Fundamentals
M7
MAINTENANCE PRACTICES

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M7.18
Disassemly, Inspect., Repair & Assembly Technics
Mechanical Topics

EASA Part-66
CAT B1

Training Manual

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M7 MAINTENANCE PRACTICES

M7.18 DISASSEMBLY, INSPECTION, REPAIR AND ASSEMBLY TECHNIQUES

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DISASSEMBLY AND RE-ASSEMBLY TECHNIQUES (CONTD.)

The standardized techniques are listed in the AMM chapter 20.

Generally only materials that are marked clearly and are approved for their airworthiness are allowed to be used.

In the aviation very high safety standards are valid, because one wrongly assembled part can always cause a fatal crash of the aircraft.

That implies that after every work a foreign objects and tool inspection is generally carried out.

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1. Approving National Aviation Authority / Country Genehmigende nationale Luftfahrtbehörde / Staat	2 **AUTHORISED RELEASE CERTIFICATE** **JAA FORM ONE**	3. Form Tracking Number laufende Formularnummer
4. Approved Organisation Name and Address Name und Anschrift des genehmigten Betriebes		5. Work Order/Contract/Invoice Arbeitsauftrag/Vertrag/Lieferschein

6. Item Lfd. Nr./Position	7. Description Bezeichnung	8. Part No. Bauteil-Nr.	9. Eligibility* Verwendbarkeit*	10. Qty Anzahl	11. Serial/Batch No. Werk-/Los-Nr.	12. Status/Work Zustand/Arbeiten

13. Remarks
Bemerkungen

14. Certifies that the items identified above were manufactured in conformity to:
Es wird bescheinigt, dass die oben aufgeführten Artikel hergestellt wurden in Übereinstimmung mit:

☐ approved design data and are in condition for safe operation
genehmigten Entwicklungsunterlagen und in einem Zustand für einen sicheren Betrieb sind

☐ non-approved design data specified in block 13
in Feld 13 aufgeführte nicht genehmigten Entwicklungsunterlagen

19. ☐ JAR-145.50 Release to Service
Freigabebescheinigung gem. JAR-145.50

☐ Other Regulation specified in block 13
Freigabebescheinigung gem. in Feld 13 aufgeführten Vorschrift

Certifies that unless otherwise specified in block 13, the work specified in block 12 and described in block 13, was accomplished in accordance with JAR-145 and in respect to that work the items are considered ready for release to service
Es wird bescheinigt, dass, wenn in Feld 13 nichts anderes festgelegt ist, die in Feld 12 aufgeführten und in Feld 13 beschriebenen Arbeiten in Übereinstimmung mit JAR-145 durchgeführt wurden, und dass die Artikel im Hinblick auf diese Arbeiten als geeignet für die Freigabe zum Betrieb betrachtet werden.

15. Authorised Signature Unterschrift der berechtigten Person	16. Approval/Authorisation Number Genehmigungs-/Berechtigungsnummer	20. Authorised Signature Unterschrift der berechtigten Person	21. Certificate/Approval Ref No. Bescheinigungs-/Genehmigungsnummer
17. Name Name	18. Date (d/m/y) Datum (Tag/Monat/Jahr)	22. Name Name	23. Date (d/m/y) Datum (Tag/Monat/Jahr)

JAA Form One - Issue 4

* Installer must cross-check eligibility with applicable technical data
Der Verwendbarkeitsnachweis ist verpflichtet, die Verwendbarkeit anhand der geltenden technischen Unterlagen zu überprüfen

Figure 1 Overview Assembly

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Anchors and Bolts

When fastening anchors and bolts always consider the particular torque.

If an anchor is screwed together with a nut, the nut has always to be held up.

Generally anchors have to be reused after a visual inspection.

If the anchor is very expensive (e.g. engine mounting anchors) it can be reasonable to repair them with a suitable repair method.

Bolt Holes

Bolt holes have to be treated with the same care. It is particularly important, that the holes in the stressed areas are free of grooves and burrs. If applicable, bolts have to be loosened with penetrating oil, before removing them. But it is also necessary, to make sure that the oil does not damage the sealing material.

When loosening bolts which are secured with a hammer method, the burrs have to be removed, in order to remove the nut. These bolts must not be reused.

Bolt Securing

There are a lot of different bolt securing methods available. These are made for keeping the parts which are fastened with the bolts in their position. They are secured by:

- locking wire,
- retainers,
- chemical securing methods,
- holding sheets,
- Lock nuts,
- etc.

Nuts

Generally nuts can be reused after a visual inspection.

Lock Nuts

Lock Nuts can if applicable be reused.

They are inspected with a certain procedure.

- Condition of parts (damages)
- Cleaning from grease and oil
- Thread inspection
- Checking of the torque and comparison with the table in the AMM chapter 20.

When the criteria listed above are not fulfilled the lock nut has to be scrapped.

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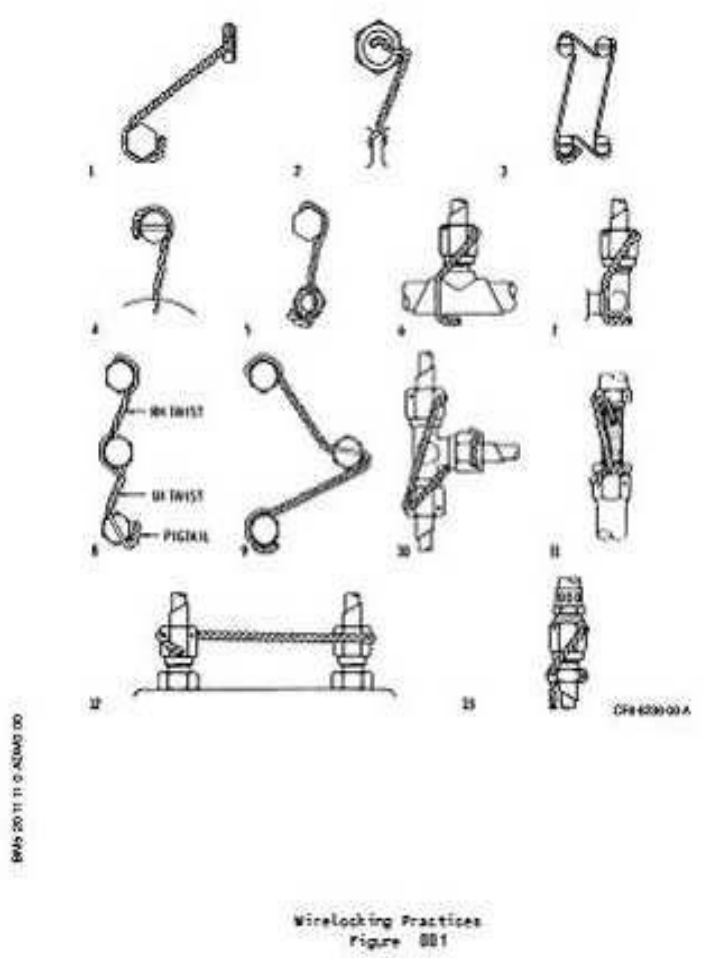












Figure 2 Bolt Securing

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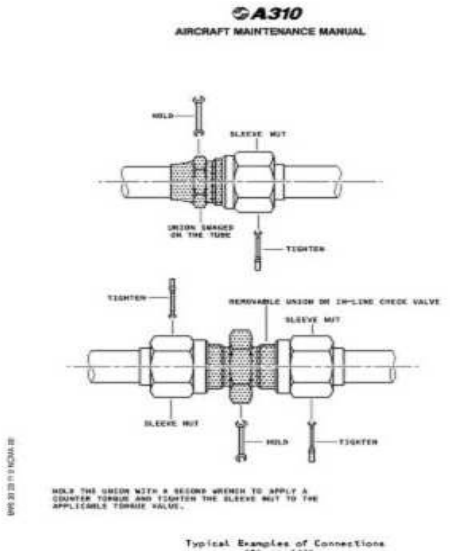
Hoses and Pipes Connections

When fastening hoses or pipes the particular torque has always to be regarded and the connection has to be held up.

