AD NUMBER
ADB004921
LIMITATION CHANGES
TO: **Approved for public release; distribution is unlimited.**
FROM: **Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; JAN 1975. Other requests shall be referred to Air Force Armament Laboratory, DLJA, Eglin AFB, FL 32542.**
AUTHORITY
afatl ltr, 23 may 1977

AFATL-TR-75-3
VOLUME I

STORES INTERFACE
DATA HANDLING ANALYSIS - PHASE II
VOLUME I. TECHNICAL DISCUSSION

HIGH-SHEAR CORPORATION

TECHNICAL REPORT AFATL-TR-75-3, VOLUME I

JANUARY 1975

AIR FORCE ARMAMENT LABORATORY
AIR FORCE SYSTEMS COMMAND • UNITED STATES AIR FORCE
EGLIN AIR FORCE BASE, FLORIDA

Stores Interface

Data Handling Analysis - Phase II

Volume I. Technical Discussion

Michael J. Lauro
George T. Collins

FOREWORD

This report was prepared by the Ordance Division, Hi-Shear Corporation, 2600 Skypark Drive, Torrance, California 90509, under Contract No. F08635-73-C-0094, with the Air Force Armament Laboratory, Eglin Air Force Base, Florida. Captain James F. Stuart, Jr. (DLJA) managed the program for the Armament Laboratory. The inclusive dates of this research were January 1974 to November 1974.

This report consists of two volumes: Volume I - Technical Discussion and Volume II - Appendices.

Contractor personnel who most actively participated in the preparation of this report were Messrs. Michael J. Lauro and George T. Collins.

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER

FENDRICK J. SMITH, Colonel, USAF
Chief, Munitions Division

ABSTRACT

This technical report describes those improvements made to the Store Interface Data Handling Analysis - Phase I for automating Aircraft/Store Electrical Interface Compatibility Analyses and computerized testing procedures. Until now, a manual method was used to compare hardcopy aircraft stores management system design data against store interface data generated by the Phase I Data Processing System. The improved system eliminates this time consuming task by automatically performing the complete interface compatibility analysis/test. A set of universal aircraft data documentation formats and new computer programs were developed for this added system capability. The new computer programs were designed to disclose any electrical incompatibility that may exist between the aircraft and store selected for comparison. New computer printouts provide detail pin to pin and general interface compatibility information. Diagnostic message printouts are also provided to define each specific incompatibility condition that was detected. The improved system may be used to evaluate or verify the adequacy of an aircraft to control its existing store complement. Essentially, the improved system would compare the electrical design limits of the aircraft stores management system against store electrical requirements that are contained in the AFATL Store Data File. Any incompatible or marginal interface condition will be detected. The system improvements described in this report will greatly reduce the time and cost associated with analyzing aircraft and stores from an electrical interface compatibility standpoint.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONCLUDED)

LIST OF FIGURES

LIST OF FIGURES (CONCLUDED)

LIST OF TABLES

SECTION I

INTRODUCTION

The improvements provided by this Phase II study have significantly increased the analytical capability of the Stores Interface Data Handling Analysis System. It is now possible to perform complex aircraft/store electrical compatibility analyses without referring to numerous aircraft technical order manuals, wiring diagrams, and other related documents. The improved system will now facilitate the storage and processing of all relevant aircraft and store technical data. The Phase II study also expanded the existing AFATL Store Data File Data Base to include additional characteristics that more precisely define the electrical composition and sequence of store interface signals. These new improvements, coupled with the existing Phase I stores interface data processing capability, offer the user a valuable analytical tool that will aid in the following areas:

(1) Aircraft/Store Standard Interface Connector Development. The existing Phase I Store Data Files and computer programs enable the system user to determine standard aircraft/store electrical interface connectors and their pin function assignments for any combination of stores required to use the interface connection.

(2) Aircraft/Store Electrical Compatibility. The new Phase II aircraft data files and computer programs enable the system user to detect incompatibilities and/or verify the overall electrical compatibility between any existing or future aircraft (that may be added to the data file) and any store documented in the AFATL Store Data File.

(3) New Store Development. The Phase I and Phase II data files and computer programs will provide detail aircraft and store electrical data in a format that can be readily used (either manually or by computer means) by weapon system designers to develop new stores that have an electrical interface that will be common to a maximum of different type aircraft.

(4) Stores Management System Development. The existing Phase I computer programs, coupled with the expanded store data base, will enable the system user (with minor Phase I computer program modifications) to accurately determine the types and minimum quantities of interface circuits required for the universal (multi-store) management of stores from individual aircraft weapon stations.

(5) Technical Data Update and Maintenance. The nature of the computerized aircraft and store data files permits the efficient update of data. File updating (file card replacement) can be accomplished with very little effort, thus enabling the system to be maintained in a current status with a minimum expenditure of time and expense.

(6) Technical Data Dissemination. The new aircraft and modified store data files, with their respective data retrieval computer programs, provide a rapid and low cost method to disseminate interface data in the form of computer printouts.

SECTION II

SUMMARY

1. AIRCRAFT DATA DOCUMENTATION AND ELECTRICAL INTERFACE ANALYSIS COMPUTER PROGRAMS

a. System Arrangement. The new Aircraft Data Documentation formats and Computer Programs System Arrangement is shown in Figure 1. This arrangement was chosen because it provides a maximum of versatility for documenting and retrieving aircraft data for a variety of existing and future aircraft.

b. Aircraft Data Documentation. Aircraft interface data is documented separately for each aircraft station. This approach compensates for any differences in aircraft stores management system equipment that may exist between the various aircraft stations. Although one aircraft station may be equivalent to another with respect to store loading capability, both stations may not always be the same with regard to the type of interface circuit components used, or circuit switching logic employed. The aircraft station data documentation formats shown in Figure 1 are shown divided in two basic card sets. One card set is used to document the general (overall) station connector and wiring configuration for the respective station. The other card set is used to document detail aircraft electrical interface circuit provisions for each specific store and/or suspension device normally operated from the station. Consequently, this card set will be comprised of a multiple of individual card sub-sets.

c. Computer Programs. Three computer programs are provided for aircraft/store electrical interface compatibility analysis purposes. These new computer programs will test the aircraft against any equipment that now exists in or may be added to the AFATL Store Data File. The Compatible Aircraft/Test Case Store Interface Connections Computer Program provides a means to determine aircraft/store electrical interface compatibility by comparing the mating ability of the aircraft and test case store interface connectors. A test case store is defined as the store or suspension device that is to be tested for compatibility with the aircraft interface. The Aircraft/Test Case Store Interface Compatibility Computer Program essentially performs a pin to pin circuit compatibility analysis for all associated aircraft/store interface connections. The program provides a diagnostic printout of any incompatibility that may exist that will preclude satisfactory electrical compatibility between the aircraft and the store. The Complementary Station Interface Circuit Analysis Computer Program provides a means to determine electrical interface compatibility independent of the aircraft to store connector mating ability. Thus, this program will facilitate the analysis and definition of all complementary (matched) circuits that exist between the test case store and any one (selected), or all, aircraft station interface connections. An Aircraft Station Data Retrieval Computer Program is also provided to retrieve any part of, or all, data documented in the aircraft interface data file. All of the aforementioned computer programs are written in the FORTRAN computer language and are functional (without change) for any type of aircraft that may be documented on

the new universal aircraft data documentation formats.

2. AIRCRAFT INTERFACE DATA DOCUMENTATION

a. Documentation Formats. A set of data documentation formats were developed and are provided to document electrical interface data for both existing and future aircraft. These formats are essentially computer punch card transcripts and are used to document all the aircraft electrical characteristics required to facilitate a computerized aircraft/store interface compatibility analysis of both hardwired and multiplexed aircraft stores management systems. The basic function of each aircraft data documentation format is described in Table I.

b. File Structure. It is expected that a set of data documentation formats will be prepared for each different aircraft. These data will then be keypunched on to computer punch cards. Once in card form, the individual aircraft card deck data may be used and stored in this form, or transferred to tape or any other suitable digital data storage and handling means.

3. COMPATIBLE AIRCRAFT/TEST CASE STORE INTERFACE CONNECTIONS COMPUTER PROGRAM

a. Description. This computer program is designed to search the aircraft data file and determine what aircraft interfaces are compatible with a selected test case store with respect to physical connector(s) mating ability. After these compatible aircraft interface connections are identified, the user may then use this information to select the appropriate aircraft interface(s) for a detailed pin to pin or circuit to circuit electrical interface compatibility analysis. Other analytical computer programs are provided by the data processing system for this purpose. The general arrangement of the Compatible Aircraft/Test Case Store Interface Connections Computer Program is depicted in Figure 2.

b. Program Control. A computer control (input) card deck is used in conjunction with the new Aircraft Interface Data File and modified AFATL Store Data File to provide the following program control features:

(1) Select the desired test case store and/or suspension device for aircraft interface compatibility testing.

(2) Select the aircraft station(s) and all aircraft interface connections that are to be examined (any one, a combination, or all).

c. Computer Printouts. The computer program will produce a data printout that will identify all aircraft interface connections (that are compatible with the test case store) by aircraft interface connection code number and connector(s) part number. This printout will also specify all store types and their connector(s) part numbers that are normally controlled by the respective aircraft interface connection. The printout will identify all selected aircraft interface connections that are not physically compatible with the test case store by an appropriate diagnostic message. A record of the requested data will also be included on the printout.

TABLE I. AIRCRAFT DATA DOCUMENTATION FORMATS AND FUNCTIONS

	Documentation Format	Function
1.	Aircraft Interface Configuration Code Conversion Matrix	Used to define and record applicability of stores to aircraft station interface connections.
2.	Station Interface Connector Characteristics Data	Used to record connector type, function and pin utilization details for all connectors associated with the respective aircraft station.
3.	Station Interface Circuit Wiring Characteristics Data	Used to record the general wiring configuration of all aircraft station/store interface wiring provisions.
4.	Aircraft Circuit Signal Form Characteristics Data	Used to define and record the electrical composition of all aircraft circuits associated with the management of a specific store type.
5.	Aircraft Circuit Signal Logic Characteristics Data	Used to define and record the basic operational usage and switching logic of all aircraft circuits associated with the management of a specific store type.
6.	Aircraft Circuit Signal Switching Form/Time Characteristics Data	Used to define and record the switching method and timing sequence of each applicable aircraft circuit associated with the management of a specific store type.
7.	Aircraft Circuit Signal Sequence Characteristics Data	Used to define and record the signal sequence order and on/off relationship of all aircraft circuits associated with the management of a specific store type.

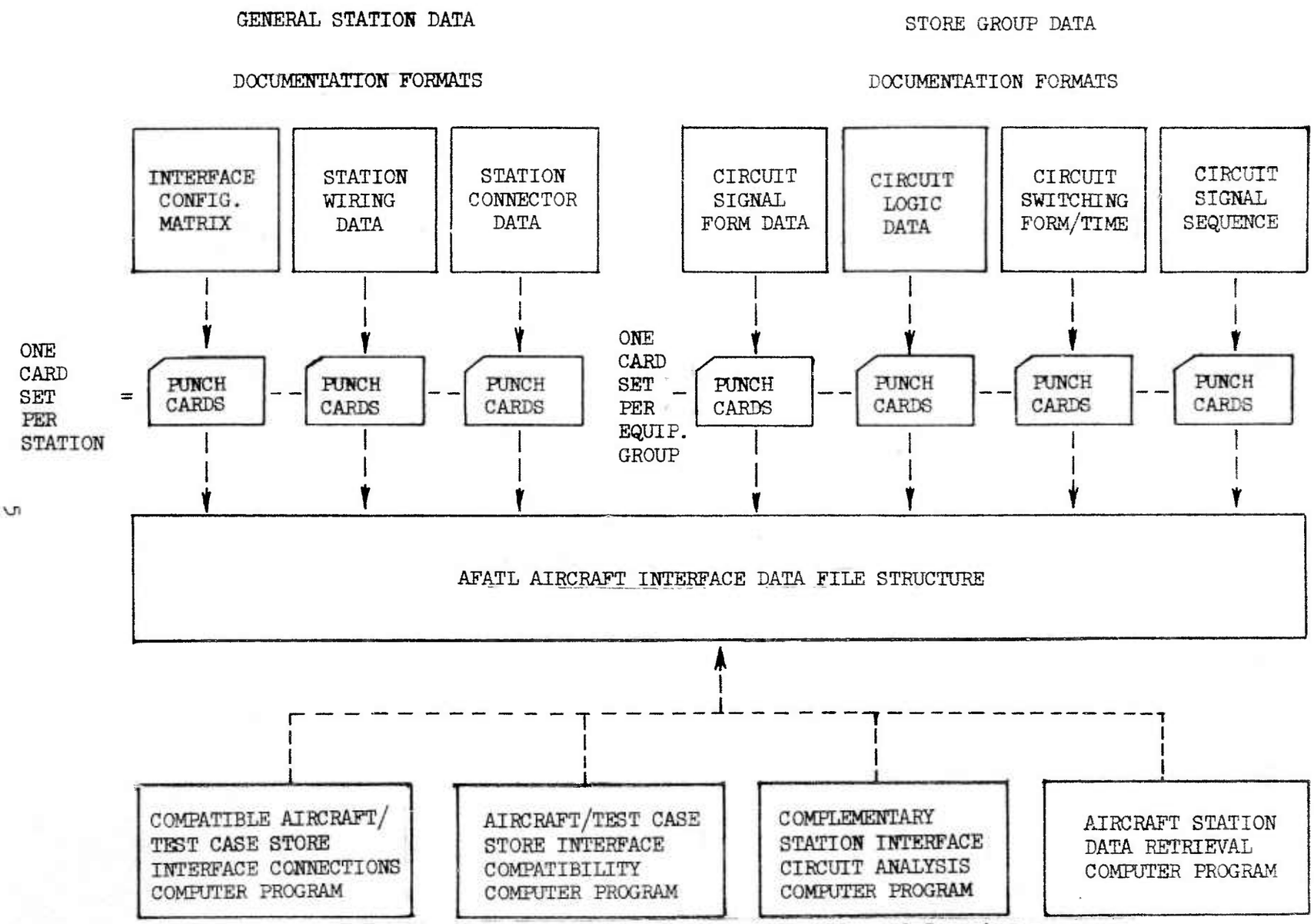

Figure 1. AFATL Aircraft Interface Data File and Computer Programs

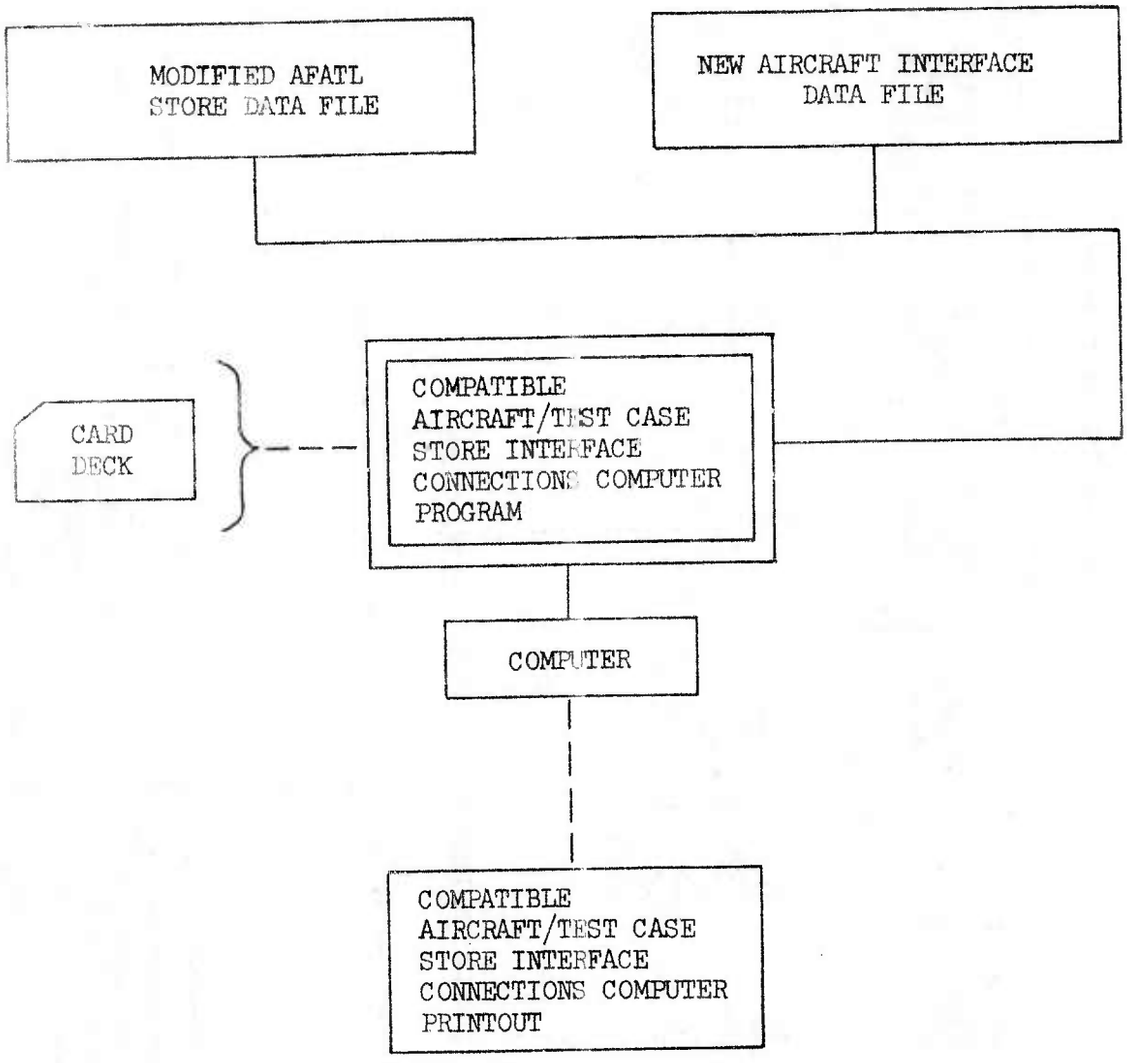

Figure 2. Compatible Aircraft/Test Case Stores Interface Connections Computer Program

4. AIRCRAFT/TEST CASE STORE INTERFACE COMPATIBILITY COMPUTER PROGRAM

a. Description. This computer program is designed to perform a detailed interface circuit compatibility analysis between all selected (and physically compatible) aircraft interface connections and the selected test case store. Essentially, this program compares the corresponding aircraft and store circuit characteristics of both sides of the interface. Each interface pin to pin connection is evaluated in one or more electrical characteristic comparison modes. Each mode determines compatibility based on different interface criteria. The function criteria of each characteristic comparison mode is described in Table II. This method of circuit comparison adds versatility to the system by allowing the user to analyze data for only those interface compatibility functions (modes) applicable to his particular needs. The general arrangement of the Aircraft/Test Case Store Interface Compatibility Program is depicted in Figure 3.

b. Program Control. A computer control (input) card deck is used in conjunction with the new Aircraft Interface Data File and modified AFATL Store Data File to provide the following program control features:

(1) Select the desired test case store and/or suspension device for aircraft interface compatibility testing.

(2) Select the aircraft station(s) and all aircraft interface connections that are to be examined (any one, a combination, or all).

(3) Select the characteristic comparsion modes to be used in the analysis (any one, a combination, or all).

(4) Select the desired computer printouts.

c. Computer Printouts. The computer program will produce the following series of computer printouts:

(1) Summary of User Input. This computer printout provides a record of all the data requested by the user.

(2) Detail Interface Circuit Connection Compatibility Report. This computer printout provides a listing of all interface connections that exist between the aircraft and test case store. Each aircraft circuit is identified by a circuit code number and its signal function nomenclature. The corresponding store circuit (pin mate) is identified by its interface connector code number and pin letter. The store circuit is also identified by its signal function nomenclature. The compatibility of each connection is indicated separately for each circuit characteristic comparison mode. A YES in an adjacent characteristic comparison mode column indicates that the respective interface connection (aircraft and store) are compatible. A NO indicates incompatibility of the interface connection. A more detailed description of this printout including sample outputs are contained in Section VI of this report.

TABLE II. CIRCUIT CHARACTERISTIC COMPARISON MODES

	Comparison Mode	Function
1.	Interface Wiring	Determine if the aircraft and test case store are compatible with respect to basic wiring installation requirements.
2.	Signal Category	Determine if the signal category assigned to each aircraft interface connection circuit is compatible with the category assigned to the mating test case store circuit.
3.	Signal Form	Determine if all circuits available at the aircraft interface connection can suitably control the test case store from an electrical power standpoint.
4.	Signal Logic	Determine if all circuits available at the aircraft interface connection can suitably control the test case store from a switching logic and operational usage standpoint.
5.	Switching Form/Time	Determine if all circuits available at the aircraft interface connection can suitably control the test case store from a switching method and timing sequence standpoint.
6.	Signal Sequence	Determine if all circuits available at the aircraft interface connection can suitably control the test case store with respect to its signal switching sequence order and related on/off signal requirements.

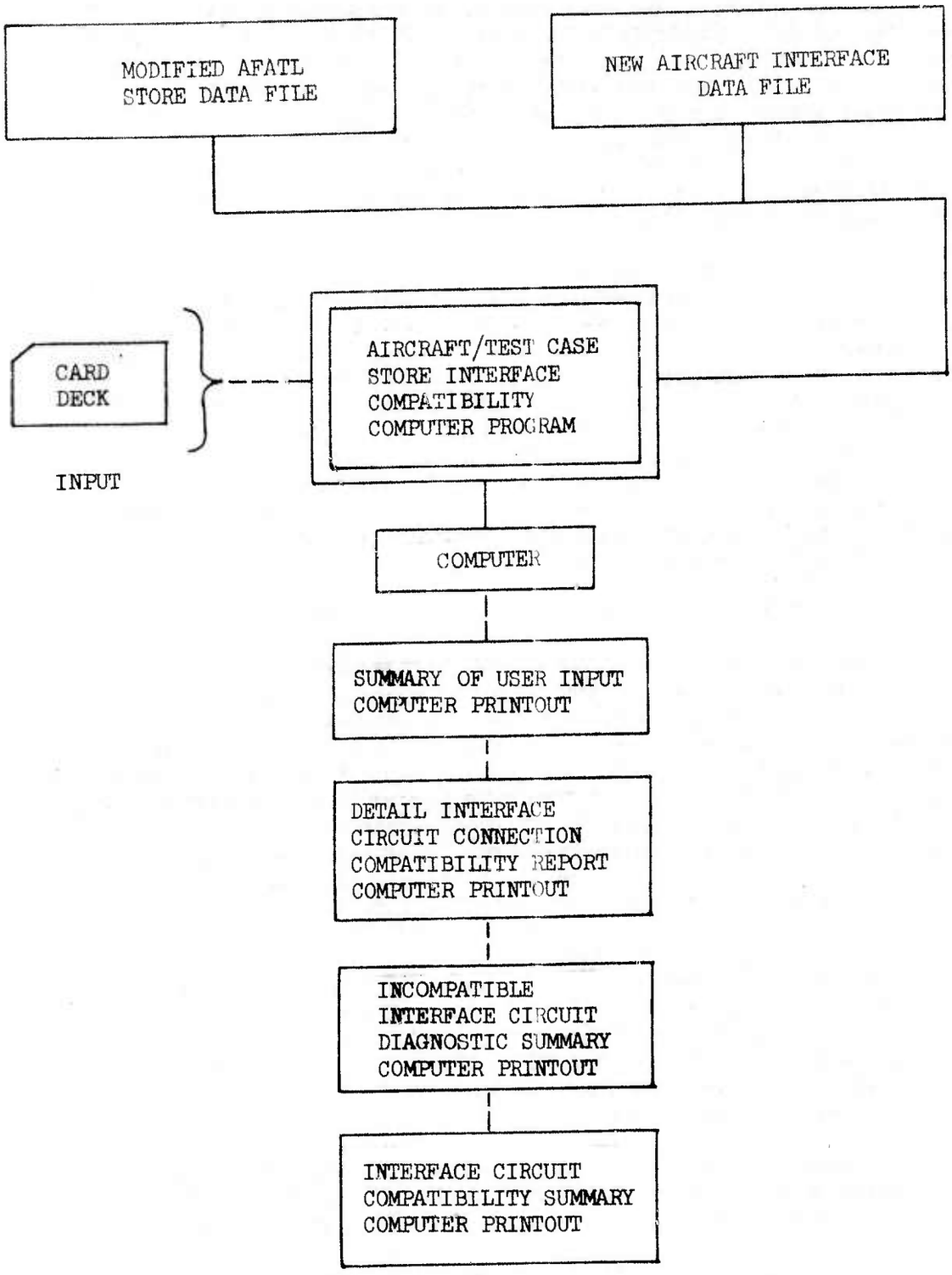

Figure 3. Aircraft/Test Case Store Interface Compatibility Program

(3) Incompatible Interface Circuit Diagnostic Printout. This computer printout complements the detail interface circuit connection compatibility report and provides a listing of all incompatible interface connections. Each incompatible connection is identified by test case store connector/pin number and corresponding aircraft circuit number. A diagnostic message will be printed out separately for each incompatible connection. The message will identify the data file (aircraft and store) characteristics numbers examined and describe the incompatible condition(s).

(4) Interface Circuit Compatibility Summary. This computer printout provides a quick reference that summarizes the compatibility of all selected aircraft station interface connections with the test case store. The printout will list all interface connections by aircraft interface connection code number. Each aircraft connection is correlated with each circuit characteristic comparison mode. A YES in the respective characteristic comparison mode column indicates that all interface circuits examined for that particular aircraft interface connection are compatible with the test case store. A NO indicates that one or more aircraft circuits are not compatible due to a circuit connector mating discrepancy, and/or a circuit electrical characteristic incompatibility.

5. COMPLEMENTARY STATION INTERFACE CIRCUIT ANALYSIS PROGRAM

a. Description. This computer program is designed to determine aircraft/store electrical compatibility by examining individual interface circuit electrical characteristics independent of the aircraft and test case store connector type and pin insert configurations. This feature will permit a detailed and complete interface circuit comparison between any aircraft and store interface stored in the respective system data files. The new Complementary Station Interface Circuit Analysis Program will therefore detect, compare, and facilitate the printout of all those aircraft interface circuits that will complement (are electrically compatible with) the selected test case store. This new computer program will also be capable of selectively testing the interface(s) in any one or all of the circuit comparison modes described in Table II. However, the signal sequence comparison mode will not be included in the analysis. This mode requires that both the aircraft and store interface connections (for all circuits) be arranged in a compatible pin insert configuration. The general arrangement of the Complementary Station Interface Circuit Analysis Program is depicted in Figure 4.

b. Program Control. A computer control (input) card deck is used in conjunction with the new Aircraft Interface Data File and modified AFATL Store Data File to provide the following program control features:

(1) Select the desired test case store and/or suspension device for aircraft interface compatibility testing.

(2) Select the aircraft station(s) and all aircraft interface connections that are to be examined (any one, a combination, or all).

