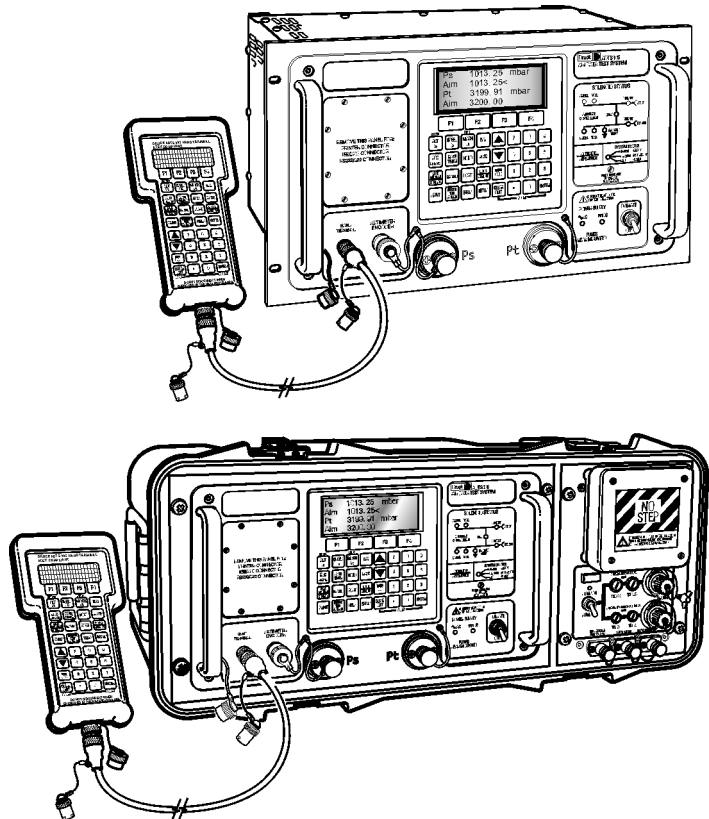


Druck Air Data Test Systems

Test Program Manager Version 4

Language Reference Manual - K230



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Erratum for K230 Issue No. 2

This erratum lists the corrections and additions to be made to K230 Issue No. 2, compatible with Version 5 software for the ADTS 405.

These commands can be used in a program stored and operated by a PC but, cannot be used in a resident program stored in the ADTS 405.

Commands	Page
HEADER	25
IF	27
READINGS	40
SUB	43

This command, in the simulation mode, only allows these sets of limits to used:

Command	Page	Limit set
AIRCRAFT	8	MAX STANDARD CIVIL

This command, supports additional arguments. Some arguments are not supported in a resident program stored in the ADTS 405.

Command	Page	Argument Supported	Argument not Supported by ADTS 405
PRINT	35	AIRCRAFT BREAK	ERROR TOL P/F '

Annex A FAR 43 Test Program

The program listed (FAR43PC.atp)* [page A4] can be used in a program stored and operated by a PC but, cannot be used in a resident program stored the ADTS 405. The file FAR43RES.atp* can be used in a resident program stored in the ADTS 405.

** supplied by Druck in the TPM package.*

Druck Publications Department 16th March 2001

Druck Test Program Manager Version 4.0 Language Manual

Introduction

This technical manual provides a programming language compatible with the requirements of a programming technician.

Scope

This language manual contains the operating codes and communications protocols for use with the user manual.

Software

This manual applies to software DK 124 version 4.00+.

Safety

- The manufacturer has designed this equipment to be safe when operated using the procedures detailed in this manual. Do not use this equipment for any other purpose than that stated.
- This publication contains operating and safety instructions that must be followed to ensure safe operation and to maintain the equipment in a safe condition. The safety instructions are either warnings or cautions issued to protect the user and the equipment from injury or damage.
- Use qualified* personnel for all procedures in this publication.

Pressure

Do not apply pressure greater the maximum safe working pressure to the equipment.

Maintenance

The equipment must be maintained using the manufacturer's procedures and should be carried out by authorised service agents or the manufacturer's service departments.

Technical Advice

For technical advice contact the manufacturer or subsidiary.

- * A qualified person must have specialist knowledge of programming for specified, authorized, aircraft test procedures.

Associated Druck Documents:

K114 ADTS 405 User Manual
K157 ADTS 405 SCPI User Manual
K220 LSU 100/101 User Manual

Druck Test Program Manager Version 4.0 Language Manual

Table of Contents

Preliminary pages	
Introduction	i
Scope	i
Table of contents (this table)	ii
Abbreviations	iv
Glossary	v
Section	page
1 INTRODUCTION	1
2 CREATING AND EDITING TEST PROGRAMS	1
3 TPM COMMAND STRUCTURE	5
AIM	7
AIRCRAFT	8
ALTCOR	9
ARINC	10
ASK	11
AUTOLEAK	12
AUTOLIMIT	13
BREAK	14
COL	15
COLDEF	16
Comments{}	17
CONTROL	18
DISPLAY	19
ECHO	20
GETKEY	21
GO	22
GOTO	23
GROUND	24
HEADER	25
HOLD	26
IF	27
INLIMIT	28
KEYLOCK	29
LABEL	30
LEAKTEST	31
LIMIT	32
LOAD	33
NUDGE	34
PRINT	35
PTONLY	39
RATETIME	40
READINGS	41
REM	42
SPEED429	43

Druck Test Program Manager Version 4.0 Language Manual

Table of Contents (contd.)

Section		page
	SUB	44
	TABLE	45
	TEST	47
	TITLE	48
	TX429	49
	UNITS	50
	VALVE	51
	WAIT	52
Annex A		A1
Annex B		B1
Annex C		C1

Druck Test Program Manager Version 4.0 Language Manual

Abbreviations

The following abbreviations are used in this manual; the abbreviations are the same in the singular and plural.

abs	Absolute
AC	Alternating current
ADTS	Air data test system
ALT	Altitude
ARINC	Air Radio Incorporated
ASI	Airspeed Indicator
ATE	Automatic test equipment
CAS	Calibrated airspeed
e.g.	For example
EPR	Engine pressure ratio
etc.	And so on
ETP	Execute test program
FAR	Federal Aviation Regulation
Fig.	Figure
ft	Feet
hPa	HectoPascal
Hz	Hertz
i.e.	That is
in	Inch
inHg	Inches of mercury
kg	Kilogram
km	Kilometre
kn	knot
kPa	KiloPascal
LED	Light emitting diode
LSU	Line Switching Unit
m	Metre
max	Maximum
mbar	Millibar
min	Minute or minimum
mm	Millimetre
No.	Number
PC	Personal computer
Ps	Static pressure
psi	Pounds per square inch
Pt	Total pressure (Pitot)
Qc	Differential pressure (Ps - Pt)
ref.	Reference
ROC	Rate of climb (vertical speed)
SCPI	Standard commands for programmable instruments
S/N	Serial number
TPM	Test program manager (Druck software package)
UK	United Kingdom
US	United States (of America)
Vc	Velocity calculated
+ve	Positive
-ve	Negative
°C	Degrees Celsius

Glossary

Terminology

The terminology used in this manual is specific and individual interpretation must not be introduced. The terms are defined as follows:

<u>Adjust</u>	To bring to a more satisfactory state; to manipulate controls, levers, linkages, etc. to return equipment from an out-of-tolerance condition to an in-tolerance condition.
<u>Align</u>	To bring into line; to line up; to bring into precise adjustment, correct relative position or coincidence.
<u>Assemble:</u>	To fit and secure together the several parts of; to make or form by combining parts.
<u>Calibrate:</u>	To determine accuracy, deviation or variation by special measurement or by comparison with a standard.
<u>Check:</u>	Make a comparison of a measure of time, pressure, temperature, resistance, dimension or other quality with a known figure for that measurement.
<u>Disconnect:</u>	To detach the connection between; to separate keyed or matched equipment parts.
<u>Dismantle:</u>	To take apart to the level of the next smaller unit or down to all removable parts.
<u>Examine:</u>	To perform a critical visual observation or check for specific conditions; to test the condition of.
<u>Fit:</u>	Correctly attach one item to another.
<u>Inspect:</u>	Review the work carried out by Specialists to ensure it has been performed satisfactorily.
<u>Install:</u>	To perform operations necessary to properly fit an equipment unit into the next larger assembly or system.
<u>Maintain:</u>	To hold or keep in any particular state or condition especially in a state of efficiency or validity.
<u>Make sure:</u>	To confirm that a proper condition exists; to find out with certainty.
<u>Operate:</u>	Ensure that an item or system functions correctly as far as possible without the use of test equipment or reference to measurement.

Druck Test Program Manager Version 4.0 Language Manual

<u>Readjust:</u>	To adjust again; to move back to a specified condition; to bring back to an in-tolerance condition.
<u>Reconnect:</u>	To rejoin or refasten that which has been separated.
<u>Refit:</u>	Fit an item which has previously been removed.
<u>Remove:</u>	To perform operations necessary to take an equipment unit out of the next larger assembly or system. To take off or eliminate. To take or move away.
<u>Repair:</u>	To restore damaged, worn out or malfunctioning equipment to a serviceable, usable or operable condition.
<u>Replace:</u>	Remove an item and fit a new or a serviced item.
<u>Reset:</u>	To put back into a desired position, adjustment or condition.
<u>Service:</u>	To perform such operations as cleaning, lubricating and replenishing to prepare for use.
<u>Test:</u>	Ascertain by using the appropriate test equipment that a component or system functions correctly.

1 INTRODUCTION

The purpose of this manual is to provide a full description of all the commands for the Druck Test Program Manager and the Druck Air Data Test System.

2 CREATING AND EDITING TEST PROGRAMS

Test Program Structure

Many different test sequences can be included in one test program such as all the tests on a pitot-static system. The different tests should be incorporated into the one test program if all the tests are normally run sequentially. Each unrelated test should be created and stored as a complete test program with an individual file name. Each program should be structured as follows:

- a. Each test program should consist of a number of tests.
- b. The test program should start with the TITLE command.
- c. When multiple instruments are to be tested, the READINGS command should be included next.
- d. Each test should start with the TEST command.

User instructions and information common to all the tests should be placed between the TITLE command and the first TEST command; use a combination of HEADER, PRINT and ASK commands. This part of the program will only be executed when the RUN ALL TESTS selection is made on the TPM.

A complete test program should be divided into as many tests as possible. The more tests there are, the more entry points there will be in the RUN SPECIFIC TEST selection during TPM execution. Any tests that share common data using STORE and RECALL must be combined into one TEST, e.g., altitude scale error, hysteresis and ground effect tests.

The UNITS should always be set before any associated commands are used. To generate a table of results, the required columns should be defined based on the items to be printed by the PRINT command and then columns switched on.

The headings for the columns should then be printed. The body of the test should now be included by using AIM, INLIMIT, WAIT and PRINT. NUDGE can be used if the test requires an increasing or decreasing value to a cardinal point rather than an exact value e.g., testing an airspeed switch.

Where a sequence of commands is to be repeated with changes only in the arguments, the TABLE command speeds up test program creation and uses less memory for the storage of the test program. If required, the test can be completed with a GROUND command.

Introduction and Creating a File

Example program

The following program is an example that illustrates the use of many of the commands. Comments after the commands are in italics and are not part of the test program.

TITLE "EXAMPLE"	<i>Test program title</i>
HEADER	<i>Inputs and prints header information</i>
DISPLAY "ENSURE SYSTEM IS FREE FROM ENTRAPPED MOISTURE"	<i>Displays user message and gets user to acknowledge by pressing ENTER</i>
PRINT	<i>Print a blank line</i>
TEST 1 "ALTITUDE SCALE AND HYSTERESIS CHECK"	<i>Name of test</i>
UNITS FT/KN	<i>Sets units to feet and knots</i>
AIM ROC 6000	<i>Rate of climb set to 6000 ft/min</i>
COLDEF 10 12 7 7 7	<i>Column widths of 10,12,7,7 and 7 characters wide</i>
COL ON	<i>Columns on, top of table printed</i>
PRINT " ALTITUDE" " INSTRUMENT" " ERROR" " LIMIT" " PASS/"	<i>Print headings in columns</i>
PRINT "" " READING" "" "" " FAIL"	
PRINT " (ft)" " (ft)" " (ft)" " (+-ft)"	
PRINT LINE	<i>Draw line across table</i>
TABLE DEF	<i>Start list of commands to be repeated</i>
AIM ALT ^1	<i>Value of altitude aim, argument 1</i>
INLIMIT ^2	<i>Wait for altitude to be inlimit, maximum time in argument 2</i>
WAIT 60	<i>Wait for 60 secs for temperature to stabilise</i>
PRINT NOM ^1 READ ALT STORE^3 ERROR TOL^4 P/F	<i>Print nominal value (argument 1), instruct user to enter altitude reading from instrument, store value if required for hysteresis check (STORE^0 does nothing) calculate and print the difference between the user reading and the nominal value, check against the limit (argument 4) and print the limit, print PASS or FAIL based on error and limit.</i>
SUB ^5	<i>If argument 5 has a file name, run the sub-test at this point.</i>

Druck Test Program Manager Version 4.0 Language Manual

TABLE DATA	<i>End of command list, start of argument list</i>
0 100 0 20 ""	<i>0 ft, 100 secs inlimit, no store, limit of ±20ft, no sub-test</i>
10000 200 1 60 "ASI"	<i>10000ft, 200 secs inlimit, store in store 1, limit of ±60, sub-test "ASI"</i>
30000 300 0 120 ""	<i>30000ft, 300 secs inlimit, no store, limit of ±120ft, no sub-test.</i>
TABLE END	<i>end of argument list</i>
COL OFF	<i>Print end of table</i>
AIM ALT 10000	<i>Go back to 10000ft</i>
INLIMIT 300	<i>Inlimit time of 300 secs.</i>
WAIT 60	<i>Wait 60 secs.</i>
PRINT "HYSTERESIS ERROR AT 10000FT = " RECALL1 'READ ALT ERROR " FEET"	<i>Print text, recall the previous instrument reading (altitude increasing) from store 1, get the instrument reading for altitude decreasing (not printed), calculate and print the error, print the final text.</i>
GROUND	<i>Go to ground.</i>

Introduction and Creating a File

This test program produces the following printed results:

Instrument under test	Calibration Equipment
Aircraft ..Avro RJ70	Test unitADTS 405F
Location ..Chester	Manuf'rDRUCK
Manuf'r ...Smiths	S/N300055
Type700	Calibrated date .7/8/91
S/N0614	Ground pressure .1015 mbar
General information	Temperature19 C
Test date .8/9/91	Client Information
Procedure .FAR43	Client
Data file .FAR0809.1	Client ref.
Operator ..J. SMITH	Our ref.
Signature	Certificate No ..
Inspector's signature	Date
Comments ..	