Opened connections have to be closed instantly with a cap.

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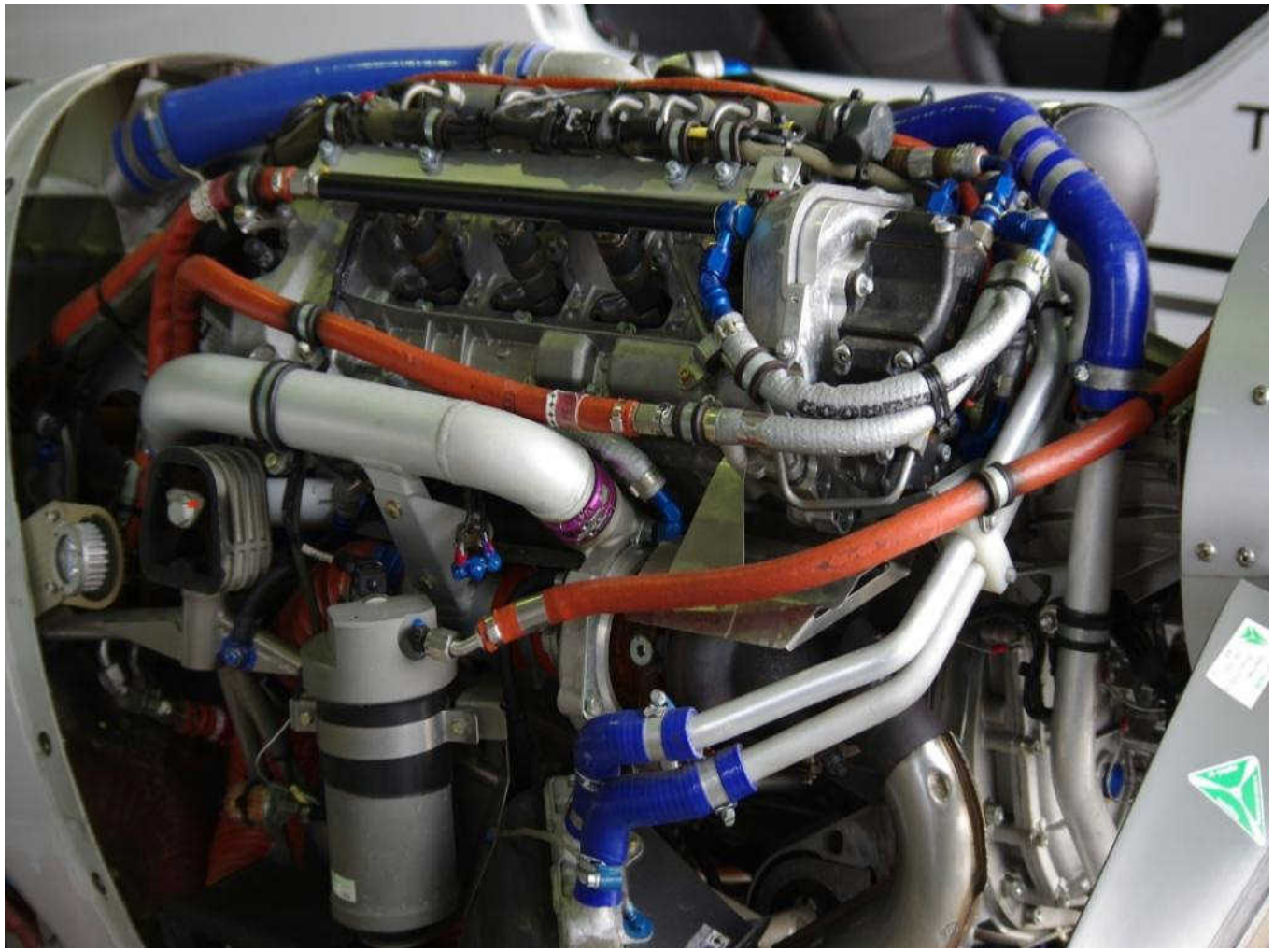


Figure 3 Hoses and Pipes

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O-Rings

O-Rings are only used one time, they are instantly after de-installation destroyed. When removing the leftovers of the o-ring it has to be taken care not to damage the base material.

Softer materials than the base material have to be used e.g. pertinax spatula. Now the sealing areas is cleaned and checked for damages.

When using the new o-ring it has to be taken into account that they can have a expiring date. The o-ring is treated with a lubricant developed for the installation and moved over an assembly sleeve.

Depending on the application other assembly aids might be needed.

Gaskets

Gaskets are only used once besides a few exceptions. Else the information listed above concerning the o-rings is also here valid.

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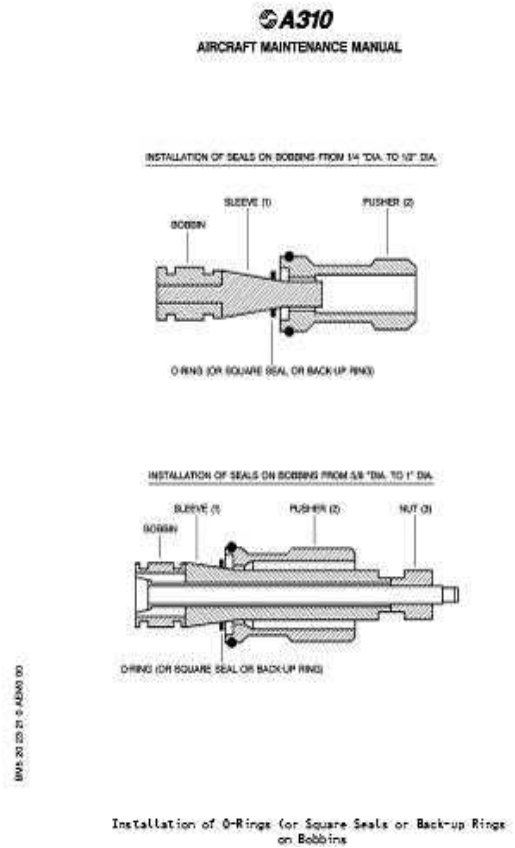