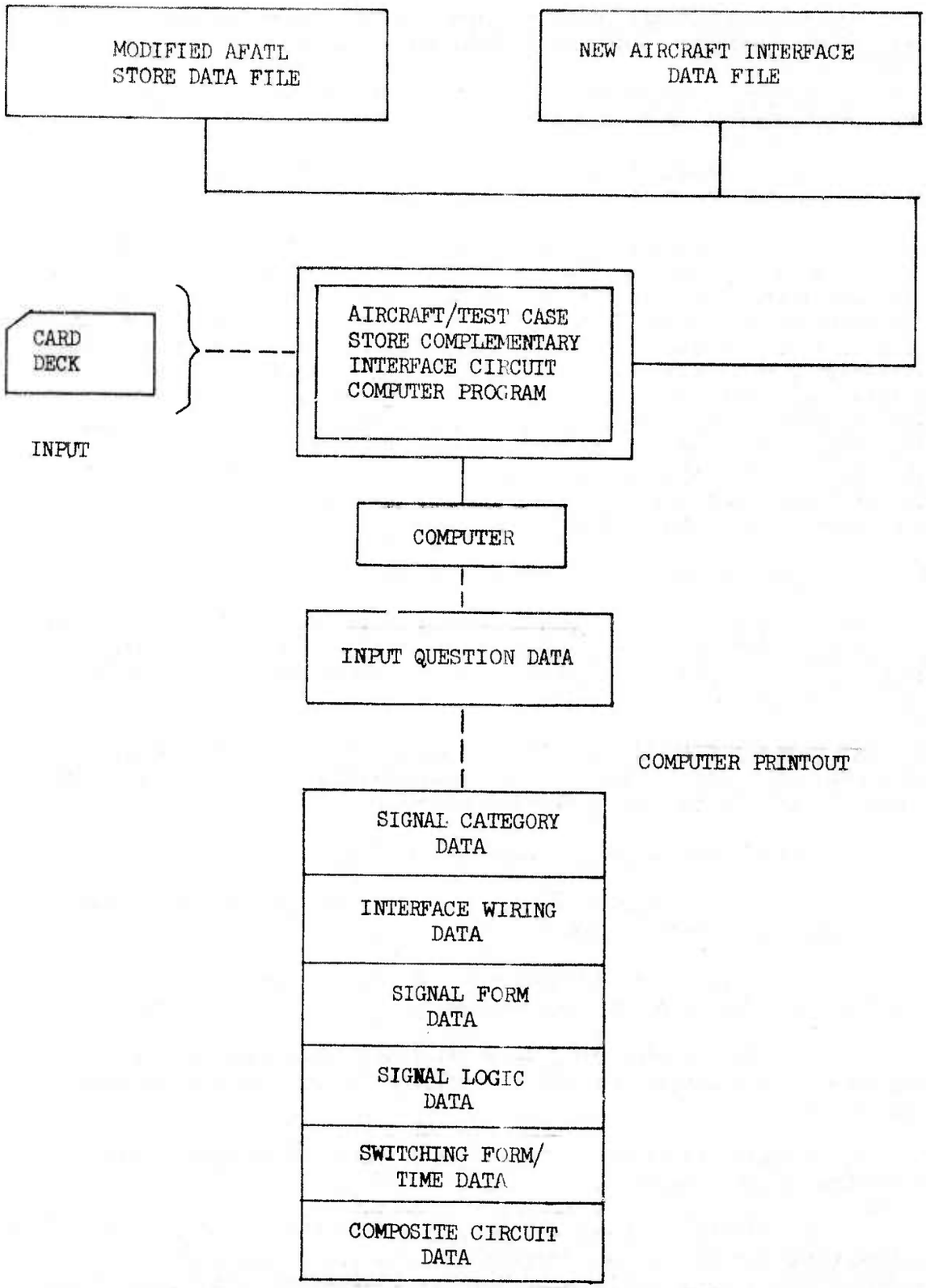

Figure 4. Aircraft/Test Case Store Complementary Station Interface Circuit Analysis Program

(3) Select the circuit characteristic comparison modes to be used in the analysis (any one, a combination, or all).

c. Computer Printouts. The computer program will produce the following computer printouts:

(1) Summary of User Input. This computer printout provides a record of all the data requested by the user.

(2) Complementary Station Interface Circuit Analysis Report. This computer printout provides a listing of all aircraft circuits that are compatible with each pin connection on the selected test case store. The printout will identify the connector identification and pin reference of each test case store circuit. The complementary aircraft circuits detected by the program will be identified by interface connection number, aircraft circuit function number, connector identification and pin reference. These data will be listed adjacent to the respective test case store circuit. A complementary aircraft circuit will be specified only if all the detail aircraft circuit electrical characteristics within each selected circuit characteristic comparison mode complements the respective store circuit.

6. AIRCRAFT STATION DATA RETRIEVAL PROGRAM

a. Description. This computer program is designed to retrieve any part, or all of the interface data documented on the formats listed in Table I. The general arrangement of the Aircraft Station Data Retrieval Program is depicted in Figure 5.

b. Program Control. A computer control (input) card deck is used in conjunction with the new aircraft interface data file to provide the following program control features:

(1) Select applicable aircraft station.

(2) Select data block printouts for station interface connector and/or station interface circuit wiring data.

(3) Select data printouts for any one, a combination, or all aircraft interface connections peculiar to a specific store type.

(4) Select electrical characteristic data block printouts (any one, a combination, or all) for those selected aircraft interface connections.

c. Computer Printouts. The computer program will produce the following computer printouts:

(1) Station Interface Connector Data. This printout lists the part numbers of all connectors associated with the selected weapon station. All detail connector characteristics data (as documented on the format described in Table I) will be printed out.

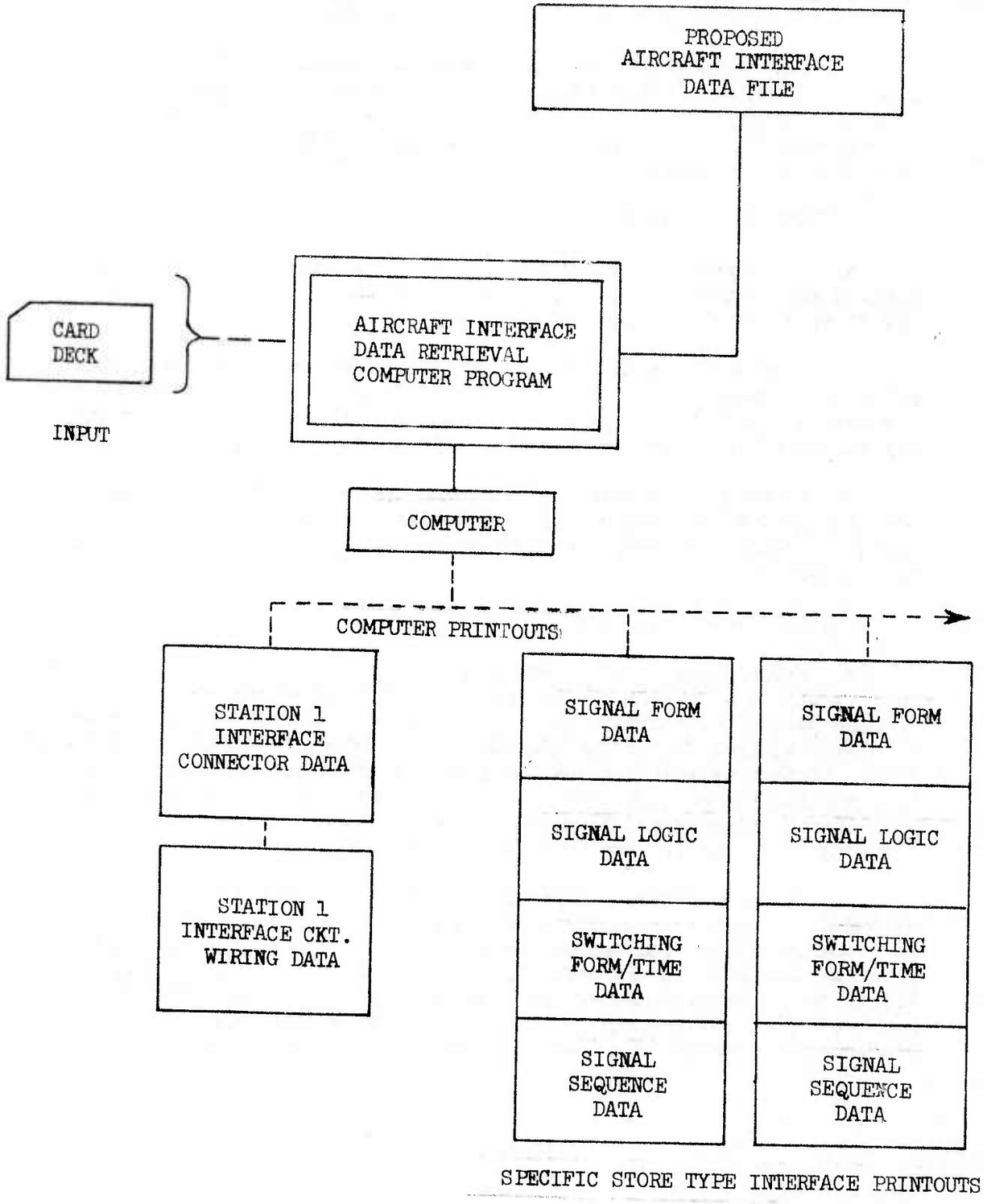

Figure 5. Aircraft Interface Data Retrieval Computer Program

(2) Station Interface Wiring Data. This printout lists all the detail station wiring data for all aircraft interface connections associated with the selected aircraft weapon station.

(3) Specific Store Type Interface Printouts. The detail electrical characteristic data associated with each aircraft/store interface connection of the selected weapon station will be printed out separately. Each printout will contain a listing of all characteristic data that was documented and is stored in the aircraft data file.

8. REVISED EQUIPMENT DATA RETRIEVAL PROGRAM

a. Description. The existing Phase I Equipment Data Retrieval Program was revised to faciliate the retrieval and printout of all new store electrical characteristic data.

b. Program Control. The method used to select store data for printout is described in AFATL-TR-73-214 (Phase I). This procedure, however, was modified to permit retrieval of data associated with the new Switching Form/Time and Signal Sequence data blocks.

c. Computer Printouts. Additional computer printouts are provided for the supplemental and new equipment characteristic data blocks. The format of these printouts are essentially the same as the existing data block printouts.

7. REVISED STORE DATA FILE

a. Description. The existing AFATL store data file structure had to be modified to facilitate operation of the new aircraft/store interface compatibility computer programs. Essentially, the original store data was expanded to include additional electrical interface characteristic data. These data were required to permit a complete and accurate means to test aircraft/store compatibility. The modified data file structure, including a brief description of the supplemental and new store data documentation formats, are described in Table III.

b. File Structure. The modified store data file structure was designed to facilitate operation of both the new aircraft/store interface compatibility programs and those store electrical analysis computer programs described in AFATL-TR-73-214 (Phase I). The Phase I Store Electrical Analysis Computer Programs were modified only to the extent required to permit reading of the modified store data file. New store characteristics data is not used or processed by these existing programs.

TABLE III. MODIFIED AFATL STORE DATA DOCUMENTATION FORMAT AND FUNCTIONS

	Documentation Format	Function
1.	Equipment Introductory/ Connector (Existing Format)	Unchanged, used to record store interface connector details for individual stores.
2.	Supplemental Introductory/ Connector (New Format)	Used to document additional data for aircraft/store connector matching purposes.
3.	Equipment Signal Form (Existing Format)	Unchanged, used to define and record the electrical composition of interface circuits peculiar to an individual store.
4.	Supplemental Equipment Signal Form (New Format)	Used to document additional signal form characteristics that further define the composition and tolerance values of interface circuits peculiar to an individual store.
5.	Equipment Signal Logic (Existing Format)	Unchanged, used to define and record store input switching logic requirements of interface circuits peculiar to an individual store.
6.	Supplemental Equipment Signal Logic (New Format)	Used do document additional signal logic, and define the circuit operation function (use) of interface circuits peculiar to an individual store.
7.	Equipment Switching Form/ Time (New Format)	Used to define and record the switching method and timing sequence required by each interface circuit peculiar to an individual store.
8.	Equipment Signal Sequence (New Format)	Used to define and record the signal sequence and on/off relationship requirements of all interface circuits associated with, and peculiar to, an individual store.

SECTION III

GENERAL CONSIDERATIONS

1. INTERFACE CIRCUIT COMPARISON METHODS FOR AIRCRAFT/TEST CASE STORE INTERFACE COMPATIBILITY PROGRAM

a. Description. The Aircraft/Test Case Store Interface Compatibility Computer Program determines the compatibility of interface circuits by performing a series of aircraft and store characteristic comparisons. These comparisons are designed to detect incompatible interface conditions. When such conditions are detected, an appropriate diagnostic message is printed out accordingly. The diagnostic message indicates what characteristics (by number) were examined and specifies the exact incompatibility that exists between the aircraft and store circuit. A complete listing of all the diagnostic messages associated with the computer program are contained in Appendix I of this report. The Aircraft/Test Case Store Interface Compatibility Computer Program was designed to determine if the selected aircraft interface connection is capable of meeting the minimum electrical interface requirements that are necessary for test case store operation. Therefore, only those aircraft and equipment characteristics that affect electrical interface compatibility will be examined. Tables IV through IX list the interface functions that are examined in each of the circuit characteristic comparison modes. These tables also identify what specific characteristics are involved with each comparison and also list all related incompatibility diagnostic message numbers.

b. Interface Wiring Comparison Mode. The objective of each interface function comparison associated with the interface wiring comparison mode (Table IV) is described in the following paragraphs:

(1) Interface Connection. Determine if an electrical connection exists between the aircraft and test case store for each corresponding connector pin letter/number assignment.

(2) Multi-Conductor Cable Configuration. Determine if the store circuit is a single conductor within a multi-conductor cable, and if the aircraft side of the interface connection meets this wiring requirement.

(3) Wire Type. Determine if the wire type existing in the aircraft (at the particular interface pin) is suitable to meet the signal transmission requirements of the respective test case store circuit.

(4) Floating Shield Circuit. Determine if both the aircraft and store pin connections are dedicated for circuit shield continuity purposes.

(5) Aircraft Structure Ground. Determine if both the aircraft and store pin connections are dedicated power return (ground to ground) circuits.

TABLE IV. INTERFACE WIRING COMPARISON MODE

	Interface Function	Aircraft Characteristic Number	Equipment Characteristic Number	Incompatibility Diagnostic Message Number
1.	Interface Connection	A200A	E166	DM-001,DM-002, DM-003
2.	Multi-Conductor Cable Configuration	A205	E156	DM-004,DM-005
3.	Wire Type	A206, A207	E112, E125, E163	DM-006,DM-007, DM-008,DM-009
4.	Floating Shield Circuit	A213	E157	DM-010,DM-011
5.	Aircraft Structure Ground	A214	E158	DM-012,DM-013
6.	Wire Size	A215	E165	DM-014,DM-015

TABLE V. SIGNAL CATEGORY COMPARISON MODE

	Interface Function	Aircraft Characteristic Number	Equipment Characteristic Number	Incompatibility Diagnostic Message Number
1.	Signal Category Assignment	A202	E111	DM-016

TABLE VI. SIGNAL FORM COMPARISON MODE

	Interface Function	Aircraft Characteristic Number	Equipment Characteristic Number	Incompatibility Diagnostic Message Number
1.	Store Loop Circuit Polarity	A301	E151,E151A, E151B,E159	DM-017,DM-018
2.	Store Loop Circuit	A301,A306A A307,A313	E152,E161 E151,E151B, E161A	DM-019,DM-020 DM-021,DM-022
3.	Sensor Circuit Code Check	A312	E162	DM-023
4.	On State Circuit Configuration	A301	E152	DM-024,DM-025 DM-026, DM-027 DM-028
5.	Off State Circuit Configuration	A302	E153	DM-029,DM-030 DM-031
6.	Voltage Type	A304	E114	DM-032,DM-033 DM-034
7.	Nominal Voltage Value	A303	E113	DM-035,DM-036
8.	Minimum Interface Voltage	A305	E154	DM-037
9.	Maximum Interface Voltage	A303	E155	DM-038
10.	Output Circuit Load Limitations - Steady State Current	A307,A313 A301	E115	DM-039
11.	Output Circuit Load Limitations-Transient Current	A308,A309 A313,A301	E118,E119	DM-040

TABLE VII. SIGNAL LOGIC COMPARISON MODE

	Interface Function	Aircraft Characteristic Number	Equipment Characteristic Number	Incompatibility Diagnostic Message Number
1.	Release Logic Usage Pylon Jettison	A401	E251	DM-041,DM-042
2.	Release Logic Usage Bomb Rack	A402	E252	DM-043,DM-044
3.	Release Logic Usage Launcher	A403	E253	DM-045
4.	Release Logic Usage Store Interface	A404	E254	DM-046
5.	Monitor Logic Usage	A421,A408	E260,E255 E259	DM-047,DM-048 DM-049,DM-050
6.	Operational Status Display	A411,A412 A421	E217,E260	DM-051
7.	Control Logic Switching	A413	E221	DM-052
8.	Power Signals	A415	E257	DM-053
9.	Sensor Circuit Code Check	A416	E258	DM-054
10.	Station Isolation Check	A417	E208	DM-055
11.	Circuit Uniqueness Check	A418	E222	DM-056,DM-057
12.	Station Select Check	A419	E261	DM-058

TABLE VIII. SWITCHING FORM/TIME COMPARISON MODE

	Interface Function	Aircraft Characteristic Number	Equipment Characteristic Number	Incompatibility Diagnostic Message Number
1.	Circuit Switching Form I/O Compatibility	A501	E501	DM-059, DM-060 DM-061
2.	Circuit Switching Form Aircraft Output Circuits	A502	E502	DM-062, DM-063
	(a) Circuit Initiate Delay Time	A505,A506 A507	E505,E506 E507,E501	DM-066, DM-067 DM-068, DM-069
	(b) Circuit On or Off Time	A508,A509 A510,A511	E501,E509 E510,E511	DM-070, DM-071 DM-072, DM-073 DM-074
	(c) Circuit Dropout Delay Time	A512,A513 A514	E513,E514 E501	DM-075, DM-076 DM-077, DM-078
	(d) Circuit Off Dwell Time	A515,A516 A517	E501,E516 E517,E502	DM-079, DM-080 DM-081
3.	Circuit Switching Form Equipment Output Circuits	A503	E503	DM-064, DM-065
	(a) Circuit Initiate Delay Time	A501,A506 A507	E505,E506 E507	DM-083, DM-084 DM-085, DM-086
	(b) Circuit On or Off Time	A501,A509 A510,A511	E508,E509 E510,E511	DM-087, DM-088 DM-089, DM-090 DM-091
	(c) Circuit Dropout Delay Time	A501,A513 A514	E512,E513 E514	DM-092, DM-093 DM-094, DM-095
	(d) Circuit Off Dwell Time	A501,A516 A517	E515,E516 E517	DM-096, DM-097 DM-098

TABLE IX. SIGNAL SEQUENCE COMPARISON MODE

	Interface Function	Aircraft Characteristic Number	Equipment Characteristic Number	Incompatibility Diagnostic Message Number
1.	Interface Circuit Signal Function	A601,A603	E601,E605 E606A,E606B	DM-100,DM-101 DM-102
2.	Interface Signal Switching Sequence Order	A601A,A603	E601A,E605	DM-103,DM-104
3.	Associated Interface Circuit Status Tests	-	-	-
	(a) On-State Test Mode	A602 (Even Number Card Columns)	E602 (Even Number Card Columns)	DM-105
	(b) Off-State Test Mode	A602 (Odd Number Card Columns)	E602 (Odd Number Card Columns)	DM-106

(6) Wire Size. Determine if the aircraft wire size (terminated at the interface connection) is suitable to control the respective test case store circuit from a current carrying capacity standpoint.

c. Signal Category Comparison Mode. The objective of this comparison mode is to determine if the signal category assigned to each aircraft interface connection circuit is the same as those assigned to the corresponding equipment circuits. This comparison is primarily concerned with detecting inconsistencies in data documentation procedures. The mode also provides a means to examine the aircraft/store interface from a basic signal function compatibility standpoint only.

d. Signal Form Comparison Mode. The objective of each interface function comparison associated with the signal form comparison mode (Table VI) is described in the following paragraphs:

(1) Store Loop Circuit Polarity. Determine if those aircraft circuits connected to a store loop connection (jumper wire, single pole sensing switch with both ends terminated at aircraft interface, etc.) are correctly polarized with respect to source voltage.

(2) Store Loop Circuit Current. Determine if the maximum output current of the aircraft circuit exceeds the current carrying/switching limits of the store loop jumper wire or series switch contact rating. Also determine if an aircraft output circuit is capable of switching a store loop series load (solenoid with both ends connected to aircraft interface, etc.).

(3) Sensor Circuit Code Check. Examine interface connection to determine if the test case store circuit is a sensor signal (audio, video, etc.). If so, both sides of the interface connection will be examined to detect any disagreement between the assigned sensor circuit characteristic identification code numbers.

(4) On-State Circuit Configuration. Determine if the aircraft side of the interface circuit being examined meets the on-state circuit configuration requirements of the test case store circuit with respect to source voltage polarity, circuit switching requirements, and circuit load location.

(5) Off-State Circuit Configuration. Determine if the aircraft side of the interface circuit being examined meets the off-state circuit requirements of the test case store circuit with respect to grounding, open circuit or parallel circuit loading.

(6) Voltage Type. Determine if both sides of the aircraft/store interface connection are compatible with respect to circuit source voltage type.

(7) Nominal Voltage Value. Determine if the test case store circuit nominal interface voltage value requirements fall within the minimum/maximum voltage range of the respective aircraft output circuit.

(8) Minimum Interface Voltage. Determine if the minimum interface voltage value required for normal operation of the test case store circuit can be maintained under the worst case (minimum) voltage conditions of the respective aircraft output circuit.

(9) Maximum Interface Voltage. Determine if the maximum interface voltage value allowable for normal test case store circuit operation is exceeded by the respective aircraft output circuit under worst case (maximum) voltage conditions.

(10) Output Circuit Load Limitations - Steady State Current. Determine if the aircraft output circuit is capable of switching and/or carrying the steady state load(s) imposed by the respective store circuit.

(11) Output Circuit Load Limitations - Transient Current. Determine if the aircraft output circuit is capable of switching the transient load(s) imposed by the respective store circuit.

e. Signal Logic Comparison Mode. The objective of each interface function comparison associated with the signal logic comparison mode (refer to Table VII) is described in the following paragraphs:

(1) Release Logic Usage - Pylon Jettison. Determine if the pylon jettison logic (jettison mode) used by the aircraft circuit is functionally compatible with the test case suspension device (pylon) jettison mechanism.

(2) Release Logic Usage - Bomb Rack. Determine if the bomb rack release signal logic used by the aircraft circuit is functionally compatible with the test case suspension device (bomb rack) release mechanism(s).

(3) Release Logic Usage - Launcher. Determine if the launcher release signal type used by the aircraft circuit is functionally compatible with the type of signal required by the test case suspension device (launcher) with respect to release circuit function usage.

(4) Release Logic Usage - Store Interface. Determine if the type of release signal used by the aircraft circuit (terminated at the aircraft to store interface connector) is functionally compatible with the test case store with respect to release circuit function usage.

(5) Monitor Logic Usage. Determine if the type of monitor aignal used by the aircraft circuit (terminated at either the aircraft to store or suspension device interface) is functionally compatible with the test case equipment with respect to monitor circuit function usage.

(6) Operational Status Display. Determine if the aircraft circuit and associated monitoring equipment is capable of displaying the respective test case equipment circuit operational status display message.

(7) Control Logic Switching. Determine if the aircraft control circuit can provide the essential inflight (pilot selectable) switching functions required by the test case equipment circuit.

(8) Power Signals. Determine if the aircraft interface circuit power signal is compatible with the test case equipment with respect to circuit shield configuration requirements.

(9) Sensor Circuit Code Check. Examine interface connection to determine if the test case store circuit is a sensor signal (audio, video, etc.). If so, both sides of the interface connection will be examined to detect any disagreement between the assigned sensor circuit characteristic identification code numbers.

(10) Station Isolation Check. Determine if the aircraft circuit meets the station isolation (no parallel connections with other station circuits) requirements of the test case equipment circuit.

(11) Circuit Uniqueness Check. Examine the interface connection to determine if the test case equipment circuit, or both the aircraft and test case equipment circuits (under test), are to be used for only one specific purpose. This check alerts the system user that the circuit(s) have restricted applications due to safety or administrative reasons.

(12) Station Select Check. Determine if the aircraft circuit meets the station selection requirements (incorporates a station selection switching means) of the test case equipment circuit.

f. Switching Form/Time Comparison Mode. The objective of each interface function comparison associated with the switching form/time comparison mode (Table VIII) is described in the following paragraphs:

(1) Circuit Switching Form I/O Compatibility. Determine if the aircraft and test case store interface circuit (under examination) is compatible with respect to input/output signal flow.

(2) Circuit Switching Form - Aircraft Output Circuits. Determine if the type of output circuit provided in the aircraft for controlling the on/off time (signal duration) of the interface circuit is compatible with the input circuit switching form requirements of the test case equipment. The following detail comparisons are performed for each interface circuit classified as an aircraft output.

(a) Circuit Initiate Delay Time. Determine if the aircraft output circuit type is able to accommodate the test case equipment circuit initiate delay time requirements.

(b) Circuit On or Off Time. Determine if the aircraft output circuit type is capable of maintaining the interface circuit in an on-state or off-state configuration according to the timing requirements of the test case equipment.

(c) Circuit Dropout Delay Time. Determine if the aircraft output circuit type is able to accommodate the test case equipment circuit dropout delay time requirements.

(d) Circuit Off Dwell Time. Determine if the pulsed type aircraft output circuit is compatible with the test case equipment circuit with respect to interface signal-off (interrupt)time requirements.

(3) Circuit Switching Form - Equipment Output Circuits. Determine if the type of output circuit provided in the equipment for controlling the on/off time (signal duration) of the interface circuit is compatible with the input circuit switching form requirements of the aircraft. The following detail comparisons are performed for each interface circuit classified as an equipment output:

(a) Circuit Initiate Delay Time. Determine if the test case equipment output circuit type is able to accommodate the aircraft circuit initiate delay time requirements.

(b) Circuit On or Off Time. Determine if the test case equipment output circuit type is capable of maintaining the interface circuit in an on-state or off-state configuration according to the timing requirements of the aircraft.

(c) Circuit Dropout Delay Time. Determine if the test case equipment output circuit type is able to accommodate the aircraft circuit dropout delay time requirements.

(d) Circuit Off Dwell Time. Determine if the pulsed type test case equipment output circuit is compatible with the aircraft circuit with respect to interface signal-off (interrupt) time requirements.

g. Signal Sequence Comparison Mode. The objective of each interface function comparison associated with the signal sequence comparison mode (Table IX) is described in the following paragraphs.

(1) Interface Circuit Signal Function. Determine if the interface signal function category assigned to each side of the interface circuit (aircraft and equipment) are identical with respect to circuit function coding.

(2) Interface Signal Switching Sequence Order. Determine if the interface signal switching sequence order number (or optional "Ø" code letter) assigned to the aircraft side of the interface connection is the same as, or is otherwise compatible with, the switching sequence order number (or optional code letter) specified by the respective test case equipment circuit.

(3) Associated Interface Circuit Status Tests. This interface function comparison is designed to test the electrical interface compatibility between the aircraft station interface connection and the test case equipment from an overall interface signal on/off configuration standpoint. The comparison is accomplished by a series of steps which

separately examines each interface signal that comprises the total electrical interface. The aircraft data file contains aircraft armament control system information that specifies the on/off relationship of all aircraft circuits associated with each interface circuit designated as a prime function signal. For example, if the circuit connected to Pin A of the aircraft interface connector is designated as a prime function signal, the on/off status of associated aircraft circuits connected to Pins B, C, D, etc. of the same connector are coded to indicate if they are active (present) or inactive (inhibited) when the subject signal (at Pin A) is applied to the interface. These Aircraft Interface Data are then compared against similar interface circuit data (peculiar to the test case equipment) contained in the AFATL Store Data File. If the data contained in both data files agree (all associated aircraft circuits meet the on/off requirements dictated by the test case equipment), the respective aircraft/store interface circuit under examination is considered to be compatible. This type of interface function comparison is repeated for all other prime function interface signals. The aforementioned interface circuit comparison is performed in the following test modes:

(a) On-State Test Mode. This mode checks the compatibility between all associated aircraft and test case equipment circuits when the prime function signal (circuit under examination) is present at the aircraft/store interface.