TEST 1 ALTITUDE SCALE AND HYSTERESIS CHECK

ALTITUDE (ft)	INSTRUMENT READING (ft)	ERROR (ft)	LIMIT (±ft)	PASS/FAIL
0	5	5	20	PASS
10000	10003	3	60	PASS
30000	30055	55	120	PASS

HYSTERESIS ERROR AT 10000FT = -11 FEET

Any printed results from the ASI test (next test in the listing) would follow on a new page after the end of the results for the main test program.

3 TPM COMMAND STRUCTURE

This section describes all the commands that are recognised by the TPM and are in alphabetical order. The commands are described using the following sections and notations:

Command key word:	identifies the command described by a key word or
Command function:	brief one-line description of the command function.
Description:	explains what the command does and how it can be used.
Format:	describes the exact format, or syntax, of the command.

Each command consists of key word(s) followed by the arguments. The arguments are the variable part of the command that makes it perform the required function.

The following notations are used to describe the format:

CAPS	Entries in capitals must be entered exactly as shown
[]	Entries in square brackets are optional.
...	An argument followed by ... can be repeated as required.
<>	These are variables. If necessary, their use is described under "where:" in the command description.

The command variables are as follows:

<n>	An integer or whole number. Leading space or "+" is positive. Leading "-" is negative.
<state>	ON or OFF
<string>	Any string included in quotes e.g., PRINT "abc". Only valid for software versions V4.17 onwards - numeric expressions enclosed in (brackets) and "AIRCRAFT" are also accepted.
<value>	Required value as integer, real or engineering format number. e.g., AIM M 0.755. From software version V4.17 onwards numeric expressions enclosed in (brackets) and "AIRCRAFT" are also accepted.

Introduction and Creating a File

<parameter>	An ADTS parameter from the following list entered exactly as shown:	
	PS	pressure static
	QC	differential pressure
	PT	pressure total (Pitot) (ADTS 405 only)
	ALT	altitude
	VC	airspeed
	M	Mach
	EPR	EPR (engine pressure ratio)
	RATEPS	rate of static
	RATEQC	rate of Qc
	RATEPT	rate of Pt
	RATEEPR	rate of EPR
	ROC	rate of climb
	RATEVC	rate of airspeed
	RATEPSALT	Ps or ALT rate measured by RATETIME
	RATEQCSPD	Qc or speed rate measured by RATETIME
	DATEUK	system date UK format
	DATEUS	system date US format
	TIME	system time separation

All parameters in a command should be separated by one space or comma. Blank lines may be included. Each command should be terminated with a <CR>.

Note:

Before software version V4.17, the display statement only accepted quote enclosed "strings" as parameters. From software version V4.17 onwards, numeric expressions enclosed in (brackets) and "AIRCRAFT" are also accepted.

AIM

New set-point

Description

AIM enters a new set-point for the specified parameter using the value specified and in the units last specified. The parameter must be of the correct parameter type (aeronautical or pressure) to match the units selected.

The parameter associated with the AIM command affects the execution of later commands. If two different parameters are changed, it is important to specify them in the correct order. Unless ROC is to be tested, the AIM associated with rates of change should appear before AIM associated with values. If a nominal airspeed is to be set during altitude testing, the airspeed aim should be set first. The display changes to show the new aim value.

Note: *The ADTS 405 must be in controller mode before AIM commands can be used.*

Format

AIM <parameter> <value>

where:

<parameter> is the parameter to be changed.

<value> is the new set-point. This can be either a value or an expression which must be enclosed by (brackets).

Example

AIM ALT 6000

Associated commands

CONTROL, INLIMIT, LEAKTEST, AIRCRAFT, UNITS, LIMIT, NUDGE, ARINC

AIRCRAFT

Select limits

Description

Selects the set of limits to be used. The name of the limits must match the name set stored in the ADTS 405.

Format

AIRCRAFT <string>

where:

<string> matches the name in the ADTS 405.

"STANDARD" may be used for standard limits.

Example

AIRCRAFT "747-400"

Associated commands

AIM

ALTCOR

Altitude correction

Description

Enters a value for altitude correction.

Default: aeronautical units as set using UNITS or default as set in the ADTS 405.

Format

ALTCOR <value>

where:

<value> is altitude correction value.

Note: *The units of altitude correction can be aeronautical units of either FT/KN or M/KM/H and are selected using the UNITS command. If the current units are set to pressure measurement units then the ADTS default aeronautical units will be automatically used for altitude correction.*

Example

ALTCOR 30

ARINC

ARINC 565 limits

Description

Switches ARINC limits on/off.
Default: as set in the ADTS 405.

Format

ARINC <state>

where

<state> is ON or OFF

Examples

ARINC ON

Associated commands

LIMIT

ASK

Display user question

Description

Displays a user question on the screen and prints the answer. If the PRINT argument is included, the associated string is printed before the answer.

Format

ASK <string 1> [PRINT <string 2>] [;]

where:

<string 1> is the question displayed to the user

PRINT causes <string 2> to be printed before the answer

;
if ; is at the end, a new line will not be started'

Examples

ASK "Enter serial number of aircraft" PRINT "Serial no.:"

The print-out would look like

Serial no. :12345

Associated commands

DISPLAY, HEADER

AUTOLEAK

Auto leak recovery

Description

Switches auto leak recovery on or off. Auto leak recovery automatically regains control if the leak rate is too high on either channel.

Default: as set on ADTS.

Format

AUTOLEAK <state>

where:

<state> is ON or OFF

Example

AUTOLEAK ON

Associated command

AUTOLIMIT

AUTOLIMIT

Auto limit recovery

Description

Switches auto limit recovery on or off. Auto limit recovery automatically regains control if the pressure on either channel leaks outside of the selected limits.

Default: as set in the ADTS 405.

Format

AUTOLIMIT <state>

where:

<state> is ON or OFF

Example

AUTOLIMIT OFF

Associated command

AUTOLEAK

BREAK

Enables or disables the use of the QUIT key

(valid code for ADTS 405 software versions V4.17 onwards)

Description

If BREAK is set to ON then the QUIT key on the ADTS 405 or the ESC key on the PC can be used to exit a test program before completion. Setting BREAK to OFF, disables the QUIT and ESC keys and forces the completion of the test program before returning to manual mode. Default is BREAK ON.

Format

BREAK <state>

where:

<state> is ON or OFF

Example

BREAK ON

COL

Draw top or bottom line of a table

Description

This command is used after a table has been set-up with the command COLDEF. If COL is set to ON, it draws the top line of the table; if it is set to OFF, it draws the bottom one.

Format

COL <state>

where:

<state> is ON or OFF

Example

```
COLDEF 3 3 6
COL ON
PRINT "Alt" "800" "PASSED"
COL OFF
```

Note: *This command MUST be placed after COLDEF, if not an error occurs.*

Associated commands

COLDEF

COLDEF

Define columns

Description

Sets the number of columns and the width of each column. To draw a table, one character width will be used before the table, between each column and after the table.

Default: No columns defined.

Format

COLDEF <n> <n> [<n>]...

where:

<n> is the column width in characters

Examples

COLDEF 10 9 10

Note: This command *MUST* be placed before COL ON, if not an error occurs.

Associated commands

COL, PRINT

Comments {}

Multi-line remark

Description

All text in the {} brackets is ignored allowing multiple lines of comments to be placed in the code as if REM statement was placed in front of each line of code.

CONTROL

Controllers on

Description

Regain control from leak/measure mode.

Format

CONTROL

Associated commands

LEAKTEST

DISPLAY

Display user message

Description

Displays strings on screen, then prompts the user to press the ETP key to acknowledge. Each display line is 20 characters long and each string will go on a new line. Strings over 20 characters long will be truncated. Each screen displays up to 3 lines with a prompt to press the ETP key for the next screen.

Displaying the result of a numeric expression will also shows the appropriate units for the expression.

Note: *Before ADTS 405 software version V4.17, the display statement only accepted quote enclosed "strings" as parameters. From ADTS 405 software version V4.17 onwards numeric expressions enclosed in (brackets) and "AIRCRAFT" are also accepted.*

Format

DISPLAY <expression> <expression>...

where:

<expression> may be a string "enclosed by quotes" or a numeric expression (enclosed by brackets) or AIRCRAFT (displaying the current limits set).

Example

DISPLAY "Ensure unused ports" "are blanked"

ECHO

Displays user message

(valid code for ADTS 405 software versions V4.17 onwards)

Description

Displays up to four lines of text on the screen. Each line can contain up to twenty characters. This is different to the DISPLAY statement because the user is not prompted to press the ETP key; the screen is normally cleared after completion of the next instruction (exceptions - REM, LABEL and GOTO). This command can be followed by the WAIT command displaying a message for a specified time or the GETKEY command providing a user prompt. See WAIT or GETKEY for details.

Displaying the result of a numeric expression also displays the appropriate units for the expression.

Format

ECHO <expression>,<expression>...

where:

<expression> is a string "enclosed by quotes" or a numeric expression (enclosed by brackets) or AIRCRAFT (displaying the current limits set).

Example

```
ECHO " ", "Running Tests", "On Aircraft", AIRCRAFT  
WAIT 10
```

GETKEY

Wait for user response

(valid code for ADTS 405 software versions V4.17 onwards)

Description

This statement waits for the user to press one of the four function ('F') keys and then jumps to a defined LABEL in accordance with the result.

Format

GET KEY <F1>,<F2>,<F3>,<F4>

where:

<F1> <F2> <F3> <F4> are labels to jump to when the required key is pressed. These must match the <identifier> in exactly one label statement, the special NULL label MUST be used if no key press is required.

Example 1

```
ECHO "Press F1 or F2"
GETKEY F1_key, F2_key, NULL, NULL
LABEL F1_key
REM F1 Pressed
GOTO DONE
LABEL F2_key
REM F2 Pressed
LABEL DONE
```

In this example, the user is asked to press F1 or F2. The labels "F1_key" and "F2_key" follow GETKEY as first and second parameter and are assigned to the two first function keys. NULL is used as third and fourth parameter. Thus, the two other function keys are not used.

Example 2

```
ECHO "Press F1 or F2/F3"
GETKEY F1_key, F23_key, F23_key, NULL
LABEL F1_key
REM F1 Pressed
GOTO DONE
LABEL F23_key
REM either F2 or F3 Pressed
LABEL DONE
```

The same label "F23_key" follow GETKEY as second and third parameter. The program jumps to this label if the F2 or F3 function keys are pressed.

Note: *GETKEY is one word*

Associated command

LABEL

GO

Continue operation

Description

Allows manual intervention by pausing the program sequence. When the GO command is executed, "GO" flashes in the lower right hand corner of the ADTS 405 display screen. Press the ETP key or F4 to continue.

The GO command can also be used to nudge an instrument indication to a cardinal point, as in example 2 below. The nudge keys will only be active if KEYLOCK is off. To adjust to a cardinal point press NUDGE UP or NUDGE DOWN as required and then press the ETP key on the ADTS 405 or the Enter key on the PC.

Format

GO

Example 1

```
AIM ROC 6000  
AIM ALT 1000  
INLIMIT  
GO  
AIM ALT 5000  
INLIMIT  
GO
```

Once each altitude is achieved, "GO" flashes on the display, check the instrument under test before pressing the ETP key to continue.

Example 2

```
KEYLOCK OFF  
DISPLAY "Use nudge keys when" "GO flashes then" "press F4 to continue"  
AIM ALT 5000  
INLIMIT  
GO  
AIM ALT 10000  
INLIMIT  
GO
```

Associated command

KEYLOCK

GOTO

Causes a jump in the program execution

(valid code for ADTS 405 software versions V4.17 onwards)

Description

This statement is used in conjunction with the LABEL statement to change the flow of execution in the program. It can be used to set-up loops in the code or cause commands to be skipped over.

Format

GOTO <identifier>

where:

<identifier> is a sequence of characters that matches the <identifier> in exactly one label statement.

Example

```
LABEL        back
REM          perform same test here
GOTO        back
```

Note: *GOTO is one word.*

Associated command

LABEL

GROUND

Go to ground

Description

GROUND executes Go to ground.

The controllers automatically switch on when the GROUND command is executed.

After getting to GROUND the controllers switch off.

Format

GROUND

HEADER

Input and print standard information

Description

Displays a screen containing standard header information as shown below.

Header setup

Calibration equipment

Test unit

Serial number

Calibration date

Ground pressure

Temperature

Client information

Client name

Client reference

Our reference

Certificate number

Instruments(s) under test

Aircraft Operator Location

Instrument name Manufacturer Instrument type Serial number

Comment

The user can move the data fields and enter information as required. On exit, the following screen is printed. If more than one instrument is tested, manufacturer, type and S/N appears for each instrument.

Instrument under test	Calibration Equipment
Aircraft ..Avro RJ70	Test unitADTS 405F
Location ..Chester	Manuf'rDRUCK
Manuf'r ...Smiths	S/N300055
Type700	Calibrated date .7/8/91
S/N0614	Ground pressure .1015 mbar
General information	Temperature19 C
Test date .8/9/91	
Procedure .FAR43	Client Information
Data file .FAR0809.1	Client
Operator ...J. SMITH	Client ref.
	Our ref.
Signature	Certificate No ..
Inspector's signature Date	
Comments ..	

The data for some fields will be entered automatically i.e., test date, procedure, data file and calibration equipment manufacturer.

Format

HEADER

Associated commands

ASK, READINGS

HOLD

Hold controllers

Description

HOLD ON puts the controllers into HOLD state. HOLD OFF releases the HOLD state.

Format

HOLD <state>

where:

<state> is ON or OFF

Example

HOLD ON

IF

Performs instructions only when a condition is met

Description

When the bracket-enclosed (condition) is TRUE, the THEN code following the condition is executed.

Format

IF (Boolean expression) THEN
statement sequence

ENDIF

or

IF (Boolean expression) THEN
statement sequence

ELSE

statement sequence

ENDIF

When the condition is not TRUE, the code following the optional ELSE statement is executed.

