SECRET
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R & D CATALOG FORM

DATE: 7 October 1966

1. PROJECT TITLE/CODE NAME
Multi-format Data Block Reader (Engineering Change)

2. SHORT PROJECT DESCRIPTION
Data Block Reader for automatic reading and decoding binary information recorded on photographic roll film.

3. CONTRACTOR NAME

25X1A

5. CLASS OF CONTRACTOR
Manufacturer

6. TYPE OF CONTRACT
Cost Incentive

7. FUNDS

25X1A

FY 1966 $
FY 1967 $
FY 1968 $ None

8. REQUISITION NO.

9. BUDGET PROJECT NO.
NP-H-3-08037

10. EFFECTIVE CONTRACT DATE *(Begin - end)*
June 1965 - June 1967

11. SECURITY CLASS.
A.A. - Confidential
T. - Unclassified
W. - Unclassified

12. RESPONSIBLE DIRECTORATE/OFFICE/PROJECT OFFICER TELEPHONE EXTENSION

25X1A

DDI/NPIC/P&DS/

13. REQUIREMENT/AUTHORITY

To read and decode binary or similarly coded information recorded on roll film.

14. TYPE OF WORK TO BE DONE

Engineering Development

15. CATEGORIES OF EFFORT

MAJOR CATEGORY	SUB-CATEGORIES
Information Handling	Information Retrieval
	Electro-Optical-Mechanical

16. END ITEM OR SERVICES FROM THIS CONTRACT/IMPROVEMENT OVER CURRENT SYSTEM, EQUIPMENT, ETC.

One prototype binary code reader and associated read-out equipment.

17. SUPPORTING OR RELATED CONTRACTS *(Agency & Other)*/COORDINATION

The only known related contracts are through the Air Systems Command (AIR 5391D), U.S.N., and the Aeronautical Systems Division, USAF for a code matrix to handle CRT recorded binary data. Coordination is being maintained with these agencies, GIMRADA, AMS, and ORD.

18. DESCRIPTION OF INTELLIGENCE REQUIREMENT AND DETAILED TECHNICAL DESCRIPTION OF PROJECT *(Continue on additional page if required)*

This engineering change is the result of an additional format which the reader is required to handle, deviations between actual material and the drawings and specifications furnished to the contractor for another format the incorporation of additional control functions, and simplification of computer processing on the retrieved data. This change will extend the delivery date one month, and will increase the total NPIC investment to [redacted] The effort is a joint procurement with GIMRADA.

25X1

19. APPROVED BY AND DATE

OFFICE	DEPUTY DIRECTOR	DDCI

DECLASS REVIEW by NIMA/DOD

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

[redacted] 25X1A

Engineering Change Proposal No. 2

[redacted] 25X1A

MULTI-PURPOSE DATA BLOCK READER
PHASE II

25X1A [redacted]

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

TABLE OF CONTENTS

Section	Title	Page
1.	INTRODUCTION	-1-
2.	PROPOSED CHANGES	-1-
2.1	General	-1-
2.1.1	Additional Format	-1-
2.1.2	Off-Line Rewinder	-3-
2.1.3	Additional Spools	-3-
2.1.4	Visual Alignment	-3-
2.1.5	Electronic Sensing of Excess Wander	-4-
2.1.6	Start and End of Film Sensing	-6-
2.1.7	Manual Data Input to Magnetic Tape	-7-
2.1.8	Display of Film Record Number	-8-
2.1.9	Aural Alarm	-8-
2.1.10	Recording of Partial Tape Blocks	-9-
2.1.11	Revision of Format 11	-10-
3.	DELIVERY	-11-

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

LIST OF ILLUSTRATIONS

Figure Number	Title	Following Page No.
1	Format Type 12	-1-

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

1. INTRODUCTION

This Engineering Change Proposal has been prepared to describe the changes in scope requested to be included in both Multi-Purpose Data Block Reader units, manufactured by [redacted] STATINTL [redacted] Under Phase II of "Project 135". STATINTL

