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ABSTRACT

Hardware and software components employed in the 1971-72 tryout of a research-based, computer-operated Instructional Management System (IMS) are listed and described. Purposes of the tryout are given, and the communications system detailed. Source-input and output documents are listed, along with the IMS computer programs and IMS files. Step-by-step explanations of pupil performance reporting procedure and maintenance of pupil data base are provided. A flowchart shows the tryout in operation. A list of references is appended. (SK)

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TITLE: OVERVIEW OF THE IMS VERSION 3 COMPUTER SOFTWARE CONSIDERATIONS IN THE 1971-72 SYSTEM EXERCISE

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ABSTRACT

This document outlines the main characteristics of the hardware/software components of the 1971-72 IMS system tryout and references TN's and TM's to provide the interested reader with additional detail.

INTRODUCTION

During the 1971-72 academic year, SWRL staff implemented and operated a research based, computer operated IMS system [1]. The configuration consisted of:

1. a Data Concentrator Unit (DCU) whose main components include a PDP8 mini-computer, with 8000 words of memory, 3 magnetic tape drives, disk storage, telecommunication interface component, and a low to medium speed card reader and line printer.

2. a large central IBM 360/91 computer located at UCLA.

The specific functions of the system elements and their inter relationships are depicted in section 9.0 below. The remaining sections of the document are presented in outline form to highlight the system features and to reference relevant documentation.

1.0 - FUNCTIONS

A. Pupil Performance Reporting
The Pupil Performance Report processing consists of:
1) Data Collection
   a) criterion exercises
   b) Class Record additions and deletions
2) Scoring the pupil responses made on the criterion exercises
3) Updating the Pupil Data Base with,
   a) the outcome scores, total score, item responses and test date of each criterion exercise processed
   b) the Class Record additions and deletions
4) Monitoring the data collected as follows:
   a) procedural errors on the part of the teacher are noted in the Processing Conditions Report
   b) system errors are listed in the Central Computer IMS Processing System (CIMS) Run Log
5) Producing a Class Record Report which notes class roster changes
6) Producing a Pupil Performance Report by class and criterion exercise unit number
7) Returning the reports in 4a, 5, and 6 to the teacher
8) Returning the CIMS Run Log in 4b above to SWRL for analysis

B. Pupil Data Base Maintenance
This processing is as follows:

1) Data Collection
   a) Teacher requests for Pupil Data Base changes, e.g., correcting a misspelled name.
   b) Class Records
2) Updating the Pupil Data Base with the information received in step 1
3) Listing the changes made to the Pupil Data Base in the Pupil Data Base Maintenance Run Log
4) Listing the new Pupil Data Base

A step by step description of the Pupil Performance Report procedure is found in Section 7.0. The flowchart on which the description is based is in Section 9.0. The Student Data Base Maintenance procedure is similarly described in Sections 8.0 and 10.0. Section 2.0 through 5.0 describe the components that make up the two procedures.

2.0 - IMS COMMUNICATION SYSTEMS

A. INPUT/OUTPUT MODES [2, 3]

Table 1 indicates the three communication systems implemented in the 1971-72 tryout.

TABLE 1

OUTPUT MODE \ INPUT MODE	U.S. MAIL	COURIER	REMOTE SCANNER	REMOTE TELETYPE
U.S. MAIL	COMSYS 1			
COURIER		COMSYS 2		
REMOTE TELETYPE			COMSYS 3	COMSYS 3

In COMSYS 3, Class Record Update information is transmitted to the 690 using an on-line teletype located in a participating school district. All other COMSYS 3 information is coded on scanner sheets and transmitted to the 690 by the on-site scanner.

B. INPUT/OUTPUT DEVICES

Table 2 indicates the Input/Output devices used in the three

COMSYS modes. In COMSYS 3 the DCT-500 and Xerox Scanner/ Copier share a 103A2 data set. SWRL has a matching 103A2 data set that is interfaced with the 690 by using a PT08 Data Set Adapter.

