 SA1-9 RG-188
 BB2-16 SA1-10 RG-188
 BB3-9 SA1-11 RG-188
 BB3-16 SA1-12 RG-188
 BB4-9 SA1-13 RG-188
 BB4-16 SA1-20 RG-188
 BB5-9 SA2-6 RG-188
 BB5-16 SA2-7 RG-188
 BB6-9 SA2-9 RG-188
 BB6-16 SA2-10 RG-188
 BB7-9 SA2-11 RG-188
 BB7-16 SA2-12 RG-188
 BB8-9 SA2-13 RG-188
 BB8-16 SA2-20 RG-188

MCB WIRING (DAISY CHAIN):

SHIELD OF DUAL TWISTED PAIR IS GROUNDED AT EACH MODULE USING GROUND LUG

MCBIN-5 GND
 MCBOUT-5 GND
 MCBIN-9 BB1-6 TWISTED PAIR (RED)
 BB2-6 TWISTED PAIR
 BB3-6 TWISTED PAIR
 BB4-6 TWISTED PAIR
 BB5-6 TWISTED PAIR

	BB6-6	TWISTED PAIR	
	BB7-6	TWISTED PAIR	
	BB8-6	TWISTED PAIR	
	IF1-6	TWISTED PAIR	
	IF2-6	TWISTED PAIR	
	FORM-9	TWISTED PAIR	
	MCBOUT-9	TWISTED PAIR	
MCBIN-8	BB1-7	TWISTED PAIR	(BLACK)
	BB2-7	TWISTED PAIR	
	BB3-7	TWISTED PAIR	
	BB4-7	TWISTED PAIR	
	BB5-7	TWISTED PAIR	
	BB6-7	TWISTED PAIR	
	BB7-7	TWISTED PAIR	
	BB8-7	TWISTED PAIR	
	IF1-7	TWISTED PAIR	
	IF2-7	TWISTED PAIR	
	FORM-8	TWISTED PAIR	
	MCBOUT-8	TWISTED PAIR	
MCBIN-2	BB1-12	TWISTED PAIR	(WHITE)
	BB2-12	TWISTED PAIR	
	BB3-12	TWISTED PAIR	
	BB4-12	TWISTED PAIR	
	BB5-12	TWISTED PAIR	
	BB6-12	TWISTED PAIR	
	BB7-12	TWISTED PAIR	
	BB8-12	TWISTED PAIR	
	IF1-12	TWISTED PAIR	
	IF2-12	TWISTED PAIR	
	FORM-2	TWISTED PAIR	
	MCBOUT-2	TWISTED PAIR	
MCBIN-1	BB1-13	TWISTED PAIR	(BLACK)
	BB2-13	TWISTED PAIR	
	BB3-13	TWISTED PAIR	
	BB4-13	TWISTED PAIR	
	BB5-13	TWISTED PAIR	
	BB6-13	TWISTED PAIR	
	BB7-13	TWISTED PAIR	
	BB8-13	TWISTED PAIR	
	IF1-13	TWISTED PAIR	
	IF2-13	TWISTED PAIR	
	FORM-1	TWISTED PAIR	
	MCBOUT-1	TWISTED PAIR	

ADDRESS WIRING:

SWITCH1	BB1-20I	#22
(CLOSED	BB2-20I	#22
TO GND	BB3-20I	#22
IN RACK	BB4-20I	#22
#1 POSN)	BB5-20I	#22
	BB6-20I	#22
	BB7-20I	#22
	BB8-20I	#22

"I" = INNER CONNECTION
SWITCHES MSD FROM 2 TO 3
AND PRESERVES PARITY

	IF1-20I	#22	
	IF2-20I	#22	
	FORM-7	#22	
	BB1-200	#22	
	BB4-200	#22	
	BB6-200	#22	
	BB7-200	#22	
	IF2-200	#22	
SWITCH2	BB2-200	#22	
(CLOSED	BB3-200	#22	
TO GND	BB5-200	#22	
IN RACK	BB8-200	#22	
#2 POSN)	IF1-200	#22	
	FORM-6	#22	
SWITCHP	GND	#22	GROUND SWITCH POLE
	GND		
BB1-18I	GND		BB1 ADDRESS 20
BB1-18O	GND		
BB1-19I	GND		
BB1-19O	GND		
BB2-18O	GND		BB2 ADDRESS 21
BB2-19I	GND		
BB2-19O	GND		
BB3-18I	GND		BB3 ADDRESS 22
BB3-19I	GND		
BB3-19O	GND		
BB4-19I	GND		BB4 ADDRESS 23
BB4-19O	GND		
BB5-18I	GND		BB5 ADDRESS 24
BB5-18O	GND		
BB5-19O	GND		
BB6-18O	GND		BB6 ADDRESS 25
BB6-19O	GND		
BB7-18I	GND		BB7 ADDRESS 26
BB7-19O	GND		
BB8-19O	GND		BB8 ADDRESS 27
IF1-18I	GND		IF1 ADDRESS 28
IF1-18O	GND		
IF1-19I	GND		
IF2-18O	GND		IF2 ADDRESS 29
IF2-19I	GND		