(b) Off-State Test Mode. This mode checks the compatibility between all associated aircraft and test case equipment circuits when the prime function signal is not present (in an off or inactive state) at the aircraft/store interface.

2. INTERFACE CIRCUIT COMPARISON METHODS FOR COMPLEMENTARY STATION INTERFACE CIRCUIT ANALYSIS PROGRAM.

a. Description. The Complementary Station Interface Circuit Analysis Program sorts complementary aircraft/equipment interface circuits by comparing interface functions in the same manner as previously described for the Aircraft/Test Case Store Interface Compatibility Program with only minor exceptions. All interface function comparisons that require the examination of more than one interface circuit at a time have been omitted from the respective comparison modes. Such interface functions as Multi-Conductor Cable Configuration, Store Loop Circuit Polarity, etc. require that the aircraft and store interface connector have the same pin insert arrangement to permit a valid pin to pin correlation circuit comparison. Since the Complementary Station Interface Circuit Analysis Program is required to function independent of aircraft/store interface connector type, these multi-circuit type comparisons cannot be accomplished.

b. Non-Tested Interface Functions. Those interface functions that will not be tested by the Complementary Station Interface Circuit Analysis Program are specified in the following paragraphs:

(1) Interface Wiring Comparison Mode. The Multi-Conductor Cable Configuration interface function will not be tested in this mode.

(2) Signal Category Comparison Mode. All interface functions will be tested in this mode.

(3) Signal Form Comparison Mode. The Store Loop Circuit Polarity and Store Loop Circuit Current interface functions will not be tested in this mode. In addition, the Output Circuit Load Limitation interface functions for steady state and transient current will not be tested. Aircraft output circuit store loads are not always associated with just one interface circuit. There are many cases where an aircraft output circuit is required to switch the load of several interface circuits. Each circuit may be connected in parallel and terminate at a different interface connector pin. In such cases the total load switched by the aircraft output circuit must be summated for a valid interface circuit load limitation compatibility test. This summation procedure for parallel store loads is only employed by the Aircraft/Test Case Store Interface Compatibility Program.

(4) Signal Logic Comparison Mode. All interface functions will be tested in this mode.

(5) Switching Form/Time Comparison Mode. All interface functions will be tested in this mode.

(6) Signal Sequence Comparison Mode. This mode will not be tested by the Complementary Station Interface Circuit Analysis Program since it is operation dependent upon aircraft/store interface connector compatibility.

3. FILE STRUCTURE FOR AIRCRAFT MASTER DATA FILE

The Aircraft Master Data File for a given aircraft is a binary tape file created by the Aircraft Master File Generation Program described in Section X of this report. The structure of this file is as follows:

a. The first logical record of the file defines the number of aircraft stations (NS) on the data file.

b. The following sequence of logical data sections and records occurs for each station:

(1) The first logical record for the station defines the station number, number of circuits at the station (k), and the number of equipment interface groups for the station (NG).

(2) The connector data section contains one logical record for each connector in each equipment interface group. The records for connectors in an equipment interface group must be together with all but the last record being marked as continuations. The connector data section therefore is completed when NG connector records which are not continuations have been processed.

(3) The station wiring data section contains one logical record for each circuit at the station (K records).

(4) The station wiring data is followed by the data for each equipment interface group, with NG groups being input. For each equipment interface group, the following sequence of logical data sections and records occurs:

(a) The first logical record for the equipment interface group defines the equipment interface group identification number and the number of circuits within the equipment interface group (NC).

(b) The signal form data section contains one logical record for each circuit in the equipment interface group (NC records).

(c) The logic data section contains one logical record for each circuit in the equipment interface group (NC records).

(d) The switching form/time data section contains one logical record for each circuit in the equipment interface group (NC records).

(e) The sequence data section contains one or more logical records for each circuit in the equipment interface group. If multiple records are required for a circuit, all but the last one are marked as continuations. Therefore, the sequence data section is completed when NC sequence records which are not continuations have been processed.

(5) When NG sets of records as described in (4)(a) through (4)(e) have been processed, the data for the aircraft station being considered is completed.

c. When NS sets of records as described in Step b have been processed, the live data for the aircraft is completed.

d. The last logical record of the data file is a record similar to b (1), with a station number equal to "**". This record is used as a convenient end of file test.

e. Sample formats for each aircraft documentation data section are shown in Section IV.

4. REVISED FILE STRUCTURE FOR MASTER EQUIPMENT DATA FILE

a. The file structure for the master equipment data file as outlined on page 23, AFATL-TR-73-214, Volume 1, October 1973, remains unchanged. However, the sequence of punched data cards and corresponding logical records on the master equipment data file for each individual equipment has been altered as outlined below.

b. The master equipment file generation program and all analysis, reporting and data retrieval programs utilizing this data file have been designed such that each individual equipment may optionally utilize only the original electrical data sections (connector, signal form and logic) or may contain all the new format data sections (supplementary

connector, supplementary signal form, supplementary logic, switching form/time and sequence) in addition to the original electrical data sections. This option is controlled by placing an X in column 72 of the Ø1 data card for the equipment if the new format sections are included. A blank in this field then indicates that only the original format data sections are included for the equipment.

c. Whether the new format data sections are included or not, the number of circuits in an equipment is now defined as the number of active circuits plus the number of spare circuits, as defined on the connector data cards. This number then defines the number of data cards required in each electrical circuit data section (except as noted below). Therefore, for equipments containing only the original format data sections, blank cards may have to be added to the signal form and logic data sections.

d. The sequence of data cards for an equipment containing all the new format data sections is as follows:

(1) Operational data card number one (Ø1), with an X in Column 72.

(2) Operational data cards Ø2-Ø3-P3-Ø4-Ø5-Ø6-Ø7-Ø8-P8.

(3) Operational data cards Ø9 and ØA, if applicable.

(4) Original format introductory (connector) data cards, with one card per connector, maximum of six. All but the last connector card must be marked as continuations.

(5) New format supplementary connector data cards, with one card per connector.

(6) Original format signal form data cards, with one card for each active or spare circuit (total of NK circuits) as defined in the original format connector data cards. If a signal form card is marked as having a second card for a sensor circuit, a second card for the circuit follows. This data section may therefore contain more than NK cards.

(7) New format supplementary signal form data cards, with one card for each active or spare circuit, a total of NK cards.

(8) Original format logic data cards, with one card for each active or spare circuit, a total of NK cards.

(9) New format supplementary logic data cards, with one card for each active or spare circuit, a total of NK cards.

(10) New format switching form/time data cards, with one card for each active or spare circuit, a total of NK cards.

(11) New format signal sequence data cards. More than one card may be required for each active or spare circuit, with all but the

last card for the circuit being marked as continuations. This data section therefore contains NK data cards which are not marked as continuations.

e. Equipments are input in ascending order of equipment identification number, as before.

f. The last equipment input must be a dummy equipment having an equipment identification number of 999999 on the first data card, followed by ten blank cards, as before.

g. The limitations for any given equipment noted on page 41, of AFATL-TR-73-214, Volume 1, October 1973, have not been altered and are still in effect.

h. Sample formats for each equipment documentation data sheet are shown in Section V of this report.

SECTION IV

AIRCRAFT DATA DOCUMENTATION

1. AIRCRAFT INTERFACE CLASSIFICATION

a. Description. The technical approach used to determine aircraft/test case store electrical interface compatibility requires that each aircraft station interface be broken down into a specific interface for each electrically different store and/or suspension device that can be controlled by the aircraft stores management system. In certain aircraft applications, the same aircraft interface connection may be used to control several store types that bear different part numbers but use the same aircraft interface connection electrical provisions. To accommodate this situation, and avoid the repetitive documentation of aircraft interface provisions for such similar stores, an aircraft interface connection coding system was employed.

b. Aircraft Interface Connection Coding. The aircraft interface connection coding system essentially assigns those stores and suspension devices that are controlled by the same aircraft interface provisions into separate groups as shown in Figure 6. Each store and suspension device group is assigned a code number. Stores are assigned a three-digit number while suspension devices are assigned a two-digit number. The combination of store and suspension device group code numbers represent the combined aircraft equipment group interface configuration. The format used to document aircraft equipment group interface configurations is shown in Figure 7. This format is used to identify and record what stores and suspension devices (by AFATL Store Data File code number) are associated with each aircraft station equipment group configuration code number. The first two digits of the Equipment Group Configuration Code Number represent the respective aircraft station number. Figure 7 depicts an example of how those equipments referenced in Figure 6 may be documented for a typical aircraft weapon station. It should be noted that equipment interface group code numbers may be assigned independently to either the store or suspension device. For example, Store 030213 may be coded without its corresponding suspension device as 01-001-00. Conversely, suspension device 110101 may be coded without a store reference as 01-000-01. The aircraft/test case store interface compatibility analysis computer programs will examine the equipment group configuration code number and process combined (store and suspension device) or individual (store or suspension device) interface data accordingly.

2. DATA DOCUMENTATION

a. Documentation Procedures. A data documentation coding rationale was established to aid in the documentation of electrical characteristic values and for the selection of multi-choice (selective) type characteristics. It is important that each aircraft and store characteristic be properly documented to assure the correct processing of data.

EQUIPMENT INTERFACE GROUPS
(FOR STATION 1)

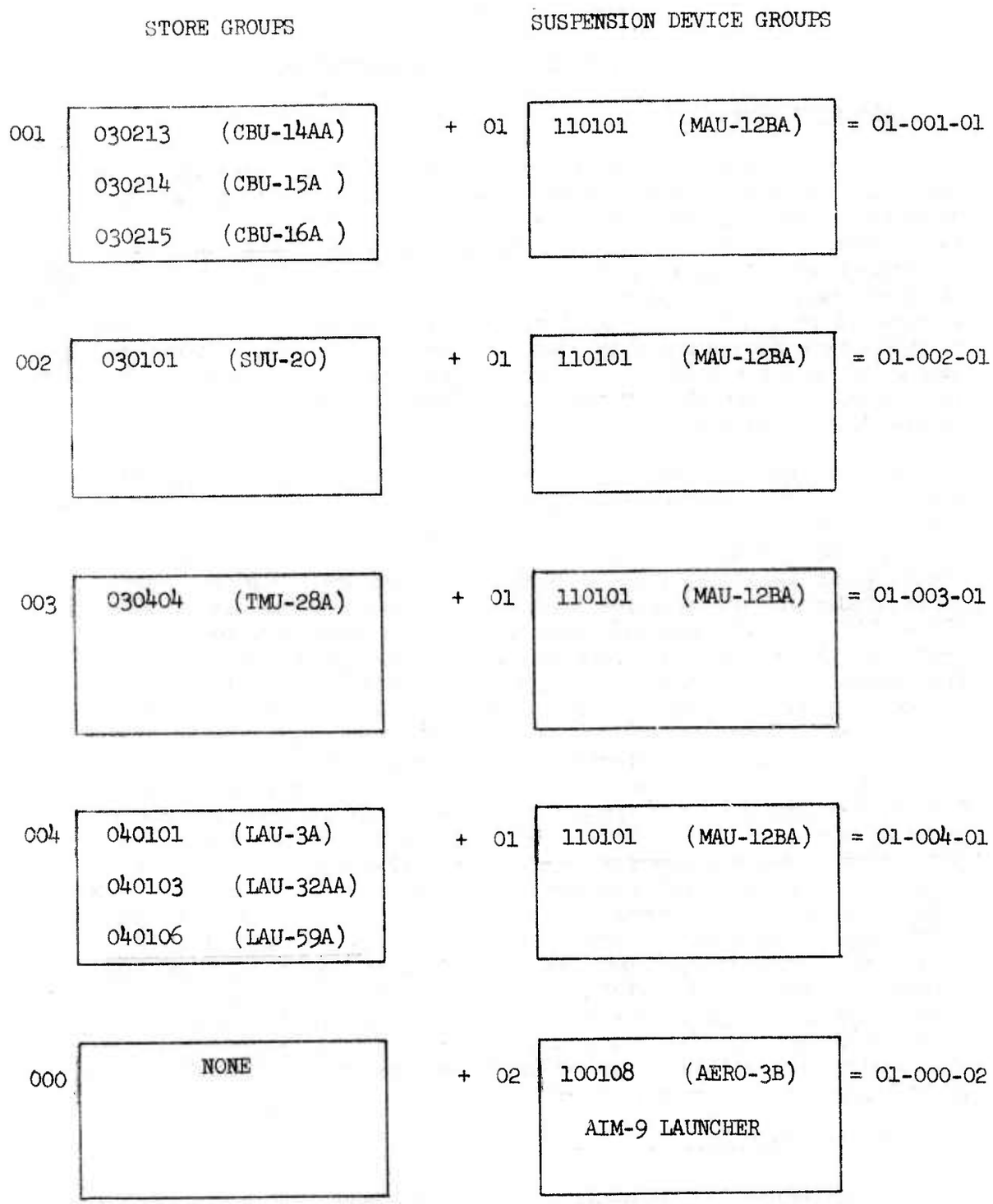

Figure 6. Aircraft Interface Connection Coding System

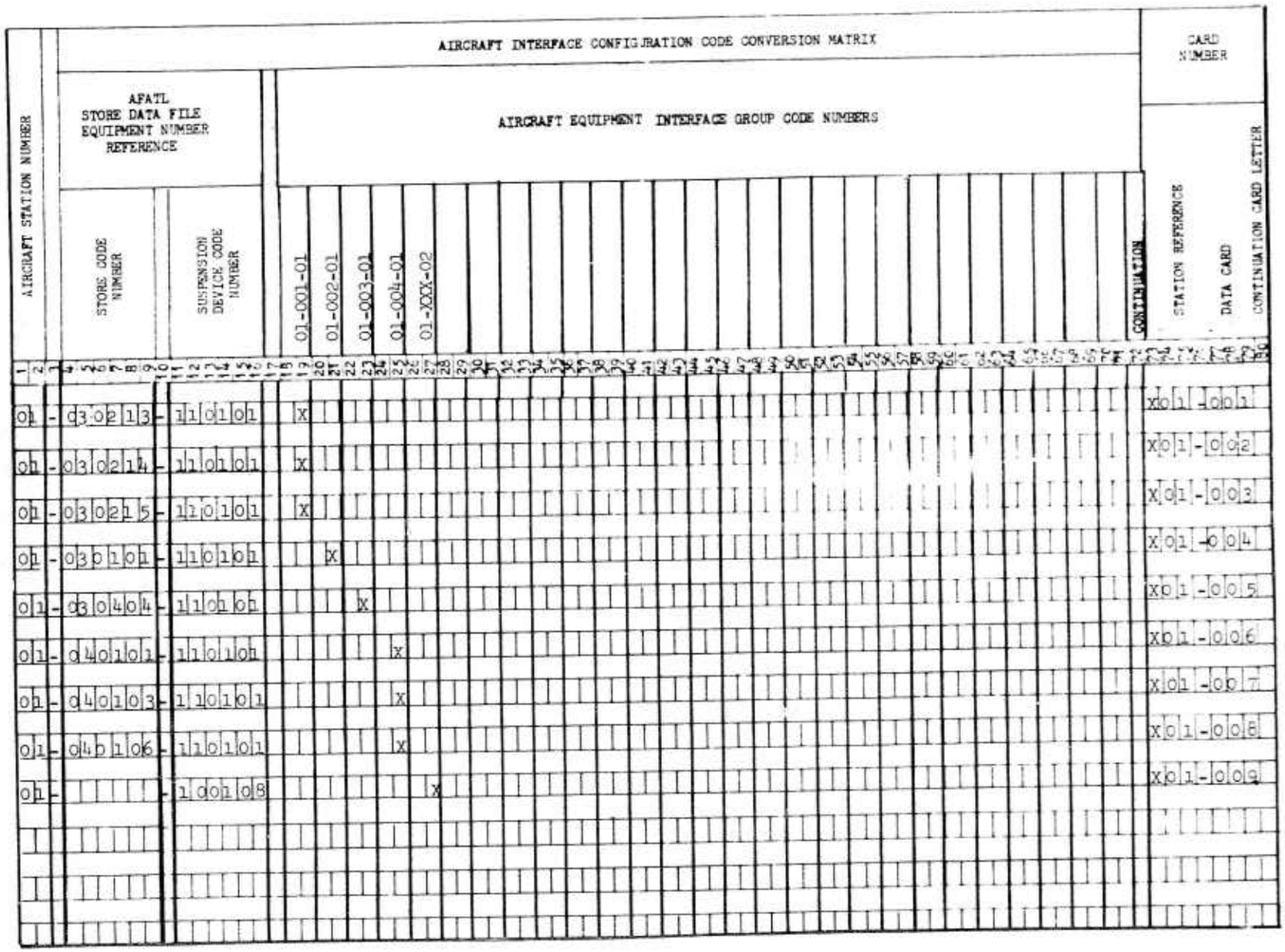

Figure 7. Aircraft Interface Configuration Code Conversion Matrix Format

TABLE X. AIRCRAFT/STORES CHARACTERISTIC DATA DOCUMENTATION STYLE CODE DEFINITION

Documentation Style Code	Definition
AN-1	Alphanumeric - This characteristic must be coded with any combination of letters, numbers, or symbols.
AN-2	Alphanumeric - This characteristic may be coded with any combination of letters, numbers, or symbols, or left blank.
DR-1	Digital Real number - This characteristic must be coded with a real number and decimal point.
DR-2	Digital Real number - This characteristic may be coded with a real number and decimal point, or left blank.
DI-1	Digital Integer number - This characteristic must be coded with a integer number (no decimal point).
DI-2	Digital Integer number - This characteristic may be coded with a integer number (no decimal point), or left blank.
SEA-1	Single Entry Alphabetical - This characteristic must be coded with a letter (A to Z).
SEA-2	Single Entry Alphabetical - This characteristic may be coded with a letter (A to Z), or left blank.
SEX	Single Entry X checkmark - This characteristic must be coded with an X, if applicable.
SSM-1	Single Selection of a Multi-Choice characteristic - Only one characteristic card column must be selected (with an X).
SSM-2	Single Selection of a Multi-Choice characteristic - Only one characteristic column may be selected (with an X), or all columns may be left blank.
MSM-1	Multiple Selection of a Multi-Choice characteristic - More than one characteristic column may be selected (with an X), but at least one card column must be checked.
MSM-2	Multiple Selection of a Multi-Choice characteristic - Any or all characteristic columns may be either selected (with an X), or all card columns may be left blank.

NOTE:

1. The above data documentation rationale does not apply to unused or test function interface pin connections.

Therefore, a data documentation style coding system was developed. This coding system is defined in Table X.

b. Aircraft Data Formats. Figures 8 through 13 depict those data documentation formats (computer keypunch card transcripts) that are provided for the documentation of aircraft interface data.

c. Aircraft Characterictics Definition. A definition of each aircraft characteristic number referenced in Figures 8 through 13 is described in Appendix II of this report.