TABLE 2

	INPUT		OUTPUT	
	TELEPRINTER	SCANNER	TELEPRINTER	PRINTER
COMSYS 1	---	OPSCAN 100	---	MOHAWK LINE PRINTER
COMSYS 2	---	OPSCAN 100	---	MOHAWK LINE PRINTER
COMSYS 3	DCT-500	XEROX SCANNER/ COPIER	DCT-500	---

C. IMPLEMENTATION OF INSTRUCTION PROGRAMS

Five programs; First Year Communication Skills (FYCSP), Harper & Row-1 (H&R-1), Harper & Row-2 (H&R-2), MacMillian Bank Street (MBS) and Harper & Row (H&R-3) were implemented in COMSYS 1 & 2. All but H&R-3 also used the COMSYS 3 mode of data transmission.

3.0 - SOURCE INPUT DOCUMENTS

A list of the types of source input documents together with the entry modes and purpose of the form is found in Table 3. Note that the scanner sheet design is specific to the scanner.

TABLE 3

FORM TYPE	ENTRY MODE	FUNCTION
IMS Class Record Sheet [2, 3]	Cardreader	Insert Class Record into the Pupil Data Base.
Teacher Note (by mail or telephone)	Cardreader	Change particular record(s) in Pupil Data Base.

IMS Class Identification Sheet/Update Sheet [2, 3]	A) XEROX Scanner (COMSYS 3) B) OPSCAN 100 Scanner (COMSYS 1&2)	The sheet contains the date of test and the class to which all following sheets until the next identification sheet belong. In COMSYS 1&2 the Class Identification Sheet can be used to add a pupil to the class record, by marking the "Add a Pupil Box" on the sheet. If the "Add" feature is being used the pupil's name and group number are also indicated.
Criterion Exercise Response Sheet (FYCSP + HR-3) [2, 3]	A) XEROX Scanner (COMSYS 3) B) OPSCAN 100 Scanner (COMSYS 1&2)	Contains pupil marked item responses on Criterion Exercises. Additionally a "delete" box can be marked by the teacher to delete the pupil from the Class Record. HR-3 was not implemented in COMSYS 3.
Criterion Exercise Reponse (or Record) Sheets (HR-1, HR-2, MBS) [2, 3]	A) XEROX Scanner (COMSYS 3) B) OPSCAN 100 Scanner (COMSYS 1&2)	Contains the teacher marked items according to the responses made by the pupils the teacher has tested. (10 pupils/page) Additionally, "delete" boxes exist for each pupil so that the teacher can indicate which pupils should be removed from the Class Record.
IMS Update Form [3]	DCT-500 (COMSYS 3)	Contains the class id, name and group number of pupil to be added to the Class Record.
End of Class Sheet	XEROX Scanner (COMSYS 3)	Defines the end of class input.
End of Transmission [4]	XEROX Scanner (COMSYS 3)	Signifies that all data has been transmitted.

4.0 - OUTPUT DOCUMENTS

Table 4 contains a list of the printed documents created during IMS processing.

TABLE 4

Output Documents

TITLE	PURPOSE
Pupil Performance Report [5]	Displays pupil percentage scores by outcome. This report is produced by CIMS.
Processing Conditions Report [5]	Notes teacher procedural problems. This report is produced by CIMS.
Class Record Report [5]	Indicates the addition or deletion of pupils to a Class Record. This report is produced by CIMS.
Data Input Tape List	Used to maintain a record of the translated source data each time OPSN (COMSYS 1&2) or RIMS (COMSYS 3) is run.
Data Input Tape Summary [6] or Console Listing [9]	Each time RIMS accepts a class id sheet it is printed on the console listing. OPSN puts similar output to the 690 printer but includes an error check of the id fields and a count of the number of sheets processed per class.
CIMS Run Log [5]	Maintains system accounting data of CIMS program run.
Maintenaince Program Log [7]	Shows changes made in the Pupil Data Base by the Student Data Base Maintenance program.
Pupil Data Base List [7]	Maintains a record of the Pupil Data Base. It is produced each time the Student Data Base Maintenaince program is used.

5.0 - IMS COMPUTER PROGRAMS

These programs are of two types: Those that operate on the 690DCU, handling and pre-processing scanned input data; and those that reside in the Central Computer and perform IMS oriented functions.

A. OPSN [8, 9]
This program operates in the 690DCU and prepares COMSYS 1&2 mode inputs in the following way:

1. Reads the OPSCAN 100 Scan Tape
2. Edits and formats each Scan Tape Record for transmission to the Central Computer. This is done according to table information keyed from the program and criterion exercise unit code fields on each Scan Tape Record.
3. Writes the reformatted record to the Data Input Tape. Port number 10 (in first two entries of the reformatted record) is assigned to the Data Input Tape records created by OPSN
4. Prints a summary of the Scan Tape data processed.