Example

```
IF (ABS(ARINC429 ALT - ALT)>100) THEN  
  DISPLAY "ALTITUDE ERROR"  
ENDIF
```

INLIMIT

Wait for aim to be achieved

Description

INLIMIT waits until all controlling channels are in limits. If this is not achieved during the time allowed, an error message is produced and program execution suspended.

The time allowed is automatically generated unless the WAIT parameter is included to override the automatic time.

Note: *INLIMIT is set immediately the AIM value is achieved. For optimum control stability, a WAIT 15 command should follow the INLIMIT command. This is not necessary if there is already a WAIT command of greater than 15 seconds following the INLIMIT command.*

Format

INLIMIT [<n>]

where:

<n> is the allowed time in seconds. If n is not included, the allowed time is automatically generated.

Example

```
AIM ALT 6000  
INLIMIT
```

Associated command

AIM, WAIT

KEYLOCK

Lock out manual keys

Description

If KEYLOCK is set to OFF, then the nudge keys can be activated during the GO command. Exit to manual mode will be allowed between tests.

If KEYLOCK is set to ON, then the nudge keys will not be activated during the GO command. Selection of manual mode will also be prevented during a test program.

Format

KEYLOCK <state>

where:

<state> is ON or OFF

Example

KEYLOCK OFF

AIM ALT 1000

GO user presses nudge to align instrument pointer with cardinal point.

PRINT "instrument reads" READ ALT "ADTS reads" ALT.

Associated command

GO, NUDGE

LABEL

Defines labels in code

(valid code for ADTS 405 software versions V4.17 onwards)

Description

Used with the GOTO and GETKEY commands, this label provides code that these commands should 'jump to'.

Format

LABEL <identifier>

where:

<identifier> is a sequence of up to 12 characters containing the letters A to Z, '_', and the numbers 0 to 9.

Notes:

1. *These letters are not case sensitive (i.e., 'a' and 'A' are considered to be the same and should not be the same as any of the commands).*
2. *The first letter must not be a digit.*
3. *Words that may not be used for LABELS.
NULL used in the GETKEY statement when no key press is expected.
All unit names.
All set-point names.
ON, OFF.*

Example

See GOTO and GETKEY

Note: *Labels should be unique to each program.
A maximum of 60 labels are allowed in a single program.*

Associated commands

GOTO, GETKEY

LEAKTEST

Controllers off

Description

Go to leak test (measure) mode.

Format

LEAKTEST

Associated commands

CONTROL

LIMIT

Set limits of operation

Description

Under TPM control, the ADTS 405 sets all internal limits to maximum, except the ARINC limits which, if selected on, remain in force. The LIMIT command enables the TPM to check a new AIM against an associated list of limits before sending the commands to the ADTS 405. The ARINC argument is used to set ARINC limits on or off in the ADTS 405. The limits must be specified in the units in use.

Note: *An error will not be detected if an AIM goes past a limit value using NUDGE. Default: Maximum limits on ADTS 405 with ARINC as set on ADTS 405.*

Format

LIMIT <type> <limit list> ARINC <state>

where:

<type> Select A for aeronautical (ft, kn, etc.) or P for pressure (mbar, inHg etc.)

<limit list> If type A then list limit parameter values:
 minALT maxALT minVC maxVC maxMACH maxROC maxRATEVC

 If type P then list limit parameter values: minPS maxPS minQC maxQC
 maxRATEPS maxRATEQC

<state> ON or OFF

Note: *For the ADTS 405, Pt aims will be checked against Min Ps and Min Qc and MAX Ps and Max Qc.*

Example

LIMIT A -1000 60000 0 500 1 3000 300 ARINC ON

Associated commands

AIM, ARINC, UNITS

LOAD

Load Limits Set

(valid code for ADTS 405 software versions V4.17 onwards)

Description

This command should only be used when the system is in “leak test” mode; it is similar to selecting a set of limits from set-up.

Format

LOAD

Note: *The LOAD command stops the “Limits Lock” CONFIG function. A new set of limits may be selected with the LOAD command even with the limits lock selected on; the new limits will be put into the system.*

NUDGE

Increment/decrement aim

Description

This command, used in control mode, allows an increase or decrease of the required parameter (one key for up and one for down) to achieve a precise value. Press a key to continue.

Format

NUDGE <param>

Examples

NUDGE ALT

Associated commands

AIM, KEYLOCK

PRINT

Generate print-out

Description

PRINT is a powerful command with the following features:

- a. Prints across the page or in tables (columns).
- b. Prints text that can be used as nominal values for error checking.
- c. Prints ADTS parameters.
- d. Requests user input for each instrument under test.
- e. Stores readings for use later for hysteresis checks.
- f. Sets tolerance for pass/fail checking.
- g. Calculates and prints errors.
- h. Prints pass/fail status.
- i. Prints line across page or table.
- j. Page breaks.
- k. Prints date or times.

Format

PRINT [**<param>[+]**] [**NOM <value>**] [**READ <param>[-]**] [**store <n>**]
[**RECALL <n>**] [**<string>**] [**TOL <value>**] [**ERROR**] [**P/F**] [**LINE**]
[**'**] [**;**] [**expressions**] [**BREAK**] [**DATE**] [**DATEUK**] [**DATEUS**]
[**TIME**]

Note: *The arguments can be in any order and repeated as required, with exceptions to the rules below:*

where:

<param>	Prints the listed parameters read from the ADTS 405. The value of the last parameter printed becomes the reference value for ERROR, TOL and PASS/FAIL calculations.
+	The "+" (plus character) causes the value of the parameter to become the reading value for ERROR, TOL and P/F. This feature can be used for checking the value of a parameter for example as a warning sounds, see example below.
<expression>	A bracket-enclosed, numeric expression can only be used in the same place as a numeric constant.
NOM <value>	Prints the value and uses it as reference for ERROR, TOL and P/F.

Command Reference

<value>	Numeric expression.
READ <param>	Prompts the user to enter the value of the required parameter, obtained from the instrument display and repeated for each instrument. Any strings assigned by the READINGS command will be appended to the question identifying the instrument to be "read". The "-" (minus character causes the value of the reading to become the reference value for ERROR, TOL and P/F. This can be used for a friction test where the error is the difference between the latest reading and the last reading.
STORE <n>	Stores the latest reading in location n for recall later on. This can be used during hysteresis testing (n is 0 to 40). If n = 0 then no STORE takes place. This is used within the TABLE command to store particular readings.
RECALL	Recalls stored value from location n and prints it. This becomes the latest reference (n is 0 to 40). If n = 0 then no RECALL takes place and a blank is printed in the column.
<string>	Prints the string enclosed in quotes, starting from the left of the column. "" can be used to skip over a column without printing in it (there must be a space between the double quotes).
ERROR	Prints the difference between the latest reading and the latest reference parameter or reference reading. One reading and one reference must precede an ERROR argument.
TOL <value>	Prints the tolerance value (assumed $\pm$) and uses the value for pass/fail checking.
P/F	Prints PASS or FAIL based on difference between the latest reading and the latest reference parameter or reference reading, using the limit specified in TOL. If no ERROR argument has been used, the absolute value of the most recent reference or reading is checked. This can be used for checking a leak rate, see example below. P/F must be preceded by a TOL argument.
LINE	If columns are on, LINE prints a horizontal line across the table. If columns are off, LINE prints a line across the page. LINE must be the only argument following a PRINT command.
'	Any argument preceded by ' will not be printed but the calculations still take place. This enables processing of ERROR and TOLerances without printing all the information. e.g., 'READ ALT asks the user for the reading but does not print it. The reading will still be used for ERROR etc. e.g., 'ERROR calculates the error for P/F but does not print it.

Druck Test Program Manager Version 4.0 Language Manual

;	Used at the end of a print statement, the ";" character prevents a CRLF (new line) taking place. This enables commands to be executed between printing one column and the next. This must be the last character of a print statement, with or without a space before it.
DATE	Prints the date in default format.
DATEUK	Prints the date in United Kingdom format (DD/MM/YY).
DATEUS	Prints the date in United States format (MM/DD/YY).
TIME	Prints the current time (HH:MM:SS).
PRINT	Without additional code prints a blank line.

Example 1

```
REM Read altimeter  
PRINT READ ALT
```

prompts the user to "Enter instrument reading for altitude" and prints the answer.

Example 2

```
REM Scale error test  
PRINT ALT READ ALT ERROR TOL 20 P/F
```

- Prints the altitude measured by the ADTS 405.*
- Asks the user for the altimeter reading and prints it.*
- Prints the difference between a. and b.*
- Prints ± 20 as the tolerance.*
- Prints PASS or FAIL depending on the difference between a. and b.; if less or more than ± 20 .*

Example 3

```
REM Friction test Waits.  
PRINT ALT READ ALT-;  
DISPLAY "Switch buzzer on"  
PRINT READ ALT ERROR
```

- Prints the altitude measured by the ADTS 405.*
- Asks the user for the altimeter reading and prints it.*
- Displays the message.*
- Asks the user for the altimeter reading and prints it.*
- Prints the error between the latest reading and the previous one.*

Command Reference

Example 4

```
REM Example for checking altitude warning switches.  
DISPLAY "Press ENTER when warning sounds"  
PRINT "Nominal value =", NOM1500, "feet, Warning sounded, at", ALT+, "feet"  
, 'ERROR, 'TOL 200, P/F
```

- Waits for the user to press ENTER.*
- Prints "Nominal value = 1500 feet, Warning sounded at".*
- Prints the current altitude.*
- Calculates the error from current altitude - 1500.*
- Checks against the tolerance of ± 200 feet.*
- Prints PASS or FAIL.*

Example 5

```
REM Leak test  
PRINT "Leak rate =" RATEPSALT " ft/min " TOL 100 P/F
```

- Prints "Leak rate =".*
- Prints the measured rate RATEPSALT.*
- Prints "ft/min".*
- Checks to see if RATEPSALT is less than ± 100 (the tolerance will not be printed as it starts with ').*
- Prints PASS or FAIL.*

Associated commands

COL, COLDEF, READINGS, RATETIME, TABLE

PTONLY

Change ADTS mode

Description

Changes the ADTS to PT (Pitot) Only mode.

Format

PTONLY <state>

where:

<state> is either ON or OFF.

Example

PTONLY OFF

RATETIME

Time leak rates

Description

Times the rate of change for all channels over n seconds. The results are stored in the special parameters RATEPSALT and RATEQCSPD that can be used in the PRINT command. The display changes to show the Ps and Pt channel leak rates in the appropriate units.

Format

RATETIME <n>

where:

<n> specifies the number of seconds to time over (minimum 30 seconds).

Example

RATETIME 60

Associated commands

PRINT, WAIT

READINGS

Input readings from multiple instruments

Description

Determines the number and names of instruments or avionic components to be tested. Except for READINGS 1, the READINGS command allows the user to select, by name, one or more instrument to be tested. Each instrument tested produces a print-out.

Default: READINGS 1

Format

READINGS <n> <string>...

where:

<n> specifies the number of names offered to the user (1 to 5).

<string> appears for each of <n>. Each <string> specifies the name that will be appended to the question. When the user is asked for a reading this name appears on the print-out. If <string> (s) are omitted, the readings will be called instrument 1, instrument 2 etc. Each string can contain a maximum 12 characters.

To control the number of print-outs produced, the command should be placed before any commands that cause a print-out. Use READINGS 1 to return to single print-out.

Example:

READINGS 3 "PILOT" "COPILOT" "STANDBY"

Associated commands

PRINT, HEADER

REM

Remark

Description

Allows remarks or comments to be included in the test program without affecting the tests.

Format

REM <any text>

Each line of comments must start with a REM command. There must be a space after the REM command.

Note: *The text after a remark should not contain a bracket.*

SPEED429

ARINC 429 Option Control

(valid code for ADTS 405 software versions V4.17 onwards)

Description

Sets the transmit speed (baud rate or kilo-bits per second) of the ARINC 429 option to either 12.5k or 100k. Also see ARINC 429 user manual for further details.

Format

SPEED429 <speed>

where:

<speed> is 12.5 or 100

Note: *SPEED429 is one word.*

Associated command

TX429

SUB

Run sub-test program

Description

This allows a sub-test program to be executed in the middle of the main test program. For example, this would allow a Mach test to be carried out at a particular altitude during an altimeter scale test. The print out from the main test program will not be affected. Any print out from the sub-test program appears after the main print out. There is one sub-test level. The user can be asked if execution is required.

Format

SUB <filename>[?]

where:

<filename> is the name of the test program file to be run. The file extension should not be included. If the <filename> is "NONE" then no SUB will take place. This can be used within the TABLE command to only SUB at particular test points.

? If "?" is included, the user is asked if it is required to run this sub-program. This feature allows optional tests to be included within a test program.

Note:

*There must not be a space before the "?".
The file name and [?] must be in double quotes.*

Example

SUB "MACHTEST?"

TABLE

Repeated command sequence

Description

TABLE enables many lines of test data and a print-out to be generated by a minimal list of commands that are repeated a required number of times. Each time the commands are repeated, they require different arguments e.g., the <value> of AIM command. To achieve this, the numeric or string arguments of any of the commands can be replaced by a flag. During execution, the TPM obtains the required argument from the argument list. Each time the command list is repeated, a different line from the argument list is used.

All headings, initial rates, etc., should be defined before using TABLE.

Format

TABLE DEF

command list

TABLE DATA

argument list

TABLE END

where:

command list

is a list of commands to be repeated. Any numeric or string parameter can be replaced by ^n - where: n is the position in the argument line with 1 as the first position.

Commands allowed in a command list are:

AIM

DISPLAY

INLIMIT

PRINT (and all the PRINT arguments)

RATETIME

REM

SUB The filename and ? can be passed as a single string. "NONE" will not cause a SUB, allowing a SUB to run only at the required point.
WAIT

argument list

consists of lines of arguments, one line for each time the command list is to be executed. Each line should consist of arguments separated in the usual way by one space or a comma.

The arguments, in the line, number from 1 on the left. String or file name arguments should be included in quotes.

Command Reference

Example

```
TABLE DEF
AIM ALT ^1
INLIMIT
WAIT ^3
PRINT "Test" ^2 "Altitude = " ^1 ", Instrument reads " READ
ALT
TABLE DATA
1000,1,30
10000,2,60
20000,3,60
TABLE END
```

This causes the altitude to go to 1000, wait 30 seconds, then print the test number, the nominal altitude and the instrument reading.