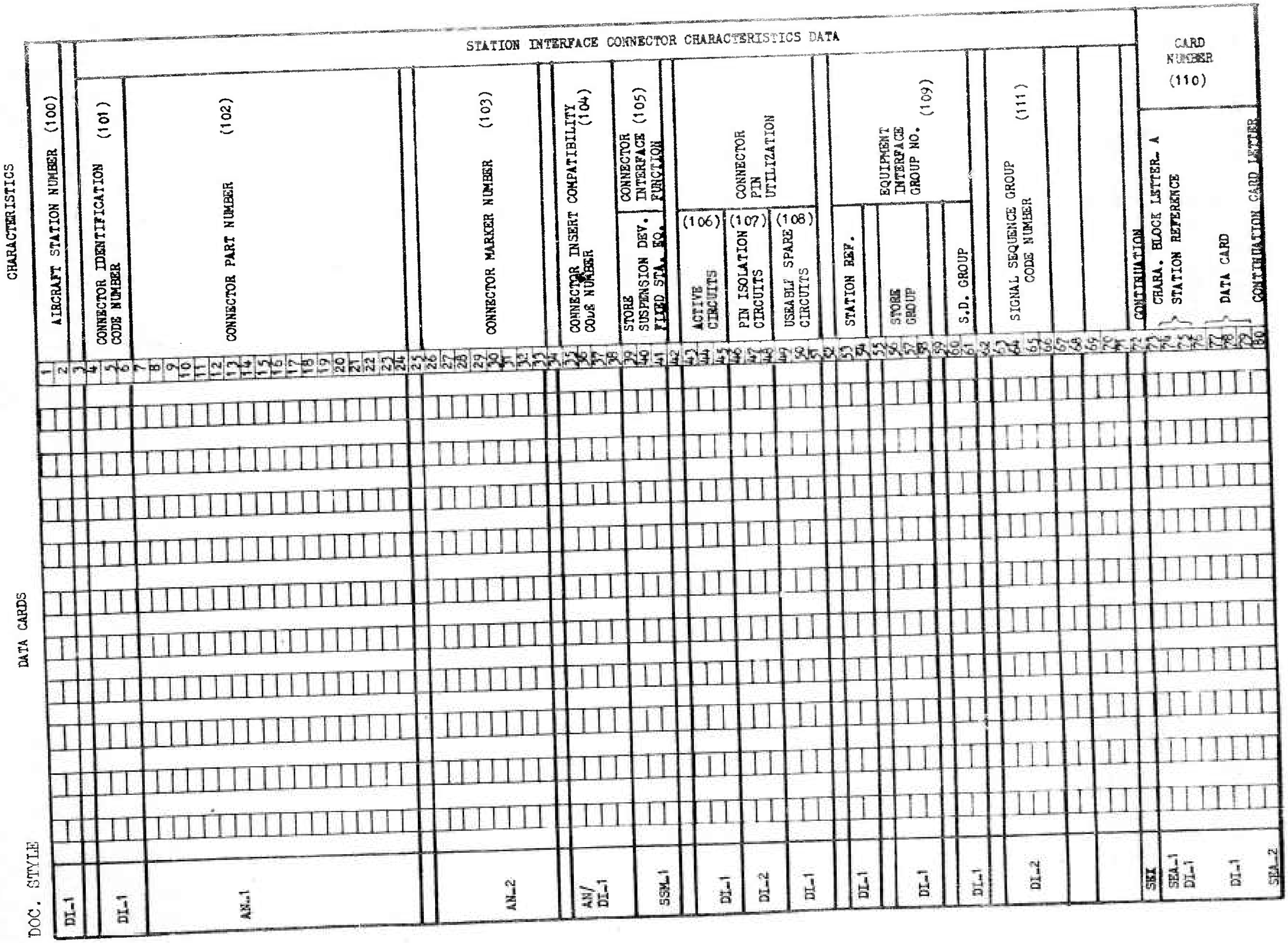

Figure 8. Data Documentation Format, Aircraft Station Interface Connectors

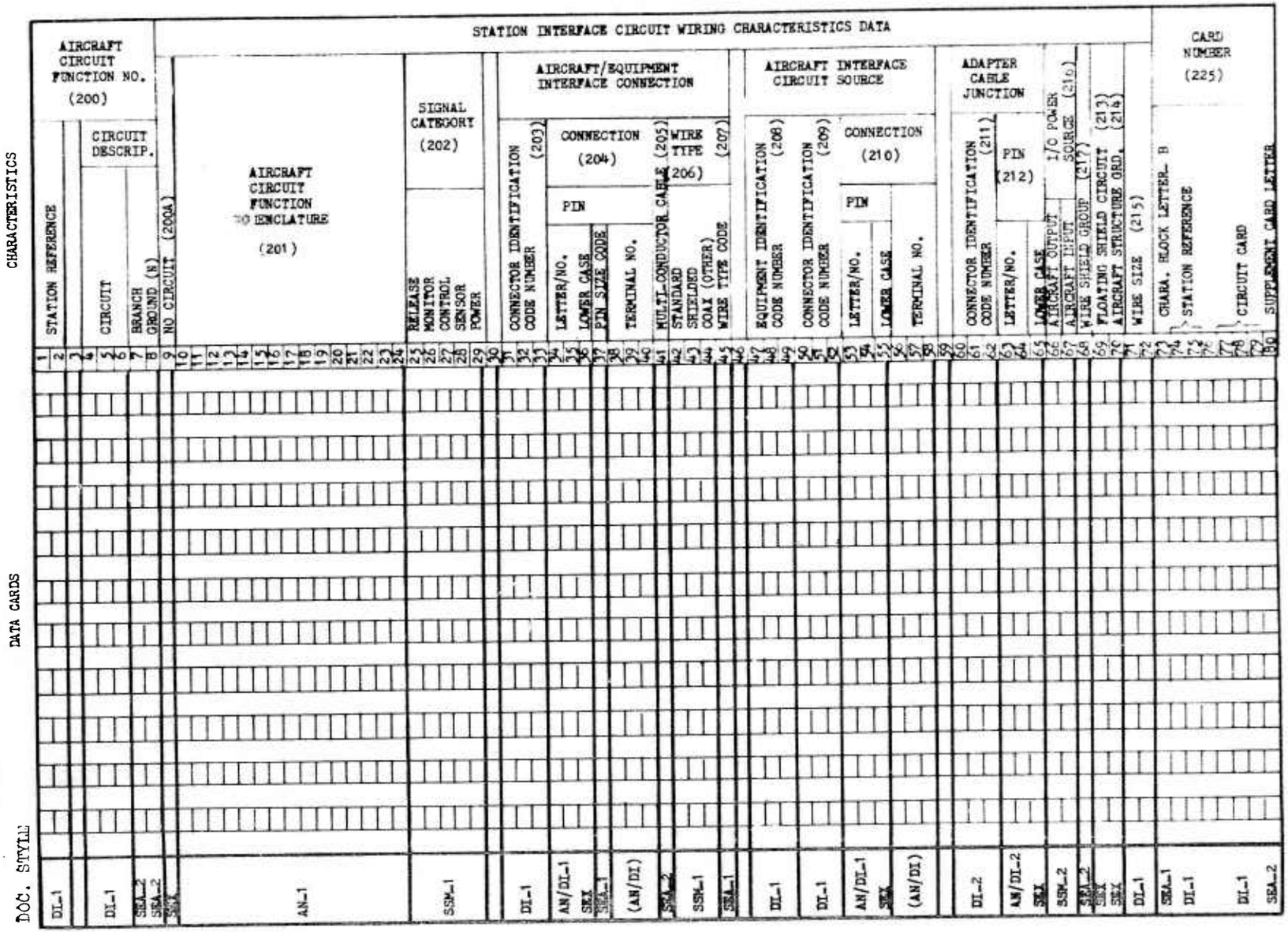

Figure 9. Data Documentation Format, Aircraft Station Interface Circuit Wiring

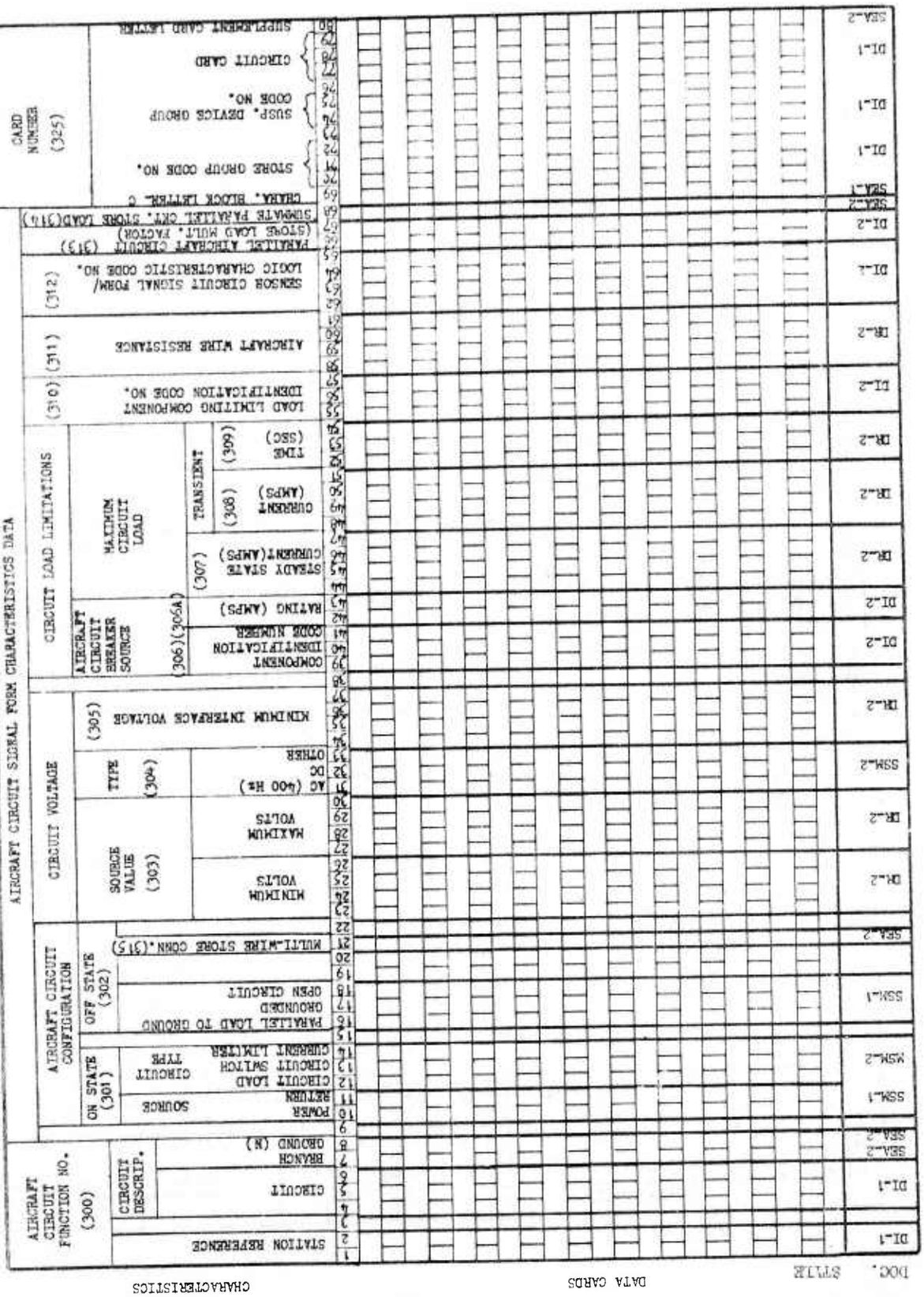

Figure 10. Data Documentation Format, Aircraft Circuit Signal Form

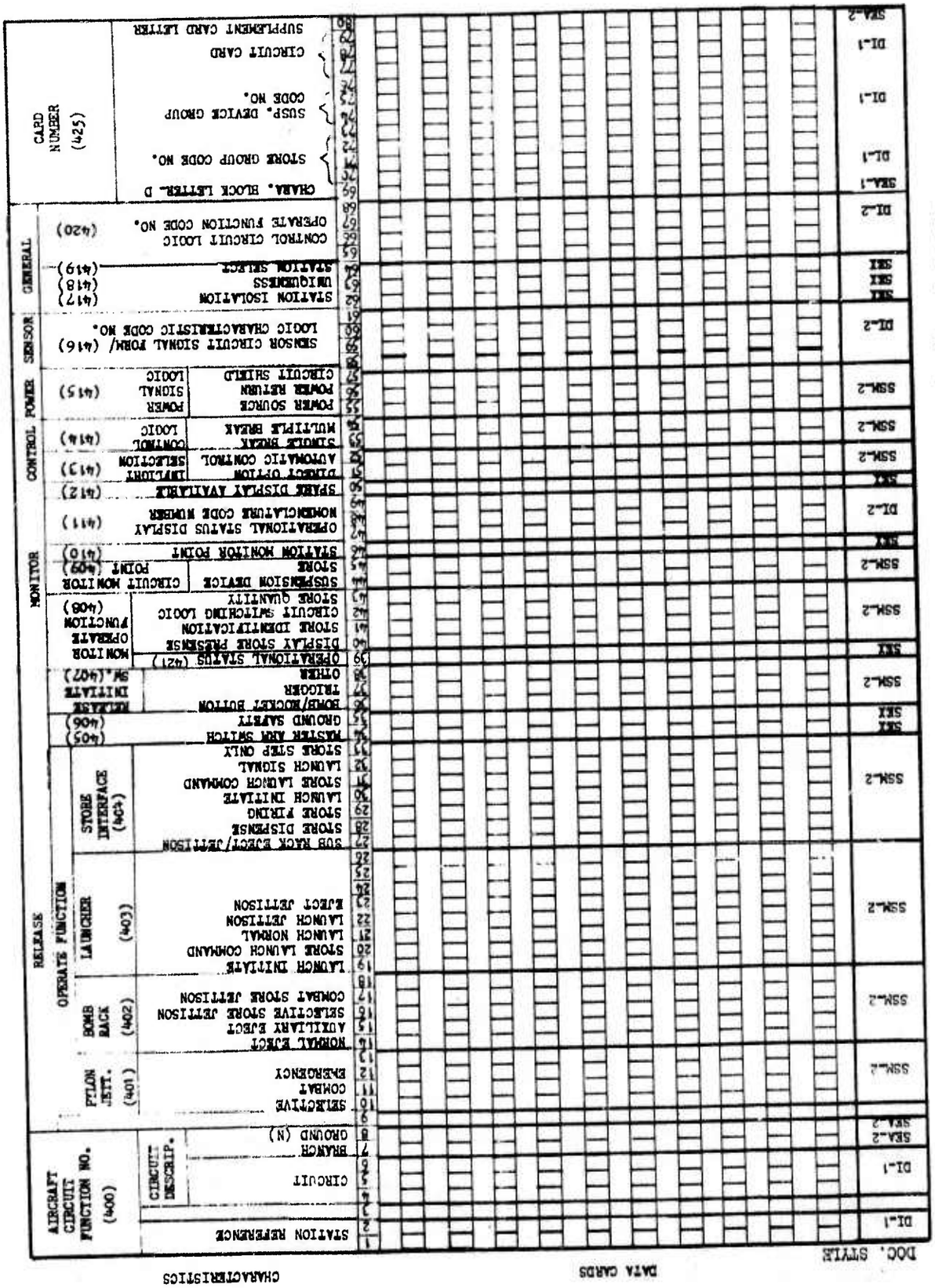

Figure 11. Data Documentation Format, Aircraft Circuit Signal Logic

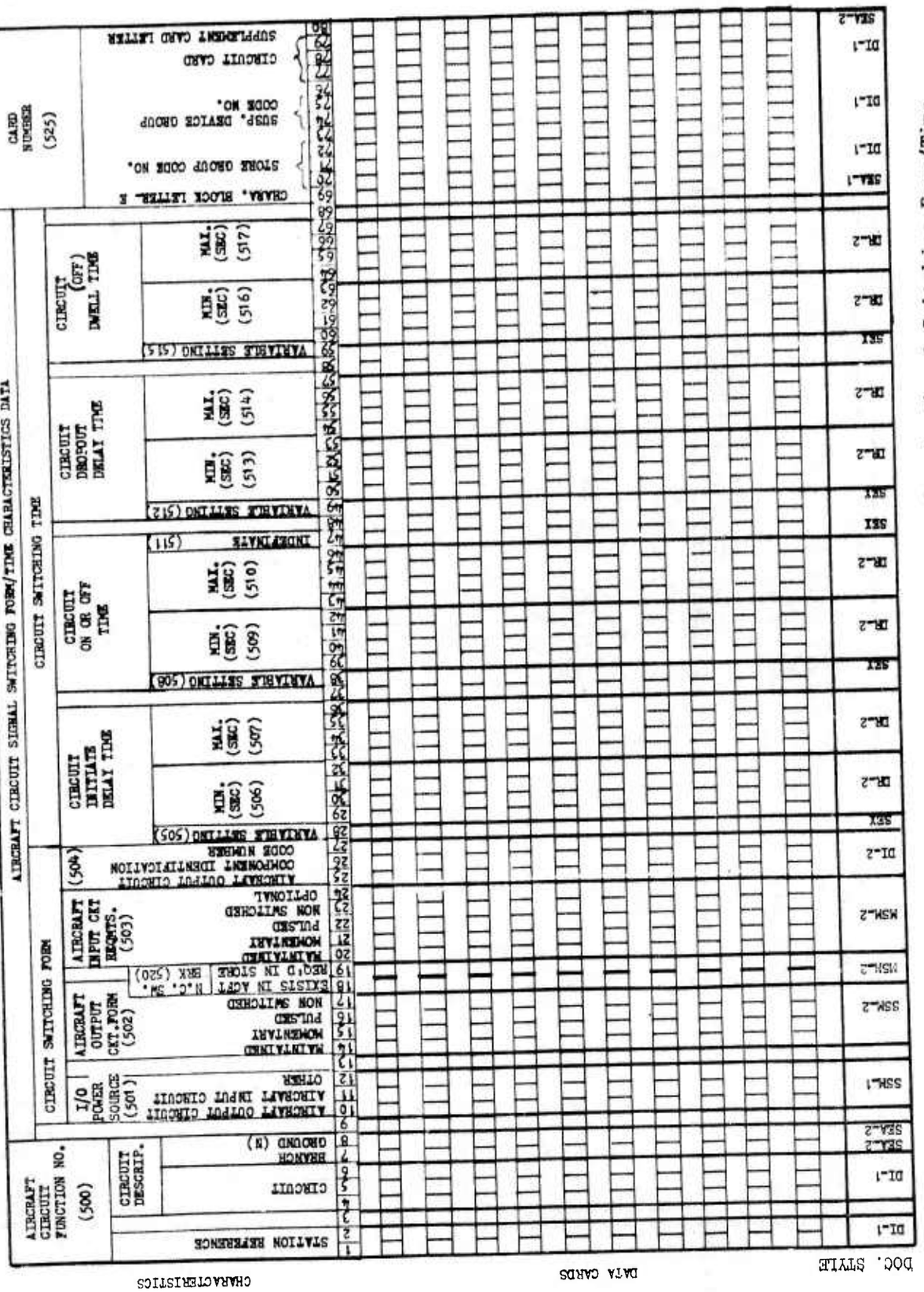

Figure 12. Data Documentation Format, Aircraft Circuit Signal Switching Form/Time

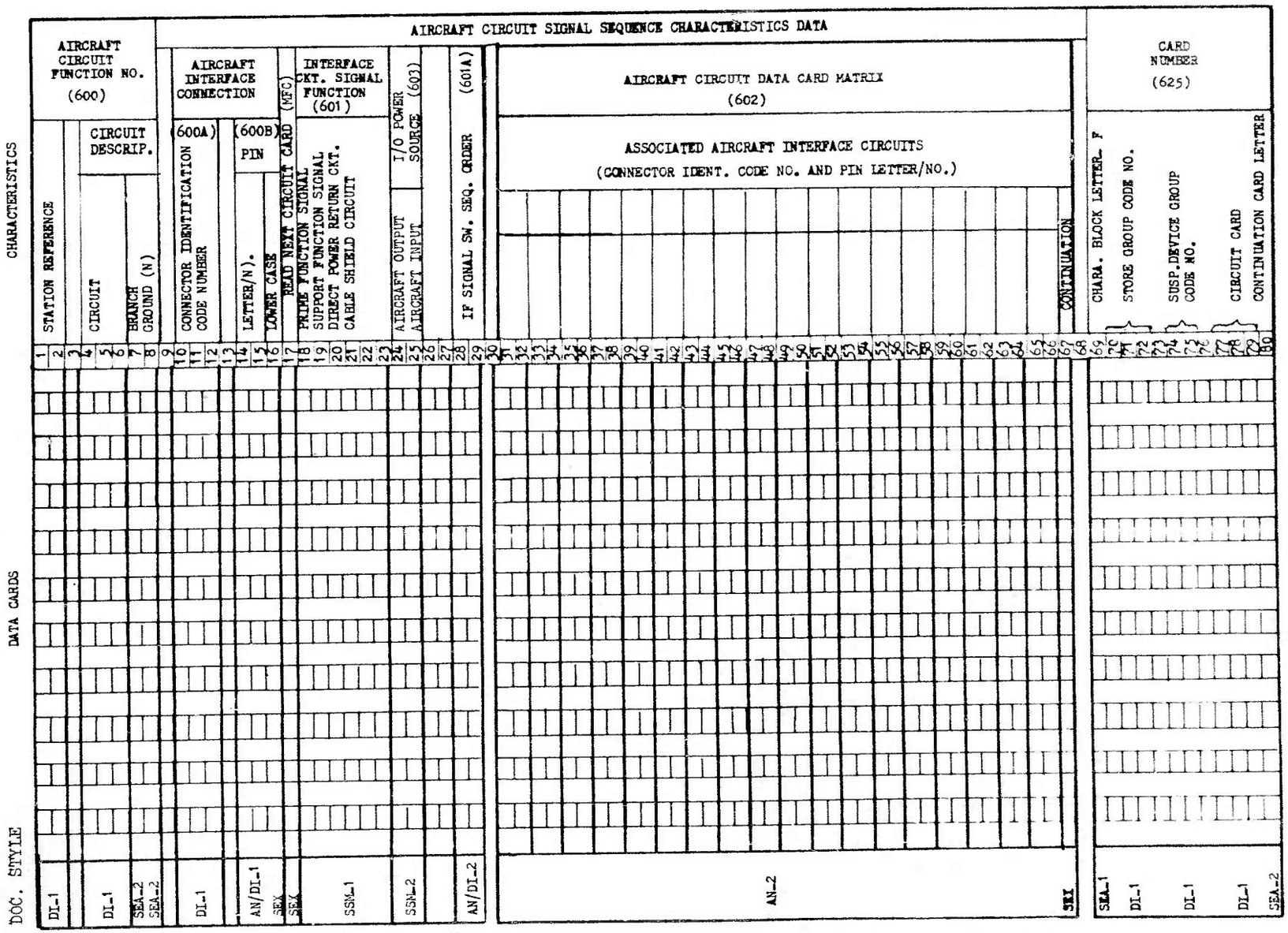

Figure 13. Data Documentation Format, Aircraft Circuit Signal Sequence

SECTION V

SUPPLEMENTAL EQUIPMENT DATA DOCUMENTATION

1. EQUIPMENT INTERFACE CLASSIFICATION

a. Description. The method and coding system used to identify stores and suspension devices to the AFATL Store Data File was not affected by Phase II of the Stores Interface Data Handling Analysis.

2. DATA DOCUMENTATION

a. Documentation Procedures. The data documentation and characteristic style coding system for equipment data is the same as that described for aircraft data in Section IV, Paragraph 2a of this report.

b. Equipment Data Formats. Figures 14 through 21 depict the complete set (existing and supplemental) data documentation formats that are provided for documentation of equipment interface data.

c. Equipment Characteristic Definition. A definition of each equipment characteristic number referenced in Figures 14 through 21 is described in Appendix III of this report.

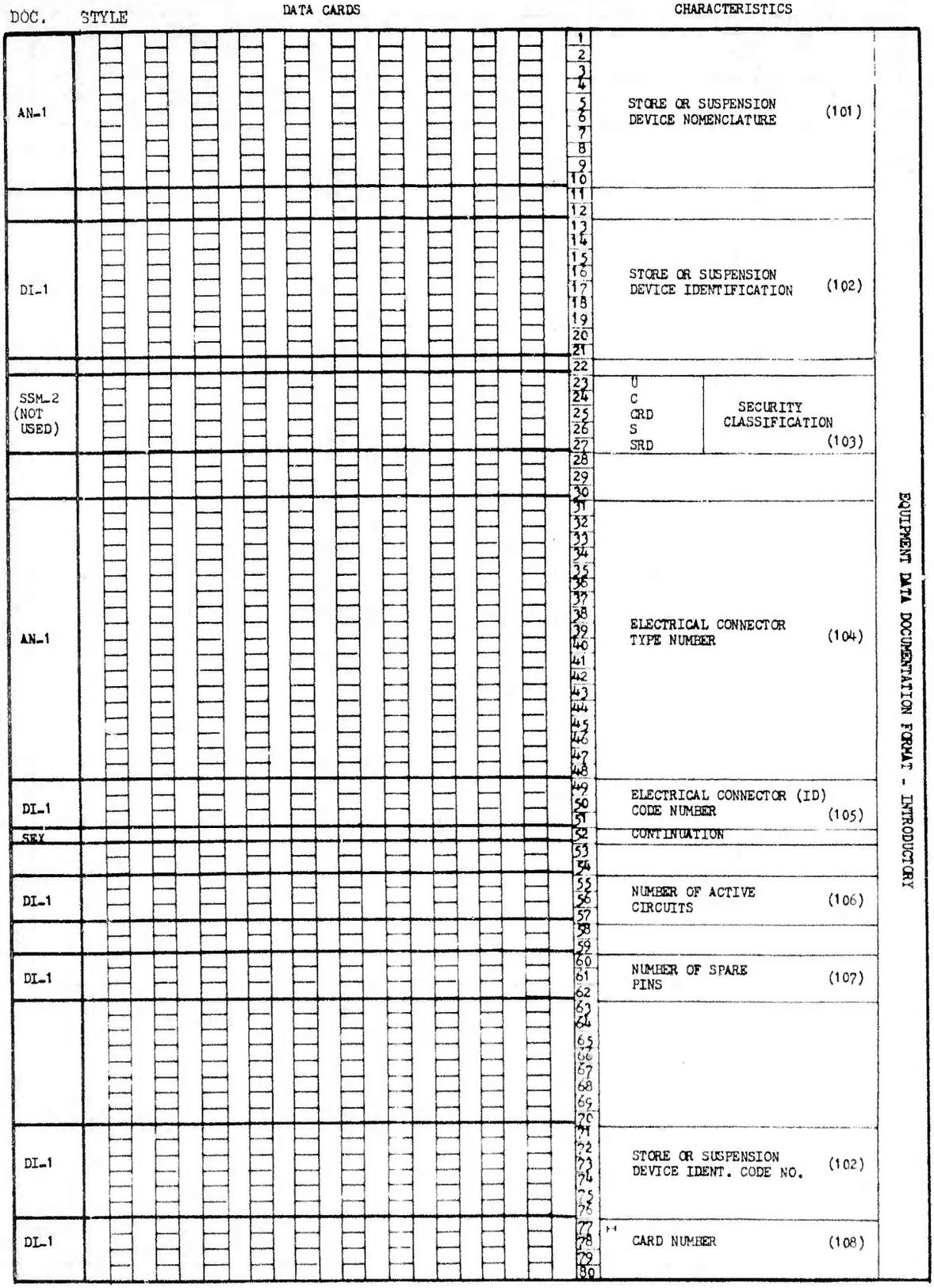

Figure 14. Data Documentation Format, Equipment Interface Connector/Introductory

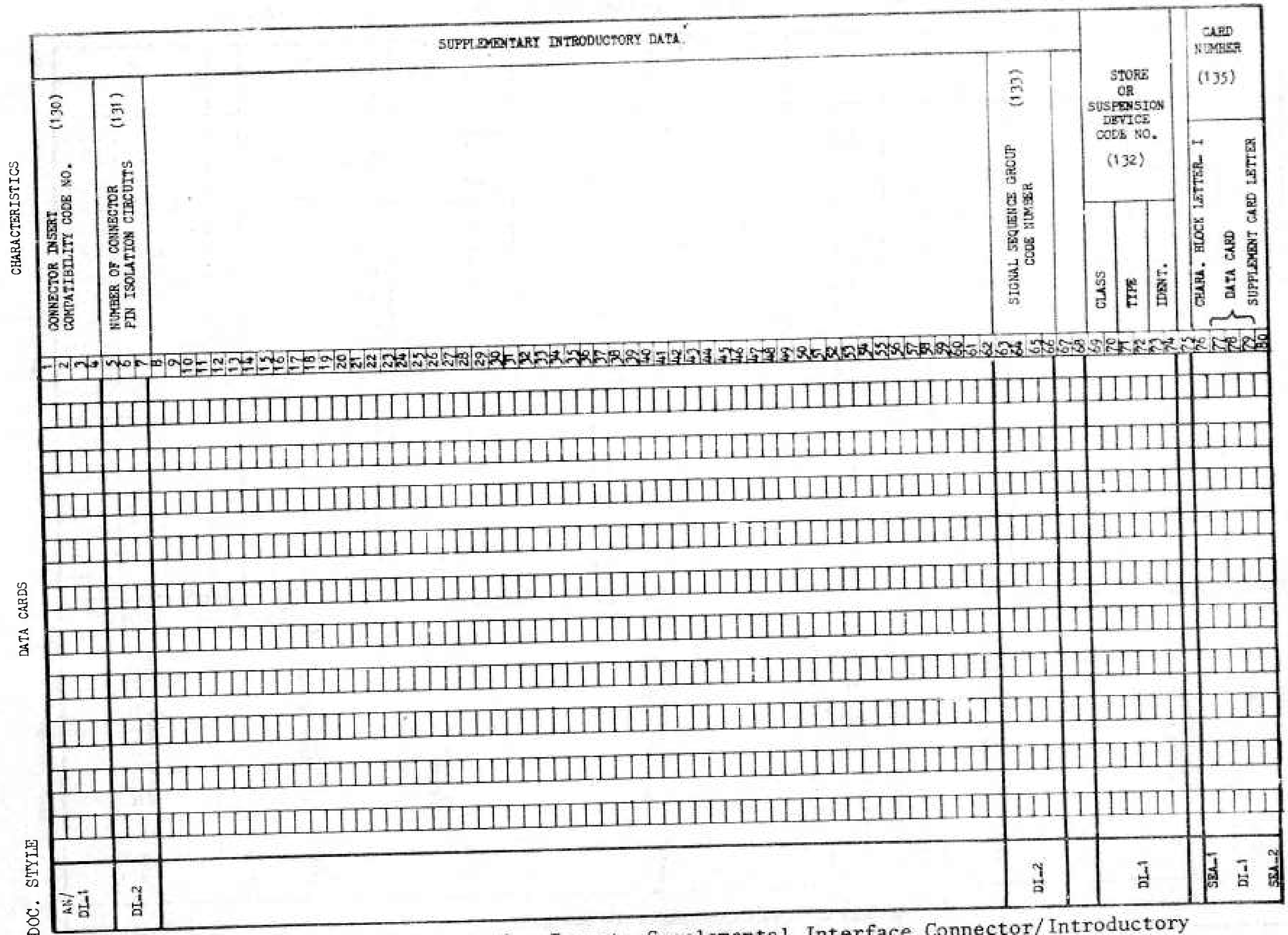

Figure 15. Data Documentation Format, Supplemental Interface Connector/Introductory