B. RIMS [6]

COMSYS 3 mode input data from an on-site XEROX Scanner is received by the 690 DCU program RIMS. RIMS does the following:

1. Receives data on-line from a teleprinter and scanner at a on site school location. RIMS can process multiple on-site sources with apparent simultaneity.
2. Checks the input for parity and record length. Records which have not been transmitted correctly are rejected and must be resubmitted.
3. Translates scan data.
4. Allows teletype user to edit a line of data before entering that line for IMS processing.
5. Writes the received records to the Data Input Tape. The first two digits of each record contain the port number (0-9), through which the record was received by the 690.
6. Creates a console listing of the class identification sheets processed.

C. RJS [10, 11]

This 690 software provides Remote Job Service to the Campus Computer Network at UCLA. The main function of RJS with respect to IMS are:

1. Transmitting the Data Input Tape to the 360/91 at UCLA for CIMS processing.
2. Receiving the reports generated by CIMS for delayed transmission to either the 690 printer or a remote site teletypewriter.

D. CIMS [5]

This 360/91 program performs the following functions:

1. Sorts the Data Input file on class identification, criterion exercise, pupil, and page (or list) codes.
2. Scores the item response data.
3. Saves the outcome scores, total scores, item responses, and test dates in the Pupil Data Base.

4. Updates the Class Records in the Pupil Data Base to reflect pupil additions and deletion.
5. Generates the Pupil Performance, Processing Conditions and Class Record Reports together with edit command records which:
   a) indicate the site to which the 690 is to transmit the reports.
   b) control the number of blank lines to be inserted into the report text by the 690.

E. SIMS [12]

The purpose of this 690 program is to transmit each report in the Report File according to the edit commands embedded in the file. Up to three terminals can be service concurrently by SIMS. The line printer can be designated as a fourth output device. Although designed for COMSYS 3 SIMS is used for COMSYS 1 & 2 by directing the output to the line printer.

F. STUDENT DATA BASE MAINTENANCE [7, 13]

This 360/91 program is used to:
1. Add Class Records to the Pupil Data Base
2. Delete records in the Pupil Data Base
3. Insert records in the Pupil Data Base

G. TEST DESCRIPTOR LOADER [14]

LOADER creates a disk file containing the information needed to score the criterion exercises. LOADER reads in the test scoring data from punched input and creates one disk record for each criterion exercise. The records are in sequence by program and criterion exercise code. Retrieval of these records is described in 6 C.

H. LABL/LABS [15]

690 utility programs which read names and addresses from punched cards and print multiple copies for addressing and other labeling purposes.

6.0 - IMS FILES

A. SCAN TAPE [8, 9, 16]

The OPSCAN 100 reads mark sense sheets and writes the data of each sheet read to magnetic tape (1 record/sheet). On each sheet one character is transmitted to tape for each field

defined by the Q & K OPSCAN 100 control sheets which precede each set of scanner sheets of a given format. The string of characters produced is in a left to right, top to bottom of scanner sheet sequence. All the OPSCAN 100 sheets mentioned in Table 3, Section 3.0 are so processed.

B. DATA INPUT FILE [5]

This file can be created by either the OPSN program (COMSYS 1&2) or the RIMS program (COMSYS 3). The Data Input File contains the content of the XEROX (COMSYS 3) or OPSCAN 100 (COMSYS 1&2) scanner sheets translated to a common format. This format simplifies further processing of this file.

C. TEST DESCRIPTOR FILE [17]

This file is stored on drum or other direct access device. Each record in the file pertains to a given criterion exercise and contains the answer key and outcome of each item on the test. Each record can be located by a calculation based on its criterion exercise and instructional program code. The Test Descriptor File is created using the Test Descriptor LOADER Program.

D. PUPIL DATA BASE [5]

The Pupil Data Base (PDB) is maintained on magnetic tape. It is updated each time a Pupil Performance or Pupil Data Base Maintenance run is made. Updating consists of merging the old PDB with the performance, class record, or maintenance data to create a new PDB tape.

The Pupil Data Base (PDB) is structured by class. Each class contains one type 1 record, one type 2 record, one type 3 record/pupil, one type 4 record/pupil's criterion exercise, and one type 5 record. All records in the PDB are sequenced by class identification code and record type. Type 3 records are further sequenced by pupil code. Type 4 records are further sequenced by criterion exercise unit and pupil codes.