This would then be repeated for tests 2 and 3 with altitudes of 10000 and 20000 and wait times of 60 seconds.

Associated commands

AIM, INLIMIT, PRINT, RATETIME, WAIT

TEST

Name of test

Description

This command defines the name and number of a test in the test program.

Format

TEST <n> <string>

where:

<n> is the number of the test, n is 1 to 40.

‘ If included, the string only appears on the display, not on the print-out.

<string> is the name of the test.

Note: *The string can contain a maximum of 40 characters.*

Example

TEST 5 "Altitude"

Associated commands

TITLE

TITLE

Test program title

Description

This is the title of the test program and should be the first line of the test program. It is used when loading and running the test program.

Format

TITLE <string>

where:

<string> is the title of the test program. The string can contain a maximum of 40 characters.

Example

TITLE "FAR43"

Associated commands

TEST

TX429

TX429 Card Control

(valid code for ADTS 405 software versions V4.17 onwards)

Description

Changes the transmit mode of the ARINC 429 option facility on and off.

Default: as set on the ADTS 405.

Also see SPEED429 for further details.

Format

TX429 <state>

where:

<state> is "ON" or "OFF"

Note: *TX429 is one word.*

Associated command

SPEED429

UNITS

Select units in use

Description

Select the units to be used by AIM, LIMIT etc. This command appears before any commands that are “unit dependent”.

Default: as set on ADTS 405.

Format

UNITS <units>

where:

<units> is one of the following:

FT/KN	
FT/MPH	(TPM version V4.40 onwards)
M/KM/H	
M/KM/H[M/S]	(TPM version V4.40 onwards)
M/KM/H[HM/M]	(TPM version V4.40 onwards)
MBAR	
INHG	
MMHG	
INH2O4	
INH2O20	
INH2O60F	(TPM version V4.10 onwards)
PSI	
HPA	
KPA	

Example

UNITS FT/KN - *Selects feet for altitude, kn for airspeed.*

Associated commands

AIM, LIMIT, NUDGE

VALVE

LSU control

Description

Sets the specified valves of the Druck Line Switching Unit (LSU 100/101 and 200 series) to a required state.

Format

VALVE <number> <state>

VALVE <source> <state>

VALVE ALL <state>

where:

<number> is the number of a valve

<source> is either "STATIC" or "PITOT"

<state> is either OPEN or CLOSED

Note: *The LSU must be connected to the ADTS 405 before this command can be used.*

Example

VALVE 1 OPEN

VALVE "PITOT" CLOSE

VALVE ALL CLOSE

WAIT

Program pause

Description

Causes the program to pause for n seconds.

Format

WAIT <n>

where:

<n>	causes a delay of n seconds. This may be used to allow temperature effects to settle before taking readings.
-----	--

Example

WAIT 10 The program pauses for 10 seconds before executing the next command.

Annex A

FAR 43 ALTIMETER TEST PROGRAM

Summary

The FAR 43 test is based on FAR 43 Appendix E 1982 Section a 1. The relevant paragraph numbers are shown after the title of each test description.

A maximum altitude of 45000 ft has been used.

The program allows up to five reading sets to be taken (such as a combination of pilot, copilot and standby altimeters).

Description

Test 1 Case Leak

FAR 43 Appendix E 1982 Section a 1 (v)

1. Altitude increases to 18000 ft at 6000 ft/min.
2. Pressure stabilises for 1 minute.
3. Leak test set for 1 minute.
4. Limit of leak rate ± 100 ft/min.
5. Altitude decreases to ground (zero).

Test 2 Scale Error Hysteresis and After Effect (Table 1)

Scale Error

FAR 43 Appendix E 1982 Section a 1 (i)

1. Altitude increases to each set-point value (column 1).
2. The rate of change between set-point values set at 6000 ft/min, reducing rate when nearing set-point.
3. After 1 minute at each set-point, user reading recorded (column 2) and compared with the tolerance (column 3).

Hysteresis

FAR 43 Appendix E 1982 Section a 1 (ii)

1. Altitude decreases to the first hysteresis set-point (column 4).
2. The rate of change between set-point values set at 6000 ft/min, reducing to less than 3000 ft/min when nearing set-point.
3. After 5 minutes at this set-point, user reading recorded and compared with the recorded reading for increasing altitude within the tolerance (column 5).
4. Altitude decreases to the second hysteresis point (column 4) and, after a 1 minute wait at this set-point, user reading recorded and compared with the recorded reading for increasing altitude within the tolerance (column 5).

Annex A

Altitude (feet)	Recorded values of increasing altitude	Tolerance (1) minus (2) (±feet)	Recorded values of decreasing altitude	Tolerance (2) minus (4) (±feet)
(1)	(2)	(3)	(4)	(5)
-1000	x	20		
0	x	20	x (after effect)	30
500	x	20		
1000	x	20		
1500	x	25		
2000	x	30		
3000	x	30		
4000	x	35		
6000	x	40		
8000	x	60		
10000	x	80		
12000	x	90		
14000	x	100		
16000	x	110		
18000	x	120	x (hysteresis)	75
20000	x	130		
22000	x	140	x (hysteresis)	75
25000	x	155		
30000	x	180		
35000	x	205		
40000	x	230		
45000	x	230		

where:

x = manually recorded and entered value

Table 1 Scale Error Hysteresis and After Effect

After Effect

FAR 43 Appendix E 1982 Section a 1 (iii)

- Altitude decreases to zero at 6000 ft/min.
- After a 1 minute wait, user reading recorded and compared with the recorded reading for increasing altitude within the tolerance (column 5).

Druck Test Program Manager Version 4.0 User Manual

Test 3 Friction (Table 2)

FAR 43 Appendix E 1982 Section a 1 (iv)

1. Altimeter vibrator circuit set to off.
2. The altitude increases to each set-point in Table 2 at a rate of 6000 ft/min, reducing to less than 750 ft/min when nearing the set-point.
3. At each set-point a user reading recorded, followed by altimeter vibrator circuit set to on and another user reading recorded.
4. The difference between the two readings compared with the tolerance shown in Table 2.
5. At the end of the test, the altitude decreases to zero (ground).

Table 2 Friction Test

Altitude (feet)	Tolerance (-feet)
1000	70
2000	70
3000	70
5000	70
10000	80
15000	90
20000	100
25000	120
30000	140
35000	160
40000	180

Annex A

Test 4 Barometric Scale Error (Table 3)

FAR 43 Appendix E 1982 Section a 1 (i)

1. The altitude controlled at zero feet and the user instructed to set the altimeter's barometric scale to each of the values in Table 3.
2. A user reading will be taken for each setting and checked against the indicated altitude values in the Table 3 with a tolerance of ± 25 feet.
3. The altitude set to ground (go to ground) at the end of the test.

Table 3 Barometric Scale Error

Barometric scale setting		Indicated altitude (feet)
mbar	inHg	
951	28.10	-1727
965	28.50	-1340
982	29.00	-863
999	29.50	-392
1013	29.92	0
1033	30.50	531
1046	30.90	893
1049	30.99	974

Druck Test Program Manager Version 4.0 User Manual

PROGRAM LISTING

```
TITLE "FAR43 ALTIMETER TESTS"
READINGS 3 "PILOT" "COPILOT" "STANDBY"
HEADER
LIMIT A -1000,45000,0,200,1,6000,300 ARINC OFF

TEST 1 "CASE LEAK"
CONTROL
UNITS FT/KN
AIM ROC 6000
AIM ALT 18000
INLIMIT
WAIT 60
LEAKTEST
RATETIME 60
PRINT
PRINT "CASE LEAK RATE = ",RATEPSALT," ft/min, LIMIT = " TOL 100 P/F
PRINT
CONTROL
GROUND

TEST 2 "ALT SCALE, HYSTERESIS AND GROUND EFFECT"
CONTROL
UNITS FT/KN
AIM ROC 6000
COLDEF 10,10,10,7,7
COL ON
PRINT "ALTITUDE","READING","ERROR","LIMIT","PASS/"
PRINT " "," "," "," "," "," ","FAIL"
PRINT "(feet)","(feet)","(feet)","(feet)", " "
PRINT LINE

TABLE DEF
AIM ALT ^1
INLIMIT
WAIT 60
PRINT NOM ^1,READ ALT,STORE ^2,ERROR,TOL ^3,P/F
TABLE DATA
-1000,0,20
0,1,20
500,0,20
1000,0,20
1500,0,25
2000,0,30
3000,0,30
4000,0,35
6000,0,40
8000,0,60
```

Annex A

```
10000,0,80
12000,0,90
14000,0,100
16000,0,110
18000,2,120
20000,0,130
22000,3,140
25000,0,155
30000,0,180
35000,0,205
40000,0,230
45000,0,255
TABLE END
COL OFF

PRINT
PRINT "HYSTERESIS AND AFTER EFFECT"
PRINT
COLDEF 10,10,10,10,7,7
COL ON
PRINT "ALTITUDE","READING","READING","ERROR","LIMIT","PASS/"
PRINT " ","GOING UP","GOING DOWN"," ",""," ","FAIL"
PRINT "(feet)","(feet)","(feet)","(feet)","(feet)"," "
PRINT LINE
TABLE DEF
AIM ALT ^1
INLIMIT
WAIT ^2
PRINT NOM ^1,RECALL ^3,READ ALT,ERROR,TOL ^4,P/F
TABLE DATA
22000,300,3,75
18000,60,2,75
0,60,1,30
TABLE END
COL OFF
PRINT
GROUND

TEST 3 "FRICTION"
CONTROL
UNITS FT/KN
AIM ROC 6000
PRINT
DISPLAY "REMOVE INSTRUMENT VIBRATION"
COLDEF 10,10,10,10,7,7
COL ON
PRINT "ALTITUDE","READING","READING","ERROR","LIMIT","PASS/"
PRINT " ","BEFORE","AFTER"," ",""," ","FAIL"
PRINT " ","VIBRATION","VIBRATION"," ",""," "," "
```

Druck Test Program Manager Version 4.0 User Manual

```
PRINT "(feet)","(feet)","(feet)","(feet)","(feet)", " "
PRINT LINE
TABLE DEF
AIM ALT ^1
INLIMIT
PRINT NOM ^1, READ ALT-;
DISPLAY "VIBRATE INSTRUMENT"
PRINT READ ALT, ERROR, TOL ^2, P/F
DISPLAY "REMOVE VIBRATION"
TABLE DATA
1000, 70
2000, 70
3000, 70
5000, 70
10000, 80
15000, 90
20000, 100
25000, 120
30000, 140
35000, 160
40000, 180
TABLE END
COL OFF
GROUND
PRINT
```

Annex A

```
TEST 4 "BAROMETRIC SCALE ERROR"
CONTROL
PRINT
AIM ROC 6000
AIM ALT 0
INLIMIT
COLDEF 10,10,10,10,10,7,7
COL ON
PRINT "BARO SCALE","BARO SCALE","NOMINAL","READING","ERROR","LIMIT","PASS/"
PRINT "(mbar)","(inHg)","(feet)","(feet)","(feet)","(feet)","FAIL"
PRINT LINE
TABLE DEF
DISPLAY ^1
PRINT ^2,^3,NOM ^4,READ ALT,ERROR,TOL 25,P/F
TABLE DATA
"SET BARO SCALE TO 951 mbar OR 28.10 inHg","951","28.10", -1727
"SET BARO SCALE TO 965 mbar OR 28.50 inHg","965","28.50", -1340
"SET BARO SCALE TO 982 mbar OR 29.00 inHg","982","29.00", -863
"SET BARO SCALE TO 999 mbar OR 29.50 inHg","999","29.50", -392
"SET BARO SCALE TO 1013 mbar OR 29.92 inHg","1013","29.92", 0
"SET BARO SCALE TO 1033 mbar OR 30.50 inHg","1033","30.50", 531
"SET BARO SCALE TO 1046 mbar OR 30.90 inHg","1046","30.90", 893
"SET BARO SCALE TO 1049 mbar OR 30.99 inHg","1049","30.99", 974
TABLE END
COL OFF
GROUND
```

Druck Test Program Manager Version 4.0 User Manual

RESULT PRINTOUTS

The following are examples of results printouts:

Print-out of header

PILOT	
Instrument under test	Calibration Equipment
Aircraft 777	Test unit ADTS 405C
Location Hangar 51	Manuf'r DRUCK
Manuf'r Smiths	S/N AB89O31
Type B4-2000	Calibrated date Dec 10 1998
S/N K3770GG5	Ground pressure 101.3kPa
	Temperature 18°C
General information	Client information
Test date 09/09/99	Client Florian Rakic
Procedure Far43.atp	Client ref 'Flo'
Data file FAR43.tr	Our ref Druck
Operator Boeing	Certificate No 2
Signature	
Inspector's signature	Date
Comment:	

Annex A

Test 1 Case Leak Result

CASE LEAK RATE = 0 ft/min, LIMIT = +-100 PASS

Test 2 Scale Error, Hysteresis and After Effect Results

Scale Error

ALTITUDE (feet)	READING (feet)	ERROR (feet)	LIMIT (feet)	PASS/ FAIL
-1000	-1000	0	+ -20	PASS
0	0	0	+ -20	PASS
500	500	0	+ -20	PASS
1000	1022	-22	+ -20	FAIL
1500	1500	0	+ -25	PASS
2000	1999	1	+ -30	PASS
3000	3000	0	+ -30	PASS
4000	4010	-10	+ -35	PASS
6000	6000	0	+ -40	PASS
8000	8060	-60	+ -60	PASS
10000	10080	-80	+ -80	PASS
12000	12000	0	+ -90	PASS
14000	14000	0	+ -100	PASS
16000	16099	-99	+ -110	PASS
18000	18120	-120	+ -120	PASS
20000	20130	-130	+ -130	PASS
22000	22000	0	+ -140	PASS
25000	25156	-156	+ -155	FAIL
30000	30000	0	+ -180	PASS
36000	35206	-206	+ -205	FAIL
40000	40000	0	+ -230	PASS
45000	45000	0	+ -255	PASS

HYSTERESIS AND AFTER EFFECT

ALTITUDE (feet)	READING GOING UP (feet)	READING GOING DOWN (feet)	ERROR (feet)	LIMIT (feet)	PASS/ FAIL
20000	22140	22000	140	+ -75	FAIL
18000	18000	18000	0	+ -75	PASS
0	30	0	30	+ -30	PASS

Druck Test Program Manager Version 4.0 User Manual

Test 3 Friction Test Result

ALTITUDE (feet)	READING BEFORE VIBRATION (feet)	READING AFTER VIBRATION (feet)	ERROR (feet)	LIMIT (feet)	PASS/ FAIL
1000	1000	1000	0	+ - 70	PASS
2000	2000	2000	0	+ - 70	PASS
3000	3000	3030	- 30	+ - 70	PASS
5000	5000	5050	- 50	+ - 70	PASS
10000	10000	11000	- 1000	+ - 80	FAIL
15000	15000	15001	- 1	+ - 90	PASS
20000	20000	20003	- 3	+ - 100	PASS
25000	25000	25900	- 900	+ - 120	FAIL
30000	30000	30001	- 1	+ - 140	PASS
35000	35000	35033	- 33	+ - 160	PASS
40000	40000	40000	0	+ - 180	PASS

Test 4 Barometric Scale Error Result

BARO SCALE (mbar)	BARO SCALE (inHg)	NOMINAL (feet)	READING (FEET)	ERROR (feet)	LIMIT (feet)	PASS/ FAIL
951	28.10	1727	1727	0	+ - 25	FAIL
965	28.50	1340	0	1340	+ - 25	FAIL
982	29.00	863	0	863	+ - 25	FAIL
999	29.50	392	700	- 308	+ - 25	FAIL
1013	29.92	0	100	- 100	+ - 25	FAIL
1033	30.50	531	0	531	+ - 25	FAIL
1046	30.90	893	0	893	+ - 25	FAIL
1049	30.99	974	222	752	+ - 25	FAIL

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Annex B - NOTES ON NUMERIC EXPRESSIONS

1. Some parameters (RATE PS, RATE QC, RATE VC, RATEPSALT, RATE QCSPD, RATEPT and RATEEPR) may not use the ARINC 429 prefix; the ARINC 429 protocol does not support these parameters.