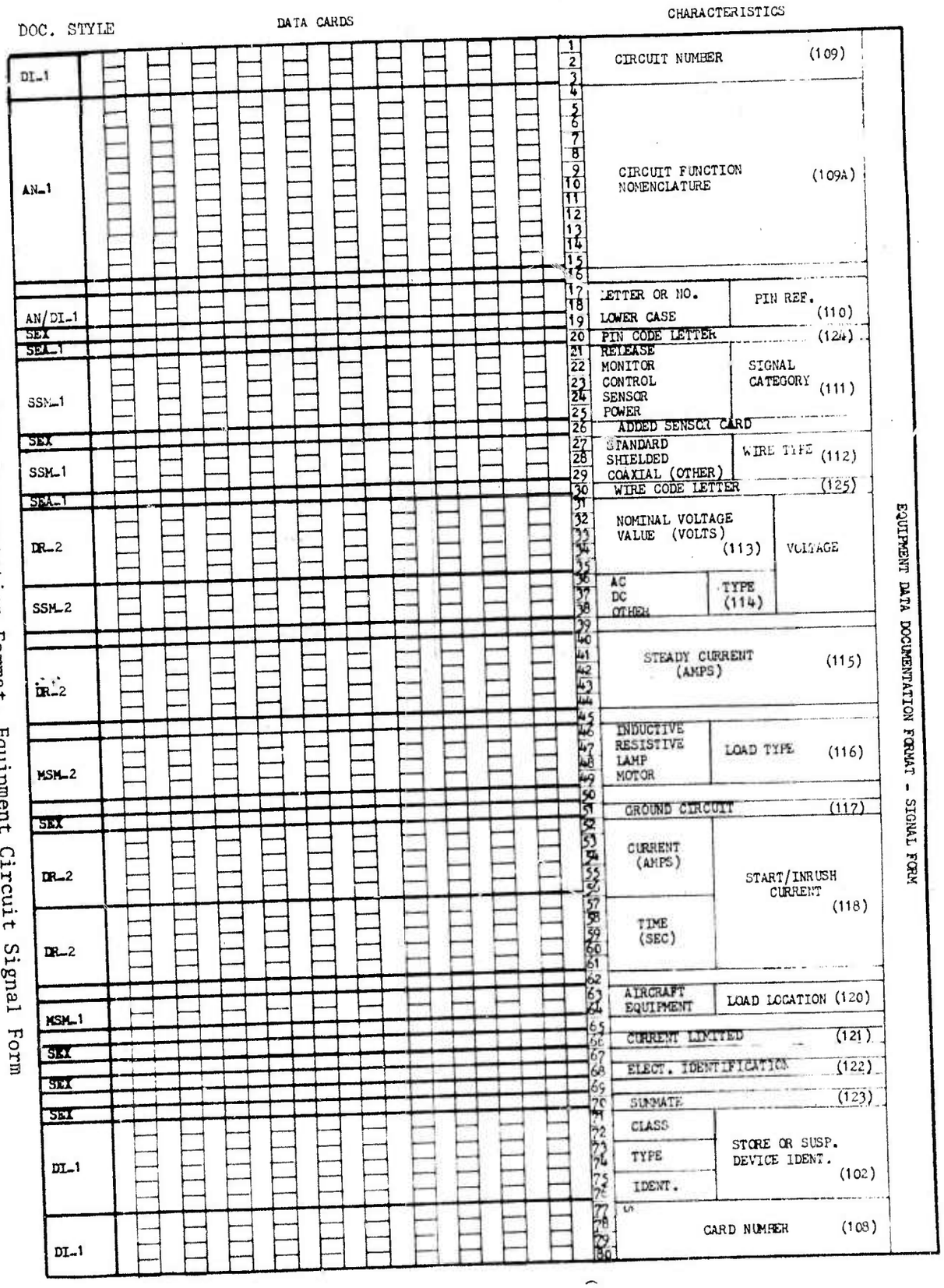

Figure 16. Data Documentation Format, Equipment Circuit Signal Form

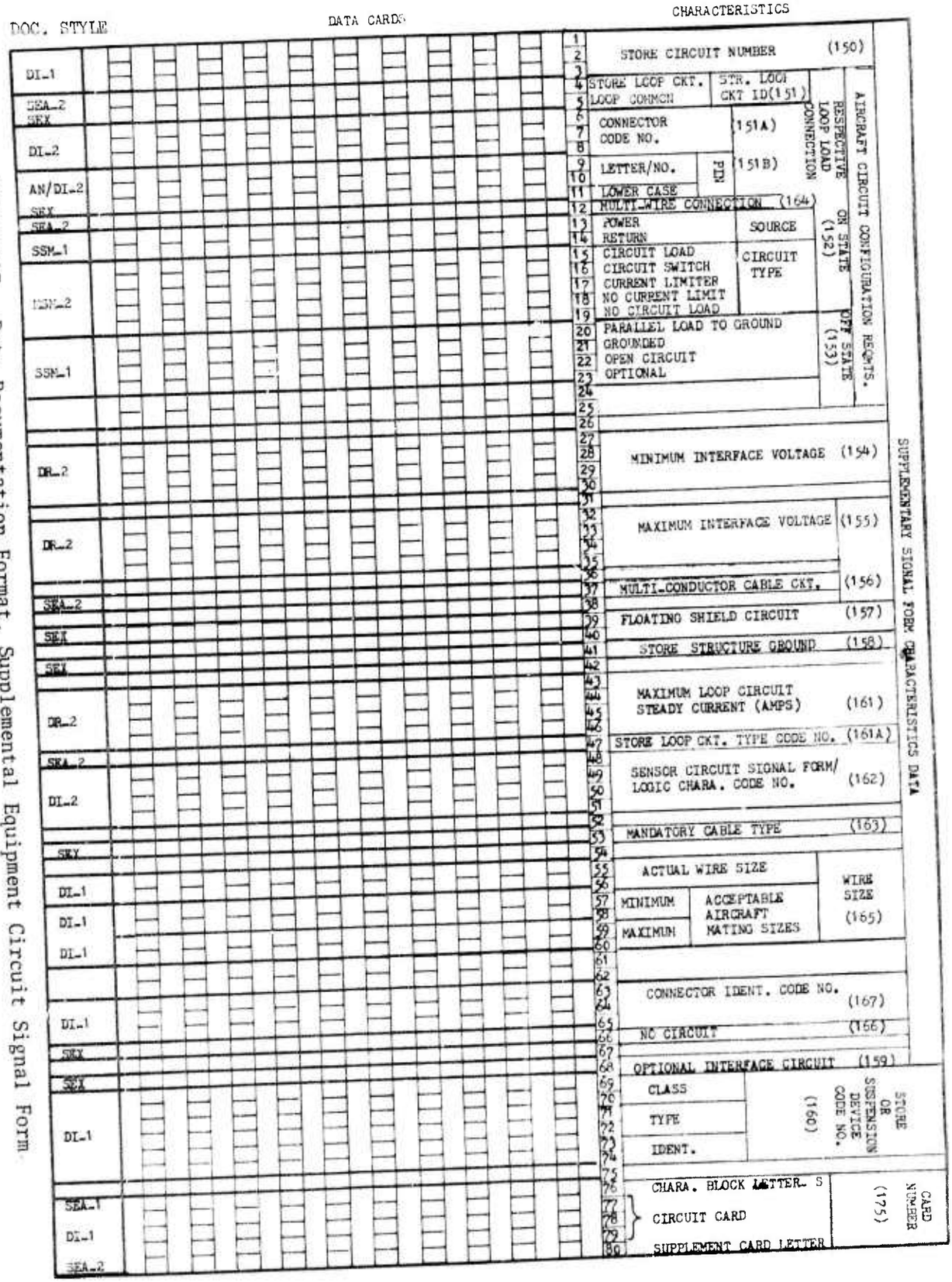

Figure 17. Data Documentation Format, Supplemental Equipment Circuit Signal Form

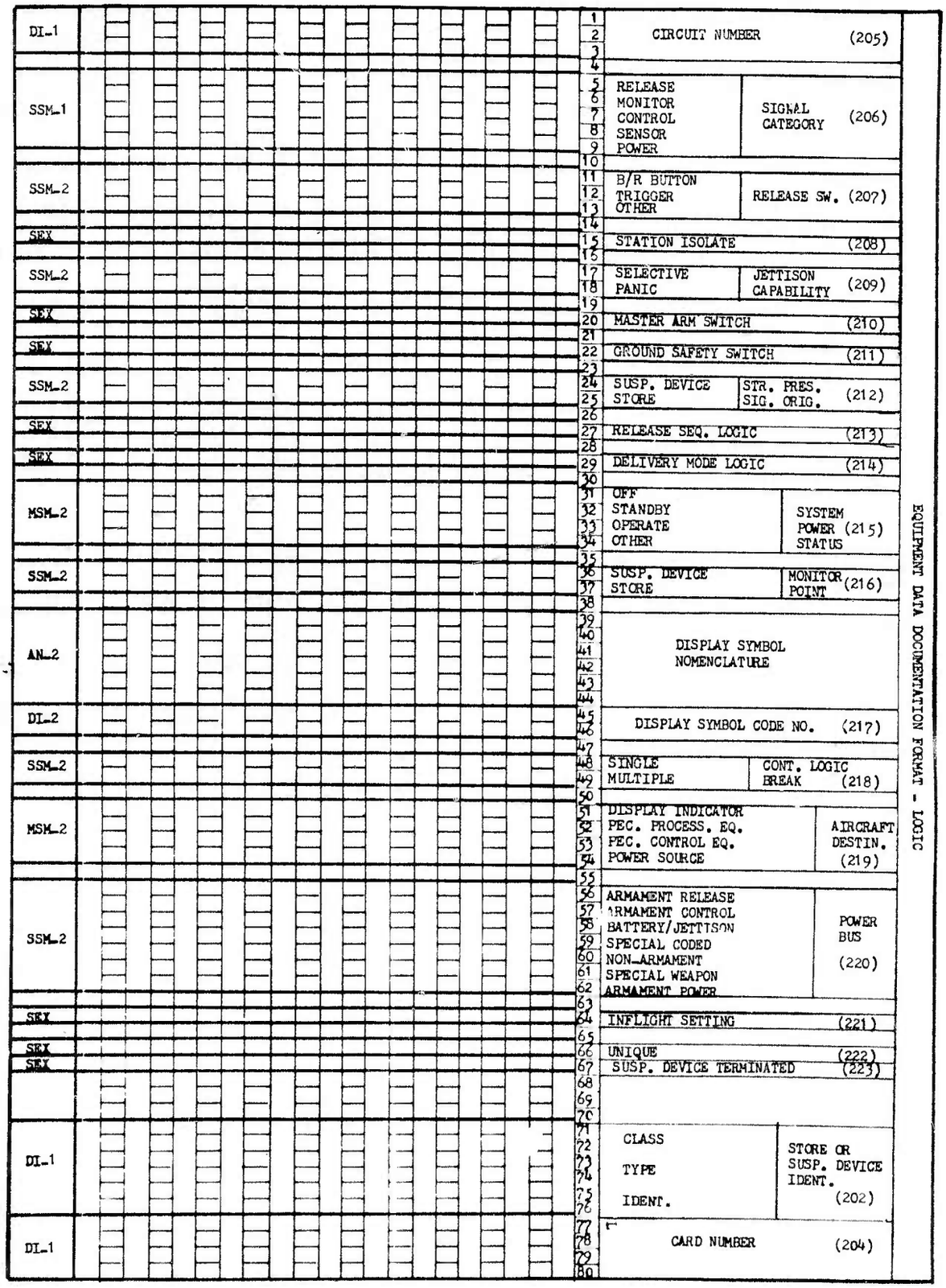

Figure 18. Data Documentation Format, Equipment Circuit Signal Logic

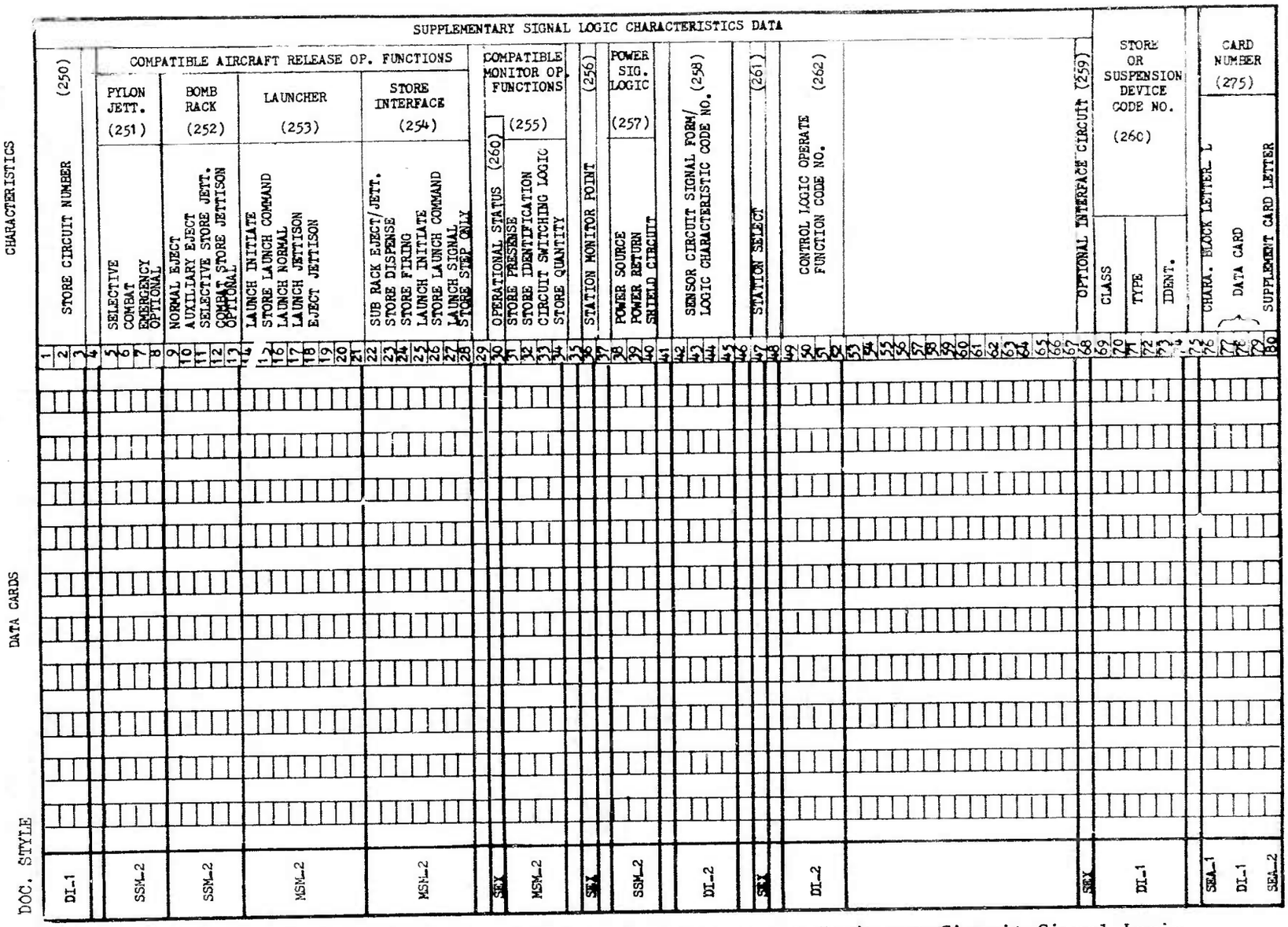

Figure 19. Data Documentation Format, Supplemental Equipment Circuit Signal Logic

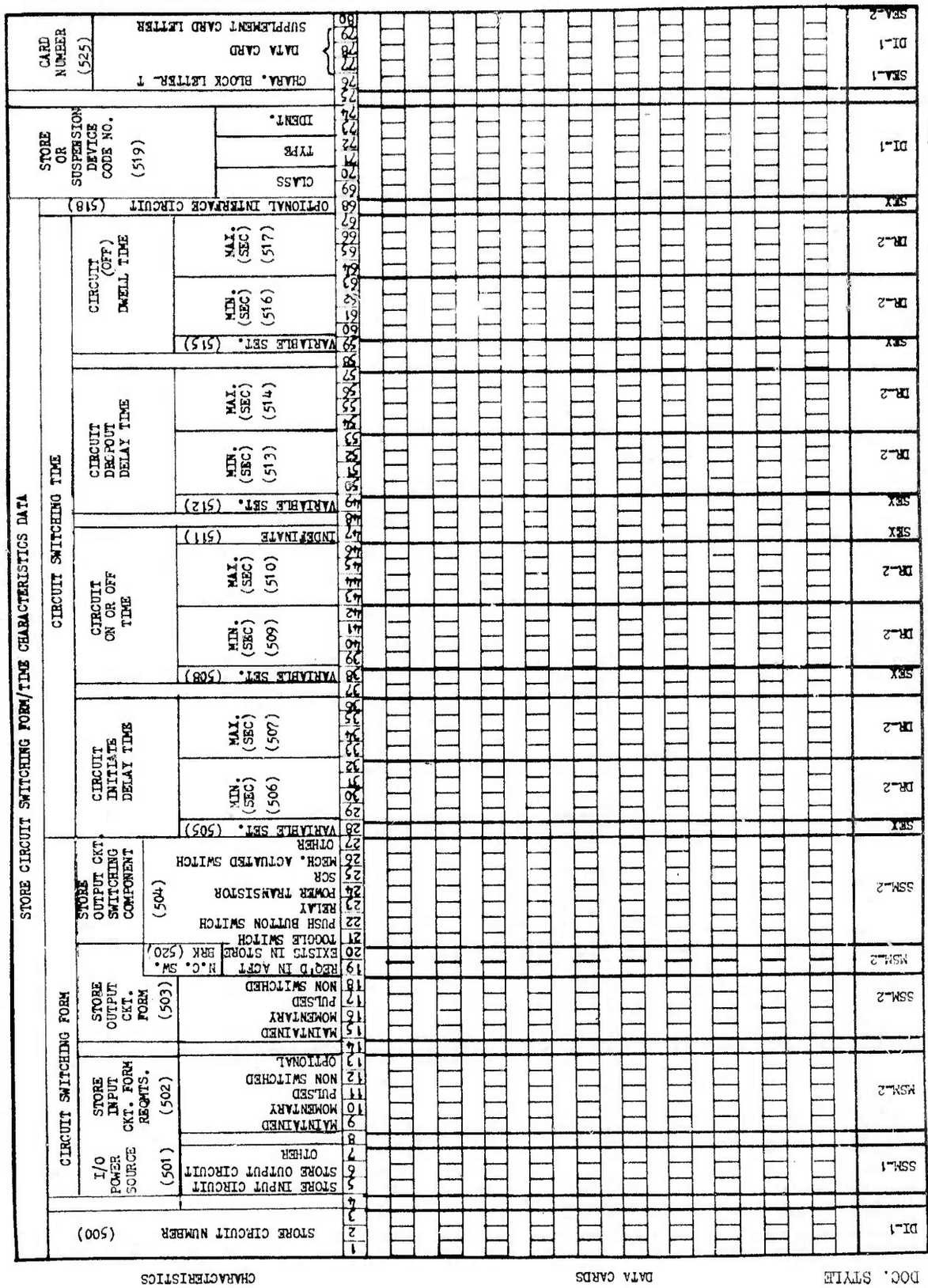

Figure 20. Data Documentation Format, Equipment Circuit Signal Switching Form/Time

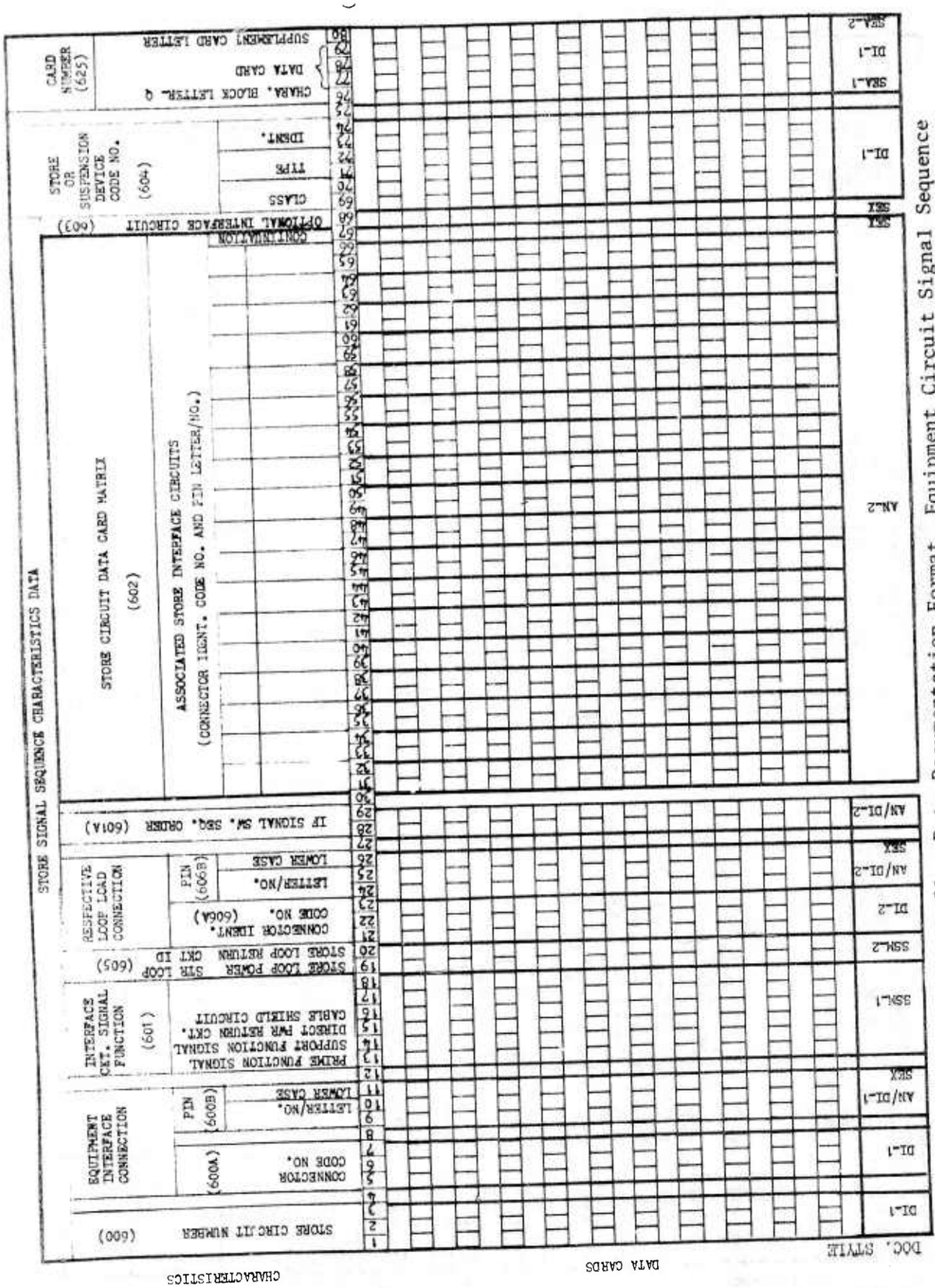

Figure 21. Data Documentation Format, Equipment Circuit Signal Sequence

SECTION VI

COMPATIBLE AIRCRAFT/TEST CASE STORE ELECTRICAL INTERFACE CONNECTIONS PROGRAM

1. METHOD

The following is a description of the procedure used by the Compatible Aircraft/Test Case Store Electrical Interface Connections Program (AF301) to generate its report.

a. Read from input punched card the requested aircraft station number, and the test case store, and/or suspension device equipment identification number.

b. Read from input punched data cards the equipment/equipment interface group matrix data.

c. Position the Aircraft Master Data File to the requested station and read in the aircraft connector data.

d. Read the data for each equipment on the Master Equipment Data File as follows:

(1) Read through the operational data section.

(2) If this is the last equipment (equipment identification number equals 999999) go to step e. below.

(3) Determine if this equipment is required for the analysis.

(a) If the equipment identification number matches one of the equipment/equipment interface group matrix entries load the equipment's connector data and equipment name into tables for the matrix entries and go to step (4) below.

(b) If the equipment is either the test case store or suspension device, load the equipment's connector data and name into tables for the test case equipments and go to step (4) below.

(c) If the equipment is not required for the analysis, bypass its connector data section on the data file.

(4) Read past the rest of the electrical data sections for this equipment.

(5) Go back to step (1) above for the next equipment.

e. For each equipment in the matrix, check that all connections, as defined by their insert compatibility codes, required for the test case store/suspension device are present. If all required connections are not present, eliminate the equipment from further consideration.

f. Loop on each test case store and/or suspension device connector, and loop on each equipment interface group, reporting the matching aircraft connector and matching equipment connector for each equipment at the given equipment interface group as defined in the input matrix.

2. SUBROUTINES

The subroutines and other program modules utilized by the Compatible Aircraft/Test Case Store Electrical Interface Connections Program are as follows:

AF301 — AF301 is the control module for the Compatible Aircraft/Test Case Store Electrical Interface Connections Program.

ACM — ACM matches up the aircraft connector for a given equipment interface group with the test case connector being processed.

ANL — ANL performs the connector matchup analysis and generates the output summary for each equipment interface group. For the first test case connection, a full matchup on insert compatibility code numbers is made for each equipment in the matrix. Each test case connection must have an equivalent connector in the equipment; if not, the equipment is not considered further. On subsequent test case connections, the matching matrix entry equipment connectors are retrieved.

BYPASS — BYPASS reads through the electrical data sections which follow the connector data for each equipment on the master equipment data file.

CONHED — CONHED controls the printing of page and column headers at the top of each page for the report generation.

HDA — HDA prints the page header at the top of each page of the output report.

HDB — HDB prints the column headers for each test case interface connection.

MATIN — MATIN reads and stores the equipment interface group matrix for the selected station.

PAC — PAC positions the Aircraft Master Data File to the requested station and loads the aircraft connector data into core.

SETICC — SETICC loads all the equipment connectors for a given store and/or suspension device matrix entry into a table in core for the analysis phase.

TMATCH — TMATCH matches up all the test case store and/or suspension device connectors with the equipment connectors for a matrix entry equipment, according to their insert compatibility codes.

TRANS TRANS converts the alphabetic first character of the insert compatibility code number to an integer value ranging from 01 for A to 26 for Z, with 27 for any character not A-Z.

3. RUNNING INSTRUCTIONS

a. Deck Setup. The deck setup for running the Compatible Aircraft/Test Case Store Electrical Interface Connections Program on the CDC 6600 at Eglin AFB is as follows:

EGLIN JOB CARD

SAD, OUTPUT, UP1.

REQUEST, TAPE8.

REQUEST, TAPE9.

FTN.

LOAD, LGO.

EXECUTE.

7/8/9

PROGRAM AF301 (INPUT, OUTPUT, TAPE5 = INPUT, TAPE6 = OUTPUT, TAPE8, TAPE9)

Source decks for AF301 and all its subroutines.

7/8/9

Input data cards.

6/7/8/9

Tape 8 is the input Aircraft Master File Data Tape.

Tape 9 is the input Master Equipment Data Tape.

b. Estimated Run Time and Pages of Output.

(1) The run time for this program should normally not exceed one minute of central processor time on the Eglin AFB CDC 6600 computer.

(2) The quantity of printed output should normally range from one to fifty pages, depending on the number of equipment interface groups, and matrix entries for the selected station.

4. INPUT

a. Card Input. The card input for the Compatibile Aircraft/Test Case Store Electrical Interface Connections Program consists of punched data cards to define the aircraft station, test case store, and/or test case suspension device to be analyzed, and an input deck of cards which define the list of equipments to be considered at each equipment interface group (matrix data). The order of punched cards and their formats are:

(1) The first data card defines the aircraft station number and test case store/suspension device. The format is:

Card Columns	Format	Description
1-2	A2	Aircraft station number.
4-9	I6	Test case store equipment identification number (0 if suspension device only to be considered).
11-16	I6	Test case suspension device equipment identification number (0 if store only to be considered).

(2) The second data card defines the number of euqipment interface groups at the requested aircraft station. The format is:

Card Columns	Format	Description
1-3	I3	Number of equipment interface groups at requested aircraft station.

(3) The matrix column headers are the equipment interface group numbers for the station to be processed. These numbers are input, ten per card, as 100* equipment group code number plus suspension device group code number. For example, the equipment interface group having the equipment group code number 002 and the suspension device group code number 01 are input as 00201 (the leading zeros are not necessary). The card format is:

Card Columns	Format	Description
1-60	10I6	Equipment interface group numbers for matrix columns.

(4) The matrix cards defining store/suspension device assignments for equipment interface groups are input. The formats are as follows:

Card Columns	Format	Description
1-2	A2	Aircraft station number
4-9	I6	Stores equipment identification number (may be zero).

Card Columns	Format	Description
11-16	I6	Suspension device equipment identification number (may be zero).
18-71	27A2	Definition of which equipment interface groups the store/suspension device belongs to. An X in a field implies that the store/suspension device is a member of the corresponding equipment interface group.
72	A1	Continuation column, contains an X if more than the first twenty-seven equipment interface groups are required to define the interface for this store/suspension device.
73-80	2A4	Card identification information.

If the continuation column is marked (column 72), a second card follows, containing the interface assignments for the twenty-eighth through the fiftieth equipment interface groups in the list. The format is:

Card Columns	Format	Description
18-71	27A2	Same as above, for twenty-eighth through fiftieth equipment interface groups at the station.

(5) The matrix cards must end with a dummy matrix card having a store equipment identification number of 999999 in columns 4-9.

b. Tape Input. This program utilizes the Aircraft Master File Data Tape for the corresponding aircraft on unit 8 and the Master Equipment Data Tape on unit 9.

5. OUTPUT

a. Diagnostic Messages. The Compatible Aircraft/Test Case Store Electrical Interface Connections Program may generate the following diagnostic message:

AF301 "ERROR--TEST CASE STORE DOES NOT HAVE NEW FORMAT DATA RUN TERMINATED" The analysis cannot be performed without the insert compatibility code characteristic, which is contained in the supplementary connector data section.

b. Description of Printed Output. For each interface connection of the test case store and/or suspension device, the following is reported:

(1) The test case store/suspension device connector part number is printed.

(2) For each equipment interface group at the aircraft station, the following is reported:

(a) The aircraft connector identification number and part number are listed.

(b) The equipment interface group number is printed.

(c) For each compatible store that is controlled by the respective equipment interface group, the store name and connector part number for the connector corresponding to the test case connector being summarized are reported.

(d) If the equipment interface group contains no compatible stores, the equipment interface group is reported as having no matching connections.

c. Sample Output. Sample printed output for this computer program is shown in Figure 25.

COMPATIBLE AIRCRAFT/TEST CASE STORE ELECTRICAL INTERFACE CONNECTIONS

STATION NO.: 1

INTERFACE CONNECTION NO. 1
TEST CASE STORE: CBU-XX(MS-3102A-14-5P)
TEST CASE SUSPENSION DEVICE: NONE REQUESTED FOR EXAMINATION

AIRCRAFT CONNECTOR IDENT.	AIRCRAFT CONNECTOR PART NO.	EQUIPMENT INTERFACE GROUP	EXISTING COMPATIBLE STORES (CONNECTOR THAT ARE CONTROLLED BY THE RESPECTIVE AIRCRAFT INTERFACE)
053	MS3108A-14S-5S	01-001-XX	CBU-XA(MS3102A-14-5P) . . . . . .CBU-XB(MS3102A-14-5P)
057	MS3108A-14S-5S	01-002-XX	LAU-XA(AN3102A-14-5P) . . . . . .LAU-XB(MS3102A-14-5P)
058	MS3108A-14S-5S	01-003-XX	TMU-XA(MS3102A-14-5P)

INTERFACE CONNECTION NO. 2

(ADDITIONAL INTERFACE CONNECTOR DATA WILL BE PRINTED OUT IF THE TEST CASE STORE REQUIRES MORE THAN ONE CONNECTION TO THE AIRCRAFT.)

Figure 25. Sample Output For Compatible Aircraft/Test Case Store Interface Connections Program.

SECTION VII

AIRCRAFT/TEST CASE STORE INTERFACE COMPATIBILITY PROGRAM

1. METHOD

The Aircraft/Test Case Store Interface Compatibility Program requires a preliminary run of a program to set up work files. That program will also be described in this section.

a. The following is a description of the procedure used by the work file setup program (AF310):

(1) Read from an input data card the test case store and/or suspension device identification numbers.

(2) Read the operational data records for the next equipment on the Master Equipment Data File.

(3) If this equipment is not the test case store or suspension device, read through all its electrical data, and go to step (2).