The type 1 and 2 records contain the site, district, school, teacher, program, grade, and class identification names and codes. Each type 3 record contains a pupil's name, code, status, and current group number. Each type 4 record contains a pupil's criterion exercise outcome scores, total score, item responses, test dates, unit code, and group number (at the time of test). The type 5 record indicates the end of the class.

E. SORTED DATA INPUT FILE [5]

To merge the Data Input File data with the old Pupil Data Base, CIMS sorts the Data Input File on Class Identification, criterion exercise unit, pupil and page (or list) codes to create the Sorted Data Input File.

F. REPORT FILE [5]

This file contains the reports generated by CIMS, namely, the Pupil Performance, Processing Conditions, and Class Record reports. The reports are in "print" image except for records which control the site destinations and line spacing.

7.0 - PUPIL PERFORMANCE REPORTING PROCEDURE

Step 1 (This procedure refers to the flowchart in Section 9.0)

A) (COMSYS 1)	Teacher mails OPSCAN Criterion Exercise and Class Record Changes sheets to SWRL. Next step in 2A.
B) (COMSYS 2)	Same as A) but using courier service. Next step is 2A.
C) (COMSYS 3)	Operator keys data on IMS update forms using a teleprinter on-line to SWRL's 690 DCU. Next step is 3B.
D) (COMSYS 3)	Operator uses XEROX 660 Scanner/Copier to transmit XEROX class identification and test sheets on-line to SWRL's 690 DCU. Next step is 3B.

Step 2

A) (COMSYS 1&2)	OPSCAN sheets are received by SWRL, pre-processed and run through the OPSCAN 100 scanner which creates the SCAN DATA file on magnetic tape. Next step is 3A.

Step 3

A) (COMSYS 1&2)	The 690 OPSN program edits the SCAN DATA file and creates the DATA INPUT file on magnetic tape. A summary which notes the number of sheets processed per class and coding errors is printed. Next step is 4.

B) (COMSYS 3)

The 690 RJMS program receives the teleprinter entries (STEP 1C) and scanner data (STEP 1D) and creates the DATA INPUT file. Next step is 4.

Step 4

(COMSYS 1, 2, 3)

The 690 utility program (MLST) lists the DATA INPUT file for record purposes. Next step is 5.

Step 5 & 6

(COMSYS 1, 2, 3)

The DATA INPUT file is transmitted to UCLA using Remote Job Service (RJS) software. The effect of this is to insert the DATA INPUT file into the system "card input" file.

Step 7

(COMSYS 1, 2, 3)

The 360/91 program CIMS program sorts the DATA INPUT FILE (SDIF). In turn, the SDIF is processed and the print images except for the 690 edit commands, of the Pupil Performance, Class Record, and Processing Conditions reports are obtained. The Pupil Data Base is updated with the item responses, outcome scores, total scores, test dates, and class record changes. Scoring of criterion exercise is done using test descriptor information read in from the Test Descriptor File. The print image of the CIMS Run Log is generated. Next step is 8.

Step 8 & 9

(COMSYS 1, 2, 3)

The reports and run log generated at the 360/91 are transmitted to SWRL using RJS. The 690 RJS software puts the CIMS RUNS LOG to the 690 printer while the reports are output to the REPORT file. Next step is 10A for COMSYS 1&2, and 10B for COMSYS 3.

Step 10

A) (COMSYS 1&2) — The 690 SIMS program directs all COMSYS 1&2 reports to the 690 printer. Next step is 11A (COMSYS 1) or 11B(COMSYS 2).

B) (COMSYS 3) — The 690 SIMS program directs the remote site information to the appropriate teleprinter. Next step is 12.

Step 11

A) (COMSYS 1) — The reports are mailed to the school sites. Address labels are printed using 690 utilities LABL and LABS. Next step is 13.

B) (COMSYS 2) — The reports are delivered to the schools by courier. Address labels are printed using 690 utilities LABL and LABS. Next step is 13.

Step 12

(COMSYS 3) — The reports are printed on the remote teleprinter. Next step is 13.

Step 13

(COMSYS 1, 2, 3) — The reports are distributed to the teachers.