Note: *Before software version V4.17 of ADTS 405 numeric expressions are limited to numbers only.*

2. It is not possible to mix parameter types inside a numeric expression.
 - i) (PS+QC) is invalid - use (PT).
 - ii) (ALT - ARINC 429 ALT) is valid as both expressions are based on altitude.
3. The AIM command checks the units of the parameter in the expression against the units of the requested set-point. If different an error occurs.
 - i.e. AIM PS (PT) is valid.
 - AIM PS (ALT) is not valid.
 - AIM ALT (VC) is not valid.
4. Displaying the results of a numeric expression through ECHO and DISPLAY statements will also display the appropriate units for the expression.

RESERVE IDENTIFIERS

Words that may not be used for LABELS

- | | |
|---------|---|
| NULL | Used in the GETKEY statement when no key press is expected. |
| | All unit names |
| | All set-point names |
| ON, OFF | |

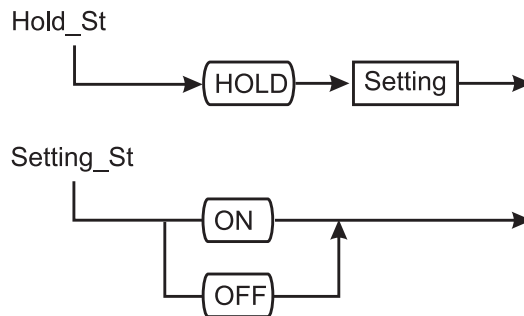
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Annex C - Syntax diagrams

The following syntax diagrams describe the TPM language structure.

To read a syntax diagram, follow the arrows. Frequently, more than one path is possible. The name in the box stand for construction. It refers to another diagram. Those in circles - reserved words, operators, and punctuation - are actual terms used in the programs.

Example:



On the first diagram, the syntax of the HOLD statement is described as the word HOLD (in a circle) followed by a setting statement (in a box).

On the second diagram, the setting statement is either the word ON or OFF.

Therefore, to use a hold statement , the user would type the word HOLD followed by ON or OFF.

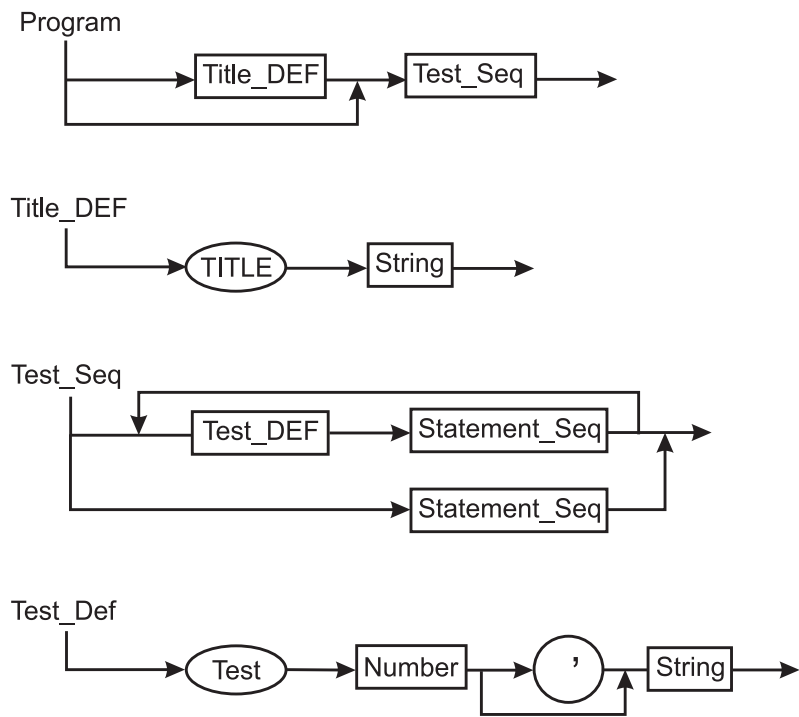


Figure 1

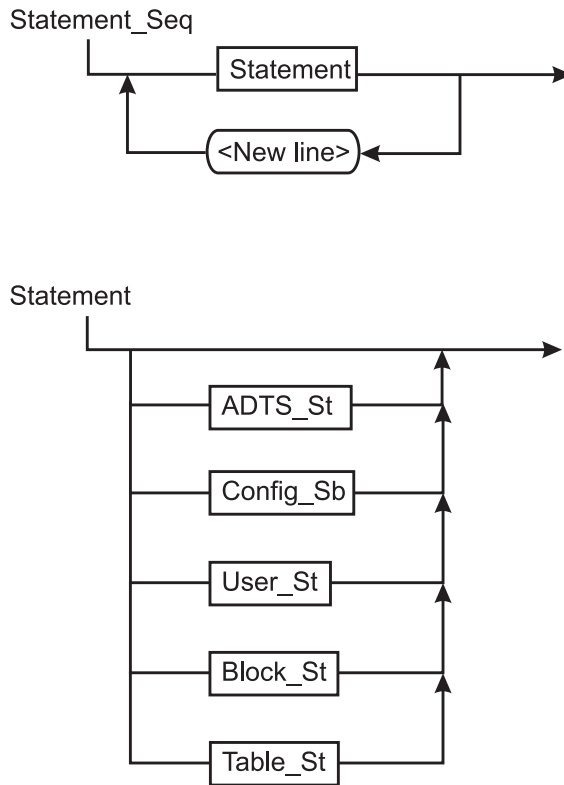


Figure 2

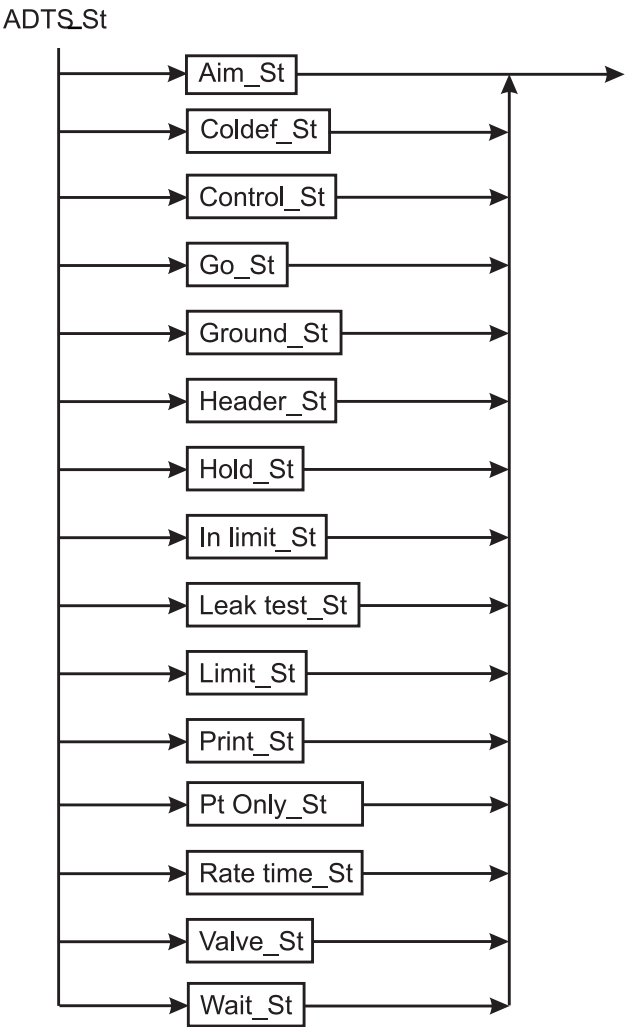


Figure 3

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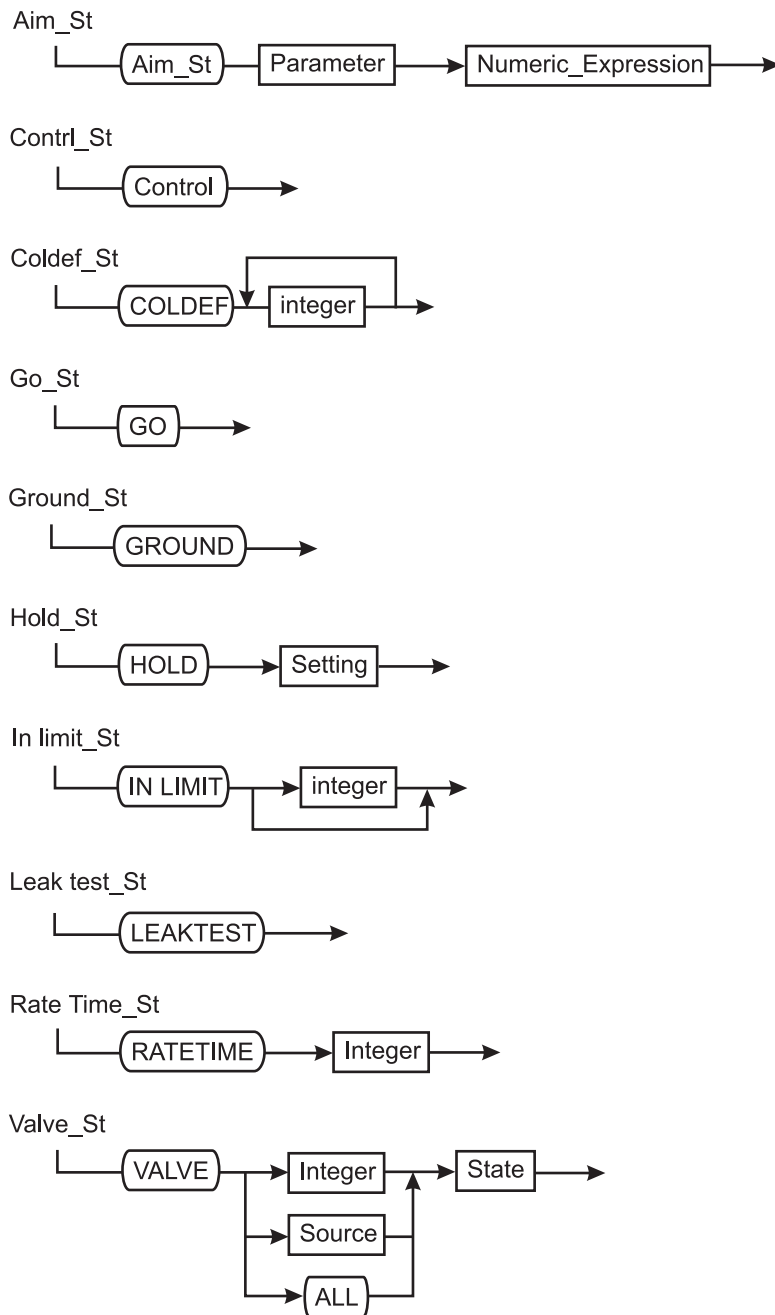