(4) If this equipment is either the test case store, or the test case suspension device, read the data for each connector or circuit for each data section, transform the data into a minimal number of words, and write the compact data onto a work data file. If this is the first of two test case equipments, write the output on file 12; if it is the second test case equipment, write the output on File 13. If there is only one test case equipment, write the output on File 10.

(5) If this equipment is the first of two test case equipments, continue steps (2) through (4) until the second test case equipment is found and processed.

(6) If there are two test case equipments, copy the data on files 12 and 13 onto file 10. File 10 then contains all the electrical data for the test case equipment(s) in a compact form.

b. The following is a description of the procedure used by the Aircraft/Test Case Store Interface Compatibility Program to generate its reports:

(1) Input all user-options, print a summary of all user-input options.

(2) Position the Aircraft Master Data File (unit 8) to the requested station and copy the connector and wiring data for the station onto file 11.

(3) Read from Aircraft Master Data File the next equipment interface group number.

(4) If the aircraft station has changed, go to step (15).

(5) If this equipment interface group is not to be processed, read through its data on the Aircraft Master Data File and go to step (3).

(6) Read and store in core the connector data for both the aircraft (Unit 11) and the test case equipment(s) (Unit 10).

(7) Process the wiring data section.

(a) Read into core the signal form data for each test case equipment circuit (unit 10).

(b) Read from unit 11 the wiring data for the next aircraft circuit for this station.

(c) If this circuit is not in this equipment interface group, go to step (b).

(d) Match the aircraft wiring circuit to the corresponding equipment circuit by matching up connector insert compatibility codes and pin letters. Store the match up subscript in a vector. If no match, generate an error diagnostic record (Unit 13).

(e) Zero out all answer keys for this aircraft circuit.

(f) Generate a record containing the information needed to produce the detailed analysis report for this circuit pair (unit 12).

(g) If the wiring analysis is not requested, go to step (k).

(h) Perform the wiring analysis checks for this aircraft/equipment circuit pair. Generate an error diagnostic record (unit 13) for each error found.

(i) If no errors found in the wiring analysis, go to step (k).

(j) If errors were found in the wiring analysis, set the wiring analysis answer key for this aircraft circuit equal to 1.

(k) If the signal category analysis is not requested, go to step (n).

(l) Perform the signal category check for this aircraft/equipment circuit pair. Generate an error diagnostic record (unit 13) if an error is found.

(m) If an error was found in the signal category analysis, set the signal category answer key for this aircraft circuit equal to 1.

(n) If this is the last aircraft circuit for the aircraft station, go to step (8), else go to step (b).

(8) Process the signal form data section.

(a) Read from the Aircraft Master Data File the signal form data for the next aircraft circuit.

(b) Determine the matching equipment circuit from the matchup vector. If no match, go to step (e).

(c) If the signal form analysis is not requested, go to step (f).

(d) Perform the signal form analysis checks for this aircraft/equipment circuit pair. Generate an error diagnostic record (unit 13) for each error found.

(e) If errors were found in the analysis, set the signal form answer key for this aircraft circuit equal to 1.

(f) If this is the last aircraft circuit for this equipment interface group, go to step (9), else go to step (a).

(9) Process the logic data section.

(a) Read into core the logic data for each test case equipment circuit (unit 10).

(b) Read from the Aircraft Master Data File the logic data for the next aircraft circuit.

(c) Determine the matching equipment circuit from the matchup vector. If no match, go to step (f).

(d) If the logic analysis is not requested, go to step (g).

(e) Perform the logic analysis checks for this aircraft/equipment circuit pair. Generate an error diagnostic record (unit 13) for each error found.

(f) If errors were found in the analysis, set the logic answer key for this aircraft circuit equal to 1.

(g) If this is the last aircraft circuit for this equipment interface group, go to step (10), else go to step (b).

(10) Process the switching form/time data section.

(a) Read into core the switching form/time data for each test case equipment circuit (unit 10).

(b) Read from the Aircraft Master Data File the switching form/time data for the next aircraft circuit.

(c) Determine the matching equipment circuit from the matchup vector. If no match, go to step (f).

(d) If the switching form/time analysis is not requested, go to step (g).

(e) Perform the switching form/time analysis checks for the aircraft/equipment circuit pair. Generate an error diagnostic record (unit 13) for each error found.

(f) If errors were found in the analysis, set the switching form/time answer key for this aircraft circuit equal to 1.

(g) If this is the last aircraft circuit for this equipment interface group, go to step (11), else go to step (b).

(11) Process the sequence data section.

(a) Read into core the sequence data for each test case equipment circuit (unit 10).

(b) Read from the Aircraft Master Data File the sequence data for the next aircraft circuit.

(c) Determine the matching equipment circuit by matching up the connector insert compatibility code number and the pin number. If no match, go to step (f).

(d) If the sequence analysis is not requested, go to step (g).

(e) Perform the sequence analysis checks for this aircraft/equipment circuit pair. Generate an error diagnostic record (unit 13) for each error found.

(f) If errors were found in the analysis, set the sequence answer key for this aircraft circuit equal to 1.

(g) If this is the last aircraft circuit for this equipment interface group, go to step (12), else go to step (b).

(12) Generate the detail analysis report for this equipment interface group. If this report is not requested, go to step (13).

(a) Rewind Unit 12.

(b) Read from unit 12 the detail report information for the next aircraft circuit.

(c) Set up the six analysis result values for this aircraft circuit from the answer keys (answer is blank if the corresponding analysis was not requested, is YES if the answer key equals zero, or is NO if the answer key equals one).

(d) Print the detail analysis report line for this aircraft circuit.

(e) If this is the last aircraft circuit for this equipment interface group, go to step (13), else go to step (b).

(13) Generate the error diagnostics report for this equipment interface group. If this report is not requested, go to step (14).

(a) Rewind units 12 and 13.

(b) Zero out diagnostic vector for each aircraft circuit in the equipment interface group.

(c) Read next error diagnostic record from unit 13.

(d) Locate the diagnostic row vector corresponding to the aircraft circuit referenced by the diagnostic.

(e) Set the corresponding diagnostic row vector switch for the diagnostic code number equal to a one.

(f) If this is the last error diagnostic record, go to step (g), else go to step (c).

(g) Read from unit 12 the detail report information for the next aircraft circuit to be reported.

(h) Locate the diagnostic row vector corresponding to this aircraft circuit.

(i) For each switch of the diagnostic row vector which is not equal to zero, generate the diagnostic message corresponding to the switch's code number.

(j) If this is the last aircraft circuit for the equipment interface group, go to step (14), else go to step (g).

(14) Rewind files 10, 11, 12, and 13 and go to step (3).

(15) When all equipment interface groups have been processed and reported, print the summary report for all equipment interface groups.

2. SUBROUTINES

a. The subroutines and other program modules utilized by the work file setup program (AF310) are as follows:

AF310	AF310 controls the generation of the work file containing all the electrical data for each circuit of each data section for the test case equipment(s).

COMBIN When both a test case store and a test case suspension device are requested, COMBIN copies the electrical data on files 12 and 13 onto file 10.

DEBUG DEBUG prints out the condensed data for each section of the equipment data for debugging purposes only.

LDSTFT LDSTFT reads the data for the switching form/time data section for each circuit of the test case store or suspension device, converts it to a more compact form, and writes it on a scratch file.

LDSTSQ LDSTSQ reads the data for the sequence data section for each circuit of the test case store or suspension device, converts it to a more compact form, and writes it on a scratch file.

LLGO LLGO reads the data for the original logic data section for each circuit of the test case store or suspension device and converts it to a more compact form, retaining it in core.

LLGS LLGS reads the data for the supplementary logic data section for each circuit of the test case store or suspension device, adds it to the compact data from LLGO, and writes it on a scratch file.

LODEX For the sequence data compacting routine (LDSTSQ) LODEX converts a sequence matrix cross-reference value into a two-bit entry in the compact vector for the equipment circuit.

LSFO LSFO reads the data for the original signal form data section for each circuit of the test case store or suspension device and converts it to a more compact form, retaining it in core.

LSFS LSFS reads the data for the supplementary signal form data section for each circuit of the test case store or suspension device, adds it to the compact data from LSFO, and writes it on a scratch file.

PSTORF PSTORF positions the Master Equipment Data File to the test case store and/or suspension device and controls the conversion of all the electrical data to a more compact form on work file unit 10.

SETBT1 SETBT1 sets a specific bit of a given word equal to a one.

b. The subroutines and other program modules utilized by the Aircraft/Test Case Store Interface Compatibility Program are as follows:

AF302	AF302 is the main program control module for the Aircraft/Test Case Store Interface Compatibility Program. AF302 controls user input, the six analyses for each equipment interface group, and the generation of the three reports.
AIROR	AIROR generates a diagnostic message record on unit 13 for each error encountered by any of the six analyses routines. The record contains information to identify the aircraft and equipment circuits and a code for the type of error encountered.
BLOCK DATA	AF302 requires a block data module which contains all the error diagnostic messages.
CATANL	CATANL performs the signal category analysis comparison for an aircraft-equipment circuit pair.
CONNE	CONNE reads the connector data for both the aircraft (for a given equipment interface group) and the test case equipment(s). The required connector parameters are retained in core.
DTLHED	DTLHED generates the page and column headings for the Detail Interface Circuit Connection Compatibility Report.
D34	D34 processes logical analyses steps D3 and D4, which both have the form of the equipment characteristic of type MSM-2 and the aircraft characteristic of type SSM-2.
HNCOMP	HNCOMP generates the page and column headings for the Incompatible Interface Circuit Diagnostic Summary.
INCOMP	INCOMP generates the Incompatible Interface Circuit Diagnostic Summary from the error diagnostic messages file. Each incompatibility for each matched aircraft-equipment circuit pair of the equipment interface group is reported.
INDY	INDY reads in all user-controlled options and prints a report of all user input.
LOGANL	LOGANL performs all the logic analysis checks for a given aircraft-equipment circuit pair. Error diagnostic records are generated for each incompatibility found.
LOOPS	For the signal form analysis module, LOOPS checks the equipment circuits for unmatched store loop circuits and generates an error diagnostic record for any unmatched ends found.

MATEY — MATEY matches the current aircraft circuit with the proper equipment circuit for the sequence data section. MATEY is analogous to subroutine MATPIN.

MATPIN — MATPIN matches the current aircraft circuit with the proper equipment circuit. The matchup is made on connector insert compatibility code and pin letter. If the equipment circuit is a loop circuit, MATPIN checks the polarity and switches pins if the polarities are reversed.

PARA — For the signal form analysis module, PARA stores in core the information for each parallel aircraft circuit needed to perform the output circuit load steady state check.

PDTAIL — PDTAIL controls generation of the Detail Interface Circuit Compatibility Report.

PGROUP — PGROUP reads through the data on the Aircraft Master Data File for an equipment interface group which is not to be processed.

PRSEQ — PRSEQ controls the sequence analysis checks for all circuits of an equipment interface group.

PRSF — PRSF controls the signal form analysis checks for all circuits of an equipment interface group.

PRLOG — PRLOG controls the logic analysis checks for all circuits of an equipment interface group.

PRSWFT — PRSWFT controls the switching form/time analysis checks for all circuits of an equipment interface group.

PRWIRE — PRWIRE controls the wiring and signal sequence analyses checks for all circuits of an equipment interface group. PRWIRE also sets up the aircraft equipment matchup vector.

PSTATN — PSTATN positions the Aircraft Master Data File to the requested station and copies the station connector and wiring data onto unit 11.

PSUM — PSUM generates the Interface Circuit Compatibility Summary report for all equipment interface groups.

REM — For each incompatibility diagnostic of the Incompatible Interface Circuit Diagnostic Summary, REM retrieves the diagnostic message for the print line.

RETBIT — RETBIT returns the value (0 or 1) of a specific bit of a given word.

ROUT — ROUT generates the incompatibility diagnostic for each diagnostic for each circuit of the equipment interface group.

SEQANL — SEQANL performs all the sequence analysis checks for a given aircraft-equipment circuit pair. Error diagnostic records are generated for each incompatibility found.

SETBT1 — SETBT1 sets a specified bit of a given word equal to a one.

SFANL — SFANL performs all the signal form analysis checks for a given aircraft-equipment circuit pair. Error diagnostic records are generated for each incompatibility found.

SSCHK — Processes all aircraft circuits marked as summate parallel circuit store loads for the steady state check C10.

STDYST — For the signal form analysis, STDYST calculates the steady state current equivalent to a given transient current and time. The summation option is taken into account if checked, and if not, the maximum of the steady state current and the transient current converted into a steady amps equivalent is returned.

SWANAL — SWANAL performs all the switching form/time analysis checks for a given aircraft-equipment circuit pair. Error diagnostic records are generated for each incompatibility found.

WIRANL — WIRANL performs all the wiring analysis checks for a given aircraft-equipment circuit pair. Error diagnostic records are generated for each incompatibility found.

3. RUNNING INSTRUCTIONS

a. Deck Setup. The deck setup for running the work file setup program (AF310) and the Aircraft/Test Case Store Interface Compatibility Program on the CDC 6600 at Eglin AFB is as follows:

```
EGLIN JOB CARD
SAD, OUTPUT, UP1.
REQUEST, TAPE 9.
FTN.
LOAD, LGO.
EXECUTE.
7/8/9
PROGRAM AF310 (INPUT, OUTPUT, TAPE5=INPUT, TAPE6=OUTPUT, TAPE9,
   TAPE10, TAPE12, TAPE 13)
Source decks for AF310 and all its subroutines
```

```
7/8/9
Input data card
6/7/8/9
EGLIN JOB CARD
SAD, OUTPUT, UP1.
REQUEST, TAPE8.
FTN.
LOAD, LGO.
EXECUTE.
7/8/9
PROGRAM AF302 (INPUT, OUTPUT, TAPE5=INPUT, TAPE6=OUTPUT, TAPE8,
   TAPE10, TAPE11, TAPE12, TAPE13)
Source decks for AF302 and all its subroutines
7/8/9
Input data cards
6/7/8/9
```

Tape 8 is the input Aircraft Master File Data Tape.
Tape 9 is the input Master Equipment Data Tape.
Tape 10 is the shared work file containing the electrical data for the test case equipments.

b. Estimated Run Time and Pages of Output.

(1) The work file setup program (AF310) should require less than one minute of central processor time on the Eglin AFB CDC 6600 computer and produces no printed output.

(2) The Aircraft/Test Case Store Interface Compatibility Program should normally require one to three minutes of central processor time on the Eglin AFB CDC 6600 computer. The amount of printed output may be estimated as follows:

(a) For the Detail Interface Circuit Connection Compatibility Report for each requested equipment interface group, one page of output is generated for each fifty circuits.

(b) The amount of output generated by the Incompatible Interface Circuit Diagnostic Summary depends on how many incompatibilities are found during the analysis. A reasonable upper limit would appear to be one page of output for each aircraft circuit in the equipment interface group.

(c) The Interface Circuit Compatibility Summary generates one page of output.

4. INPUT

a. Card Input.

(1) The work file setup program (AF310) requires one input data card, as follows:

Card Columns	Format	Description
1-6	I6	Equipment identification number for test case store
7-12	I6	Equipment identification number for test case suspension device

One of the equipment identification numbers may be zero, but not both. Both may be legitimate values.

(2) The card input for the Aircraft/Test Case Store Interface Compatibility Program consists of punched data cards to define the aircraft station, equipment interface groups and test case equipments to be analyzed, what combination of the six possible analyses are to be used, and which of the three reports are to be generated. The input card requirements are as follows:

(a) The first card defines the aircraft station to be processed and the aircraft name. The format is:

Card Columns	Format	Description
1-2	A2	Aircraft station to be processed
4-15	3A4	Aircraft name

(b) The second card defines the test case store to be examined, which must be the same store as for AF310. The format is:

Card Columns	Format	Description
1-6	I6	Test case store equipment identification number (may be zero)
8-19	3A4	Test case store name
21-23	I3	Code for type of equipment 1 = store 2 = suspension device 3 = fixed station should be a 1 for this card

(c) The third card defines the test case suspension device to be examined, which must be the same suspension device as for AF310. The format is:

Card Columns	Format	Description
1-6	I6	Test case suspension device equipment identification number (may be zero)

Card Columns	Format	Description
8-19	3A4	Test case suspension device name
21-23	I3	Code for type of equipment: 1 = store 2 = suspension device 3 = fixed station Should be a 2 for this card

(d) The fourth card defines the number of equipment interface groups to be examined. The format is as follows:

Card Columns	Format	Description
1-2	I2	Number of individual equipment interface groups to be processed (not all of them)
4-7	A4	"ALLb" if all equipment interface groups at the station are to be processed

(e) If the ALL option was utilized on the fourth card, go on to step (f). Otherwise, one card is required to define each requested equipment interface group for analysis. The format is:

Card Columns	Format	Description
1-2	A2	Station number
4-6	I3	Store group number for this equipment interface group
8-9	I2	Suspension device group number for this equipment interface group

(f) The next card defines which sorting modes are to be analyzed. The format is:

Card Columns	Format	Description
1-4	A4	First sorting mode keyword
5-8	A4	Second sorting mode keyword
9-12	A4	Third sorting mode keyword
13-16	A4	Fourth sorting mode keyword
17-20	A4	Fifth sorting mode keyword

Legal keywords are left-adjusted in the fields, and are:

ALL	All six sorting modes are requested.
WIR	Perform the wiring analysis.
CAT	Perform the signal category analysis.
SIG	Perform the signal form analysis.
LOG	Perform the logic analysis.
SWT	Perform the switching form/time analysis.
SEQ	Perform the sequence analysis.
(blank)	Null keyword

(g) The last input data card defines which output reports are to be generated. The format is:

Card Column	Format	Description
1	I1	1 if the Detail Interface Circuit Connection Compatibility Report is desired; else 0
2	I1	1 if the Incompatible Interface Circuit Diagnostic Summary is desired; else 0
3	I1	1 if the Interface Circuit Compatibility Summary is desired; else 0

b. Tape Input. Both AF310 and the Aircraft/Test Case Store Interface Compatibility Program utilize several files which will be briefly described here.

(1) AF310 utilizes the following files:

I/O Unit	Description
9	Master Equipment Data Tape (input only).
10	Work file containing all electrical data for the test case store and/or suspension device; this file is passed to the Aircraft/Test Case Store Interface Compatibility Program.

12	Work file for electrical data for first of two test case equipments.
13	Work file for electrical data for second of two test case equipments.

(2) The Aircraft/Test Case Store Interface Compatibility Program utilizes the following files:

I/O Unit	Description
8	Aircraft Master Data Tape (input only).
10	Work file containing all electrical data for the test case store and/or suspension device, from program AF310.
11	Work file containing the connector and wiring data sections for the selected aircraft station.
12	Work file containing circuit identification information for both the aircraft and equipment circuits of each circuit pair of the current equipment interface group.
13	Work file containing diagnostic message records identifying the circuit pair and the type error for each incompatibility found for the circuit pairs of the current equipment interface group.

c. Sample Card Input. Sample card input for the Aircraft/Test Case Store Interface Compatibility Program is shown in Figure 26.

5. OUTPUT

a. Diagnostic Messages

(1) Program AF310 may generate the following diagnostic messages:

PSTORF "TEST CASE STORE/SUSPENSION DEVICE nnnnnn IS NOT ON STORE DATA FILE."

PSTORF "TEST CASE STORE/SUSPENSION DEVICE nnnnnn NOT NEW FORMAT DATA."

PSTORF "TEST CASE STORE/SUSPENSION DEVICE nnnnnn HAS NO CIRCUITS."

All of the above diagnostics cause the run to be terminated.

(2) The Aircraft/Test Case Store Interface Compatibility Program may generate the following diagnostic messages:

INDY "***ERROR--ILLEGAL KEYWORD IN SORTING MODES REQUESTED. BAD WORD IS nnnn." The legal keywords for defining sorting modes to be processed are shown in the INPUT section of the report for this program. The run is terminated.

INDY "ERRORS WERE ENCOUNTERED IN USER INPUT. THIS RUN IS TERMINATED." This message is generated also if an illegal sorting mode keyword is encountered.

PARA "WARNING--MORE THAN 30 AIRCRAFT CIRCUITS HAVE SUMMATE PARALLEL STORE LOAD MARKED." The number of summate parallel store load marked circuits is limited to thirty because of a dimension statement. The circuit causing the diagnostic is not treated as a parallel load and processing continues.

b. Description of Printed Output.

(1) Program AF310 produces no printed output.

(2) Printed output for the Aircraft/Test Case Store Interface Compatibility Program consists of the following:

(a) A report of all input is printed.

(b) The Detail Interface Circuit Connection Compatibility Report shows the aircraft circuit identification, the matching equipment circuit identification, and the compatible sorting modes, for each aircraft circuit in a given equipment interface group.

(c) The Incompatible Interface Circuit Diagnostic Summary reports the equipment circuit identification, the aircraft circuit identification and the diagnostic message for each incompatibility found in the analyses of each circuit matchup for the equipment interface group.

(d) The Interface Circuit Compatibility Summary shows for each equipment interface group at the aircraft station which sorting modes were completely compatible.

c. Sample Output.

Sample output for the Aircraft/Test Case Store Interface Compatibility Program is shown in Figures 27 through 29.

CARD COLUMNS

CARD NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	80
1		0	1	F	-	1	1	1	A			F	-	B										
2		0	5	0	1	9	0		A	G	M	-	X	A	1									
3							0																	
4		0	5																					
5		0	1			0	0	1	0	0														
6		0	1			0	0	2	0	0														
7		0	1			0	0	4	0	0														
8		0	1			0	0	7	0	0														
9		0	1			0	1	0	0	0														
10		W	I	R		S	I	G		L	Ø	G		S	W	T		S	E	Q				
11		1	1	1																				

Figure 26. Sample Card Input for the Aircraft/Test Case Store Interface Compatibility Program

DETAIL INTERFACE - CIRCUIT CONNECTION COMPATIBILITY

STATION NO.: 1

TEST CASE STORE: CBU-XX, CONTROLLED BY THE FOLLOWING AIRCRAFT INTERFACE CONNECTIONS

AIRCRAFT INTERFACE CONNECTION			TEST CASE STORE CONNECTION		COMPATIBLE CIRCUIT CHARACTERISTICS					
EQUIPMENT GROUP	AIRCRAFT CIRCUIT NO.	CIRCUIT FUNCTION	CONNECTOR IDENT. NO. & PIN REF.	STORE CIRCUIT FUNCTION	INTER-FACE WIRING	SIGNAL CATEGORY	SIGNAL FORM	SIGNAL LOGIC	SWITCH F/T	SIGNAL SEQUENCE
01-00-XX	01-306	DISPENSE	038-A	DISPENSE	YES	YES	YES	YES	YES	YES
	01-309A	EMPTY MONITOR	038-B	EMPTY GROUND	YES	YES	YES	YES	YES	YES
	01-309B	STATION TRANSFER	038-B	EMPTY GROUND	YES	YES	YES	YES	YES	YES
	01-311	3 TUBE FLASHER	038-C	3 TUBES REMAIN(O)	YES	YES	YES	YES	YES	YES
	-	NO CIRCUIT	038-D	NO CIRCUIT	YES	YES	YES	YES	YES	YES
	01-315N	GROUND	038-E	GROUND	YES	YES	YES	YES	YES	YES
01-002-XX	01-358	ROCKET FIRE	038-A	DISPENSE	YES	YES	NO	NO	YES	YES
	-	NO CIRCUIT	038-B	EMPTY GROUND	NO	NO	NO	NO	NO	NO
	-	NO CIRCUIT	038-C	3 TUBES REMAIN(O)	NO	NO	NO	NO	NO	NO
	-	NO CIRCUIT	038-D	NO CIRCUIT	YES	YES	YES	YES	YES	YES
	01-317N	GROUND	038-E	GROUND	YES	YES	YES	YES	YES	YES
01-003-XX	01-364	OPERATE	038-A	DISPENSE	YES	YES	NO	NO	NO	NO
	01-365	EXTEND	038-B	EMPTY GROUND	YES	NO	NO	NO	NO	YES
	01-366	RETRACT	038-C	3 TUBES REMAIN(O)	YES	NO	NO	NO	NO	NO
	01-367	STORE ARM	038-D	NO CIRCUIT	NO	NO	NO	NO	NO	NO
	01-318N	GROUND	038-E	GROUND	YES	YES	YES	YES	YES	YES

(O) = INDICATES OPTIONAL STORE INTERFACE CIRCUIT

Figure 27. Sample Output for the Detail Interface Circuit Connection Compatibility Report

INCOMPATIBLE INTERFACE CIRCUIT DIAGNOSTIC

TEST CASE STORE CONNECTOR	AIRCRAFT CIRCUIT NO.	INCOMPATIBLE CIRCUIT CHARACTERISTICS (AIRCRAFT AND STORE CHARACTERISTIC NO. & DIAGNOSTIC MESSAGE)
038-A	01-358	(A301-E152) AIRCRAFT CIRCUIT CONTAINS A SERIES CURRENT LIMIT RESISTOR THAT IS NOT REQUIRED AND MAY AFFECT NORMAL TEST CASE STORE OPERATION.
		(A404-E254) AIRCRAFT STORE INTERFACE RELEASE LOGIC IS NOT COMPATIBLE WITH TEST CASE STORE CIRCUIT RELEASE FUNCTION.
038-B	-	(A200A-E166) NO CIRCUIT EXISTS IN AIRCRAFT TO MATE WITH ACTIVE TEST CASE STORE INTERFACE CONNECTION.
038-C	-	(A200A-E166) NO CIRCUIT EXISTS IN AIRCRAFT TO MATE WITH ACTIVE TEST CASE STORE INTERFACE CONNECTION.
038-D	-	NONE - INTERFACE PIN CONNECTION NOT USED BY AIRCRAFT OR TEST CASE STORE.
038-E	01-317N	NONE - ALL CHARACTERISTICS COMPATIBLE.

(Similiar diagnostic printouts will be provided for all other aircraft equipment examined)

Figure 28. Sample Output for the Incompatible Interface Circuit Diagnostic Report

INTERFACE CIRCUIT COMPATIBILITY SUMMARY

STATION NO.: 1

TEST CASE STORE: CBU-XX, CONTROLLED BY LISTED AIRCRAFT INTERFACE CONNECTION

AIRCRAFT INTERFACE CONNECTION	COMPATIBLE CIRCUIT CHARACTERISTICS					
EQUIPMENT GROUP	INTERFACE WIRING	SIGNAL CATEGORY	SIGNAL FORM	SIGNAL LOGIC	SWITCH F/T	SIGNAL SEQUENCE
01-001-XX	YES	YES	YES	YES	YES	YES
01-002-XX	NO	NO	NO	NO	NO	NO
01-003-XX	NO	NO	NO	NO	NO	NO

Figure 29. Sample Output for the Interface Circuit Compatibility Summary Report

SECTION VIII

COMPLEMENTARY STATION INTERFACE CIRCUIT ANALYSIS PROGRAM

1. METHOD

a. The Complementary Station Interface Circuit Analysis Program requires a preliminary run of the work file setup program (AF310), which is fully described in Section VII of this report.

b. The following is a description of the procedure used by the Complementary Station Interface Circuit Analysis Program (AF303) to generate its report:

(1) Input all user-defined options and print a summary of all user-input options.

(2) Position the Aircraft Master Data File (unit 8) to the requested station and copy the connector and wiring data for the station onto file 11.

(3) Read from the Aircraft Master Data File the next equipment interface group number.

(4) If the aircraft station number has changed, go to step (14).

(5) If this equipment group is not to be processed, read through its data sections on the Aircraft Master Data File and go to step (3).

(6) Read and store in core the connector data for both the aircraft (unit 11) and the test case equipment(s) (unit 10).

(7) Process the wiring data section.

(a) Zero out the answer matrix, which has one entry for each possible aircraft/test case equipment circuit pairing combination for the given equipment interface group.