8.0 - MAINTENANCE OF PUPIL DATA BASE

(This procedure refers to the flowchart in Section 10.0)

Step 1

A) — Teacher mails or telephones request to make a change in Pupil Data Base, e.g., a pupil's name is misspelled.

B) — Teacher mails her Class Record to SWRL.

Step 2 — Keypunch changes and Class Records.

Steps 3 & 4 — Changes/Class record data are submitted using Remote Job Service (RJS) software to the 360/91 for processing.

Step 5 — MAINTENANCE program inserts into and deletes from the Pupil Data Base according

to the Changes/Class Records cards and creates a new Pupil Data Base. A Run Log of the changes made is printed together with a listing of the new Pupil Data Base.

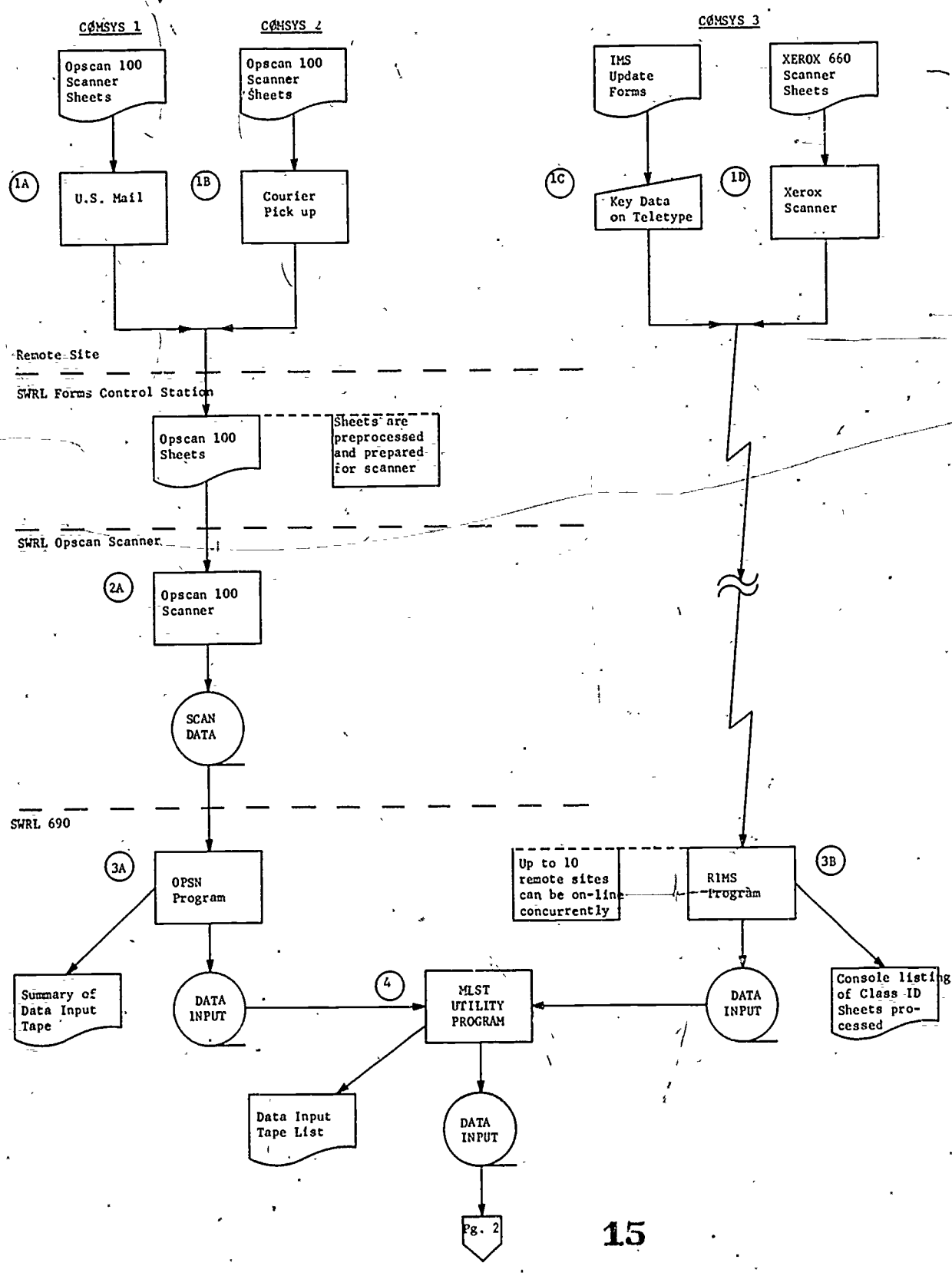
Steps 6 & 7

RJS transmits the RUN LOG and list of new Pupil Data Base to SWRL where these are output on the 690 printer.