Figure 4

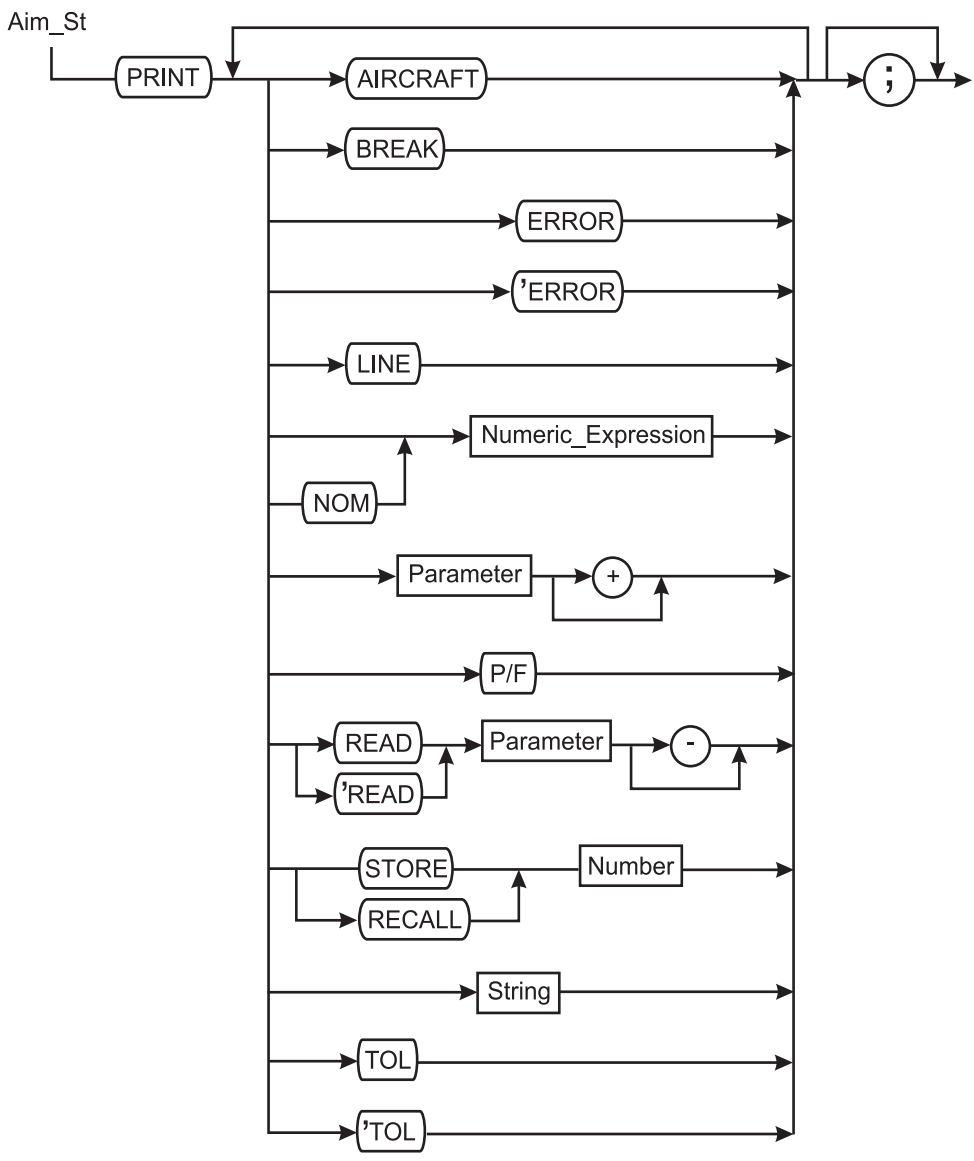


Figure 5a

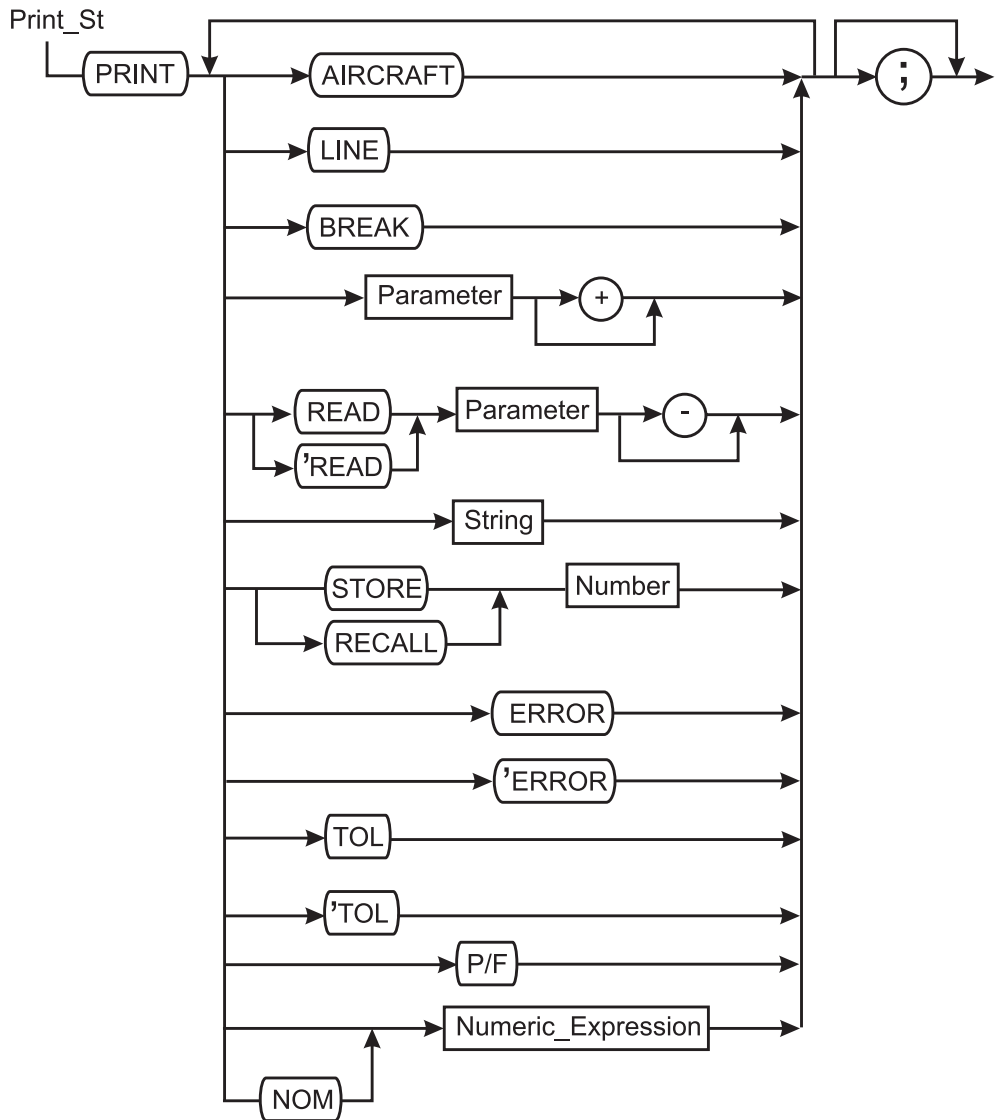


Figure 5b

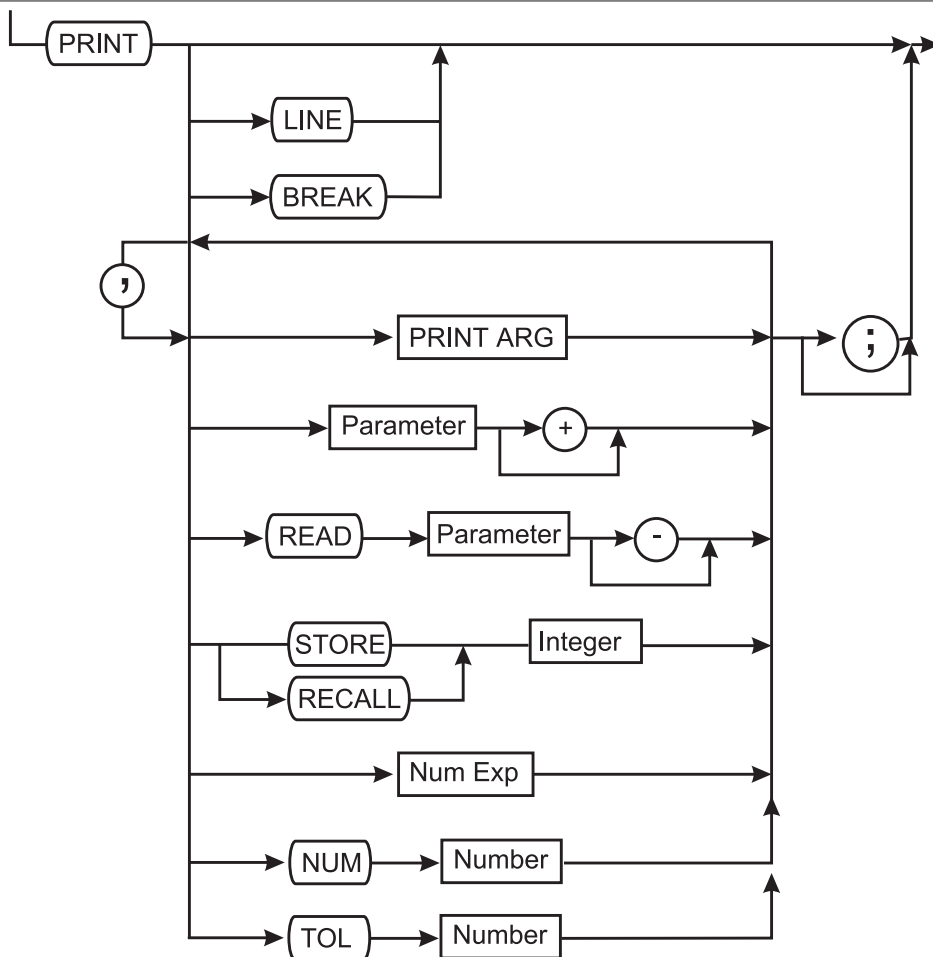


Figure 5c

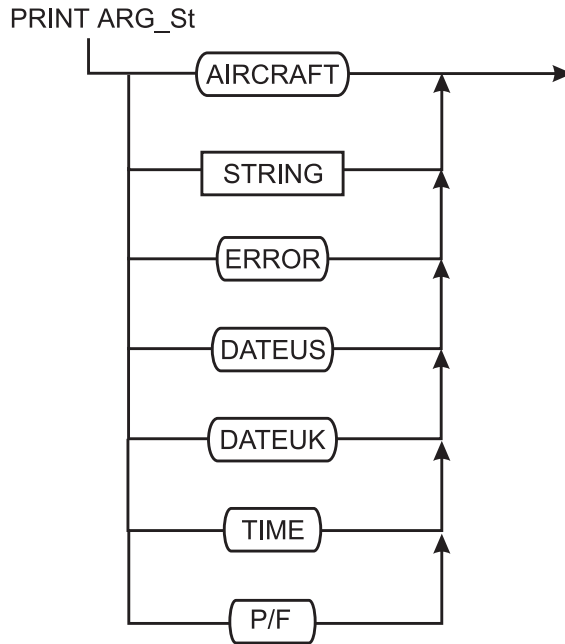


Figure 5d

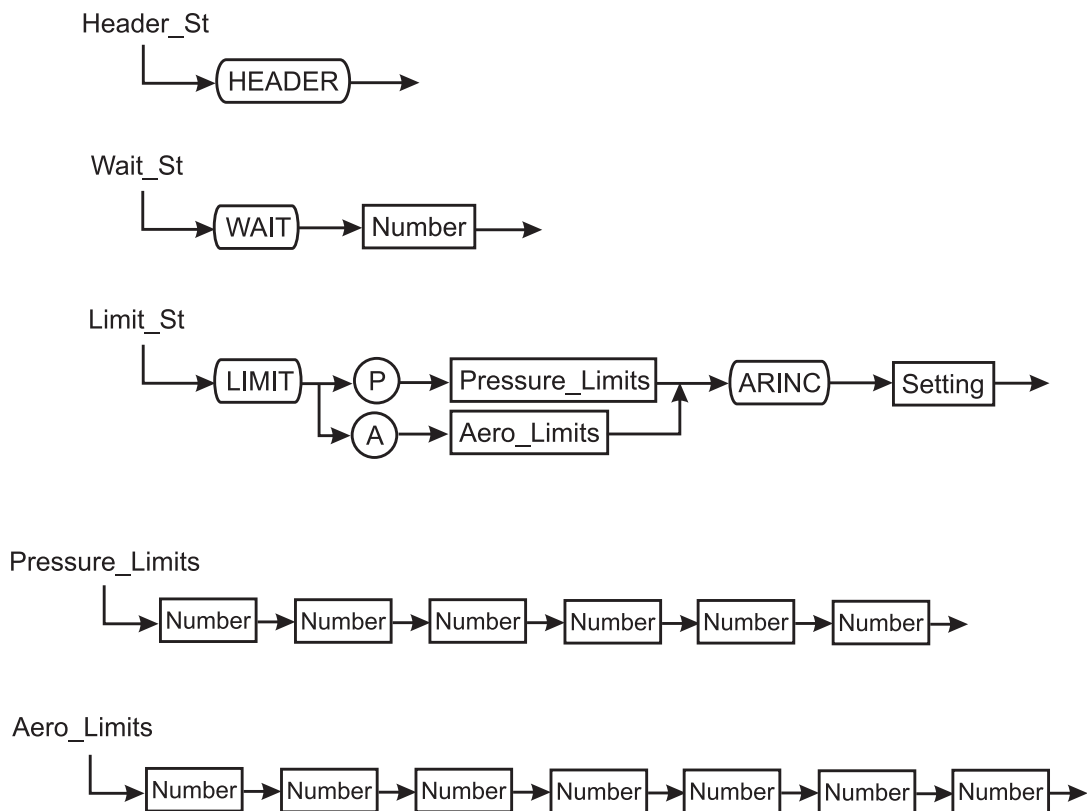


Figure 6

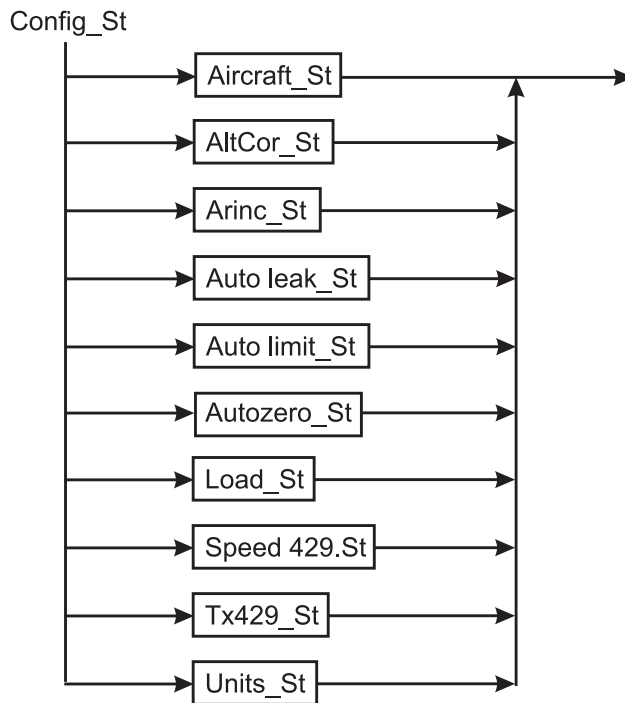


Figure 7

Annex C