2. PROPOSED CHANGES

2.1 General

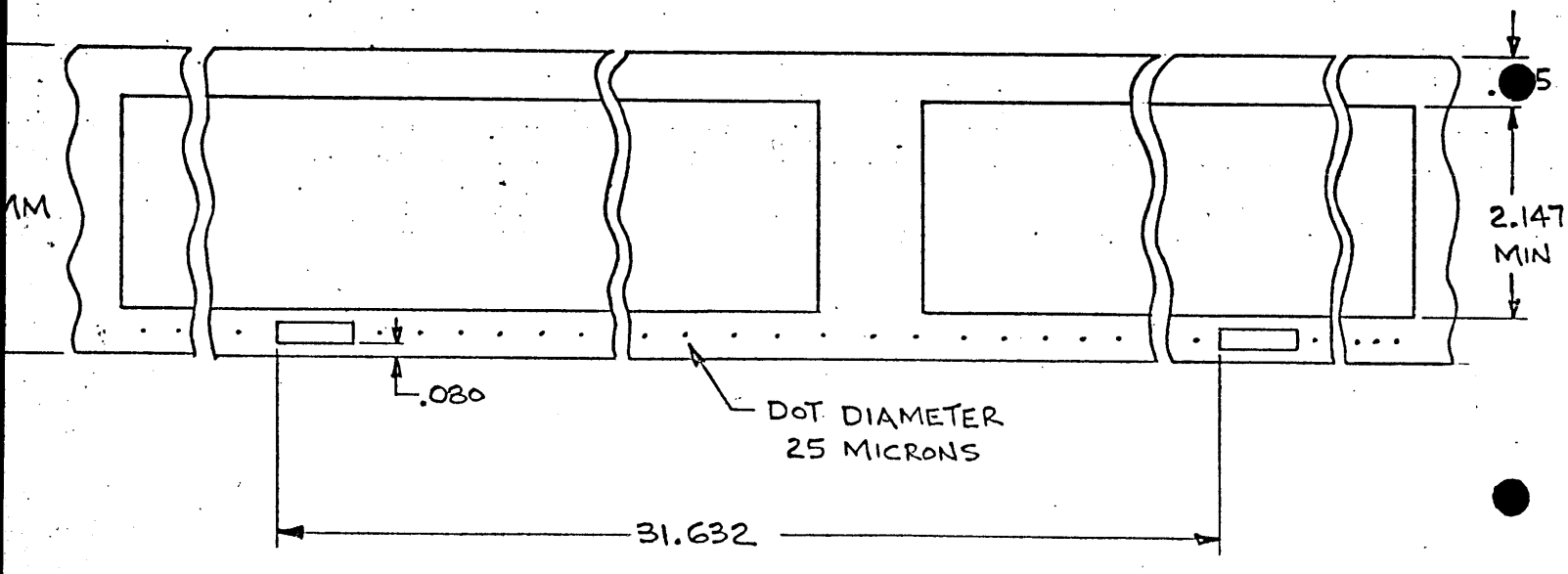
The proposed changes increase the capacity of the reader to read one additional format, improve the operator's efficiency by incorporating new control functions, and simplify the computer processing of the retrieved data. In addition, a redesign is proposed for one of the existing formats due to its deviation from the original specification.

2.1.1 Additional Format

The new format to be read will be called format No. 12. It is recorded (See Figure 1) on the lower border of 70mm film at a nominal pitch of 31.632 inches.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9



FORMAT TYPE 12

FIG 1

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Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

The data block will consist of three horizontal lines of 30 bits each. The line closest to the film edge will be an index line, the second line will consist of 29 binary bits and an odd parity bit, and the third line will be the complement of the second. The data block will be read off the film in groups of three bits - one index bit, one data bit and one complement bit. The index bit will serve as a strobe and wander correction flag, and will be discarded after it has served its purpose. The data and complement words will be stored, checked for parity, and recorded on tape. The tape format of the data block will consist of ten characters, the first five being the data, and the next five the data complement. The order of significance of the bits on tape will depend on the direction of the film in the reader. Wander correction limits for this format will remain at the nominal system wander correction of .072 inches. This will require that the recording wander will be kept under ± .020 inches. The interfering dots will be ignored as long as their diameter is .0015 inches or less, and as long as their pitch is far greater than the .018 inches pitch of the data block.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

2.1.2 Off-Line Rewinder

To allow off line rewinding of the spools while the reader is in operation, a separate rewinder is proposed.

The rewinder will be bidirectional and will accept either standard film spools or the special reader spools, or one of each, in variable film widths.

Two rewinding units will be supplied, one with each reader.

2.1.3 Additional Spools

Special reader spools for 70mm, 5-inch and 9-1/2 inch film, in quantities of six of each type per reader will be supplied. The original quantity of two spools of each type did not allow off line rewinding during reader operation.

2.1.4 Visual Alignment

The current visual alignment is limited to rotational alignment of the data block. This will be expanded to allow viewing of the relationship across the film between the read head and data block. Thus, compensation for excess wander and "off printing" will be accomplished under visual control rather than by trial and error.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

To accomplish this feature, the field of view of the alignment optics will be expanded to include the complete data block and its wander limits. A new reticle will be installed, showing both vertical and horizontal limits of the data block.

2.1.5 Electronic Sensing of Excess Wander

The automatic compensation for film wander in the original system encompassed total system wander of .072 inches. This figure assumes good tracking in the printing process. However, experience with Project 136 showed that in some cases the printing wander alone exceeded .072 inches. In such cases, automatic wander compensation is not feasible, and a manual realignment of the read head position is required.