SWRL

FLOWCHART LAYOUT FORM

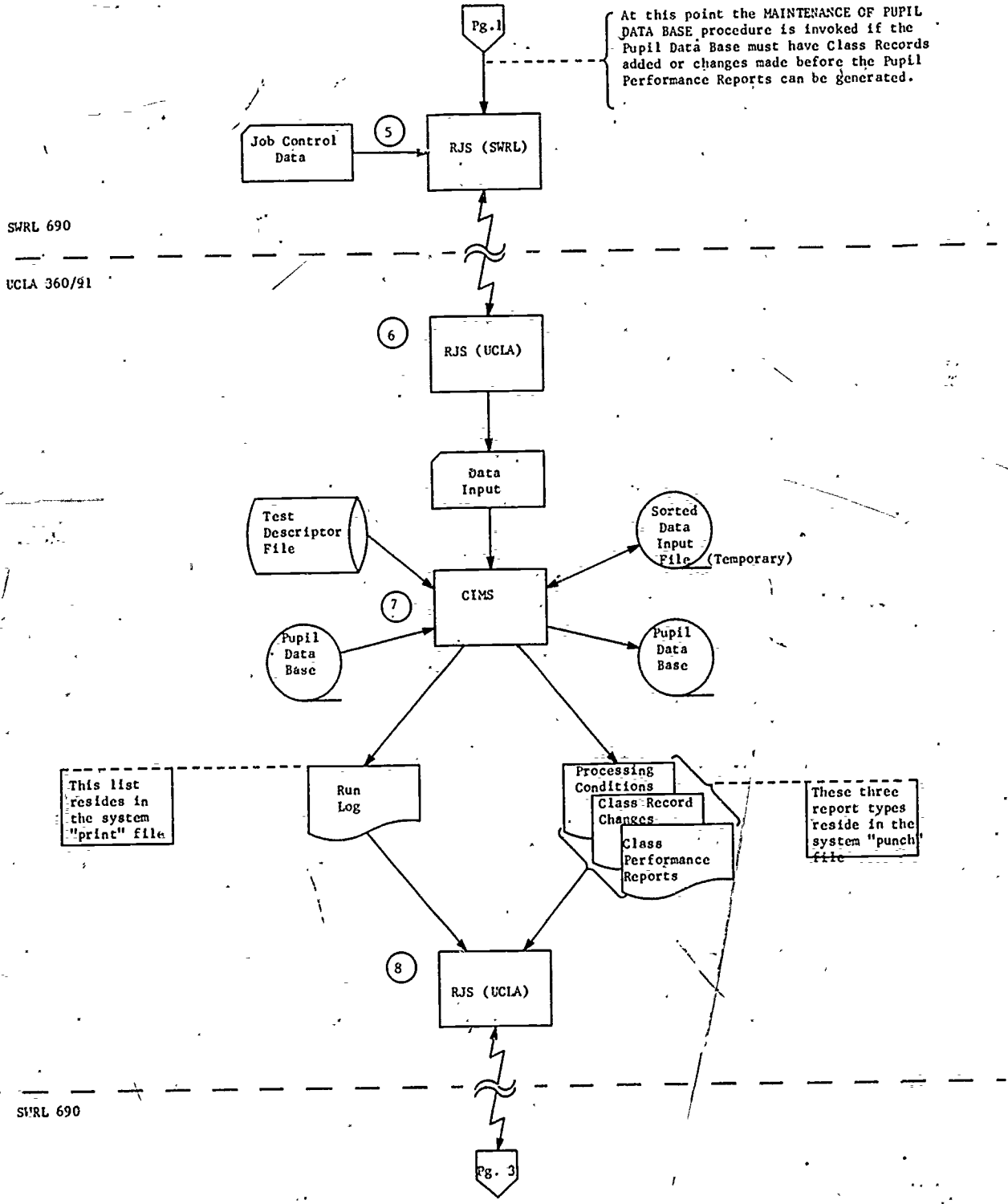
PROGRAMMER: Howard Wolfe
PROGRAM ID:. IMS System Flow
DATE: 7-20-72
PAGE 1 OF 3