Figure 4 O-Rings

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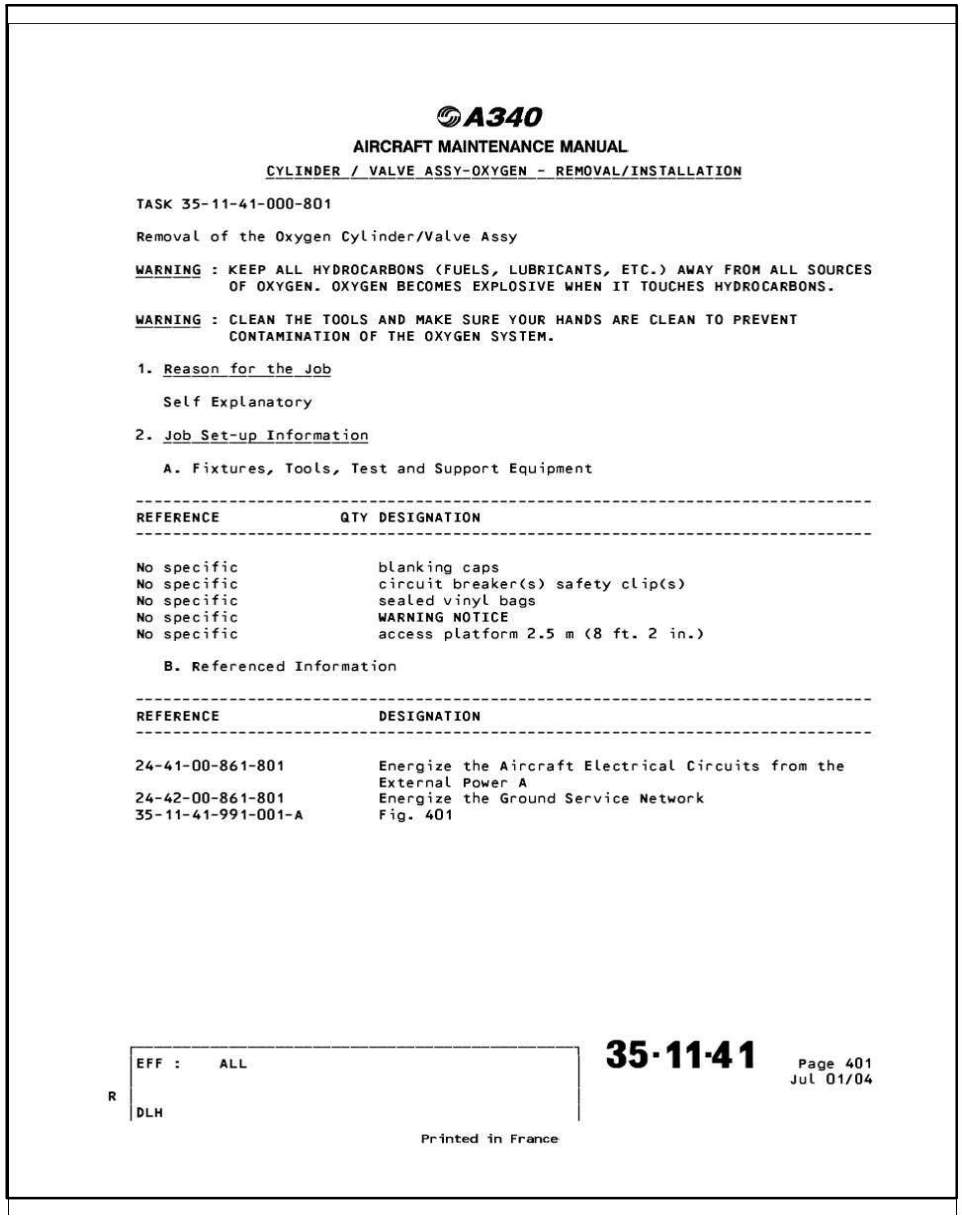
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Working Procedures

On the following figures a simple working procedure is depicted, which can once be related to.

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CYLINDER / VALVE ASSY-OXYGEN - REMOVAL/INSTALLATION

TASK 35-11-41-000-801

Removal of the Oxygen Cylinder/Valve Assy

WARNING : KEEP ALL HYDROCARBONS (FUELS, LUBRICANTS, ETC.) AWAY FROM ALL SOURCES OF OXYGEN. OXYGEN BECOMES EXPLOSIVE WHEN IT TOUCHES HYDROCARBONS.

WARNING : CLEAN THE TOOLS AND MAKE SURE YOUR HANDS ARE CLEAN TO PREVENT CONTAMINATION OF THE OXYGEN SYSTEM.

1. Reason for the Job

Self Explanatory

2. Job Set-up Information

A. Fixtures, Tools, Test and Support Equipment

REFERENCE	QTY	DESIGNATION
No specific		blanking caps
No specific		circuit breaker(s) safety clip(s)
No specific		sealed vinyl bags
No specific		WARNING NOTICE
No specific		access platform 2.5 m (8 ft. 2 in.)

B. Referenced Information

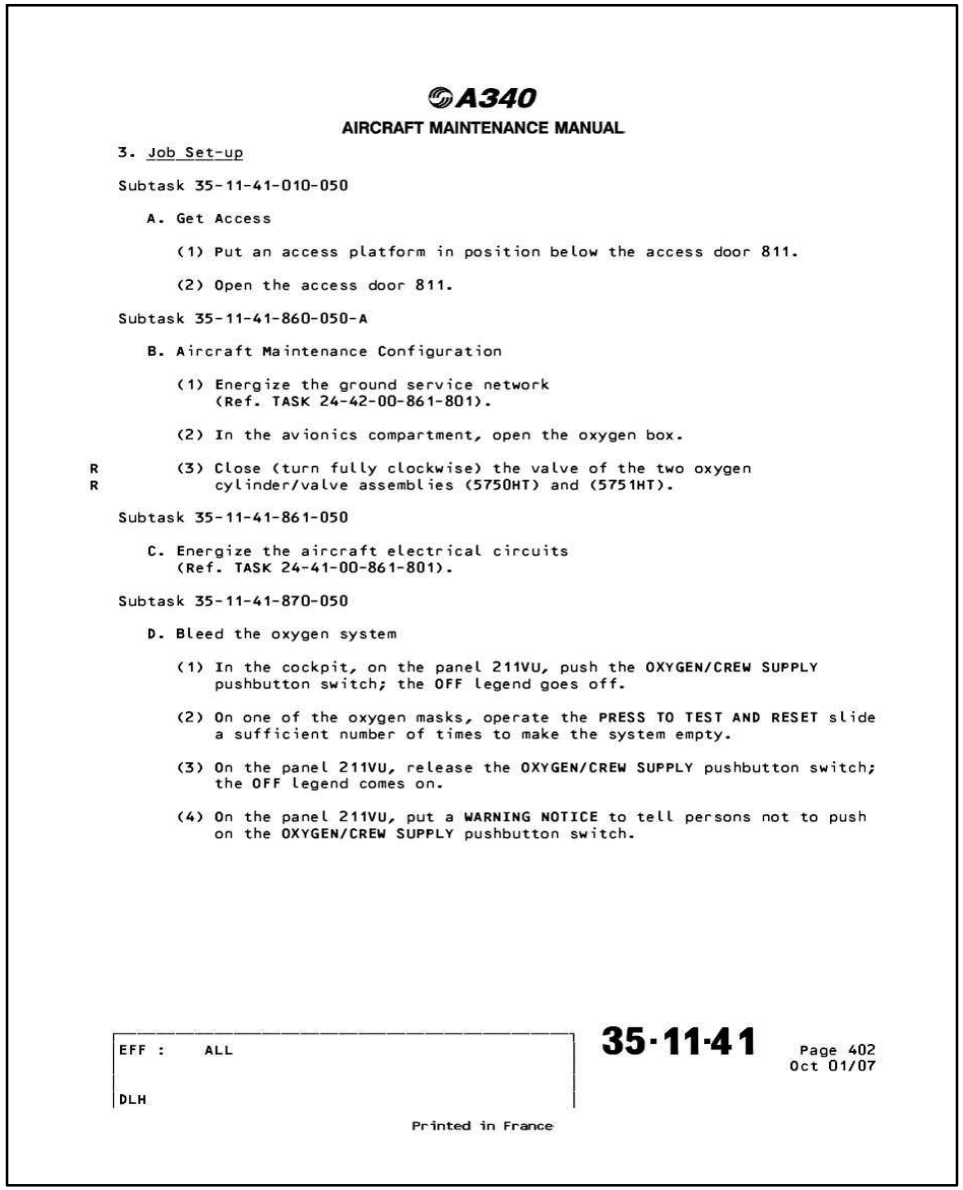
REFERENCE	DESIGNATION
24-41-00-861-801	Energize the Aircraft Electrical Circuits from the External Power A
24-42-00-861-801	Energize the Ground Service Network
35-11-41-991-001-A	Fig. 401

EFF : ALL
R
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3. Job Set-up

Subtask 35-11-41-010-050

A. Get Access

(1) Put an access platform in position below the access door 811.

(2) Open the access door 811.

Subtask 35-11-41-860-050-A

B. Aircraft Maintenance Configuration

(1) Energize the ground service network (Ref. TASK 24-42-00-861-801).

(2) In the avionics compartment, open the oxygen box.

R (3) Close (turn fully clockwise) the valve of the two oxygen
R cylinder/valve assemblies (5750HT) and (5751HT).

Subtask 35-11-41-861-050

C. Energize the aircraft electrical circuits (Ref. TASK 24-41-00-861-801).

Subtask 35-11-41-870-050

D. Bleed the oxygen system

(1) In the cockpit, on the panel 211VU, push the OXYGEN/CREW SUPPLY pushbutton switch; the OFF legend goes off.