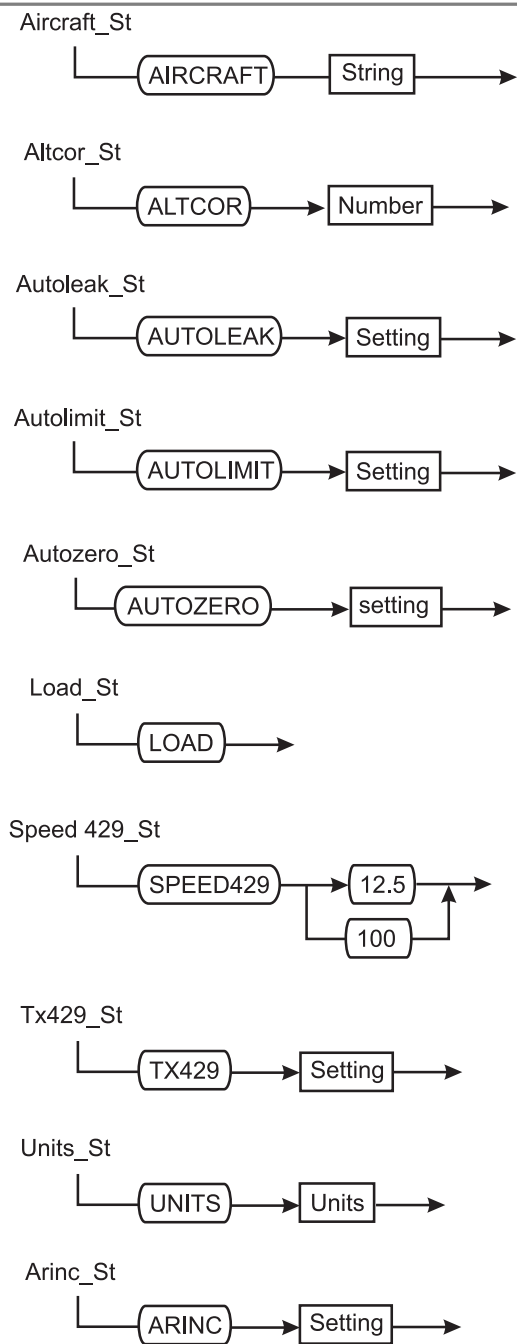


Figure 8

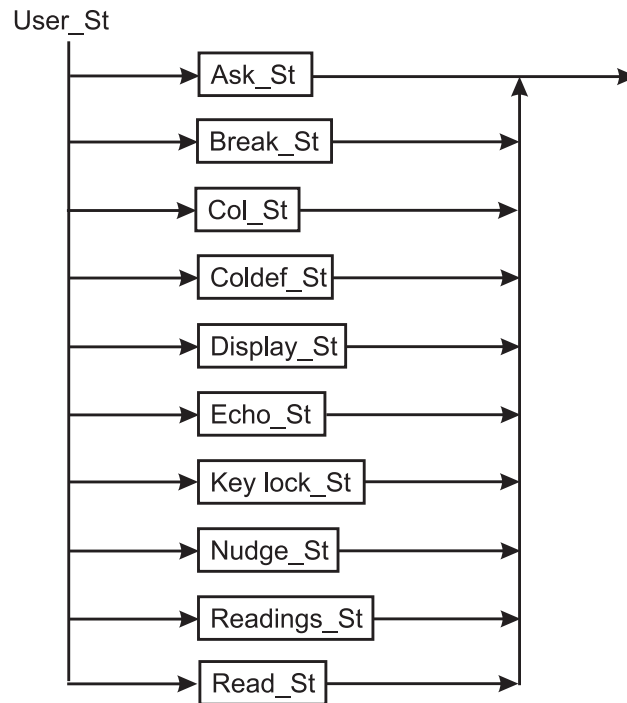


Figure 9

Annex C

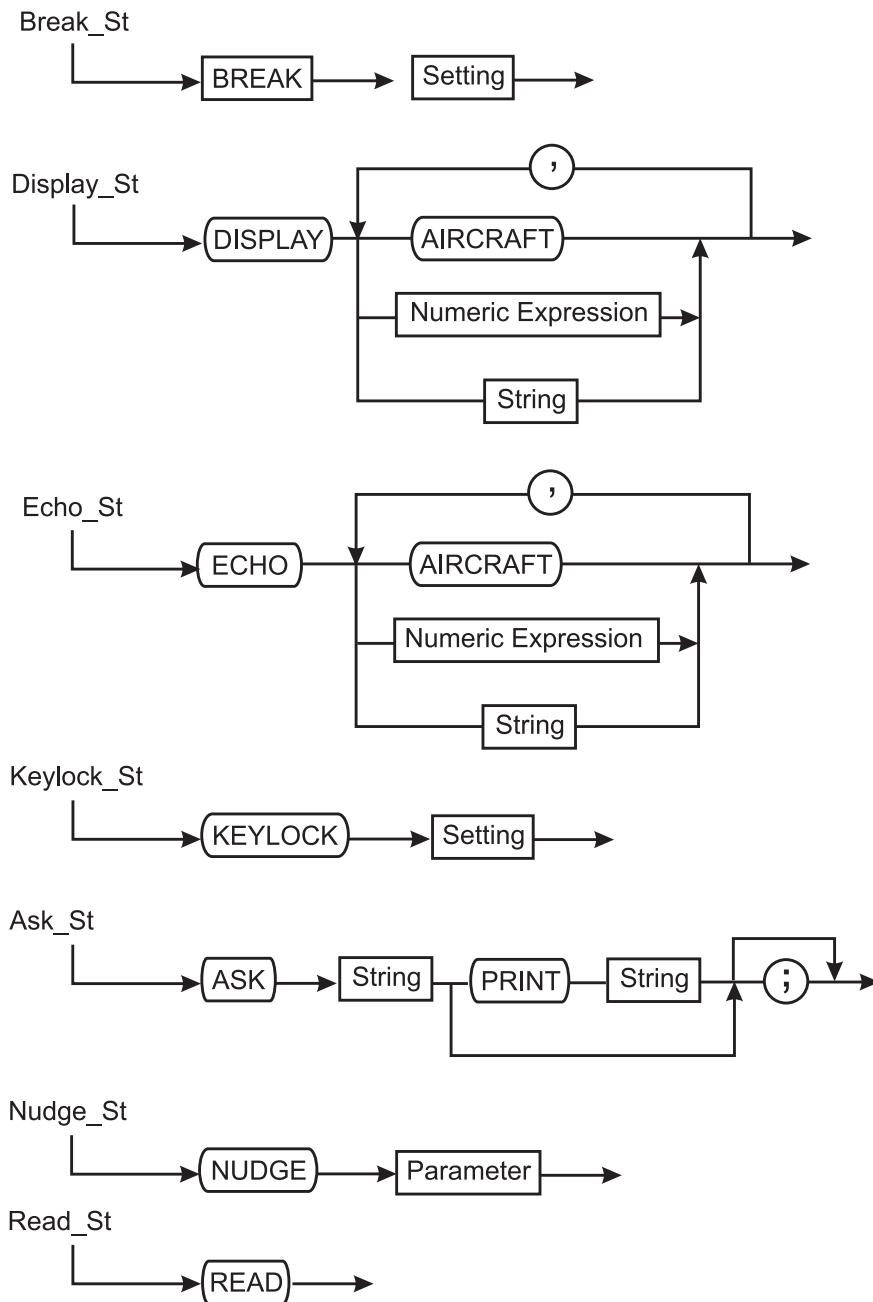


Figure 10

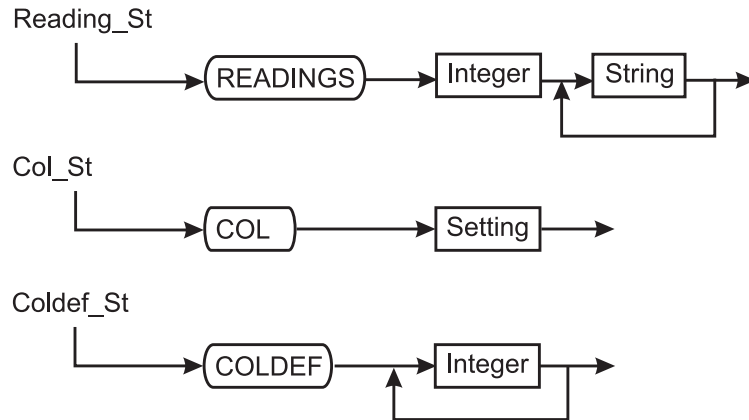


Figure 11

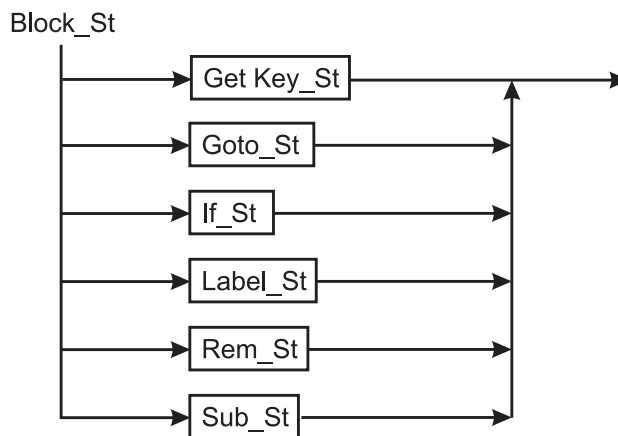


Figure 12

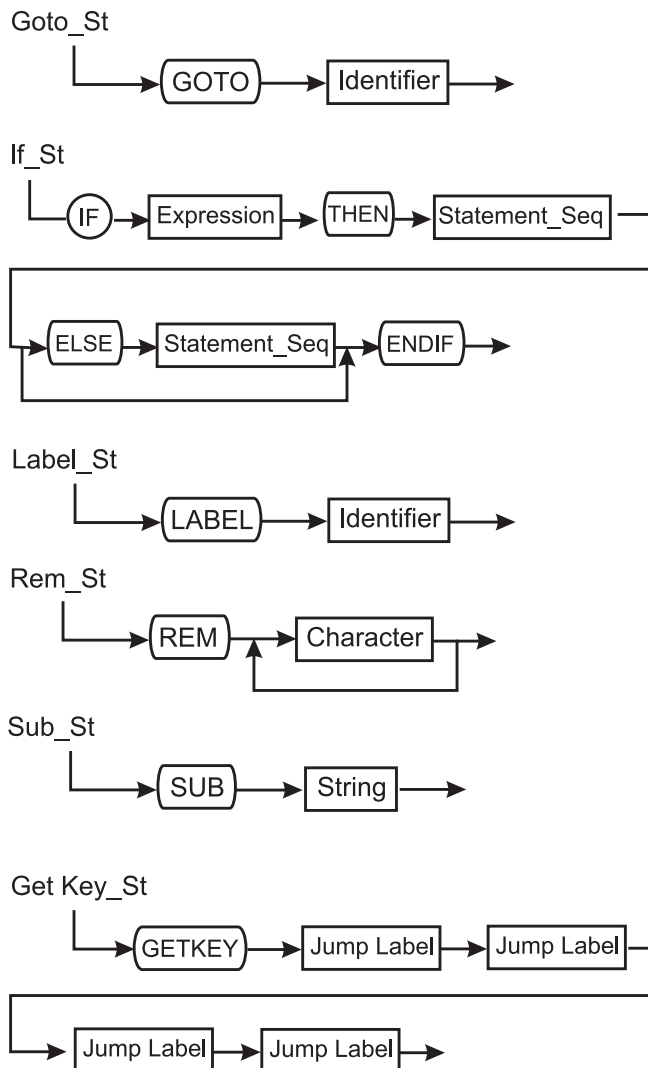


Figure 13

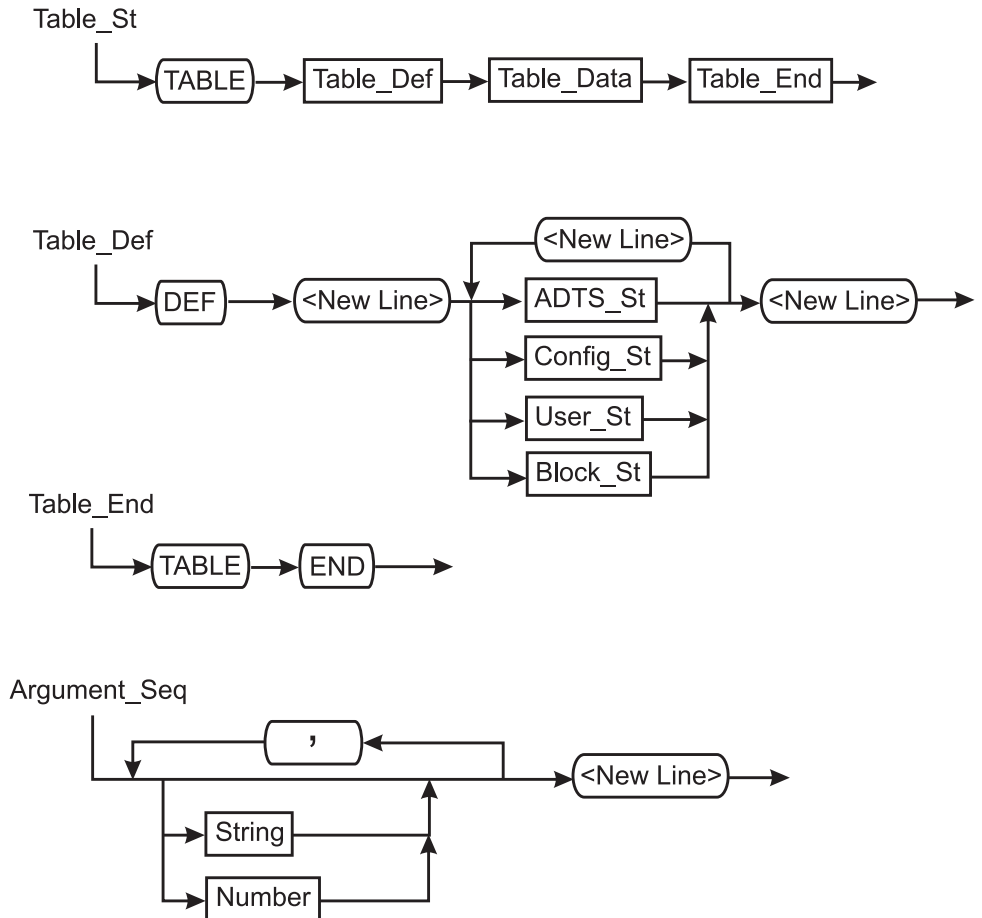