PARTS LIST FROM DBASE FILE:PARTS.DBF

REF	SUBMOD	PART	DESC	MFR	COST	QTY	TOTAL COST
MP	RACK	010-070-012	PANEL MTG ANGLE	EQUIPTO	42.60	4	170.40
MP	RACK	091-170-010	LH REAR DOOR	EQUIPTO	178.70	1	178.70
MPX	RACK	1-745129-7	FERRULE	AMP	1.00	2	2.00
MPX	RACK	1-745130-0	OUTER SHIELD	AMP	1.00	2	2.00
MP	RACK	1105-7521-003	SMC CABLE PLUG	AEP	2.49	3	7.47
MPX	RACK	17-12090-00	9-PIN D FEMALE	AMPHENOL	1.00	1	1.00
MPX	RACK	17-22090-00	9-PIN D MALE	AMPHENOL	1.00	1	1.00
MP	RACK	170-0937-0501	RACK C13030M2-2C	EQUIPTO	680.30	1	680.30
MPX	RACK	200458-1	BLOCK FOR EXTDR	AMP	3.00	1	3.00
MP4	RACK	200459-1	BLOCK	AMP	3.00	17	51.00
MP6	RACK	200833-4	GUIDE PINS	AMP	0.50	34	17.00
MP7	RACK	200835-4	GUIDE SOCKETS	AMP	0.50	34	17.00
MP9	RACK	201142-2	SPRING	AMP	0.05	200	10.00
MPX	RACK	201143-5	COAXICON PINS	AMP	2.70	15	40.50
MP11	RACK	201144-5	COAXICON SOCKET	AMP	2.70	200	540.00
MPX	RACK	201443-2	EXTENDER COVER	AMP	1.00	2	2.00
MP8	RACK	202417-1	POWER SOCKET	AMP	0.50	50	25.00
MPX	RACK	202422-1	POWER PINS	AMP	0.50	5	2.50
MPX	RACK	202516-3	NIM BLOCK	AMP	3.00	6	18.00
MP5	RACK	202579-5	HOOD	AMP	1.00	17	17.00
MPX	RACK	2313	20A PWR PLUG	HUBBEL	5.00	1	5.00
MPX	RACK	2315	20A POWER SOCKET	HUBBEL	5.00	1	5.00
MPX	RACK	2520P	20 PN CROSS-OVER	MIDDCO	5.00	2	10.00
MPX	RACK	2540P	40 PN CROSS-OVER	MIDDCO	5.00	4	20.00
MP	RACK	316-970-010	LATCH SIDE PANEL	EQUIPTO	184.60	2	369.20
MP10	RACK	328666	FERRULE	AMP	0.08	200	16.00
MP	RACK	371-030-019	GRILLED TOP PANL	EQUIPTO	64.50	1	64.50
MP1	RACK	4506-7941-02	OSP CONNECTOR	OMNI-SPECTRA	22.45	8	179.60
MPX	RACK	47-11-204-10	CAPTIVE SCREW	SOUTHCO	1.00	48	48.00
SS	RACK	54100I009	I/O SILK SCREEN	NYES	100.00	1	100.00
MS	RACK	54100M008	I/O PANEL	HAYSTACK	20.00	1	20.00
MS	RACK	54100M010	PWR SPLITTER MNT	HAYSTACK	20.00	2	40.00
MS	RACK	54100M011	REAR BIN PANEL	PREC.MACHINE	10.00	17	170.00
MPX	RACK	5807-1501-000	SMC TEE	AEP	12.70	1	12.70
MPX	RACK	745171-5	RFI METAL SHIELD	AMP	5.15	2	10.30
MPX	RACK	747024-3	RFI GASKET	AMP	1.00	2	2.00
MP	RACK	B1305M4	GUIDE	NRAO	1.00	96	96.00
MPX	RACK	B53306M018	GUIDE		1.00	24	24.00
MS	RACK	C53306M031-7-2UA	FILLER PANELS	PREC.MACHINE	20.00	16	320.00
MP2	RACK	D13050M8	BIN	MACK 2	297.52	5	1487.60
WORK	RACK	ENGINEER	CHECKOUT	HAYSTACK	100.00	8	800.00
MPX	RACK	MISC HARDWARE	MISC HARDWARE		0.50	200	100.00
WORK	RACK	SHOP TECH	MACHINING	HAYSTACK	10.00	80	800.00
WORK	RACK	TECH	ASSEMBLY	HAYSTACK	10.00	80	800.00
MPX	RACK	WIRE	MISC CABLE		100.00	1	100.00

*** Total ***

7385.77