(2) On one of the oxygen masks, operate the PRESS TO TEST AND RESET slide a sufficient number of times to make the system empty.

(3) On the panel 211VU, release the OXYGEN/CREW SUPPLY pushbutton switch; the OFF legend comes on.

(4) On the panel 211VU, put a WARNING NOTICE to tell persons not to push on the OXYGEN/CREW SUPPLY pushbutton switch.

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Figure 5 Working Procedures (1)

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Subtask 35-11-41-865-050

E. Open, safety and tag this(these) circuit breaker(s):

PANEL	DESIGNATION	FIN	LOCATION
742VU	CREW OXY CTL	4HT	L73

4. Procedure

Subtask 35-11-41-020-051-A

A. Removal of the Oxygen Cylinder/Valve Assemblies (5750HT) and (5751HT) (Ref. Fig. 401/TASK 35-11-41-991-001-A)

(1) Loosen the nuts (6) and disconnect the oxygen pressure regulator/transmitters (5) from the cylinder valves (7).

(2) Put blanking caps on the regulator/transmitters (5).

(3) Put the regulator/transmitters (5) in sealed vinyl bags.

(4) Put the oxygen-cylinder stowage caps on the cylinder valves (7).

R (5) Disconnect the HP oxygen-overpressure hoses (3) from the cylinder valves (7) and discard the conical seals (4).

(6) Put blanking caps on the hoses (3).

R (7) Put the oxygen-cylinder stowage caps on the cylinder valves (7).

(8) Loosen and open the straps (1).

(9) Remove the cylinders (2).

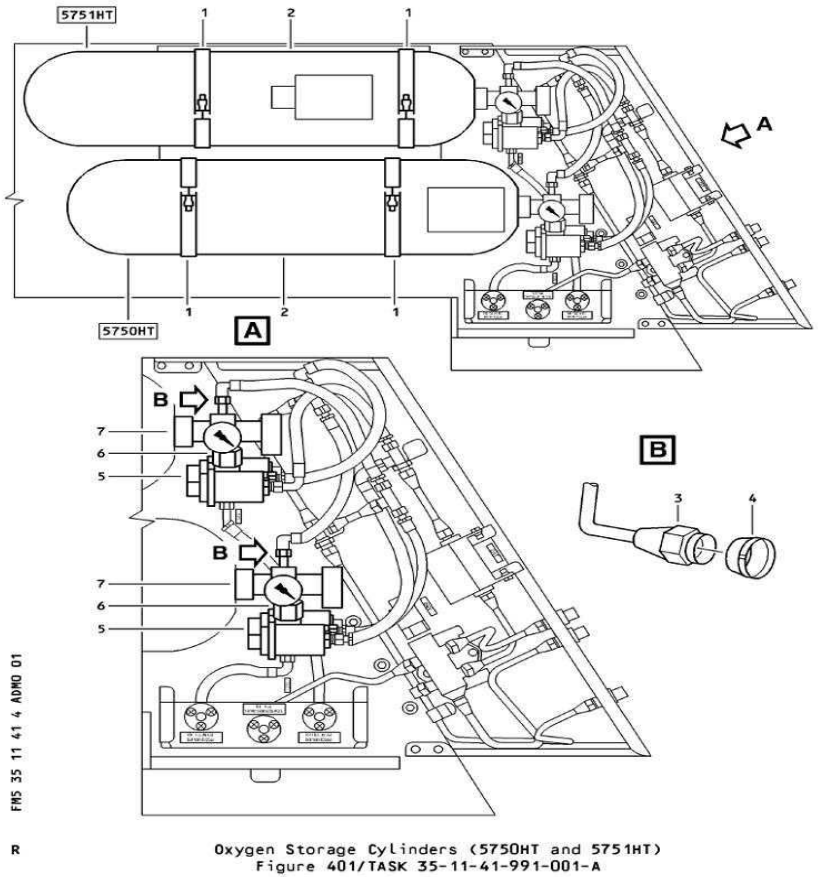
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R Oxygen Storage Cylinders (5750HT and 5751HT)
Figure 401/TASK 35-11-41-991-001-A

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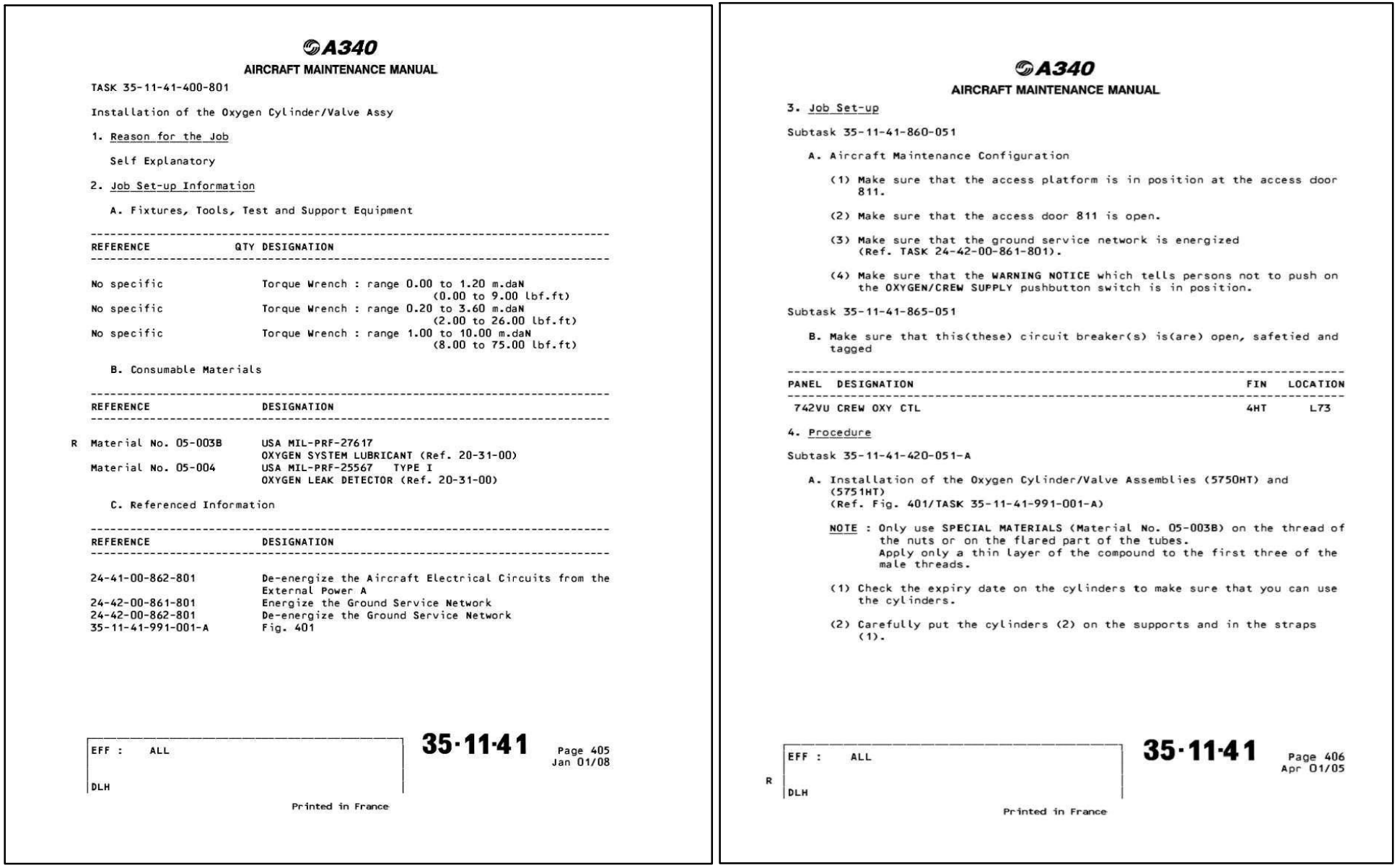
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Figure 6 Working Procedures (2)

