

## ELECTRONIC EQUIPMENT

Electronic equipment for Phase I and II of the NRAO required for full operation of the 85-foot and 140-foot telescopes - say by January 1, 1960:

1. The following is an attempt to estimate the cost of equipping the electronic facility of the Observatory. It is based on the following assumptions: -

(a) Laboratory space available:

- (i) Phase I and II of main laboratory - 6000 square feet of space in 8 separate laboratories.
- (ii) Control rooms - Approximately 3000 square feet of space, 1000 in the 85-foot control room and 2000 in the 140-foot control room.
- (iii) Field experiments - An interference measuring truck and about 3 field huts or trailers.

(b) Instruments and research:

The 85-foot and the 140-foot telescopes are supposed to be working on full observational programs. There are about three field experiments in progress and a full program of research and development of electronic devices, antennas and feeds are in progress in the laboratories. A first start has been made on data extraction, data handling, and computation, but not to the extent of the installation of the first general purpose digital computer. The very large antenna (1000') has been built, but no receiving equipment feeds or auxiliary equipment has been provided for them in these estimates.

2. The present estimates have been made by estimating (a) Main items of receiving equipment needed for the 85-foot and 140-foot telescopes, including feeds; (b) Main items of electronic test and standardizing equipment needed for the laboratory and (c) A flat rate estimate, based on laboratory area of the costs of general electronic test equipment.

3. Estimates:

Under these separate headings, therefore, we have: --

(a) Main receiver items:

- (1) A.I.L. Receiver for 1430-1170 mc. \$ 35,000\*

(ii)	Ewen-Knight Receiver for X-band	\$ 80,000.*
(iii)	Galactic hydrogen line receiver	80,000.*
(iv)	Receiver for S-band	90,000.
(v)	Wide range hydrogen line receiver	120,000.
(vi)	Two phase-switched interferometer receivers	70,000.
(vii)	Receivers for experiments as yet unplanned	35,000.
(viii)	Special feeds	50,000.
(ix)	Data processing equipment	<u>35,000.</u>
		\$400,000.

\*These items already included in 1957-58 budget and therefore not included in present total.

(b) Main items of test gear:

(i) Frequency measuring equipment

2 Hewlett-Packard equipments	10,000.
Frequency meters	3,000.

(ii) Signal sources

1 Crystal stabilized standard source	20,000.
10 Signal Generators	10,000.
2 Thermal Noise sources	4,000.
Gas discharge tube noise sources	3,000.

(iii) Impedance measuring equipment

3 Slotted line equipments	3,000.
2 Impedance bridges	1,000.
1 Q-Meter	1,000.

(iv) Field strength measuring equipment

1 mobile test laboratory for measuring and locating interference	20,000.
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(v) Oscilloscopes

10 Oscilloscopes	7,000.
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(vi) Measuring equipment

3 Highly stable (standard cell) power supplies	5,000.
Sub-standard laboratory instruments	<u>3,000.</u>

\$90,000.

(c) General test equipment:

The following types of equipment are included under this heading and estimated on the basis of a cost of about \$5000. per laboratory:

Power supplies, strip chart recorders, tube testers, multimeters, test oscillators, mixers, receiver components, initial component and tube supplies.

8 laboratories at \$5,000. \$ 40,000.

4. Total estimates:

Receiving equipment (paragraph 3a)	\$400,000.
Main test gear items (paragraph 3b)	90,000.
General test Gear (paragraph 3c)	<u>40,000.</u>
TOTAL	<u>\$530,000.</u>

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Dec 16 '57.