

**NATIONAL RADIO ASTRONOMY OBSERVATORY
Green Bank, West Virginia**

Electronics Division Internal Report No. 11

**STANDARD RECEIVER ASSEMBLY,
COMPONENTS, AND COST**

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STANDARD RECEIVER ASSEMBLY, COMPONENTS, AND COST

The following information for this report was gathered while the actual assembly of a standard switched receiver was being preformed by the Standard Receiver Section of the National Radio Astronomy Observatory at Green Bank, West Virginia.

The following breakdown was used to divide the costs into various categories:

(1) Purchased components

Purchased components are those purchased from outside vendors already assembled, i. e. , White Instruments, Sanborn, AC-DC Electronics, etc.

(2) Small components

Small components are those used such as resistors, capacitors, chokes, diodes, etc.

(3) Labor

A reasonably close time was kept of the number of hours spent to assemble the standard receiver. This figure includes the Machine Shop time in chassis manufacture.

(4) Miscellaneous

Miscellaneous items are those such as screws, nuts, bolts, wire, decals, etc.

An individual parts list has been made for each chassis used in the standard receiver containing the following information:

- (1) Component name
Component value
Component manufacturer
Component part number
Component cost

This information should be helpful when ordering stock for new receivers.

Cost

The cost of the components used in the standard receiver were obtained as follows:

(1) Purchased components

From manufacturer's catalogs or from previous purchase orders.

(2) Small components

From previous purchase orders or from mail order catalogs, i. e. , Allied Radio.

(3) Labor

Labor costs were based on an estimated hourly rate for assembly times the number of man hours worked on standard receiver.

(4) Miscellaneous

An estimated cost of miscellaneous materials used was made because no accurate method could be used to obtain costs of material.

The costs of the individual chassis or assemblies for the standard receiver are as follows:

(1)	Gain Modulator -----	\$ 167. 18
(2)	Switch Driver-----	242. 65
(3)	IF Chassis-----	848. 23
(4)	Integrator -----	110. 72
(5)	Recording System -----	1,760. 00
(6)	Audio Speaker Panel-----	18. 52
(7)	Power Supply -----	676, 21
(8)	Cabinet Assembly -----	278. 48
(9)	Miscellaneous -----	<u>50. 00</u>
	Total -----	\$4, 151. 99
	Purchased components-----	\$3, 133. 21
	Small components -----	486. 28
	Labor-----	482. 50
	Miscellaneous -----	<u>50. 00</u>
	Total -----	\$4, 151. 99

Complete as of July 10, 1963.

GAIN MODULATOR

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	Kay attenuator	0-20	\$75.00
1	Bud panel	PA1102HG	1.42
2	Cambion handles	1252-1	1.82
1	Cinch barrier strip	5-141-Y	.68
1	Greomar connector	UG88B/U	1.18
2	Greomar connector	UG657/U	2.28
2	Greomar connector	UG306/U	2.62
2	Cinch sockets	7XM1	.38
2	IERC tube shields	TR52050B	1.50
2	RCA tubes	6AH6	4.70
4	H. H. Smith knobs	2208	3.60
4	Jeffers RF chokes - 5.6 uh	10203-20	1.16
4	Transitron diodes	1N270	2.00
2	CRL switches	2512	8.04
2	Ohmite pots	CU5001	3.90
4	Cambion coil forms	PLS6D-2C4L	3.16
2	Erie S. O. capacitor	326-X5U-102M	1.96
8	CRL ceramic capacitor	DD-102	1.20
4	Ohmite resistors	100 Ω , 1/2 watt	.36
2	Ohmite resistors	120 Ω , 1/2 watt	.18
20	Ohmite resistors	12 Ω , 1/2 watt	1.80
1	Ohmite resistor	3.3 K, 1/2 watt	.09
1	Ohmite resistor	1 K, 1/2 watt	.09
2	Ohmite resistors	2.2 K, 1 watt	.18
2	Ohmite resistors	4.7 K, 1 watt	.18
2	Millen couplings	39023	2.70
Labor	-----		<u>45.00</u>
	Total	-----	\$167.18

