ELECTRONIC SPACE SYSTEMS CORPORATION

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12 METER MILLIMETER WAVE TELESCOPE
MEMO No. ___4̸2̸
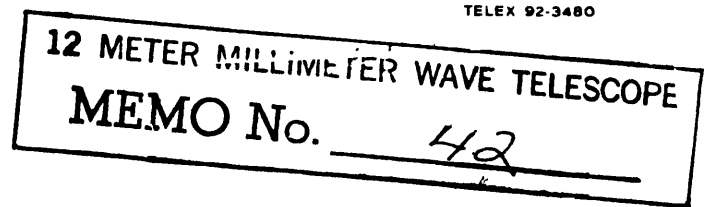
May 21, 1981

Mr. William Horne
National Radio Astronomy Observatory
P. O. Box 2
Green Bank, West Virginia 24944

Dear Mr. Horne:

Enclosed is information that you requested concerning the 12-meter re-
flector panels. The information included in the enclosed ESSCO Document
D81-15 and this letter is intended to explain the describe the following:

   1) antenna panel support bracketry

   2) panel setup procedure (for measurement)

   3) panel measurement procedure

   4) panel surface error computation

   5) aggregate surface rms error computation

The antenna panel support bracket and associated fasteners for final
assembly on ESSCO's box beam backstructure is shown in Figure A. For
panel measurement, the aluminum "panel mounting bracket" is replaced
by an aluminum angle, which is mounted on the bed of the coordinate
measuring machine (CMM). All other hardware remains the same.

Extending through the slot in the top of the bracket is a steel 1/2-20
UNF hollow threaded rod, supported by a pair of spherical washer sets
and nuts. The slots in the bracket allow for radial and circumferential
panel adjustment on the backstructure, while the threaded rod/spherical
washer/nut arrangement permits panel adjustment normal to the reflecting
surface, as well as correction of angular misalignment between the top of
the bracket and the backside of the panel. This angular correction mini-
mizes any tendency for the panel supporting hardware to deform the panel,
and thus degrade the panel surface accuracy. Any small deformations which
do occur are included in the panel accuracy measurements on the CMM.

Finally, the panel is fastened to the top of the threaded rod by a 1/4-20
UNC bolt which extends through the full length of the threaded rod, and
is held in place with a washer and locking nut, as shown.

For surface accuracy measurement, the panel is supported on the bed of
the CMM as shown in Figure 3 of Document D81-15, using the hardware
described above. The inboard tooling holes (hole A of the inner panel
and hole C of the outer panel) are set to the proper X and Y coordinate,
and the outer tooling holes (BO and D) to the proper Y coordinate only,

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all to a tolerance of ±.25µ. Then the target holes (1 through 4 on the inner panel and 5 through 7 on the outer panel) are adjusted to within 25µ of their proper height using the adjustment screws positioned directly below each target hole. The tooling hole positions are checked and adjustments are made as required until all hole positions are within tolerance.

The panel surface position is calculated by an on-line computer (using the "PDAS" program in Document D81-15) which directly reads the X_2 and Y_2 coordinates of the CMM probe tip, calculates the theoretical Z_2 panel position, compares it to the measured Z_2 position of the probe tip and informs the operator as to the difference. Thus the operator can find the panel surface error at any point on the surface.

Once the panel is properly set up on the CMM, 72 data points are read on the inner panel, and 51 on the outer panel. These points are pre-selected such that each point represents an equivalent surface area of the panel (approximately 45 square inches per reading). From these data, the individual panel surface accuracies and the aggregate surface a uracy are calculated as described in Section 4 of Document D81-15.

The only other piece of information that we owe you is an outline/interface drawing of the reflector panels, including panel bracket support locations. The drawing is in process and will be sent to you upon completion. It will show a complement of 72 surface panels having a diameter of 12.0 meters with a focal length of 5.080 meters and a central opening that is 1.20 meters in diameter.

If you need more information or have questions, please feel free to call myself or Gene Rhoades.

Very truly yours,

ELECTRONIC SPACE SYSTEMS CORPORATION

Michael J. Brenner
Mechanical Engineer

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encs

cc: Findlay, Dr. John W. - NRAO - Charlottesville

THEODOLITE
TARGET

SURFACE PANEL

PANEL MOUNTING
BRACKET

BACKSTRUCTURE RIB.

FIGURE A

SURFACE PANEL MOUNTING BRACKET