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TASK 35-11-41-400-801

Installation of the Oxygen Cylinder/Valve Assy

1. Reason for the Job

Self Explanatory

2. Job Set-up Information

A. Fixtures, Tools, Test and Support Equipment

REFERENCE	QTY	DESIGNATION
No specific		Torque Wrench : range 0.00 to 1.20 m.daN (0.00 to 9.00 lbf.ft)
No specific		Torque Wrench : range 0.20 to 3.60 m.daN (2.00 to 26.00 lbf.ft)
No specific		Torque Wrench : range 1.00 to 10.00 m.daN (8.00 to 75.00 lbf.ft)

B. Consumable Materials

	REFERENCE	DESIGNATION
R	Material No. 05-003B	USA MIL-PRF-27617 OXYGEN SYSTEM LUBRICANT (Ref. 20-31-00)
	Material No. 05-004	USA MIL-PRF-25567 TYPE I OXYGEN LEAK DETECTOR (Ref. 20-31-00)

C. Referenced Information

REFERENCE	DESIGNATION
24-41-00-862-801	De-energize the Aircraft Electrical Circuits from the External Power A
24-42-00-861-801	Energize the Ground Service Network
24-42-00-862-801	De-energize the Ground Service Network
35-11-41-991-001-A	Fig. 401

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3. Job Set-up

Subtask 35-11-41-860-051

A. Aircraft Maintenance Configuration

(1) Make sure that the access platform is in position at the access door 811.

(2) Make sure that the access door 811 is open.

(3) Make sure that the ground service network is energized (Ref. TASK 24-42-00-861-801).

(4) Make sure that the WARNING NOTICE which tells persons not to push on the OXYGEN/CREW SUPPLY pushbutton switch is in position.

Subtask 35-11-41-865-051

B. Make sure that this(these) circuit breaker(s) is(are) open, safetied and tagged

PANEL	DESIGNATION	FIN	LOCATION
742VU	CREW OXY CTL	4HT	L73

4. Procedure

Subtask 35-11-41-420-051-A

A. Installation of the Oxygen Cylinder/Valve Assemblies (5750HT) and (5751HT)
(Ref. Fig. 401/TASK 35-11-41-991-001-A)

NOTE : Only use SPECIAL MATERIALS (Material No. 05-003B) on the thread of the nuts or on the flared part of the tubes.
Apply only a thin layer of the compound to the first three of the male threads.

(1) Check the expiry date on the cylinders to make sure that you can use the cylinders.

(2) Carefully put the cylinders (2) on the supports and in the straps (1).

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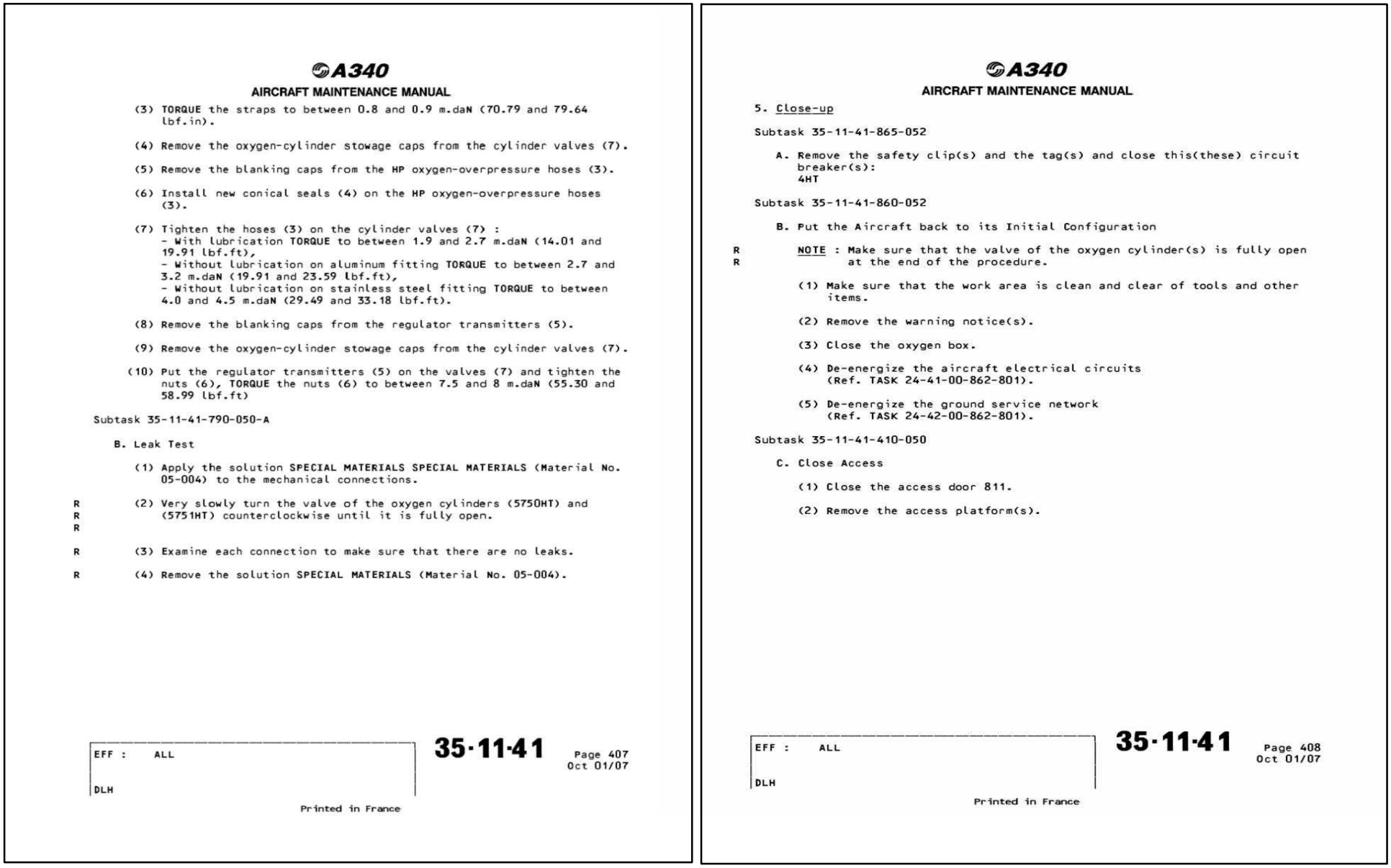
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Figure 7 Working Procedures (3)

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(3) TORQUE the straps to between 0.8 and 0.9 m.daN (70.79 and 79.64 lbf.in).

(4) Remove the oxygen-cylinder stowage caps from the cylinder valves (7).

(5) Remove the blanking caps from the HP oxygen-overpressure hoses (3).

(6) Install new conical seals (4) on the HP oxygen-overpressure hoses (3).

(7) Tighten the hoses (3) on the cylinder valves (7) :
- With lubrication TORQUE to between 1.9 and 2.7 m.daN (14.01 and 19.91 lbf.ft),
- Without lubrication on aluminum fitting TORQUE to between 2.7 and 3.2 m.daN (19.91 and 23.59 lbf.ft),
- Without lubrication on stainless steel fitting TORQUE to between 4.0 and 4.5 m.daN (29.49 and 33.18 lbf.ft).

(8) Remove the blanking caps from the regulator transmitters (5).

(9) Remove the oxygen-cylinder stowage caps from the cylinder valves (7).

(10) Put the regulator transmitters (5) on the valves (7) and tighten the nuts (6), TORQUE the nuts (6) to between 7.5 and 8 m.daN (55.30 and 58.99 lbf.ft)

Subtask 35-11-41-790-050-A

B. Leak Test

(1) Apply the solution SPECIAL MATERIALS SPECIAL MATERIALS (Material No. 05-004) to the mechanical connections.

R (2) Very slowly turn the valve of the oxygen cylinders (5750HT) and
R (5751HT) counterclockwise until it is fully open.
R

R (3) Examine each connection to make sure that there are no leaks.

