

RESEARCH AND DEVELOPMENT LABORATORY

August 1966

I. GENERAL

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1. Laboratory travelers this month include Mr. [REDACTED] 25X1A9a
[REDACTED] TDY to [REDACTED] for the purpose of installing the PD-1 predetection medium-speed base station receiving system; [REDACTED] to Harrisburg, Pa., for the purpose of visiting [REDACTED], in connection with the Laboratory case-to-case connector design project; and [REDACTED] to Philadelphia, Pa., where he visited [REDACTED] in connection with minor problems being encountered in the micro-miniature assembly activity. 25X1A5a1
 2. Mr. [REDACTED], R&D Laboratory senior engineer, completed a course in Digital Systems Engineering given locally by [REDACTED] 25X1A5a1
[REDACTED], during this reporting period.
 3. Two new Laboratory engineers entered on duty this month. Mr. [REDACTED] have been assigned to the A&A unit for training prior to assignment to design. 25X1A9a

II. DESIGN

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1. A second version of the HARK-1, 100 wpm Baudot coder/keyer/ transmitter is being constructed for the forthcoming [REDACTED] operational tests. The HARK-1 is the CK-36 brevity code coder/keyer mated to the ASR-100 VHF transceiver. The new version will have a simplified coder/keyer, designated CK/A-36, mated to the ASR-100 and will differ from the original in that it will only have six information switches instead of seventeen. The electronic assembly, however, will be identical to the CK-36. The CK/A-36 contains improvements which will be incorporated in future CK-36's as well. These are: elimination of the coder ON/OFF switch by the substitution of a momentary push-button which will initiate transmission of the coded message without the need for using the ASR-100's push-to-talk switch. Message length has been shortened by the reduction of the activation sequency to 1-N-T Figs. and by the elimination of the S-T-O-P deactivation sequence. Both the original HARK-1 and the revised unit will be used in the [REDACTED] tests.

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2. A design project for the development of secure voice/facsimile terminal equipment received successful operational testing this reporting period. A system was assembled for testing which demonstrated the use of the KY-8 in a commercial cover installation. This system has inputs for both voice and facsimile equipment [REDACTED]

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The KY-8 was then interfaced with a prototype gallium arsenide ($G_a A_s$) infrared communications system. The system is very simple. It consists of a $G_a A_s$ diode (with optics and amplifiers) on the transmitter end and a semiconductor IR detector (again with optics and amplifiers) for the receiver. It has an information bandpass from 3 kHz to 25 kHz. This was needed to pass the KY-8 signal.

A system test was conducted over a two- and a three-mile path. Operation over the three-mile path was adequate but would not have worked if degraded by weather. The two-mile path was stable and operated during a moderate rain.

3. The design project, initiated in February of this year, to provide a dual diversity medium speed receiving system was completed this month. This system, designated the DD-2, was delivered to the warehouse for shipment to [REDACTED]. The DD-2 dual diversity receiving system is designed to add the advantages of space diversity reception to the techniques presently in use at base stations for receiving and recording 300 wpm Morse traffic. The DD-2 produces a stereo recording in which phase relationships of signal and QRM at the separated receiving antennas are preserved. Upon reduced speed playback with a stereo BP/A-12 and stereo headphones, the operator is greatly assisted in copying weak and fading messages. The DD-2 also provides an alternate channel containing a diversity switch which makes a simultaneous monophonic recording if desired. Improvements incorporated in the DD-2's IF converters will result in recordings of increased quality, through the elimination of overloading in the IF converters. The DD-2 contains two Racal RA-117 receivers interconnected for diversity operation.

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4. A new project was initiated this month for the development of the PD-2 medium-speed base station receive system. The PD-2 will combine and utilize to best advantage the features of the DD-2 (space diversity reception) and the PD-1 (broadband predetection recording).