It is proposed that an excess wander sensing mechanism be installed in the reader. Such a mechanism will indicate a possible excess wander condition and, depending on a switch setting on the front panel, will either stop the reader automatically or indicate excess wander and let the operator decide whether or not to stop the unit.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

There are two possible cases of excess wander.

a) The data block is recorded closer to the edge of the film than allowed by the design parameters. For this case, an additional set of three diodes and amplifiers will be added ahead of the existing index sensing diodes, outside the nominal data block boundary. When a data block is sensed by the nominal window, the added diodes will be sampled for the existence of a dot pattern. The existence of such a dot will indicate excess wander.

b) The data block is recorded further away from the edge of the film than allowed by design parameters. In this case, the data block will fall outside the sensing window, and be missed completely by the reader. The absence of a data block within a set distance from its nominal position along the film will be interpreted as an excess wander condition and the reader will indicate accordingly.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Normally, the detection of excess wander will cause the reader to stop automatically. However, at the option of the operator, an override switch will allow the reader to continue its operation when the excess wander indicator lights up.

2.1.6 Start and End of Film Sensing

The present method of detecting the first block on the film requires manual positioning of the block at a fixed distance from the read head. When the start switch is depressed, the reader will blank out the sensing for that distance. This method could cause the first block to be missed if it was positioned too close to the read head, or the reader would stop on a false excess wander indication if the first block was positioned too far from the read head.

It is proposed that a positive method of sensing the beginning and end of the film be incorporated. During the off line winding of the film onto the special spool, a reflective foil sticker will be attached onto the film immediately ahead of the first block, and behind the last block. A photosensing device capable of detecting this foil will be installed in the reader. The output of the photosensor will control the beginning and the

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

end of the reading cycle. This will eliminate the need for accurate initial positioning of the film in the reader and eliminate the possibility of reading false blocks off the trailer of the film. In addition, it will be possible to start at the middle of the film from a known block, just by adding a foil sticker in front of this block.

2.1.7 Manual Data Input to Magnetic Tape

Provision for manual insertion of auxiliary data onto the magnetic tape is proposed. Twelve decimal thumbwheel switches will be supplied on the front panel, along with a "manual record" switch. When the manual record switch is depressed, the data from the thumbwheel switches will be recorded in BCD format on the magnetic tape and the "manual record" indicator will light up. If more than 12 digits of manual data are required, the manual recording procedure may be repeated. Each set of 12 characters will be recorded as a separate block on the magnetic tape. When less than 12 characters are used, the recorded block will still be 12 characters long, but the unused characters will be set to zero.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

By using a fixed size block of 12 characters, the computer processing the tape will be able to distinguish between the manual information block and the block containing information that was retrieved from film, which appears on tape in multiples of 5, 50 or 96 characters, depending on the film format.

2.1.8 Display of Film Record Number

A film record number of 4 digits will be displayed on the reader's front panel. The display will read from zero through 9999, and advance by one count every time a film record is read by the reader. In case of a detected reading error, the displayed film record number will correspond to the number printed on the line printer. The film record counter will not reset when the "start" switch is depressed, but will have a separate reset switch to allow consecutive counts for reading of multiple film reels.

2.1.9 Aural Alarm

An aural alarm will be supplied with the reader. This alarm will sound each time an error indicator lights up. It will not sound twice for the same type of error unless the error indicator is manually reset between errors. The aural alarm will emit 3 to 5 bursts of 2500 cps "beep" tone for each error.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

2.1.10 Recording of Partial Tape Blocks

The information retrieved from the film is normally accumulated in a magnetic core memory until a known number of information characters is reached. At this time, the content of the memory is recorded on the magnetic tape as a fixed format tape block. However, when the film reel is completed, the information in memory may not have reached its full count, and, therefore, not recorded on tape.

The operator will then have the option of manually recording the data in memory on the magnetic tape by depressing the "memory dump" switch or to continue reading additional reels of film without resetting the memory's address register. The latter will create a continuous record despite the fact that multiple film reels are used. This will be achieved by depressing the "proceed" switch rather than the "start" switch for all reels following the first.

To indicate to the operator that the memory contains a partial record, an indicator will light up every time the film is stopped and the memory is not empty.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

2.1.11 Revision of Format 11

It has been pointed out in paragraph 6.1 of Report No. SME-AL-8, dated 30 June 1966, that the test material for the 4 bit-50 character data format (format 11) was not compatible with its original specifications. The deviation is large enough to cause redesign of the reader section assigned to this format.

Figure 11 in the Report shows the data tracks as typically .076 inches or .151 inches for a pair of black and white bits. The test material shows that the figure of .151 inches per pair of bits is kept between .149 and .153 inches, but the division of the bits in the pair may be as uneven as .063 and .091. In addition, the same figure shows that the beginning and end of the data and clock bits coincide. The test samples, however, show that the edges of two bits in adjacent tracks may overlap by as much as .016 inches.