Figure 14

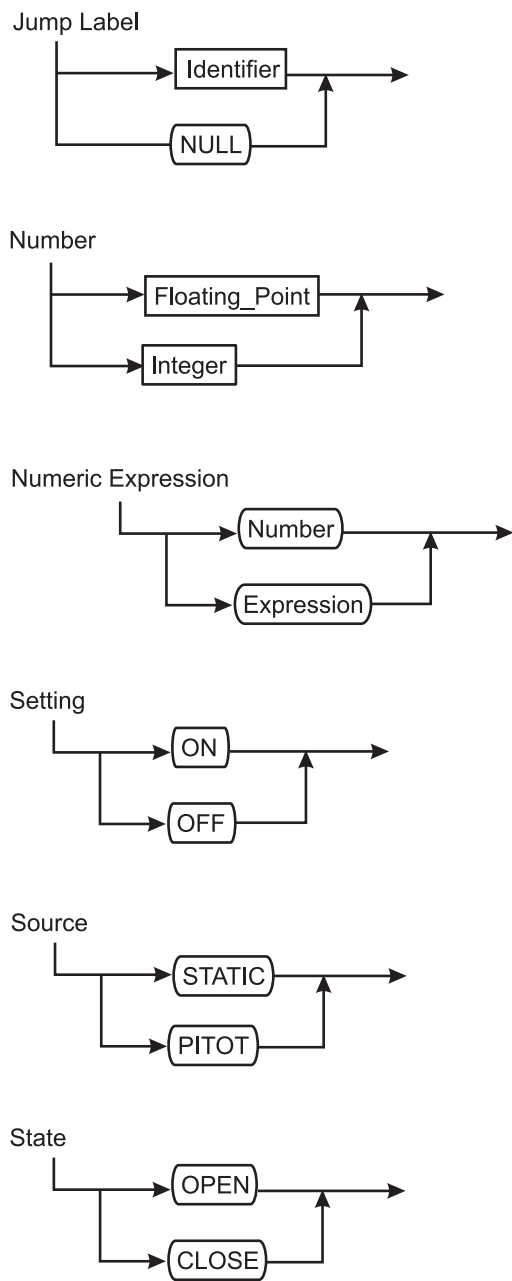


Figure 15

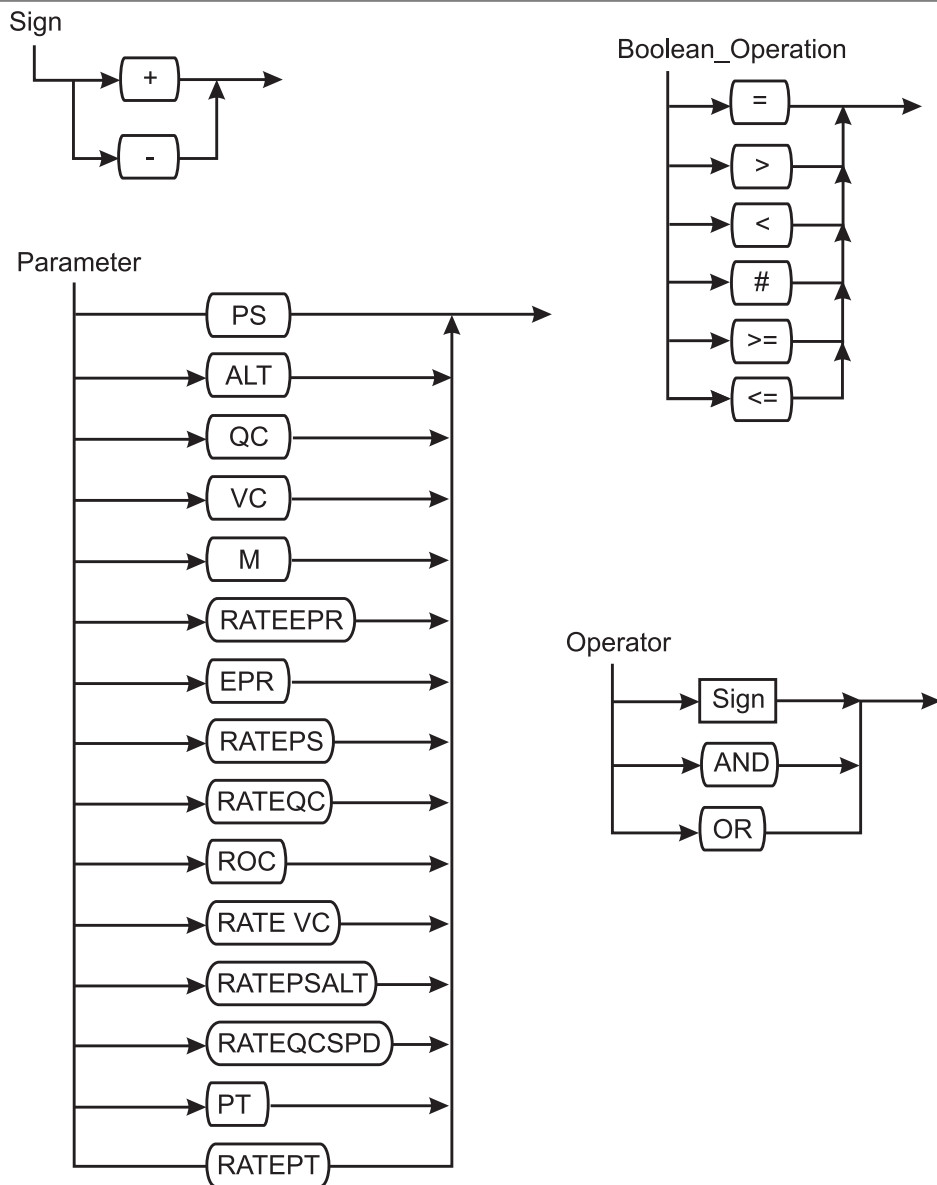


Figure 16

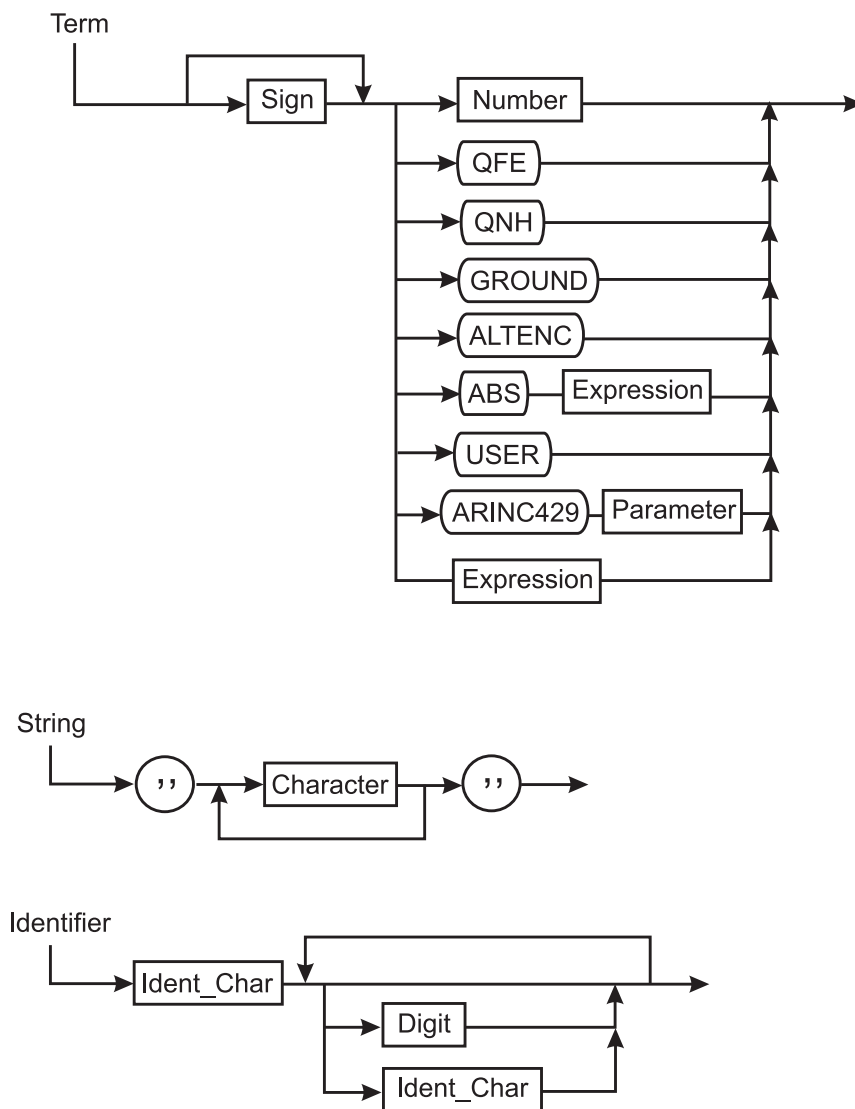


Figure 17

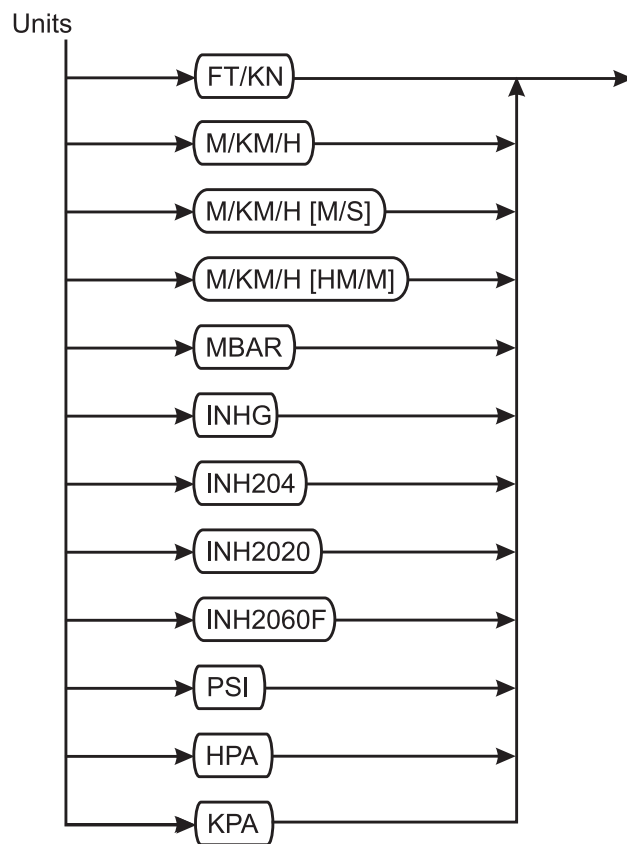


Figure 18

Annex C

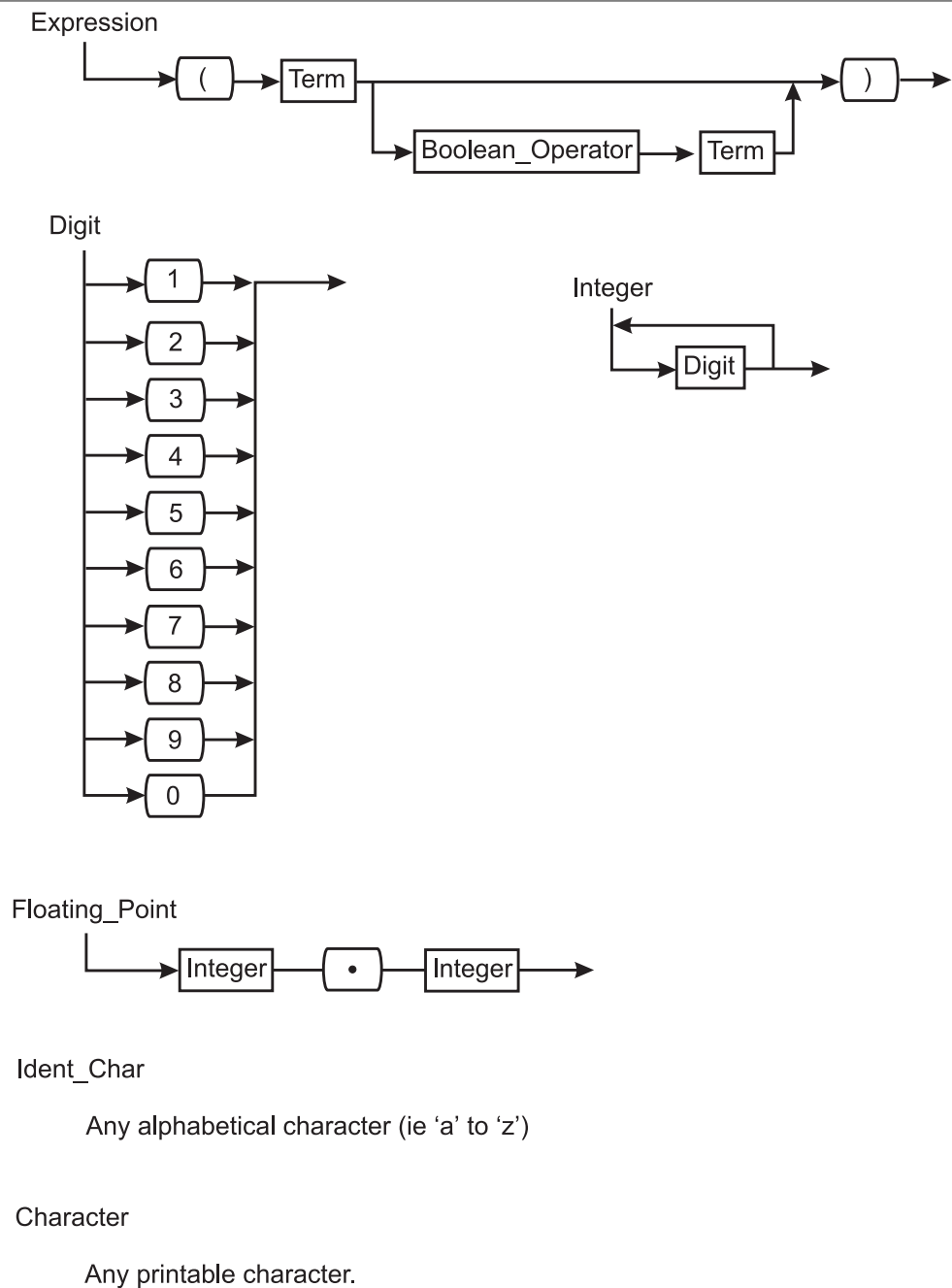


Figure 19

Customer service

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