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Chief, ~~ASST~~

Operational/Engineering
AS-3 Equipment

[Redacted]

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[Redacted]

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Attachments:

- (1) AS-3 Transmitter, Serial No. [Redacted]
- (2) Technical Notes on AS-3 Transmitter, Serial No. [Redacted]

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26 August 1960

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 NO CHANGE IN CLASS.
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Distributions:

Orig. + 2 - Chief, [Redacted] w/atts.

- 1 - CC-RC, w/atts.
- 1 - R&D/Subject File, w/att. (2)
- 1 - R&D/Lab w/att. (2)
- 1 - CC-XXX, w/att. (2)
- 1 - CC-ED, w/att. (2)
- 1 - CC-E/MS, w/atts.

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CONTINUATION OF DISPATCH	CLASSIFICATION SECRET	DISPATCH SYMBOL AND NO. 50X1
<p>Page 2</p>		
OC-E/R+D	<input type="text"/> (12 August 1960) (Rewritten 8/26/60)	50X1
<input type="text"/> <u>Acting Chief, OC-ED</u> (Releasing Officer)	<u>OC-E/MSB</u> <u>OC-TTT</u> (Coordinating Officer)	<input type="text"/> <u>Chief, OC-E</u> (Authenticating Officer)
FORM 10-57 53a (40)	USE PREVIOUS EDITION REPLACES FORMS 51-28, 51-28A AND 51-24 WHICH ARE OBSOLETE.	CLASSIFICATION SECRET
<input type="checkbox"/> CONTINUED		PAGE NO.

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ATTACHMENT (2) to

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26 August 1960

TECHNICAL NOTES ON AT-3 TRANSMITTER

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1. The last design details of the AT-3 are firming up now and proto-type is very close to what you can expect production units to be. This is one of ten prototypes being produced prior to production of 250 units. These informal notes may answer some of your questions about this and future AT-3's.

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2. Since you will be explaining the operation of this equipment to others, here is a short run-down on the theory of the present system. As you know, the pulses are put on the tape electrically (not magnetically) by the CO-3. A small one-stroke magneto in the CO-3 puts out a few volts of AC when the dot or dash key is struck and the current is rectified and fed to the appropriate side of the recording head. Shorting contacts ground the side not in use to prevent inductive coupling between windings. On the up-stroke of the key the tape in the cartridge is advanced .030" for dots or spaces and .060" for dashes. A double ratchet stop - as in a typewriter line feed - provides tight control of the amount of tape advance. Band length on the tape is .015" and one baud of post-element spacing is included within every tape advance. The space button is depressed once between letters and three times between words for standard Morse.

3. In the transmitter a dual channel keying amplifier generates a dot or a dash electronically when triggered by a pulse from the two-channel read head. Operation of both channels is identical except for the timing of the one-shot multivibrator. A signal on the tape appears across one of the two read head windings as a damped wave pulse a few millivolts in amplitude. After amplification and clipping it trips a pulse forming circuit whose output is a 30 μ s pulse of about 10 volts. This pulse drives a one-shot multivibrator - for 3.3 ms in the dot channel and for 10 ms on the dash side. The one-shot controls a gating circuit in the transmitter biasing network which places the carrier on the air for the length of a dot or a dash.

4. The IDY function consists of a 150 cps neon relaxation oscillator coupled into the dot channel prior to the pulse forming circuit. A potentiometer sets the repetition rate of the IDY signal but does not affect the duration of dots, all of which are 3.3 ms long. The neon tubes used in the relaxation oscillator are expensive ones supposed to have excellent long term low temperature characteristics. We'll see.

5. The rf portion of the transmitter is more or less conventional. The crystal oscillator is turned on only when the band key, IDY or MSG is pressed. The same operation switches the antenna from receive to transmit. Power is always applied to the receiver so that signals can be heard at all times except when one of the operating buttons is being pushed. Adjusting

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the exciter control automatically sets the pi-output capacitor of the final tank to the proper range, allowing the independently controlled variable inductance and output capacitors to match wide antenna impedance. The low power tune position reduces the output power to less than a watt. (This is still a creditable signal when properly matched to the antenna so operators should be trained to keep their on-the-air tune-up to a minimum.)

6. So much for the theory - here are some practical considerations. We have tried nearly everything to reduce the operating noise of the coder, and the latest one you have is somewhat quieter than earlier models. Additional improvement, however, is not likely without delaying the production program so we have decided to settle for what we have. Operators in quiet places will undoubtedly learn to muffle the noise with a coat or something.

7. The CA-3 cartridge you have is the final design, except for the addition of a spot of white paint to the beginning of the tape to assure the operator that it is fully rewound. You may have noticed that the cartridge drive gear is spring loaded to prevent damage from tooth-on-tooth binding when first inserted.

8. There are several minor items we would like to call to your attention on the AT-3 prototype forwarded with this dispatch. Knobs on production units will be anodized instead of painted and the etched dial markings will be white instead of red, for easier visibility. The Allen tension adjustment screw on the hand key will be changed to a slotted shaft screw. Production transmitters will contain the necessary Allen and/or spline wrenches needed to service the AT-3. We won't tell you how to release the pop-up handles on the tuning controls because it is such good fun the first time you try, but we will point out that in future units stainless steel handles will be used instead of aluminum and they will be cut to size so the controls may be operated with the handles folded down. A note on tuning the AT-3: the output meter measures rf voltage at the plate of the 6883 final tube so the operator should not adjust this meter for maximum deflection. We have found that maximum transfer of power to the antenna is effected when the needle on the output meter is adjusted to the low edge of the green area. If the needle goes high into the green or red area on the meter, the antenna matching switch should be turned to a higher number and the inductor re-peaked.

9. We are working on two AC power supplies for the AT-3 - a miniature one [redacted] and a larger, cheaper one for use when portability isn't too important. We will advise you of cost, size, and technical data when it is available, probably within 60 days. We are still trying to find a cheap replacement battery for the BA-3 and have several good leads. Incidentally, we too had trouble with the BA-3 not accepting a charge and it turned out to be out of electrolyte. If the level on the cells of the battery you have is low we suggest adding distilled water to bring it up to the red line. For your information we recently ran the AT-3 for one hour at a 50 per cent duty cycle from a 10" X 3 1/2" X 1 1/2" water activated battery. We'll try to reduce its length and if the production price is reasonable this may become a stock item. Its advantage of course is indefinite shelf life.

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10. To relieve the problem of operating the AS-3 system on a non-flat surface, we are considering a short extension stub for use between transmitter and power supply, printer or receiver. A connector and plug would be wired to a 9-wire cable about four inches long. Only one type of stub would be necessary and two or three could be furnished with each set as optional accessories. Comments?

11. The [] remarks were appreciated and showed their usual awareness of operational realities. We hope to muffle the chatter of the T/R relay and convert to flat sided control shafts, as they suggest. Several of their complaints, of course, referred to the individual prototype they were testing and will not be a problem in other units. Please assure your 'customers' that their comments - pro or con - are welcomed and appreciated. Minor changes can still be cranked into the production program if the reasons are adequate. [] comments and suggestions are, as always, welcome.

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