R (4) Remove the solution SPECIAL MATERIALS (Material No. 05-004).

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5. Close-up

Subtask 35-11-41-865-052

A. Remove the safety clip(s) and the tag(s) and close this(these) circuit breaker(s):
4HT

Subtask 35-11-41-860-052

B. Put the Aircraft back to its Initial Configuration

R NOTE : Make sure that the valve of the oxygen cylinder(s) is fully open
R at the end of the procedure.

(1) Make sure that the work area is clean and clear of tools and other items.

(2) Remove the warning notice(s).

(3) Close the oxygen box.

(4) De-energize the aircraft electrical circuits (Ref. TASK 24-41-00-862-801).

(5) De-energize the ground service network (Ref. TASK 24-42-00-862-801).

Subtask 35-11-41-410-050

C. Close Access

(1) Close the access door 811.

(2) Remove the access platform(s).

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Figure 8 Working Procedures (4)

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TROUBLE SHOOTING TECHNIQUES

Basics - Example Airbus (Trouble Shooting Manual)

General

The contents of the TSM used to be part of the AMM, page block 101 ff. Nowadays the TSM itself is so comprehensive that it has become an individual manual.

The TSM contains procedures regarding the systematic classification, isolation and trouble shooting of malfunctions.

Faults can be localized with the warnings of the Centralized Maintenance System (CMS / A340), the CFDS (Central Fault Display System / A320) and through fault reports or the observation of malfunctions.

Effectivity

The TSM is an aircraft type-related and usually also an owner-related document.

Structure

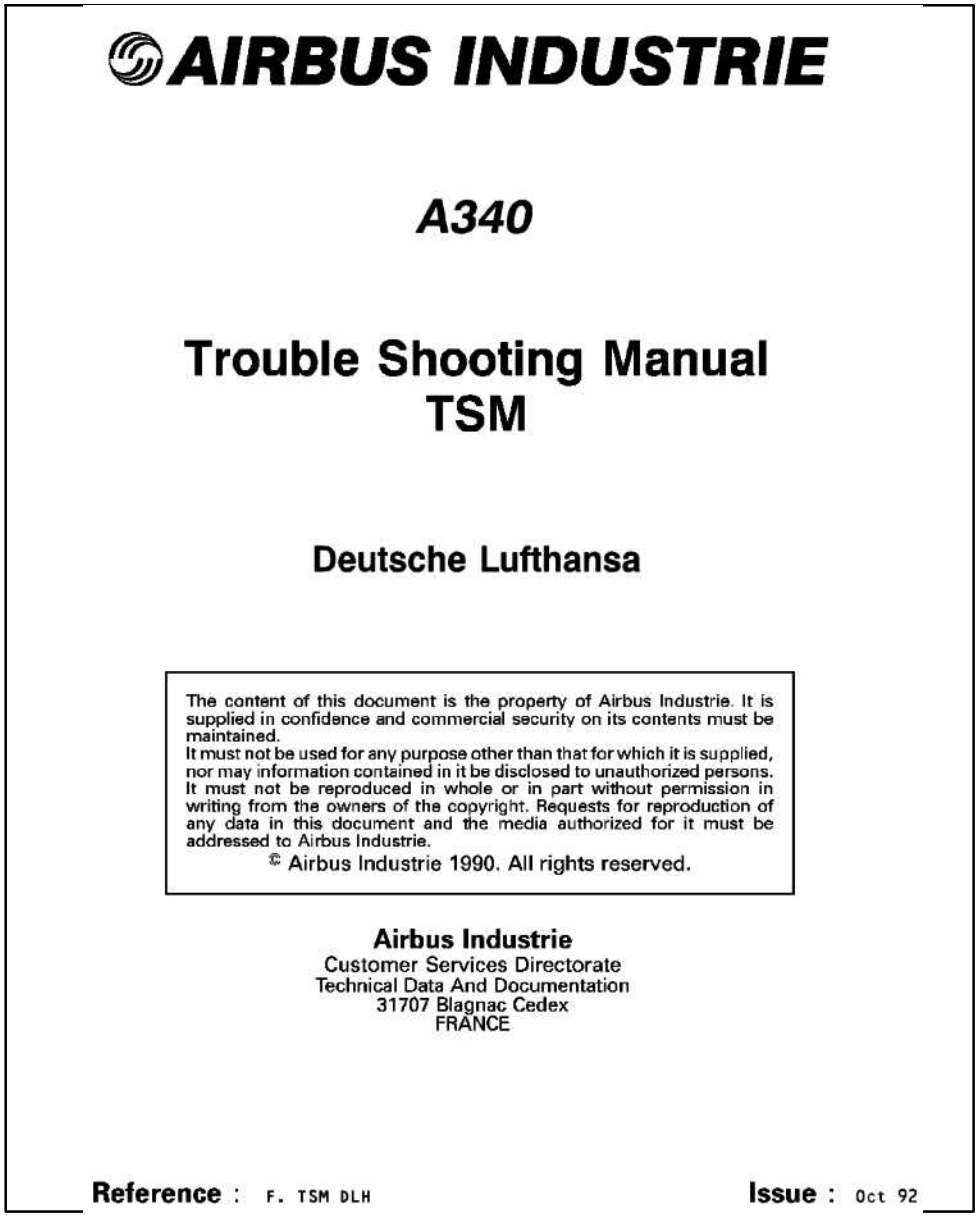
The TSM is structured in accordance with the ATA iSpec. 2200.

Procedures

For the fault isolation and trouble shooting, the TSM refers to specific instructions included in other manuals (AMM, WDM, ...).

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AIRBUS INDUSTRIE

A340

Trouble Shooting Manual
TSM

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Reference : F. TSM DLH **Issue :** Oct 92

Figure 9 Front Page TSM

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General Structure of the TSM

STRUCTURE OF THE MANUAL

The following chapters can be found in the beginning of the TSM:

- **Manual Front Matter** incl.:
  - Record of Revisions
  - List of Temporary Revisions
  - List of Chapters
  - SB-List
  - COC-List
  - Index of Warnings / Malfunctions
  - Index of Maintenance Fault Messages
- **Chapter 00** incl.:
  - Highlights (HL)
  - List of Effective Pages (LEP)
  - Table of Content (TOC)
  - Introduction

In the beginning of every chapter, lists relating to the respective chapter are included:

- Highlights (HL)
- List of Effective Pages (LEP)
- Table of Content (TOC)
- Fault Symptoms incl.:
  - ECAM (not in every chapter)
  - EFIS (not in every chapter)
  - Local
  - Observations
  - CMS / CFDS

Every chapter is divided into:

- Chapter
- Section
- Subject

The respective page blocks are allocated to every subject in the TSM as well:

- PB 001 - 099:
  - All lists mentioned previously included in the beginning of the manual and in the beginning of the relevant chapter.
- PB 101 - 199:
  - Fault Symptoms
- PB 201 - 299:
  - Fault Isolation Procedures
- PB 301 - 399:
  - Task Supporting Data