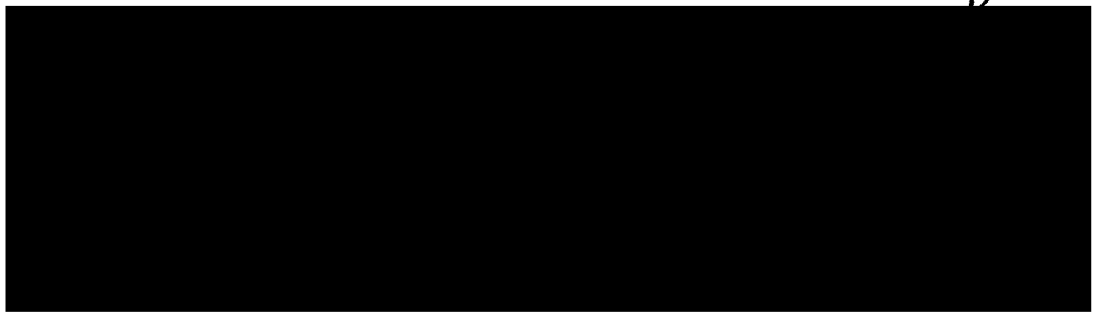
The space diversity reception is accomplished through the use of two interlocked Racal 117 receivers. Predetection recordings of the receiver IF's are then made on a two-channel recorder capable of a 100 kHz response. The 100 kHz recordings are then played back through two interlocked tunable narrow band VLF receivers with an output of 15 kHz. This output is recorded on a high speed stereo Spotmaster and played back at low speed on a BP-12 stereo playback.

One system is being assembled with a targeted completion date of 1 November 1966.

5. A second prototype of the RR-59 agent receiver was completed and delivered to OC-OS for operational evaluation. Prior to this delivery, it was subjected to a cursory A&A evaluation and it equalled or surpassed the first prototype in every respect. The RR-49 is a 2-16 MHz agent receiver with its own self-contained ten-channel crystal matrix. Physical measurements are approximately 4 1/8" x 2 5/16" x 1 5/16". Pending a successful operational evaluation, ten service test models will be constructed.

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III. ANALYSIS AND APPRAISAL

1. Six evaluations were published and distributed during August. Seven other evaluations were completed and the reports written. These are in process of being published. Six evaluations are presently in the testing phase.

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2. A breadboard model of a battery charger for the ASR-100 Nicad batteries was developed by [REDACTED]

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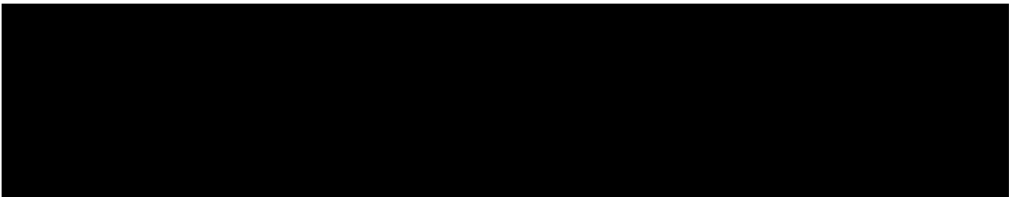
[REDACTED] The unit is designed to charge four 14.4-volt battery packs at a 50 ma rate simultaneously. It is also capable of accepting power line voltages from 90-240 volts at 50/60/400 Hz. One switch is required to switch input voltages above or below 160 volts. Temperature range is 0° to 60° C. The charger met all the above specifications with no malfunctions. The unit has additional versatility in that outputs can be paralleled to provide charging currents of 50, 100, 150, and 200 ma for various size batteries. One accelerated life test was given the unit. The four outputs were tied together and a 7-ampere hour battery was charged for 48 hours. The unit performed excellently throughout the test and maintained a constant 200 ma charge current throughout the test.

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A previous unit had been checked and rejected because it failed to meet any of the specifications. The success of this project is, in large part, due to the excellent cooperation of the contractor with the various units of the Engineering Staff.

IV. FABRICATION

1. One production project was completed this month. This was a rerun of the ruggedized AN-58B agent antenna. The AN-58B's are modified for use with the Delco 5300. Eighty-three units were modified.
2. Five production projects had partial deliveries this month. The first was for the CC-15 crystal case. The CC-15 is a Lexan molded case with a vinyl insert designed to hold 44 crystals using the HC-6/U holders. One hundred and sixty-five units were delivered to the warehouse for stock.
3. The second partial completion was for the HG-48A hand-crank generators. Thirty-two units were delivered to the warehouse for stock.
4. The third partial completion was for the CL-48 universal clamp for use with the HG-48A. One hundred and thirteen units were delivered to the warehouse for stock.
5. The fourth partial completion was for the RS-72 transceiver. The RS-72 consists of a G.E. Porta-Mobil mounted within a waterproof case and the controls adapted for external operation and made waterproof. This system is intended to provide communications from small boats or rubber rafts. Nineteen units were delivered to the warehouse for stock.