SWITCH DRIVER

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	White amp	212A	\$ 16.20
1	White filter	542-400	23.50
1	Bud panel	PA1102HG	1.42
1	Bud chassis	CB1371	2.59
2	Simpson meters, 0-100 ma DC	1212C	25.50
2	CRL switches	2507	5.64
1	C. H. SPDT switch	ST42D	1.12
1	Ohmite pot	CLU5011	1.95
2	Ohmite pots	CLU1021	2.90
2	H. H. Smith knobs	2208	1.80
2	Cambion handles	1252-1	1.82
4	Cinch tube sockets	9XM	.88
2	Eby tube sockets	TSB8T101	.70
1	Triad transformer	F40X	3.39
1	Stancor transformer	A3250	4.19
1	Stancor transformer	A3856	2.90
11	Greomar connectors	UG657/U	15.07
2	Sarks Tarzian rectifier	1N2483-F4	2.28
2	Printed circuit boards - Kepco	PI-1212-G	1.75
1	Cinch barrier strip	5-141-Y	.68
3	H. H. Smith tie points	864	.45
1	Ohmite resistor	1 Ω , 1 watt	.47
2	Ohmite resistors	18 Ω , 2 watt	.48
1	Ohmite resistor	470 Ω , 1/2 watt	.10
1	Ohmite resistor	1.2 K, 1/2 watt	.10
3	Ohmite resistors	10 K, 1/2 watt	.30
2	Ohmite resistors	22 K, 1/2 watt	.20
1	Ohmite resistor	47 K, 1/2 watt	.10
1	Ohmite resistor	82 K, 1/2 watt	.10

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
7	Ohmite resistors	100 K, 1/2 watt	.70
1	Ohmite resistor	270 K, 1/2 watt	.10
2	Ohmite resistors	390 K, 1/2 watt	.20
6	Ohmite resistors	470 K, 1/2 watt	.60
1	Ohmite resistor	680 K, 1/2 watt	.10
1	Ohmite resistor	10 Ω , 10 watt	.57
1	Ohmite resistor	75 Ω , 20 watt	.68
1	Ohmite resistor	100 Ω , 20 watt	.68
2	Ohmite resistors	150 Ω , 10 watt	1.14
2	Ohmite resistors	350 Ω , 10 watt	1.14
10	C. D. tubular capacitors	PM4P1	2.10
2	C. D. tubular capacitors	PM4S1	.30
2	C. D. electrolytic capacitors	BR 500-50	2.88
2	C. D. electrolytic capacitors	BR 500-25	2.76
2	RCA tubes	12AX7	2.56
2	RCA tubes	12BH7	3.06
1	IERC tube shields	TR5-5020B	.75
3	IERC tube shields	TR6-6020B	2.25
2	IERC tube shields	TR6-6025B	1.50
Labor-----			<u>100.00</u>
Total -----			\$242.65

IF CHASSIS

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	LEL IF amplifier	20B	325.00
1	Sanborn phase detector	850-1200	250.00
1	White amplifier	212A	16.20
1	White filter	542-400	23.50
1	Winco Electronics mity-amp		8.39
1	Mallory T Pad	T8	3.09
1	Simpson 1212C meter	100-0-100ua	12.75
1	Simpson 1212C meter	0-100 ua	12.75
2	Simpson 1212C meters	0-5 ma	25.50
1	Amp connector	126-195	2.04
1	Amp connector	126-192	1.48
1	Smith banana jack	206-R	.16
1	Smith banana jack	206-B	.16
1	Amp connector	26-4201-16S	3.13
2	Amp sockets	77M1P8T	.38
11	Gremer connector	UG657/U	15.07
2	Gremer connectors	UG88B/U	2.36
2	Gremer connector	UG306/U	5.24
1	Cinch barrier strip	7-141-Y	.92
2	Bud panels	PA-1105-HG	5.68
1	Bud panel	PA-1106-HG	3.59
1	Bud chassis	AC-432	2.33
1	Par-Metal brackets	SB 711	1.32
2	Cambion handles	1965	2.38
2	Cornell Dubilier capacitors	PM4P1	.42
1	Cornell Dubilier capacitor	PM 2S2	.15
3	Sylvania diodes	1N270	1.50

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	Ohmite resistor	18 K, 1/2 watt, 5%	.24
5	H. H. Smith tie points	864	.75
7	H. H. Smith clamps	834	.35
1	H. H. Smith knob	2208	.90
4	Barry shock mounts	275-2	1.52
2	Raytheon captive screws	CS122	1.02
2	Raytheon panel inserts	PIN 122	.46
Labor	-----		<u>117.50</u>
		Total -----	<u>\$848.23</u>