(b) Read into core the signal form data for each test case equipment circuit (unit 10).

(c) Read from unit 11 the wiring data for the next aircraft circuit for this station.

(d) If this circuit is not in the given equipment interface group, go to step (c).

(e) Match the aircraft circuit with the next test case equipment circuit.

(f) If the signal category analysis is not requested, go to step (j).

(g) Perform the signal category analysis for this aircraft/test case equipment circuit pair.

(h) If no incompatibilities were found for the signal category analysis, go to step (j).

(i) Set the answer matrix entry for this aircraft/test case equipment circuit pair to a value of one and go to step (n).

(j) If the wiring analysis is not requested, go to step (n).

(k) Perform the wiring analysis checks for this aircraft/test case equipment circuit pair.

(l) If no incompatibilities were found for the wiring analysis, go to step (n).

(m) Set the answer matrix entry for this aircraft/test case equipment circuit pair to a value of one.

(n) If this is the last test case equipment circuit, go to step (o), else go to step (e).

(o) If this is the last wiring data circuit record for the aircraft station, go to step (8), else go to step (c).

(8) Process the signal form data section.

(a) Read from the Aircraft Master Data File the signal form data for the next aircraft circuit for this equipment interface group.

(b) If the signal form analysis is not requested, go to step (i).

(c) Match the aircraft circuit with the next test case equipment circuit.

(d) Check the answer matrix entry for this circuit pair. If the value is one, the pair has already been found to be incompatible, so go to step (h).

(e) Perform the signal form analysis checks for this aircraft/test case equipment circuit pair.

(f) If no incompatibilities were found for the signal form analysis, go to step (h).

(g) Set the answer matrix entry for this aircraft/test case equipment circuit pair to a value of one.

(h) If this is the last test case equipment circuit, go to step (i), else go to step (c).

(i) If this is the last signal form circuit record for this equipment interface group, go to step (9), else go to step (a).

(9) Process the logic data section.

(a) Read into the core the logic data for each test case equipment circuit (unit 10).

(b) Read from the Aircraft Master Data File the logic data for the next aircraft circuit for this equipment interface group.

(c) If the logic analysis is not requested, go to step (j).

(d) Match the aircraft circuit with the next test case equipment circuit.

(e) Check the answer matrix entry for this circuit pair. If the value is one, the pair has already been found to be incompatible, so go to step (i).

(f) Perform the logic analysis checks for this aircraft/test case equipment circuit pair.

(g) If no incompatibilities were found for the logic analysis, go to step (i).

(h) Set the answer matrix entry for this aircraft/test case equipment circuit pair to a value of one.

(i) If this is the last test case equipment circuit, go to step (j), else go to step (c).

(j) If this is the last logic circuit record for this equipment interface group, go to step (10), else go to step (b).

(10) Process the switching form/time data section.

(a) Read into core the switching form/time data for each test case equipment circuit (unit 10).

(b) Read from the Aircraft Master Data File the switching form/time data for the next aircraft circuit for this equipment interface group.

(c) If the switching form/time analysis is not requested, go to step (j).

(d) Match the aircraft circuit with the next test case equipment circuit.

(e) Check the answer matrix entry for this circuit pair. If the value is one, the pair has already been found to be incompatible, so go to step (i).

(f) Perform the switching form/time analysis checks for this aircraft/test case equipment circuit pair.

(g) If no incompatibilities were found for the switching form/time analysis, go to step (i).

(h) Set the answer matrix entry for this aircraft/test case equipment circuit pair to a value of one.

(i) If this is the last test case equipment circuit, go to step (j), else go to step (c).

(j) If this is the last switching form/time circuit record for this equipment interface group, go to step (11), else go to step (b).

(11) Skip the sequence data sections, as this program does not perform a sequence analysis.

(a) Read through the sequence data section for this equipment interface group on the Aircraft Master Data File.

(b) Rewind unit 10.

(12) Generate a record on a work file for each compatible aircraft/test case equipment circuit pair for this equipment interface group.

(a) For the next aircraft/test case equipment circuit pair for this equipment interface group, check the corresponding answer matrix entry; if it has a value of one, go to step (c).

(b) Output on work-file unit 12 a record for this compatible circuit pair. The record defines the aircraft circuit, the equipment circuit, and the equipment interface group.

(c) If this is the last aircraft/test case equipment circuit pair for this equipment interface group, go to step (13), else go to step (a).

(13) The processing for this equipment interface group is completed.

(a) Rewind unit 11.

(b) Go to step (3).

(14) The processing for the requested aircraft station is completed. Generate the Complementary Station Interface Circuit Analysis Report.

(a) Rewind unit 12.

(b) Determine if all complementary circuit pair records can be loaded into core (the limit per pass is 1400); if so, go to step (c); if not, go to step (o).

(c) Read from unit 12 all complementary circuit pair records and load the information into the report array in core.

(d) Determine the complementary aircraft circuits for the next test case equipment circuit in the report array.

(e) If the equipment circuit is marked as a no circuit entry, report is as such and go to step (h).

(f) If the equipment circuit has no complementary aircraft circuits, report it as "NO COMPLEMENTARY AIRCRAFT CIRCUITS FOUND" and go to step (h).

(g) If there are complementary aircraft circuits for this equipment circuit, report all the complementary aircraft circuits (two per report line).

(h) If this is the last test case equipment circuit go to step (i), else go to step (d).

(i) If all complementary circuit pair records have been reported, go to step (q).

(j) Reverse the input and output work file assignments (units 12 and 13). Rewind units 12 and 13.

(k) Determine the range of test equipment circuits to be loaded into core.

(l) Read from the input work file the next complementary circuit pair record.

(m) If the test case equipment circuit number for the current complementary circuit pair record is within the range of equipment circuits being processed, load its information into the report array in core and go to step (o).

(n) If the test case equipment circuit number for the current complementary circuit pair record is greater than the upper range limit of equipment circuits being processed, write the record on the output work file.

(o) If this is the last complementary circuit pair record on the input work file, go to step (d), else go to step (l).

(p) Assign unit 12 as the input work file and unit 13 as the output work file and go to step (k).

(q) The Complementary Station Interface Circuit Analysis Report is completed.

2. SUBROUTINES

The subroutines and other program modules utilized by the Complementary Station Interface Circuit Analysis Program are as follows:

AF303 — AF303 is the main program control module for the Complementary Station Interface Circuit Analysis Program. AF303 controls user input, the five analyses for each equipment interface group, and the generation of the output report showing the complementary aircraft circuits at all equipment interface groups examined for each test case equipment circuit.

ANCAT — ANCAT performs the signal category analysis comparison for an aircraft/test case equipment circuit pair.

ANLOG — ANLOG performs the logic analysis checks for a given aircraft/test case equipment circuit pair.

ANSF — ANSF performs the signal form analysis checks C3 through C11 for a given aircraft/test case equipment circuit pair.

ANSWT — ANSWT performs the switching form/time analysis checks for a given aircraft/test case equipment circuit pair.

ANWIR — ANWIR performs the wiring analysis checks A3 through A6 for a given aircraft/test case equipment circuit pair.

D34 — D34 processes logical analyses steps D3 and D4. D34 is the same module as used by program AF302.

H303 — H303 generates the page and column headings for the Complementary Station Interface Circuit Analysis Report.

INCONN — INCONN reads the connector data for both the aircraft (for a given equipment interface group) and the test case equipment(s). The required connector parameters are retained in core.

INUSR — INUSR reads in all user-controlled options and prints a report of all user input.

LCORE — If not all complementary circuit pair records can be loaded into core at once, LCORE reads through the input work file for these records, loads those data records having equipment circuit pointers in the process interval into core, and writes those records having equipment circuit pointers higher than the upper limit of the process interval onto the output work file.

OUT — If an aircraft/test case equipment circuit pair encounters an incompatibility during one of the requested analyses, OUT sets the corresponding answer matrix entry to a value of one.

0303 — After all analyses have been completed for a given equipment interface group, 0303 generates a record on file 12 for each complementary aircraft/test case equipment circuit pair for the equipment interface group.

PACFIL — PACFIL positions the Aircraft Master Data File to the requested station and copies the station connector and wiring data sections onto work unit 11.

PASQ — PASQ reads through the sequence data for an equipment interface group on the Aircraft Master Data File. The sequence data section is not utilized by the AF303 program.

PGROUP — PGROUP reads through all the data sections of an equipment interface group on the Aircraft Master Data File which is not to be processed.

PRCLOG — PRCLOG controls the processing of the logic analysis for all pairs of aircraft/test case equipment circuits. If a given circuit pair has already been found to be incompatible, the logic analysis checks are not performed. If a given circuit pair is found to be incompatible during the logic analysis checks, the corresponding answer matrix entry is set to a value of one.

PRCSF — PRCSF controls the processing of the signal form analysis for all pairs of aircraft/test case equipment circuits. If a given circuit pair has already been found to be incompatible, the signal form analysis checks are not performed. If a given circuit pair is found to be incompatible during the signal form analysis checks, the corresponding answer matrix entry is set to a value of one.

PRCSWF — PRCSWF controls the processing of the switching form/time analysis for all pairs of aircraft/test case equipment circuits. If a given circuit pair has already been found to be incompatible, the switching form/time analysis checks are not performed. If a given circuit pair is found to be incompatible during the switching form/time analysis checks, the corresponding answer matrix entry is set to a value of one.

PRCSWR — PRCSWR controls the processing of the wiring and signal category analyses for all pairs of aircraft/test case equipment circuits. If a given circuit pair is found to be incompatible during the wiring or signal category analyses checks, the corresponding answer matrix entry is set to a value of one.

RETBIT — RETBIT returns the value (0 or 1) of a specified bit of a given word.

R303 R303 controls generation of the Complementary Station Interface Circuit Analysis Report after all circuit pairs for all requested equipment interface groups have been analyzed for complementary aircraft/test case equipment circuits.

SETBT1 SETBT1 sets a specified bit of a given word equal to a one.

STDYST For the signal form analysis, STDYST calculates the steady state current equivalent to a given transient current and time. The summation option is taken into account if checked and, if not, the maximum of the steady state current and the transient current converted into a steady amps equivalent is returned. This module is the same as in program AF302.

3. RUNNING INSTRUCTIONS

a. Deck Setup. The deck setup for running the work file setup program (AF310) and the Complementary Station Interface Circuit Analysis Program on the CDC 6600 at Eglin AFB is as follows:

```
EGLIN JOB CARD
SAD, OUTPUT, UP1.
REQUEST, TAPE9.
FTN.
LOAD, LGO.
EXECUTE.
7/8/9
PROGRAM AF310 (INPUT, OUTPUT, TAPE5=INPUT, TAPE6=OUTPUT, TAPE9,
   TAPE10, TAPE12, TAPE13)
Source decks for AF310 and all its subroutines.
7/8/9
Input data card
6/7/8/9
EGLIN JOB CARD
SAD, OUTPUT, UP1.
REQUEST, TAPE8.
FTN.
LOAD, LGO.
EXECUTE.
7/8/9
PROGRAM AF 303 (INPUT, OUTPUT, TAPE5=INPUT, TAPE6=OUTPUT, TAPE8,
   TAPE9, TAPE10, TAPE11, TAPE12, TAPE13)
Source decks for AF303 and all its subroutines.
7/8/9
Input data cards.
6/7/8/9
```

Tape 8 is the input Aircraft Master File Data Tape.

Tape 9 is the input Master Equipment Data Tape.

Tape 10 is the shared work file containing the electrical data for the test case equipments.

b. Estimated Run Time and Pages of Output.

(1) The work file setup program (AF310) should require less than one minute of central processor time on the Eglin AFB CDC 6600 computer and produces no printed output.

(2) The Complementary Station Interface Circuit Analysis Program should normally require one to five minutes of central processor time on the Eglin AFB CDC 6600 computer. The amount of printed output is a function of the number of test case equipment circuits, the number of aircraft circuits for all equipment interface groups requested, and the expected level of complementary circuit pairs. An upper limit of three hundred pages should be adequate for most computer runs.

4. INPUT

a. Card Input. The card input for the Complementary Station Interface Circuit Analysis Program consists of punched data cards to define the aircraft station, equipment interface groups, and test case equipments to be analyzed, and what combination of the five possible analyses are to be used. The input card requirements are as follows:

(1) The first card defines the aircraft station to be processed and the aircraft name. The format is:

Card Columns	Format	Description
1-2	A2	Aircraft station to be processed.
4-15	3A4	Aircraft name.

(2) The second card defines the test case store to be examined, which must be the same store as for AF310. The format is:

Card Columns	Format	Description
1-6	I6	Test case store equipment identification number (may be zero).
8-19	3A4	Test case store name.
21-23	I3	Code for type of equipment: 1 = Store 2 = Suspension device 3 = Fixed station Should be a 1 for this card.

(3) The third card defines the test case suspension device to be examined, which must be the same suspension device as for AF310. The format is:

Card Columns	Format	Description
1-6	I6	Test case suspension device equipment identification number (may be zero).
8-19	3A4	Test case suspension device name.
21-23	I3	Code for type of equipment: 1 = Store 2 = Suspension device 3 = Fixed station Should be a 2 for this card.

(4) The fourth card defines the number of equipment interface groups to be examined. The format is:

Card Columns	Format	Description
1-2	I2	Number of individual equipment interface groups to be processed (not all of them).
4-7	A4	ALLb if all equipment interface groups at the station are to be processed.

(5) If the ALL option was utilized on the fourth card, go on to step (6). Otherwise, one card is required to define each requested equipment interface group for analysis. The format is:

Card Columns	Format	Description
1-2	A2	Station number.
4-6	I3	Store group number for this equipment interface group.
8-9	I2	Suspension device group number for this equipment interface group.

(6) The last date card defines which sorting modes are to be analyzed. The format is:

Card Columns	Format	Description
1-4	A4	First sorting mode keyword.
5-8	A4	Second sorting mode keyword.
9-12	A4	Third sorting mode keyword.
13-16	A4	Fourth sorting mode keyword.
17-20	A4	Fifth sorting mode keyword.

Legal keywords are left-adjusted in the fields, and are:

ALL	All five sorting modes are requested.
WIR	Perform the wiring analysis.
CAT	Perform the signal category analysis.
SIG	Perform the signal form analysis.
LOG	Perform the logic analysis.
SWT	Perform the switching form/time analysis.
(Blank)	Null keyword.

b. Tape Input. Both AF310 and the Complementary Station Interface Circuit Analysis Program utilize several files which will be briefly described here.

(1) AF310 utilizes the following files:

I/O Unit	Description
9	Master Equipment Data Tape (input only).
10	Work file containing all electrical data for the test case store and/or suspension device; this file is passed to the Complementary Station Interface Circuit Analysis Program.
12	Work file for electrical data for first of two test case equipments.
13	Work file for electrical data for second of two test case equipments.

(2) The Complementary Station Interface Circuit Analysis Program utilizes the following files:

I/O Unit	Description
8	Aircraft Master Data Tape (input only).
10	Work file containing all electrical data for the test case store and/or suspension device from program AF310.
11	Work file containing the connector and wiring data sections for the selected aircraft station.
12	Work file containing one record for each pair of complementary aircraft/test case equipment circuits for all equipment interface groups processed.

CARD COLUMNS

CARD NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	80
1		0	1		F	-	1	1	1	A		F	-	B										
2		0	5	0	1	9	0		A	G	M	-	X	A	1									
3							0																	
4		0	5																					
5		0	1		0	0	1		0	0														
6		0	1		0	0	2		0	0														
7		0	1		0	0	4		0	0														
8		0	1		0	0	7		0	0														
9		0	1		0	1	0		0	0														
10		W	I	R		S	I	G		C	A	T			S	W	T							

Figure 30. Sample Card Input for the Complementary Station Interface Circuit Analysis Program

13 Alternate work file similar to unit 12, used when all complementary circuit pair records cannot be loaded into core at one time.

c. Sample Card Input. Sample card input for the Complementary Station Interface Circuit Analysis Program is shown in Figure 30.

5. OUTPUT

a. Diagnostic Messages. The Complementary Station Interface Circuit Analysis Program may generate the following diagnostic messages:

INUSR "***ERROR---ILLEGAL KEYWORD IN SORTING MODES REQUESTED. BAD WORD IS nnnn." The legal keywords for defining sorting modes to be processed are shown in the INPUT section of the report for this program. The run is terminated.

INUSR "ERRORS WERE ENCOUNTERED IN USER INPUT. THIS RUN IS TERMINATED." This message is also generated if an illegal sorting mode keyword is encountered.

b. Description of Printed Output.

(1) The Complementary Station Interface Circuit Analysis Program first prints a report of all user input.

(2) The program generates one report, the Complementary Station Interface Circuit Analysis Report.

(a) Each test case equipment circuit is identified by connector code number and pin reference.

(b) For each test case equipment circuit, all complementary (according to the user-selected analyses) aircraft circuits at the selected equipment interface groups are reported.

(c) The format for each complementary aircraft circuit is:

equipment interface group number
aircraft circuit function number
connector identification number and
pin reference

as in:

01-001-00, 01-023N (1-A) or
01-002-01, 01-017 (205-C)

c. Sample Output. Sample output for the Complementary Station Interface Circuit Analysis Program is shown in Figure 31.

COMPLEMENTARY STATION INTERFACE CIRCUIT ANALYSIS

STATION NO.: 1

CIRCUIT CHARACTERISTIC COMPARISON MODE: ALL MODES SELECTED

TEST CASE STORE: CBU-XX

TEST CASE STORE CONNECTOR IDENT. AND PIN REF.	COMPLEMENTARY AIRCRAFT CIRCUITS (EQUIPMENT GROUP NO. & AIRCRAFT CIRCUIT FUNCTION NO. & CONNECTOR IDENT. AND PIN REF.)
038-A	01-001-00, 01-306(053-A)....01-007-00, 01-413A(063-P)
038-B	01-001-00, 01-309A(053-B)....01-001-00, 01-309B(053-B)....01-012-00, 01-507A(064-F)
038-C	01-001-00, 01-311(053-C)....01-012-00, 01-508(064-A)....01-014-00, 01-607(077-P)
038-D	INTERFACE CONNECTION NOT USED BY TEST CASE STORE
038-E	01-001-00, 01-315N(053-E)....01-007-00, 01-417N(063-R)....01-007-00, 01-419N(063-S) 01-007-00, 01-420N(063-T)....01-014-00, 01-611N(077-M)

Figure 31. Sample Output for the Complementary Station Interface Circuit Analysis Program

SECTION IX

AIRCRAFT STATION DATA RETRIEVAL PROGRAM

1. METHOD

The following is a description of the procedure used by the Aircraft Station Data Retrieval Program to generate a summary of data for all selected station and equipment interface group data sections for a given aircraft station on an Aircraft Master File Data Tape:

a. Read user-input options to define those station data sections and/or equipment interface group data sections for a specific aircraft station which are to be reported.

b. Position the Aircraft Master File Data Tape to the data for the requested aircraft station.

c. If the connector data section is requested, read the connector data section for the station and generate a report of the data for each connector record; else, skip the connector data section for the station.

d. If the wiring data section is requested, read the wiring data section for the station and generate a report of the wiring data for each aircraft circuit at the station; else, skip the wiring data section for the station.

e. Loop on each equipment interface group for the aircraft station.

(1) If any data section of the equipment interface group was selected for reporting, go to Step f.

(2) If no data section of the equipment interface group was selected for reporting, skip the data for the entire equipment interface group and continue with the next equipment interface group.

f. Perform the following for each equipment interface group having some or all of its data sections requested to be reported:

(1) If the signal form data section is requested for reporting, read the signal form data and generate a report of the signal form requirements for each circuit of the equipment interface group; else, skip the signal form data for the equipment interface group.

(2) If the logic data section is requested for reporting, read the logic data and generate a report of the logic requirements for each circuit of the equipment interface group; else, skip the logic data for the equipment interface group.

(3) If the switching form/time data section is requested for reporting, read the switching form/time data and generate a report of the switching form/time requirements for each circuit of the equipment interface group; else, skip the switching form/time data for the equipment interface group.

(4) If the sequence data section is requested for reporting, read the sequence data and generate a report of the sequence requirements for each circuit of the equipment interface group; else, skip the sequence data for the equipment interface group.

g. Continue steps e and f for each equipment interface group in the requested aircraft station. When this procedure is completed, the program run is terminated.

2. SUBROUTINES

The subroutines and other program modules used by the Aircraft Station Data Retrievel Program are as follows:

AF305	AF305 is the main program control module for the Aircraft Station Data Retrieval Program. The user must specify one aircraft station of the Aircraft Master File Data Tape for reporting and may selectively request individual station or equipment interface group data sections to be reported. The procedure utilized by AF305 is outlined in the METHOD section above.
ACCON	ACCON generates a summary of the connector data for each connector of the aircraft station interface.
ACLOG	ACLOG generates a report of the signal logic requirements for each aircraft circuit of a specific equipment interface group. This report is generated in three sections.
ACOFON	ACOFON generates reports of the off-state and on-state matrix sequence requirements for each aircraft circuit of a specific equipment interface group.
ACSEQ	ACSEQ controls the reporting of the sequence data requirements for each aircraft circuit of a specific equipment interface group. ACSEQ directly generates the first section of this report, and writes the off-state and on-state matrix data on scratch files. Subroutine ACOFON is called to report the two matrices.
ACSF	ACSF generates a report of the signal form requirements for each aircraft circuit of a specific equipment interface group. This report is generated in two sections.

ACSWT	ACSWT generates a report of the switching form and time requirements for each aircraft circuit of a specific equipment interface group. This report is generated in two sections.
DEF	DEF reads the user-defined options to define which equipment interface groups and/or station data sections are to be reported. DEF also prints the summary of all user-defined input options.
HACCON	HACCON generates the page and column headers for the station connector data report.
HACLOG	HACLOG generates the page and column headers for all three sections of the equipment interface group logic data report.
HACSEQ	HACSEQ generates the page and column headers for all three sections of the equipment interface group sequence data report.
HACSF	HACSF generates the page and column headers for both sections of the equipment interface group signal form data report.
HACSWT	HACSWT generates the page and column headers for both sections of the equipment interface group switching form/time data report.
HACWIR	HACWIR generates the page and column headers for both sections of the station wiring data report.
LSTWIR	LSTWIR generates a report of the station wiring data requirements. This report is generated in two sections.
QCON	QCON reads past the station connector data if this data section is not to be reported.
QGRP	QGRP reads past the signal form, logic, switching form/time and sequence data for an equipment interface group for which no output has been requested.
QLOG	QLOG reads past the logic data of an equipment interface group if that data section is not to be reported.
QSEQ	QSEQ reads past the sequence data of an equipment interface group if that data section is not to be reported.
QSF	QSF reads past the signal form data of an equipment interface group if that data section is not to be reported.

QSTN — QSTN reads past all the data for an aircraft weapons station in the process of positioning the Aircraft Master File Data Tape to the start of the data for the requested station.

QSWT — QSWT reads past the switching form/time data of an equipment interface group if that data section is not to be reported.

QWIR — QWIR reads past the station wiring data if this data section is not to be reported.

3. RUNNING INSTRUCTIONS

a. Deck Setup. The deck setup for running the Aircraft Station Data Retrieval Program on the CDC 6600 at Eglin AFB is as follows:

```
EGLIN JOB CARD
SAD, OUTPUT, UP1.
REQUEST, TAPE 8.
REQUEST, TAPE 12.
REQUEST, TAPE 13.
FTN.
LOAD, LGO.
EXECUTE.
7/8/9
PROGRAM AF305 (INPUT, OUTPUT, TAPE5=INPUT, TAPE6=OUTPUT, TAPE8,
   TAPE 12, TAPE 13)
Source decks for AF305 and all its subroutines
7/8/9
Data cards defining data sections to be reported.
6/7/8/9
```

Tape 8 is the input Aircraft Master File Data Tape. Tapes 12 and 13 are scratch tapes.

b. Estimated Run Time and Pages of Output

(1) Run time and pages of output for AF305 are functions of the number of equipment interface groups, data sections and aircraft circuits involved.

(2) The run time for this program should be no more than one minute of central processor time on the Eglin AFB CDC 6600 computer.

(3) The quantity of printed output for each requested data section is approximately one page for each fifty circuits or connectors contained in the data section.

4. INPUT

a. Card Input. The card input for the Aircraft Station Data

Retrieval Program consists of punched data cards which define which station is to be reported and which data sections for that station or for equipment interface groups within that station are to be reported. For any one aircraft station, all subsections or any combination of subsections of data may be requested by the user. The formats for the data card input for the Aircraft Station Data Retrieval Program are as follows:

(1) The first data card defines the aircraft name, which is used only for page header information.

Card Columns	Format	Description
1-12	3A4	Aircraft Identification.

(2) The second data card defines which aircraft station is to be reported.

Card Columns	Format	Description
1-2	A2	Aircraft Station Number.

(3) The third data card defines the station data sections and the default data sections, which are reported for any equipment interface group which does not specifically request data sections.

Card Columns	Format	Description
1-4	A4	First data section keyword.
6-9	A4	Second data section keyword.
11-14	A4	Third data section keyword.
16-19	A4	Fourth data section keyword.
21-24	A4	Fifth data section keyword.
26-29	A4	Sixth data section keyword.

Allowable keywords are:

CONN	-	Connector data for station
WIRE	-	Wiring data for station
SIGN	-	Signal form data for equipment interface group
LOGI	-	Logic data for equipment interface group
SWIT	-	Switching form/time data for equipment interface group
SEQU	-	Sequence data for equipment interface group
ALLb	-	All data sections for station or equipment interface group
(Blank)	-	Null keyword

Erroneous keywords cause a warning error diagnostic and execution continues.

(4) The fourth data card is a control card defining whether all or selected equipment interface groups are to be reported.

Card Columns	Format	Description
1-4	A4	ALLb
or 1-15	A4	SELECTED GROUPS

(5) If the fourth card was an ALL card (all equipment interface groups to be reported), those data sections named in the third data card (default data sections) will be reported for each equipment interface group of the station. No further input card data is therefore required in this case.

If the fourth data card requested SELECTED GROUPS, the user must define each equipment interface group and data sections which are to be reported. One card is required for each equipment interface group and its data sections which are to be reported as follows:

Card Columns	Format	Description
1-3	I3	Store equipment interface group code number.
5-6	I2	Suspension device equipment interface group code number.
8-11	A4	First data section keyword.
13-16	A4	Second data section keyword.
18-21	A4	Third data section keyword.
23-26	A4	Fourth data section keyword.

Allowable keywords are:

SIGN	-	Signal form data, this equipment interface group
LOGI	-	Logic data, this equipment interface group
SWIT	-	Switching form/time data, this equipment interface group
SEQU	-	Sequence data, this equipment interface group
ALLb	-	All of the above sections for this equipment interface group
(Blank)	-	Null Keyword

If columns 8-26 are blank, the default data sections defined on the third data card are assumed.

CARD COLUMNS

CARD NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23 80
1		F	-	1	1	1	E																
2		0	2																				
3		C	Ø	N	N		W	I	R	E		L	Ø	G	I		S	E	Q	U			
4		S	E	L	E	C	T	E	D		G	R	O	U	P	S							
5		0	0	1		0	0																
6		0	0	2		0	0		S	I	G	N		S	W	I	T		S	E	Q	U	
7		9	9	9																			

Figure 22. Sample Card Input For Aircraft Station Data Retrieval Program

The last data card of the individual equipment interface group definitions must be a dummy card with 999 in Columns 1-3.

(6) A sample data card input set is shown in Figure 22.

b. Tape Input. The Aircraft Station Data Retrieval Program requires the Aircraft Master File Data Tape and two scratch tapes as input.