The design of the reader logic will be modified to accommodate these deviations using the aforementioned numbers as worst case conditions.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

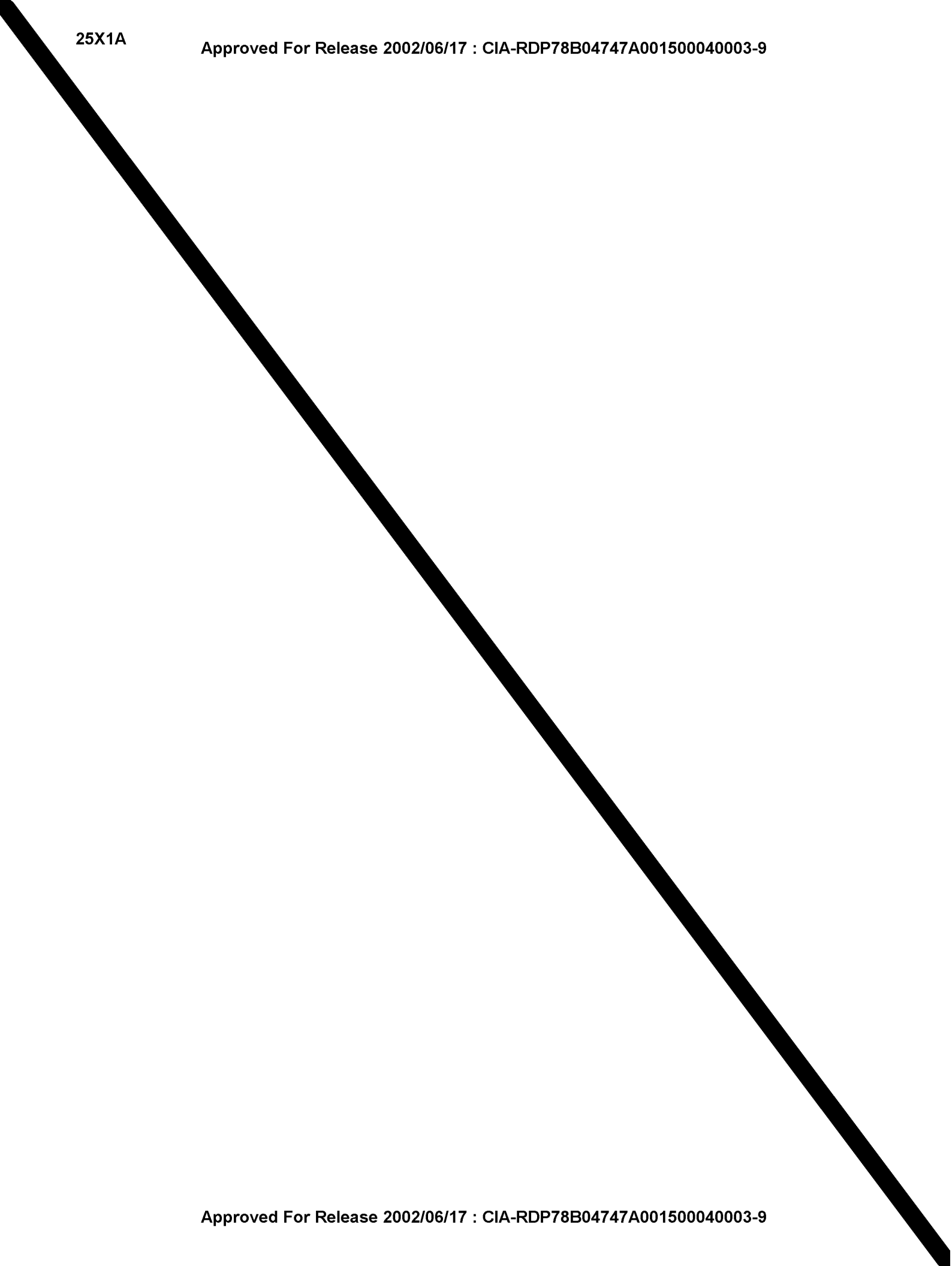
3. DELIVERY

If your authorization to proceed with these proposed changes is received prior to 15 October 1966, we will still be able to make delivery of the Multi-Purpose Data Block Readers with a minimal extension of 30 days to the program. In the event that your authorization to proceed with these changes is received after 15 October 1966, it is quite possible that a more severe stretch-out program will be encountered. In any event, it is necessary that we receive authorization to proceed before 1 November 1966 since by this time we will be into the fabrication stage and the cost and delay to incorporate these changes into each of the units will increase considerably.

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9

25X1A

Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9



Approved For Release 2002/06/17 : CIA-RDP78B04747A001500040003-9