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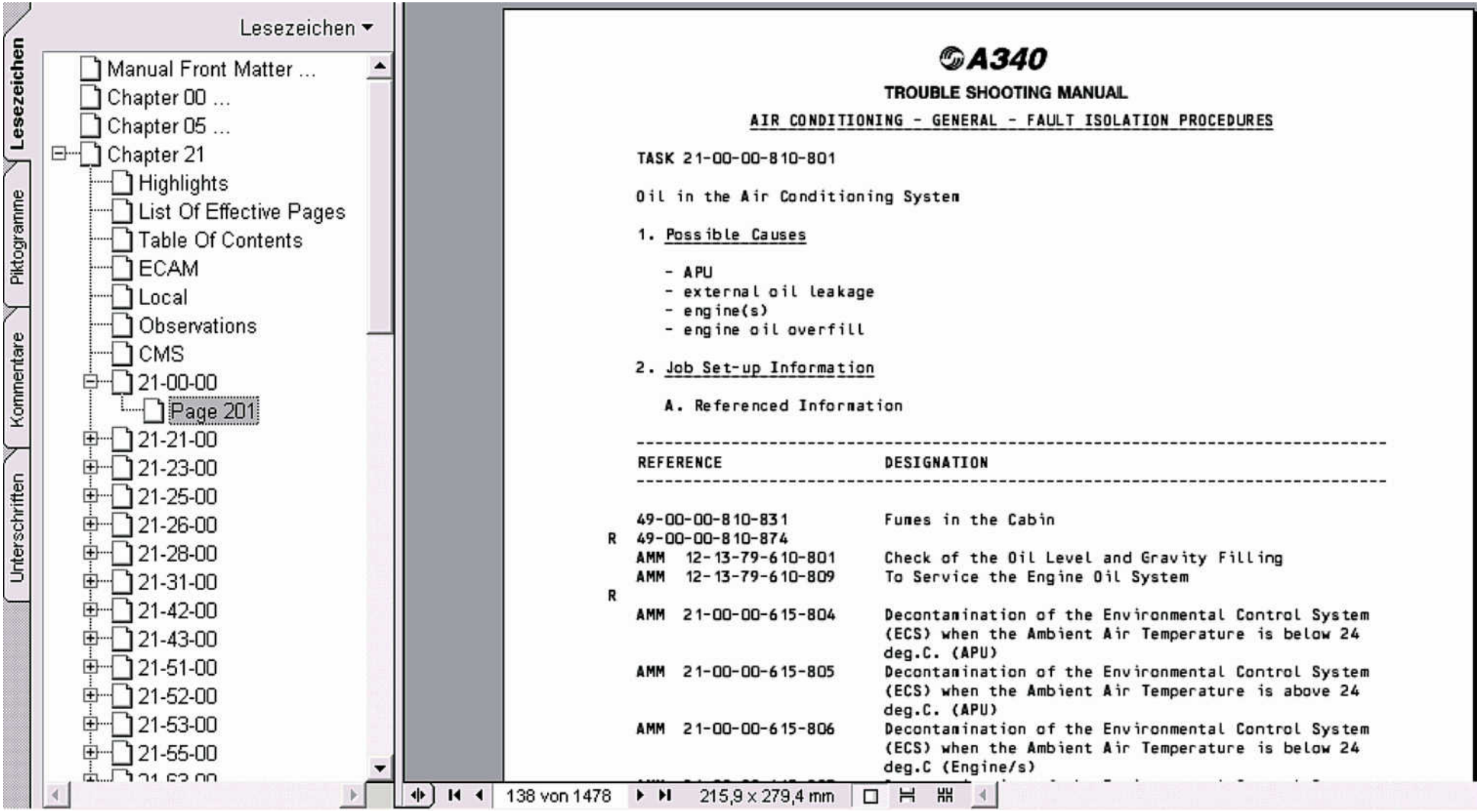


Figure 10 Chapter Structure

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MANUAL FRONT MATTER

This chapter contains general information on the present TSM.

- **Front Page**
  - Cover page
- **Request for Information**
  - Sheet to contact Airbus Industry
- **Record of Revisions**
  - List of all the revisions for this document with the date of issue.
- **List of Temporary Revisions**
  - Information on the included temporary revisions.
- **List of Chapters**
  - This list contains all ATA chapters included in this manual.
- **SB-List**
  - The Service Bulletin List includes all SBs the aircraft owner has chosen to carry out (provided the manufacturer was notified) as well as SBs that are mandatory to be carried out. The list also includes the status of the SBs.
- **COC-List**
  - The COC list contains the Customer Originated Changes (changes in configuration requested by the aircraft owner) that have an influence on the contents of the TSM.

Furthermore the manual front matter in the TSM contains the Index of Warnings / Malfunctions and the Index of Maintenance Fault Messages

The contents of those lists are structured as follows:

- **Index of Warnings / Malfunctions**
  - **Highlights**
  - **List of effective pages**
  - **Index ECAM:** List of all possible warnings by the ECAM (Electronic Centralized Aircraft Monitoring), divided into the sources of the fault messages:
    - EWD - Engine / Warning Display or Upper ECAM DU (Display Unit) Warnings,
    - STS (Status) - message INOP or MAINTENANCE,
    - EWD - Flag (s) or Upper ECAM DU - flag (s),
    - SD (System Display) - Flag (s) or Lower ECAM DU - flag (s) and
    - SD - Advisory (ies) or Lower ECAM DU - Advisory (ies).
  - **Index EFIS:** List of all possible warnings by the EFIS (Electronic Flight Instrument System), divided into the sources of the fault messages:
    - PFD (Primary Flight Display) - Flag (s) and
    - ND (Navigation Display) - Flag (s).
  - **Index LOCAL:** List of all possible local warnings, divided into the sources of the fault messages:
    - Here all panels are listed on which local fault messages may occur.
  - **Index OBSV:** List of a wide range of fault observations by the crew and/or the maintenance personnel.
- **Index of Maintenance Fault Messages**
  - **Highlights**
  - **List of effective pages**
  - **Index of CMS Fault Messages**
    - List of all possible warnings and fault messages of the CMS (Central Maintenance System) or the CFDS (Central Fault Display System).

The lists mentioned here serve the purpose of quickly finding the required information.

That is why cross references to the respective trouble shooting procedures are made.

Additional information regarding the ATA chapters, the source of the fault message as well as the classification can be found in the CMS / CFDS fault messages.

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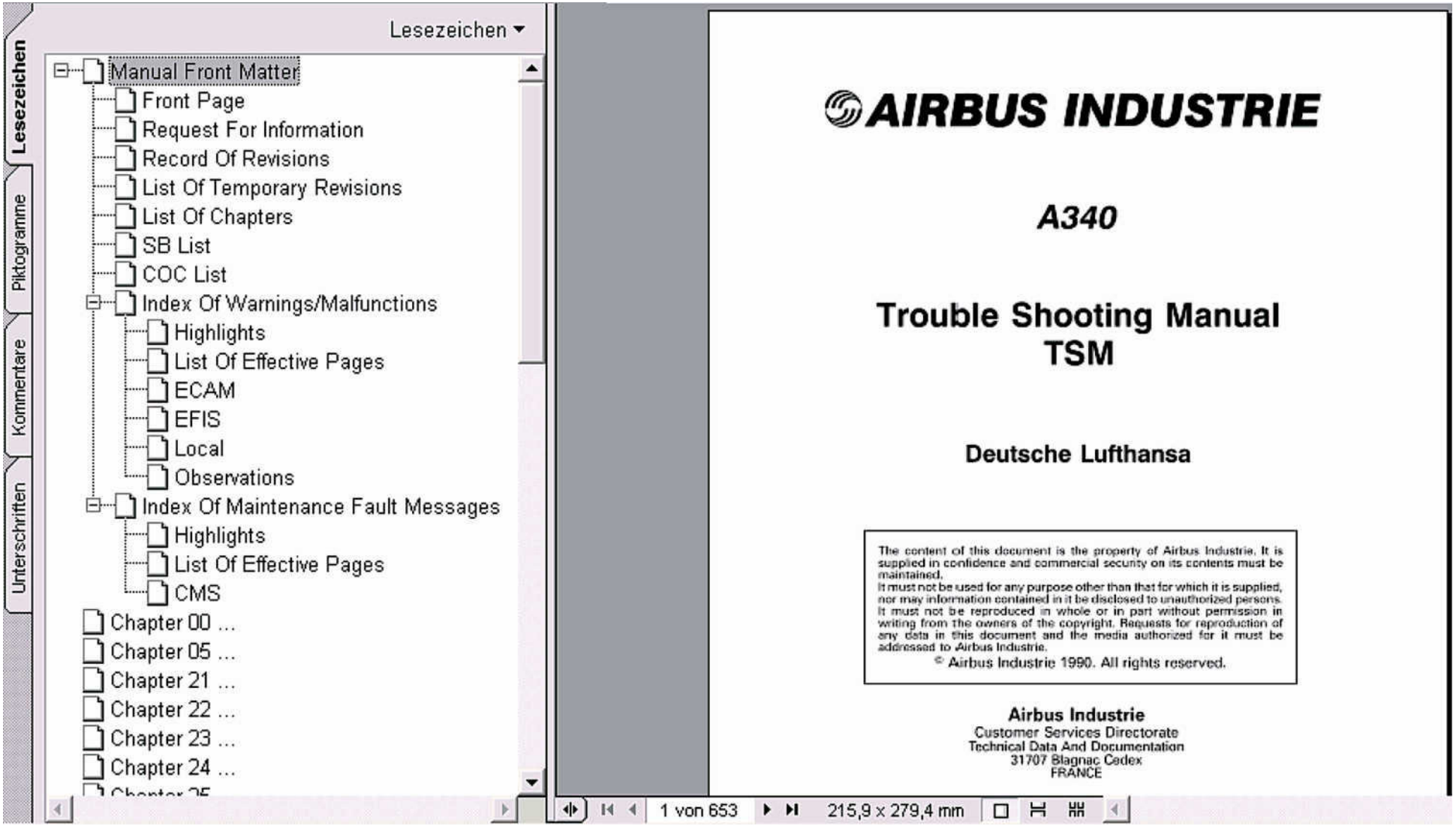