INTEGRATOR

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	Bud panel	PA1102HG	\$ 1.42
1	Bud chassis	CB 1371	2.59
2	Cambion handles	1252-1	1.82
2	CRL switches	2512	8.04
2	H. H. Smith knobs	2208	1.80
10	Gremer connectors	UG657/U	13.70
8	Goodall capacitors, 5 mfd, 100 v.	X663FR - 5%	22.90
2	Eveready battery	950	.26
1	Keystone battery holder	176	.38
1	C. H. switch - DPDT	ST52N	1.83
1	Borg pot, 10 K	1111B	10.00
1	Borg dial	1320	5.82
2	Ohmite resistors	1 meg, 1/2 watt, 5%	.38
2	Ohmite resistors	100 K, 1/2 watt, 5%	.38
2	Ohmite resistors	240 K, 1/2 watt, 5%	.38
2	Ohmite resistors	510 K, 1/2 watt, 5%	.38
2	Ohmite resistors	750 K, 1/2 watt, 5%	.38
2	Ohmite resistors	1.5 meg, 1/2 watt, 5%	.38
2	Ohmite resistors	3.0 meg, 1/2 watt, 5%	.38
Labor -----			<u>37.50</u>
Total -----			\$110.72

SANBORN RECORDING SYSTEM

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	Sanborn amplifier	150-2900Z	\$580.00
1	Sanborn recorder	152-100B	1,155.00
1	Sanborn light panel	154-1100-C10	<u>25.00</u>
	Total	-----	\$1,760.00

AUDIO SPEAKER PANEL

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	Oaktron speaker	210E3	5.28
1	Bud panel	PA1102HG	1.42
2	Cambion handles	1252-1	1.82
Labor	-----	-----	<u>10.00</u>
	Total	-----	<u>\$18.52</u>

POWER SUPPLY

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	RPM power supply	200-150	\$124.00
1	RPM power supply	50-150	91.00
1	Technipower power supply	M6. 0-12. 0A	265.00
1	Simpson meter 1212C	0-300 V DC	12.75
1	Simpson meter 1212C	0-250 MA DC	12.75
1	Simpson meter 1212C	0-10 V DC	12.75
1	Simpson meter 1212C	0-15 A DC	12.75
1	Simpson meter 1212C	0-15 V DC	12.75
1	Simpson shunt	6705	6.90
2	C. H. switches - DPST	7561-K4	1.62
1	C. H. switch - DPDT	7565-K5	.96
1	C. H. switch - DPST	8829-K5	1.30
1	Dialco light	95408-X-935	1.19
1	Buss fuse holder	HKL-90-300	1.26
1	Belden cord	17408-S	.90
1	Ohmite pot Model "E"	1 K - 12.5 watt	4.63
1	Ohmite resistor	5 K - 10 watt	.61
1	Ohmite resistor	2 Ω - 25 watt	.72
1	Cinch barrier strip	15-141-Y	1.91
1	CD capacitor	BR 500-50	1.44
1	Hoffman zener diode	1N938A	9.05
1	Bud panel	PA1106HG	3.59
1	Par Metal side brackets	SB713	1.50
2	Cambion handles	1965	2.38
	Labor -----		<u>92.50</u>
	Total-----		<u>\$675.21</u>

CABINET ASSEMBLY

<u>Quantity</u>	<u>Manufacturer and Component</u>	<u>Model or Part No.</u>	<u>Cost</u>
1	Par Metal cabinet, Mod. FD	Px6724A	\$114.36
1	Par Metal roller truck	HD420	24.45
1	Rotron fan, Type 3L	CFG	25.00
1	Bud chassis	MS3051	3.50
1	Stancor choke	C1080	1.62
7	H. H. Smith plastic clamps		.35
2	Cinch fanning strips	5-161	.54
1	Cinch fanning strip	7-161	.38
1	Cinch fanning strip	15-161	.75
1	CD capacitor	BR 20-250	.81
5	Cinch barrier strips	5-141	1.90
1	National Electric Products power strip	CF2G-606-6	6.25
14	Gremer connectors	UG88B/U	13.72
2	NRAO - pieces of plyboard 59 1/2 x 8 x 3/4 inches		2.00
1	Belden power cable - 15 ft.	14-3-S	2.25
1	Hubbell power plug	5667	.60
Labor	-----		<u>80.00</u>
	Total	-----	<u>\$278.48</u>