5. OUTPUT

a. Diagnostic Messages. The Aircraft Station Data Retrieval Program may generate the following diagnostic messages:

SUBROUTINE	DIAGNOSTIC MESSAGE
AF305	"ERROR--REQUESTED A/C STATION NOT ON MASTER FILE. REQUESTED STATION NO. = nn RUN TERMINATED." The aircraft station number on the second data card is mispunched or the wrong master file tape was used.
DEF	"ILLEGAL STATION DATA SECTION REQUEST. WORD IS -- nnnn BAD WORD IGNORED, PROGRAM EXECUTION CONTINUES." An illegal keyword for defining requested data sections at the station level (input card number 3) is used. Check for keypunch errors. Legal codes are defined in the INPUT section of this report for AF305.
DEF	"ILLEGAL DATA SECTION OPTION FOR EQ. GROUP nnn-nn BAD WORD IS -- nnnn BAD WORD IGNORED, EXECUTION CONTINUES." An illegal keyword appears in the definition of requested data sections for an equipment interface group. Check for keypunch errors. Legal codes are defined in the INPUT section of this report for AF305.

b. Description of Printed Output. The Aircraft Station Data Retrieval Program summarizes all characteristics for each connector or circuit for each requested data section at the requested aircraft station.

(1) The output is headed by a page of printout which summarizes all user-input definitions of data sections to be reported.

(2) If the aircraft station connector data section is

requested for reporting, each connector characteristic of each connector of the given station is reported.

(3) If the aircraft station wiring data section is requested for reporting, each wiring data characteristic for each electrical circuit at the given station is reported.

(4) For each signal form data section (for a given equipment interface group) which is requested for reporting, each signal form data characteristic for each electrical circuit within the given equipment interface group is reported.

(5) For each logic data section (for a given equipment interface group) which is requested for reporting, each logic data characteristic for each electrical circuit within the given equipment interface group is reported.

(6) For each switching form/time data section (for a given equipment interface group) which is requested for reporting, each switching form/time data characteristic for each electrical circuit within the given equipment interface group is reported.

(7) For each sequence data section (for a given equipment interface group) which is requested for reporting, each sequence data characteristic for each electrical circuit within the given equipment interface group is reported.

Off-state or on-state matrix entries are shown as: A/C connector identification number; dash; A/C circuit pin letter; asterisk if pin lower case (else blank); equal sign; A/C sequence requirement (A = active, I = inactive, O = optional); semi-colon, as in:

```
102-A *=A;     or
106-BB =I;
```

c. Sample Output. Sample printed output for this computer program is shown in Figure 23.

SIGNAL FORM DATA (SECTION 1)

AIRCRAFT F-TCA STATION NO. 01 EQUIPMENT GROUP 001-00 PAGE 1

ON STATE CIRCUIT VOLTAGE

A/C CIRCUIT FUNCTION NO. STN REF	CKT	BRCH	CIRCUIT TYPE GRD	SOURCE	CKT LOAD	CKT SWT	CORR. LIMTR	OFF STATE	MULTI WIRE STORE CONN.	SOURCE VALUE MIN. VOLTS	MAX. VOLTS	TYPE	MINIMUM INTERFACE VOLTAGE
01	1			RETURN	NO	YES	NO	PARALLEL LOAD TO GRD		0.	0.	OTHER	0.
01	2			RETURN	NO	NO	NO	GROUNDED		0.	0.		0.
01	3			POWER	YES	NO	NO	OPEN CIRCUIT		0.	0.		0.
01	4		N	RETURN	NO	NO	NO	GROUNDED		0.	0.		0.
01	5			POWER	YES	NO	NO	OPEN CIRCUIT		0.	0.		0.
01	6			RETURN	NO	YES	NO	OPEN CIRCUIT		0.	0.		0.
01	7			POWER	YES	NO	NO	OPEN CIRCUIT		0.	0.		0.
01	8			RETURN	NO	NO	NO	GROUNDED		0.	0.		0.
01	9			POWER	NO	YES	NO	OPEN CIRCUIT		105.000	125.000	AC	103.000
01	10	A		POWER	YES	NO	NO	OPEN CIRCUIT		0.	0.		0.
01	10	B		POWER	YES	NO	NO	OPEN CIRCUIT		0.	0.		0.
01	11	A		POWER	NO	YES	YES	GROUNDED		24.000	32.000	DC	22.000
01	11	A		POWER	NO	YES	NO	GROUNDED		24.000	32.000	DC	22.000
01	12			RETURN	YES	YES	NO	OPEN CIRCUIT		0.	0.	DC	0.
01	13			POWER	NO	YES	NO	OPEN CIRCUIT		24.00	32.000	DC	22.000
01	14		N	RETURN	NO	NO	NO	GROUNDED		0.	0.		0.

100

Figure 23. Sample Output for Aircraft Station Data Retrieval Program.

SECTION X

AIRCRAFT MASTER FILE GENERATION PROGRAM

1. METHOD

The following is a description of the procedure used by the Aircraft Master File Generation Program (ACGEN) to generate an Aircraft Master File Data Tape from the corresponding aircraft punched data cards:

a. Read from a punched card the number of aircraft stations for the aircraft.

b. Perform the following for each aircraft station:

(1) Read from a punched card the station number, number of station circuits, and the number of equipment interface groups. Write these three values on the Aircraft Master File Data Tape.

(2) Read one punched card for each connector at the station and output this data on the tape, with one record per input connector card.

(3) Read one punched card for each circuit at the station which contains the wiring data for the circuit and output this data on the tape, with one record per input wiring data card.

(4) Perform the following for each equipment interface group at the aircraft station:

(a) Read the equipment interface group number and the number of circuits within the equipment interface group; write these values on the tape.

(b) Read one signal form data punched card for each circuit in the equipment interface group and write this data on the tape, with one record per input card.

(c) Read one logic data punched card for each circuit in the equipment interface group and write this data on the tape, with one record per input card.

(d) Read one switching form/time data punched card for each circuit in the equipment interface group and write this data on the tape, with one record per input card.

(e) Read one or more sequence data punched cards for each circuit in the equipment interface group (continuation cards may be used for the on-state, off-state cross-reference matrix) and write this data on the tape, with one record per input card.

(5) Proceed through step b(4) for the next equipment interface group at the station until all equipment interface groups at the station have been processed.

c. Repeat the steps outlined in step b above for each subsequent aircraft weapon station until all have been processed.

d. Write a dummy aircraft station header record (as in step b(1) above) which contains an aircraft station number of ** to signify the end of the aircraft file.

2. SUBROUTINES

The Aircraft Master File Generation Program utilizes only a mainline module named ACGEN.

3. RUNNING INSTRUCTIONS

a. Deck Setup. The deck setup for running the Aircraft Master File Generation Program on the CDC 6600 computer at Eglin AFB is as follows:

```
EGLIN JOB CARD
SAD, OUTPUT, UP1.
REQUEST, TAPE 8.
FTN.
LOAD, LGO.
EXECUTE.
7/8/9
PROGRAM ACGEN (INPUT, OUTPUT, TAPE5 = INPUT, TAPE6 = OUTPUT,
   TAPE8)
Source deck for ACGEN mainline
7/8/9
Data cards for all aircraft stations
6/7/8/9
```

b. Estimated Run Time and Pages of Output

(1) Run time and volume of output for the Aircraft Master File Generation Program are dependent on the number of aircraft stations, equipment interface groups, and circuits.

(2) The Aircraft Master File Generation Program should require no more than one minute of central processing time on the Eglin AFB CDC 6600 computer.

(3) This program generates two to ten pages of printed output.

4. INPUT

a. Card Input. The card input for the Aircraft Master File Generation Program is the set of punched cards for all data sections at all defined weapon stations for the aircraft. The control card

formats and order of data sections are as follows:

(1) The first card defines the number of aircraft weapon stations being defined for the aircraft:

Card Columns	Format	Description
1-2	I2	Number of aircraft stations

(2) The data for each aircraft station with each station being headed by a card are as follows:

Card Columns	Format	Description
1-2	A2	Station number
3-6	I4	Number of circuits at station (i.e., number of wiring data cards)
7-9	I3	Number of equipment interface groups at the station

(3) The station header card is followed by the station connector data. The format for a station connector data card is given in Section IV.

(4) The station connector data is followed by the station wiring data. The number of data cards in this section is defined in the station header card. The format for a station wiring data card is shown in Section IV.

(5) The data sections for each equipment interface group follow the station wiring data. Each equipment interface group has a header card as follows:

Card Columns	Format	Description
1-2	A2	Station number
4-6	I3	Equipment interface group; store code number
8-9	I2	Equipment interface group; suspension device code number
10-13	I4	Number of aircraft circuits in equipment interface group

(6) The equipment interface group header card is followed by the signal form data for the equipment interface group. The number of cards in this section is defined on the equipment interface group header card. The format for an aircraft signal form data card is shown in Section IV.

(7) The signal form data section is followed by the logic data for the equipment interface group. As with the signal form data, there is one punched card for each circuit in the equipment interface group, and the format for an aircraft logic data card is shown in Section IV.

(8) Next come the switching form/time data for the equipment interface group, with one punched card for each circuit in the equipment interface group. The format for the switching form/time data card is shown in Section IV.

(9) Lastly for each equipment group are the sequence data cards. Since some circuits may require more than one data card to define off-on state matrix requirements, this data section may contain more cards than the other equipment interface group sections. The format for the sequence data card is shown in Section IV.

(10) The next card in the data begins the next equipment interface group for the station, or if the proceding equipment interface group was the last for its station, the next data card begins the next aircraft weapon station.

(11) No special data card is required after the last aircraft station's data input has been completed, as the counter for the number of input stations as defined on the first data card is the controlling mechanism for ending the output file.

b. Tape Input. The Aircraft Master File Generation Program uses no tape input.

5. OUTPUT

a. Diagnostic Messages.

The Aircraft Master File Generation Program generates the following diagnostic messages, which are self-explanatory:

(1) "THIS AIRCRAFT HAS nn STATIONS"

(2) "A/C STATION nn HAS nnnnn CIRCUITS AND nnn EQUIPMENT INTERFACE GROUPS"

(3) "CONNECTOR INPUT OK FOR STATION nn"

(4) "WIRING DATA INPUT OK FOR STATION nn, nnnn CIRCUITS INPUT"

(5) "SIGNAL FORM INPUT OK FOR EQ, GROUP nn-nnn-nn, nnnn CIRCUITS INPUT"

(6) "LOGIC INPUT OK FOR EQ. GROUP nn-nnn-nn"

(7) "SWITICHING F/T INPUT OK FOR EQ. GROUP nn-nnn-nn"

(8) "SEQUENCE INPUT OK FOR EQ. GROUP nn-nnn-nn"

b. Description of Printed Output.

The only printed output generated by the Aircraft Master File Generation Program are the diagnostic messages listed above, which are generated for each data section processed. In the event of a program run termination due to faulty data, the diagnostics enable the user to determine the data section containing the error.

c. Sample Output

Sample printed output for this computer program is available upon request from the Air Force Armament Laboratory (DLJA), Eglin AFB, Florida.

d. Tape Output

This program generates the Aircraft Master File Data Tape for a given aircraft. This tape is a binary file containing one record for each input punched data card. The order of records on this file is shown in Section III.

SECTION XI

REVISED EQUIPMENT DATA RETRIEVAL PROGRAM

1. METHOD

The Equipment Data Retrieval Program has been revised to report fully those equipment data sections added during the course of developing the analytical reports referenced in Section VI, VII and VIII (supplementary connector data, supplementary signal form data, supplementary logic data, switching form/time data, and sequence data).

The basic program methodology has remained the same, with alterations to the corresponding section of AFATL-TR-73-214, Phase I, October 1973, being only the obvious ones implied by the addition of the new data sections.

2. SUBROUTINES

a. Unmodified Program Modules. The following subroutines required no modifications from the Phase I Equipment Data Retrieval Program:

BUMBLE
BUZZ1
BUZZ2
BUZZ3
HDRL
LOGH
LOGLST
LOGPAS
OPNUM
OPOA
OPSEL
SFDICT
SFH
SFLIST
SFPASS
TETE

b. Modified Program Modules. The following program modules required minor modifications to process the new format data, but retained the same basic functional usage:

AF201 (main program)
CONLST
CONNIE
NSTOR
READOP

c. New Program Modules. The following new program modules were added to the Equipment Data Retrieval Program to process and report the new equipment data documentation sections:

HLGSUP	HLGSUP generates the page and column title headings for the supplementary logic data section report (LOGSUP).
HSEQL	HSEQL generates the page and column title headings for the sequence data section report (LISSEQ).
HSFSUP	HSFSUP generates the page and column title headings for the supplementary signal form data section report (SFSUP).
HSWT	HSWT generates the page and column title headings for the switching form/time data section report (LISSWT).
LISSEQ	LISSEQ controls the reporting of the sequence data requirements for each equipment circuit. LISSEQ directly generates the first section of this report, and writes the off-state and on-state matrix data on scratch files. Subroutine OFFON is called to report the two matrices.
LISSWT	LISSWT generates the report of the switching form and time requirements for each equipment circuit. This report is generated in two sections.
LOGSUP	LOGSUP generates the report of the supplementary logic data for each equipment circuit. This report is generated in two sections.
OFFON	OFFON generates reports of the off-state and on-state matrix sequence requirements for each equipment circuit for LISSEQ.
SEQPAS	SEQPAS reads past the sequence data of an equipment if that data section is not to be reported.
SFSPAS	SFSPAS reads past the supplementary signal form data of an equipment if that data section is not to be reported.
SFSUP	SFSUP generates the report of the supplementary signal form data for each equipment circuit. This report is generated in two sections.
SLOGP	SLOGP reads past the supplementary logic data of an equipment if that data

	section is not to be reported.
SWTPAS	SWTPAS reads past the switching form/ time data of an equipment if that data section is not to be reported.

3. RUNNING INSTRUCTIONS

a. Deck Setup. The deck setup for running the Equipment Data Retrieval Program on the CDC 6600 at Eglin AFB is as follows:

```
EGLIN JOB CARD
SAD, OUTPUT, UP1.
REQUEST, TAPE 9.
REQUEST, TAPE 12.
REQUEST, TAPE 13.
FTN.
LOAD, LGO.
EXECUTE.
7/8/9
PROGRAM AF201 (INPUT, OUTPUT, TAPE5 = INPUT, TAPE6 = OUTPUT,
   TAPE 9, TAPE 12, TAPE 13)
Source decks for AF201 and all its subroutines
7/8/9
Data cards defining equipment data sections to be reported
6/7/8/9
```

Tape 9 is the master equipment data file.

b. Estimated Run Time and Pages of Output

(1) The Equipment Data Retrieval Program should require no more than 2 minutes of central processing time on the Eglin AFB CDC 6600 computer.

(2) For each equipment requested, the quantity of printed output is dependent on the report sections requested and the number of circuits as follows:

(a) The operational data section generates twelve pages of output.

(b) The introductory (connector) data section generates one page of output.

(c) The electrical signal form data section (original and supplementary data) generates five pages of output for each fifty equipment circuits.

(d) The electrical logic data section (original and supplementary data) generates five pages of output for each fifty equipment circuits.

(e) The electrical switching form/time data section generates two pages of output for each fifty equipment circuits.

(f) The electrical sequence data section generates three to twenty-five pages of output for each fifty equipment circuits, depending on the number of off-on state matrices entries.

4. INPUT

a. Card Input. The card input for the Equipment Data Retrieval Program consists of punched data cards which define which data sections of which equipments on the master equipment data file are to be retrieved and reported. There is a limit of twenty-five equipments which can be summarized in one run of this program. For any one equipment, any combination or all subsections of data may be requested by the user.

(1) Each equipment to be reported is defined on one input punched card having the following format:

Card Columns	Format	Description
1-6	I6	Equipment identification number
8-11	A4	First optional data section keyword
13-16	A4	Second optional data section keyword
18-21	A4	Third optional data section keyword
23-26	A4	Fourth optional data section keyword
28-31	A4	Fifth optional data section keyword
33-36	A4	Sixth optional data section keyword

(2) Legitimate keywords for defining data sections to be reported are:

Keyword	Data Section(s)
OPER	Operational data, both numerical and selective characteristics
INTR	Introductory (connector) data
SIGN	Electrical signal form data for each circuit (original and supplementary)
LOGI	Electrical logic data for each circuit (original and supplementary)

Keyword	Data Section(s)
SWIT	Electrical switching form/time data for each circuit
SEQU	Electrical sequence data for each circuit
ELEC	Electrical data for each connector and each circuit (signal form, logic, switching form/time, and sequence)
ALLb	All of the above report sections
(Blank)	Null Keyword

Any other value in any of the keyword fields is ignored; that is, is treated as a blank (null) keyword.

(3) The last card of the user card input must have 999999 as the equipment identification number (card columns 1-6).

b. Tape Input. The Equipment Data Retrieval Program requires the master equipment data file and two scratch tapes as input.

5. OUTPUT

a. Diagnostic Messages. The following diagnostic messages may be printed by the Equipment Data Retrieval Program (AF201):

Subroutine	Diagnostic
AF201	"NO LISTINGS REQUESTED--RUN TERMINATED" This message will be generated if the user does not input any punched cards requesting the retrieval of equipment data.
CONLST	"THIS STORE HAS NO ELECTRICAL DATA" If the user requests that the introductory (connector) data be listed for an equipment which has no electrical data, this message will be generated. Processing will continue for the next equipment in the processing list.
SFSUP	"nnnnnn HAS NO SUPPLEMENTARY SIGNAL FORM DATA" The indicated equipment does not contain the new formatted data sections. Processing continues.
LOGSUP	"nnnnnn HAS NO SUPPLEMENTARY LOGIC DATA" The indicated equipment does not contain the new formatted data sections. Pro-

Subroutine	Diagnostic
	cessing continues.
LISSWT	"nnnnnn HAS NO SWITCHING FORM/TIME DATA" The indicated equipment does not contain the new formatted data sections. Processing continues.
LISSEQ	"nnnnnn HAS NO SEQUENCE DATA" The indicated equipment does not contain the new formatted data sections. Processing continues.

b. Description of Printed Output. The Equipment Data Retrieval Program summarizes all operational data characteristics and/or all characteristics for each connector or circuit for each requested data section of each requested equipment on the master equipment data file.

(1) The output is headed by a page of printout which summarizes all user-input definitions of equipment data sections to be reported.

(2) For each equipment requested for reporting, each characteristic of each requested data section is reported as follows:

(a) The characteristic names and data values for the three characteristics 301-303 are printed on the first page of the operational data section. This output serves as a header for the equipment and is not optional.

(b) If requested, the operational data section will be reported. Modifications made in phase two of this study do not alter the reporting of this data section; the user is therefore referred to the description of output for this section contained in pages 102 ff, AFATL-TR-73-214, Volume 1, October 1973.

(c) If requested, the introductory (connector) data section will be reported. This data section has been modified to include the new supplementary data characteristics for each connector.

(d) If requested, the electrical signal form data section will be reported. This output reports all characteristic data values for both the orginal and supplementary signal form data sections for each circuit of the equipment. The orginal signal form data is reported in the first three sections, while the supplementary signal form data is reported in the last two sections. If the supplementary data is not present, a diagnostic message informs the user of this fact.

(e) If requested, the electrical logic data section will be reported. This output reports all characteristic data values for both the original and supplementary logic data sections for each circuit of the equipment. The original logic data is reported in the first three sections, while the supplementary logic data is reported in the last two sections. If the supplementary data is not present, a diagnostic message informs the user of this fact.

(f) If requested, the electrical switching form/time data section will be reported. This output reports all characteristic data values of the switching form/time data section for each circuit in the equipment. This report is generated in two sections. If this data section is not present, a diagnostic message so informs the user.

(g) If requested, the electrical sequence data section will be reported. This output reports all characteristic data values of the sequence data section, including off-state and on-state matrix requirements, for each circuit in the equipment. This report is generated in three sections. If this data section is not present, a diagnostic message so informs the user.

Off-state or on-state matrix entries are shown as equipment circuit number; sequence requirement (A = active, I = inactive); semi-colon, as in:

3A; or

11 I;

c. Sample Output. Sample printed output for this computer program is shown in Figure 21.

EQUIPMENT DATA RETRIEVAL PROGRAM

SUMMARY OF USER INPUT SELECTIONS

EQUIP IDENT	REQUEST DATA SECTIONS				
	OPER	INTRO	S.F.	LOGIC	SWITCH	SEQUENCE
50190		YES	YES	YES	YES	YES

50190 INTRODUCTORY (CONNECTOR) DATA

STORE OR SUSP. DEV. NOMENCLAT.	STORE OR SUSP. DEV. IDENTIFIC.	SECURITY CLASSIF.	ELECTRICAL CONNECTOR TYPE NUMBER	CODE	NUMBER ACTIVE CKTS	NUMBER SPARE PINS	CONNECTOR INSERT COMPATIBL. CODE NO.	NUMBER OF CONN. PIN ISOLATION CIRCUITS
AGM-XA1	05 01 90	UNCLASS.	MS3102A-10SL-3P	301	2	1	A 11	0
AGM-XA1	05 01 90	UNCLASS.	MS3102A-24-7P	302	15	1	A 21	0

TOTAL NUMBER OF CONNECTORS	2
TOTAL NUMBER ACTIVE & SPARE CIRCUITS	19
TOTAL NUMBER OF CONN. PIN ISOL. CKTS.	0

Figure 24. Sample Output for Revised Equipment Data Retrieval Program

SECTION XII

CONCLUSIONS AND RECOMMENDATIONS

1. CONCLUSIONS

The Phase II Stores Interface Data Handling Analysis (SIDHA) has accomplished its objective of augmenting the system with the capability to test aircraft/store electrical interface compatibility by a completely computerized means. This system improvement will greatly aid those agencies concerned with performing aircraft/stores compatibility tests. Although several other factors such as mechanical fit, ground clearance, flight dynamics, and store separation characteristics must be tested to determine the overall compatibility between the aircraft and store, the electrical compatibility testing aspects present a unique problem. It is not practical, or wise, to mate a new store to an existing aircraft station electrical disconnect unless a complete electrical compatibility analysis has been accomplished. To do otherwise may result in damage to electrical components within the aircraft or store. More seriously, an inadvertent release or firing may occur. The degree of testing provided by the Stores Interface Data Handling and Analysis System is sufficient to detect both electrical operation and/or safety incompatibilities. By having a prior knowledge of compatibility facts, the system user can readily evaluate the situation and, if feasible, make the required aircraft wiring and/or component changes accordingly. After all incompatible conditions are corrected (and the aircraft data file is updated accordingly) the SIDHA system electrical compatibility test should be repeated to verify that all incompatible conditions have been corrected and no new ones were introduced.

2. RECOMMENDATIONS

a. Aircraft and Store Data Documentation

The F-111E Aircraft Stores Interface was documented in the formats described in Section IV as part of this Phase II development activity. Unfortunately, this aircraft data file was not tested using the new Phase II computer programs since the AFATL Store Data File was not modified to accept all the additional store characteristic data that is required for a complete analysis. The Phase II computer programs were tested and debugged using a test case aircraft data file and several test case (dummy) stores. It is strongly recommended that the AFATL Store Data File be upated to include data for all the required electrical characteristics. Once updated, the file can then be used to test the compatibility of stores for the F-111E and any other aircraft that may be documented and filed in the system.

b. System Maintenance

The Store Interface Data Handling and Analysis aircraft

and store data files should be maintained in a current status to assure the accuracy and validity of system output data. It is recommended that a cognizant military agency be designated as the office of prime responsibility. This agency should be on distribution for all applicable aircraft and store technical order changes. New aircraft and store data should also be made available for incorporation into the SIDHA system.

c. System Utilization

A considerable amount of time and effort was expended to develop the Stores Interface Data Handling and Analysis System and analytical benefits are too great to be overlooked. It is therefore recommended that the availiability of the system be made known to the appropriate military agencies and weapon system manufacturers. If possible, the most involved Government Agencies should be briefed on the system and its usefulness as a cost savings analytical tool. Furthermore, the Sponsor should consider the feasibility of having AFATL-TR-73-214 and this report listed as design guides or reference documents for all R&D activities that are concerned with the electrical management of airborne ordnance.

d. System Improvements

It is apparent that the electrical data processing capabilities of the system are now adequate for general use without any further improvements. The system may require some minor changes as its use increases. These type changes will most likely be concerned with revising the systems' computer programs to facilitate the addition of new data sorting modes that may be required to support specialized analytical studies.

(The reverse of this page is blank)

INITIAL DISTRIBUTION

Hq USAF/RDQRM	2
Hq USAF/XOXFCM	1
AFSC/SDWM	1
ASD/ENYS	1
AFWL/SUL	1
AFWL/SECA	1
AUL (AUL/LSE-70-239)	1
USNWC/Code 753	1
Nav Wpns Eval Fac/Code W	1
Sandia Lab/Tech Lib Org 3141	1
Rand Corp/Library-D	1
DDC	2
AFATL/DLOSL	2
AFATL/DL	1
AFATL/DLOU	1
AFATL/DLY	1
AFATL/DLGS	1
AFATL/DLR	1
AFATL/DLXP	1
AFATL/DLM	1
AFWL/SES	1
AFAL/AAA	1
AFATL/DLJC	1
AFATL/DLJA	15
TAWC/TRADOCLO	1
Hq USAF/SAMI	1
ASD/ENYEHM	1
Ogden ALC/MMNOP	2
AFWL/LR	2
AFIS/INTA	1
USAF/SAMID	1
USA Aviation School/ATSAV-CTD	1
Office of Chief Naval Ops	1
ADTC/XRC	1

(The reverse of this page is blank)

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)

Hi-Shear Corporation
2600 Skypark Drive
Torrance, California

2a. REPORT SECURITY CLASSIFICATION

Unclassified

2b. GROUP

3. REPORT TITLE

STORES INTERFACE DATA HANDLING ANALYSIS - PHASE II. VOLUME I.
TECHNICAL DISCUSSION

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report - January 1974 to November 1974

5. AUTHOR(S) (First name, middle initial, last name)

Michael J. Lauro
George T. Collins

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
January 1975	127	

8a. CONTRACT OR GRANT NO	9a. ORIGINATOR'S REPORT NUMBER(S)
F08635-73-C-0094	
b. PROJECT NO 2070	
c. Task No. 03	9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d. Work Unit No. 001	AFATL-TR-75-3, Volume I

10. DISTRIBUTION STATEMENT

Distribution limited to U. S. Government agencies only; this report documents test and evaluation; distribution limitation applied January 1975. Other requests for this document must be referred to the Air Force Armament Laboratory (DLJA), Eglin Air Force Base, Florida 32542.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
Available in DDC	Air Force Armament Laboratory Air Force Systems Command Eglin Air Force Base, Florida 32542

13. ABSTRACT

This technical report describes those improvements made to the Store Interface Data Handling Analysis - Phase I for automating Aircraft/Store Electrical Compatibility Analysis and computerized testing procedures. Until now, a manual method was used to compare hardcopy aircraft stores management system design data against store interface data generated by the Phase I Data Processing System. The Improved system eliminates this time consuming task by automatically performing the complete interface compatibility analysis/test. A set of universal aircraft data documentation formats and new computer programs were developed for this added system capability. The new computer programs were designed to disclose any electrical incompatibility that may exist between the aircraft and store selected for comparison. New computer printouts provide detail pin to pin and general interface compatibility information. Diagnostic message printouts are also provided to define each specific incompatibility condition that was detected. The improved system may be used to evaluate or verify the adequacy of an aircraft to control its existing store complement. Essentially, the improved system would compare the electrical design limits of the aircraft stores management system against store electrical requirements that are contained in the AFATL Store Data File. Any incompatible or marginal interface condition will be detected. The system improvements described in this report will greatly reduce the time and cost associated with analyzing aircraft and stores from an electrical interface compatibility standpoint.

DD FORM 1 NOV 65 1473

UNCLASSIFIED
Security Classification

14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Store Interface Data Handling						
Aircraft/Store Electrical Interface Compatibility						
Computerized Testing Procedures						