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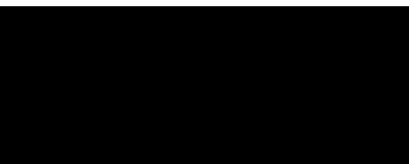
7. The value of equipment fabricated in the Laboratory and delivered this month was \$47,760.


V. ADMINISTRATIVE

TDY

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 8-31 August
 Harrisburg, Pa. 4 August
 Harrisburg, Pa. 4 August
 Philadelphia 25-26 August

TRANSFERS

N.A.

PCS

N.A.

EOD

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[REDACTED]

1 August 1966
15 August 1966

RESIGNATIONS

N.A.

EFFECTIVE PROMOTIONS

N.A.

TRAINING

25X1A9a

[REDACTED]

[REDACTED]

1 - 6 August

25X1A5a1

OTHER

Co-Op students returned to duty:

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[REDACTED]

22 August 1966

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available broadcast quality tape recorder. The master storage film, of course, is a fixed memory and can not be changed other than by replacing films. The films are currently prepared by [redacted], from a prerecorded tape recording supplied us. However, we are investigating the possibility of preparing these films ourselves.

Further operational evaluations will be run before the SY-3 is produced. Preliminary price estimates of \$5,000 each in quantities of ten, less output tape recorder, seem realistic. It appears that the SY-3 will prove a reliable and convenient device for field stations.

2. VHF SPREAD SPECTRUM TRANSCEIVER

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In-house

Approximately one year ago we entered into discussions with [redacted] as to the possibility of constructing a developmental VHF transmitted reference, noise modulated, spread spectrum communications system to augment our speech privacy developments. [redacted] had previously constructed and tested a breadboard feasibility model of the system. They proposed to redesign the system into a 75 cubic inch package for \$136,000. At this time the price and size seemed high in view of their previous work.

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Upon re-examination of the situation by both [redacted] and ourselves, it was decided that a more cautious approach was in order. A contract was let to [redacted] for \$17,525 to package the system into a conveniently transportable breadboard to be field tested in Washington, D. C., to give us a feel for the effects of multipath and interference on a spread spectrum system. The transceiver was to be delivered to us for evaluation and to remain in our possession for not less than 30 days. [redacted] is not to make known, demonstrate or attempt to market to any possible customer, commercial or Government, this system within one year from the date of delivery of the breadboard to Washington, D. C.

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Now, they are trying to give us a hand time on this point.

The breadboard was delivered and is now in the process of being evaluated. The preliminary tests indicate that the system works quite well. The system utilizes a transmitted reference technique which uses a noise diode as a random source of noise. Two frequency bands of random noise are transmitted, each 10 MHz wide and one band being a frequency-shifted version of the other. They are transmitted side by side in the spectrum centered at 235 MHz. One band is the reference for the other band, which

*about a 13 db
processing gain*

carries the information via narrow band FM. These two bands are then correlated in the receiver, resulting in a simple FM signal that is fed to a discriminator. There is no obvious way to derive any intelligence from the signal if intercepted. The receiver will work when the received signal is as much as 16 db below the ambient noise level. The only way one can tell the signal is being transmitted is by a rise in the noise level in his receiver when very close to the transmitter.

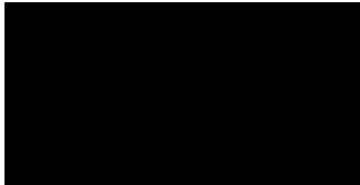
In view of a possible requirement for mobile and body-worn surveillance transceivers, we have asked for cost and development time information from [redacted]. We have not at this writing received this information, but it will be available soon.

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II. ADMINISTRATIVE

TDY

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|------------------------|--------------|
| Dallas, Texas | 1-2 August |
| Torrance, California | 22-23 August |
| Hawthorne, California | 24 August |
| Chatsworth, California | 25 August |
| Buffalo, New York | 25 August |

TRANSFERS

N. A.

PCS

N. A.

EOD

25X1A9a



16 August 1966

RESIGNATIONS

N. A.

TRAINING

N. A.

EFFECTIVE PROMOTIONS

N. A.

OTHER

25X1A9a