SWRL

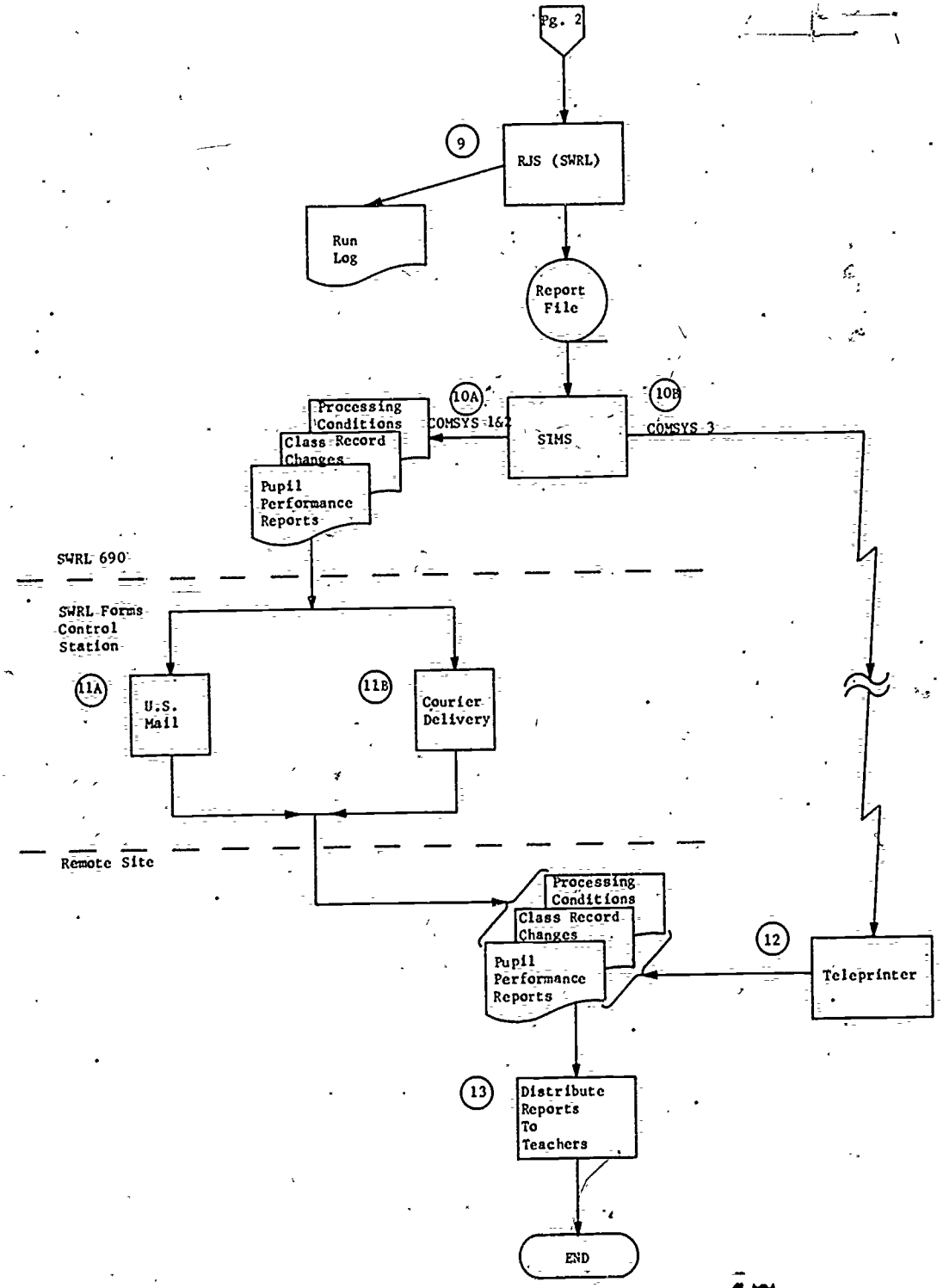
FLOWCHART LAYOUT FORM

PROGRAMMER: Howard Wolfe
PROGRAM ID: IMS System Flow
DATE: 7-20-72
PAGE 2 OF 3



FLOWCHART LAYOUT FORM

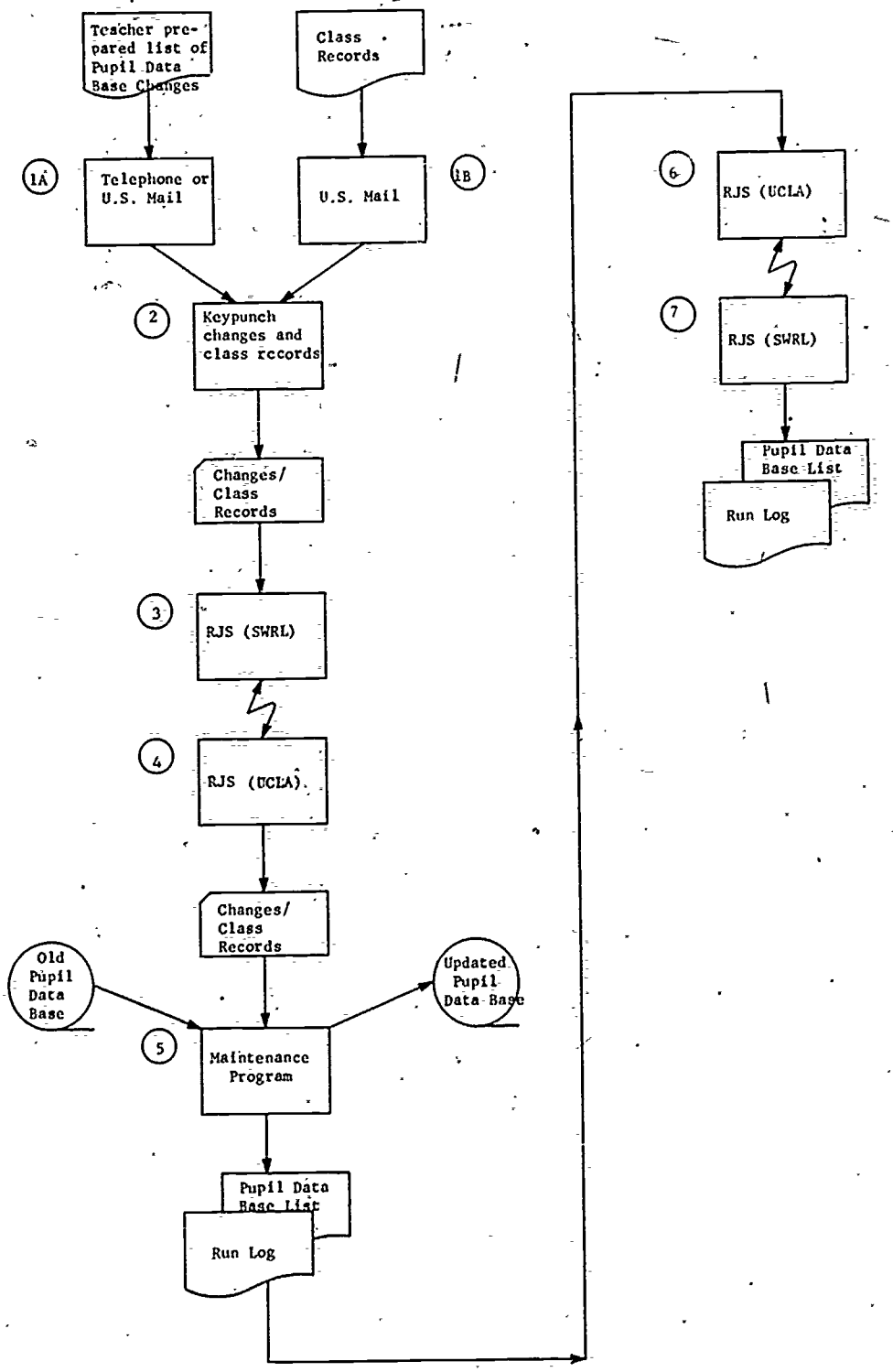
PROGRAMMER: Howard Wolfe
PROGRAM ID: IMS System Flow
DATE: 7-20-72
PAGE 3 OF 3



SWRL

FLOWCHART LAYOUT FORM

PROGRAMMER: Howard Wolfe
PROGRAM ID: MAINTENANCE OF PUPIL DATA BASE
DATE: 4-20-72
PAGE 1 OF 1



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