Figure 11 Manual Front Matter

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CHAPTER 00

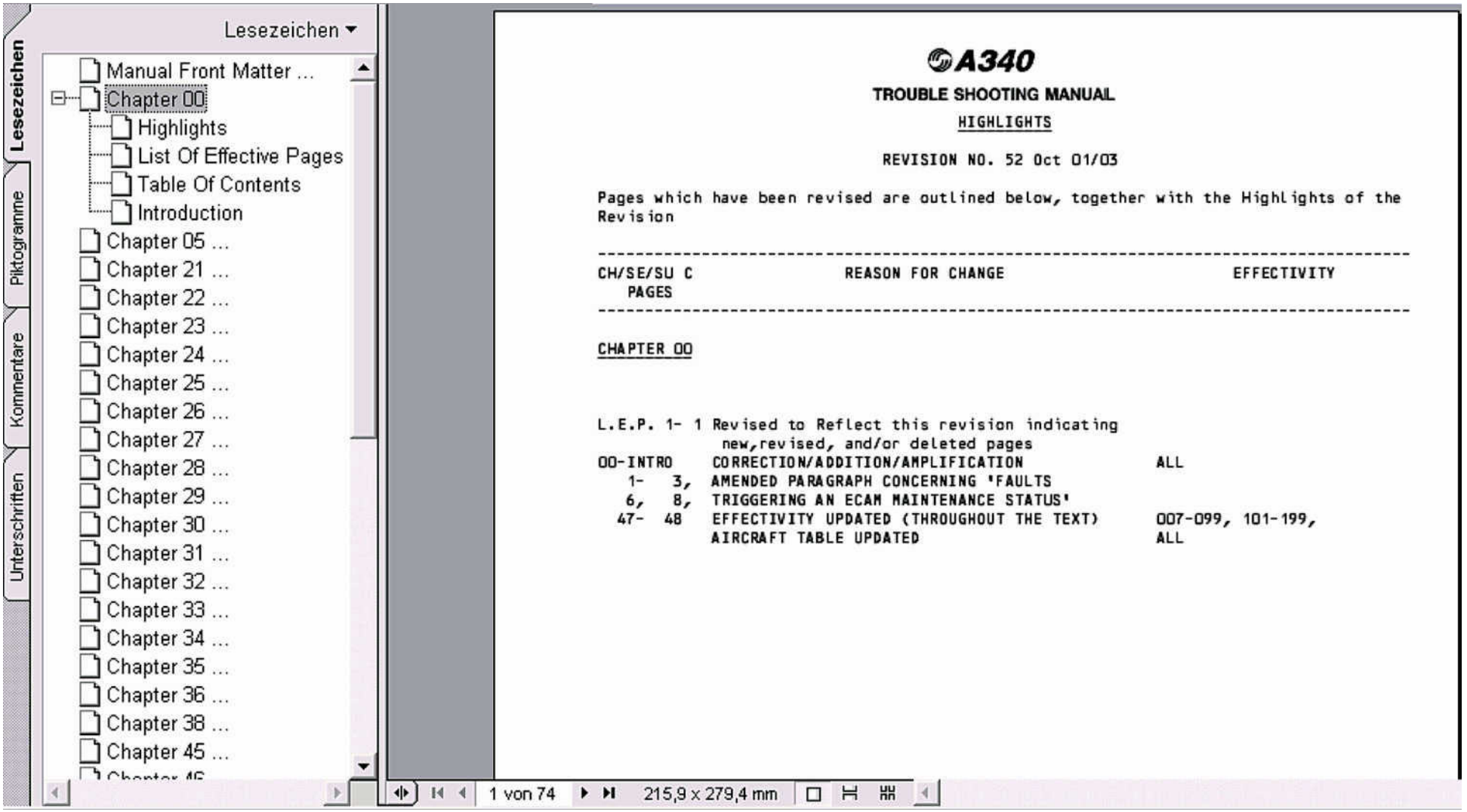
Besides the Highlights (HL), the List of Effective Pages (LEP) and the Table of Content (TOC), Chapter 00 also includes the **Introduction**.

This **Introduction** to the Trouble Shooting Manual contains the following points:

- **General**
  - Reason for issue and
  - Effectivity Table.
- **TSM Organization and Content**
  - Detailed description of the structure and the contents of the present document, such as:
    - Index description,
    - Structure of the Fault Isolation Procedure
    - Breakdown and Page Numbering,
    - Effectivity Statements,
    - Revision Service,
    - Text Breakdown (AMTOSS),
- **Philosophy and Use**
  - Maintenance Philosophy:
    - Usage of the CMS-/CFDS-Systems.
  - TSM Philosophy:
    - Explanation of the use of the TSM.
- **How to use the TSM**
  - Detailed description on how to use the manual:
    - Fault differentiation (monitored / non-monitored),
    - Introduction to the manual,
    - Differentiation of the Trouble Shooting Procedures,
    - Trouble Shooting Tips,
- **How to use the CMS/CFDS**
  - Detailed description of the Central Maintenance Systems:
    - Types of systems,
    - Flight / ground influence,
    - Messages,
    - Fault messages,
    - Maintenance functions (Post Flight Report, ...) and
    - Test functions.
- **Abbreviations**
  - List of abbreviations.

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A340

TROUBLE SHOOTING MANUAL

HIGHLIGHTS

REVISION NO. 52 Oct 01/03

Pages which have been revised are outlined below, together with the Highlights of the Revision

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
CHAPTER 00		
L.E.P. 1- 1	Revised to Reflect this revision indicating new,revised, and/or deleted pages	
00-INTRO	CORRECTION/ADDITION/AMPLIFICATION	ALL
1- 3,	AMENDED PARAGRAPH CONCERNING 'FAULTS	
6, 8,	TRIGGERING AN ECAM MAINTENANCE STATUS'	
47- 48	EFFECTIVITY UPDATED (THROUGHOUT THE TEXT)	007-099, 101-199,
	AIRCRAFT TABLE UPDATED	ALL

Figure 12 Chapter 00

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How to use the Manual

Types of faults

In the TSM, the faults are divided into two types:

- **Monitored Faults:**
  - ECAM warnings,
  - EFIS flags,
  - LOCAL warnings and
  - CMS / CFDS fault messages.
- **Non-Monitored Faults:**
  - Crew or Maintenance OBSERVATIONS.

When using the TSM, the types of faults serve as starting point. That means, depending on the localized fault, the way of finding the trouble shooting procedure can be different as well.

Introduction to the TSM

Trouble shooting is caused by a defect reported by the crew or the maintenance personnel.

Depending of the type of fault, trouble shooting with the TMS starts through the Fault Symptoms (PB 101), the Index of Warnings / Malfunctions or the Index of CMS / CFDS fault messages.

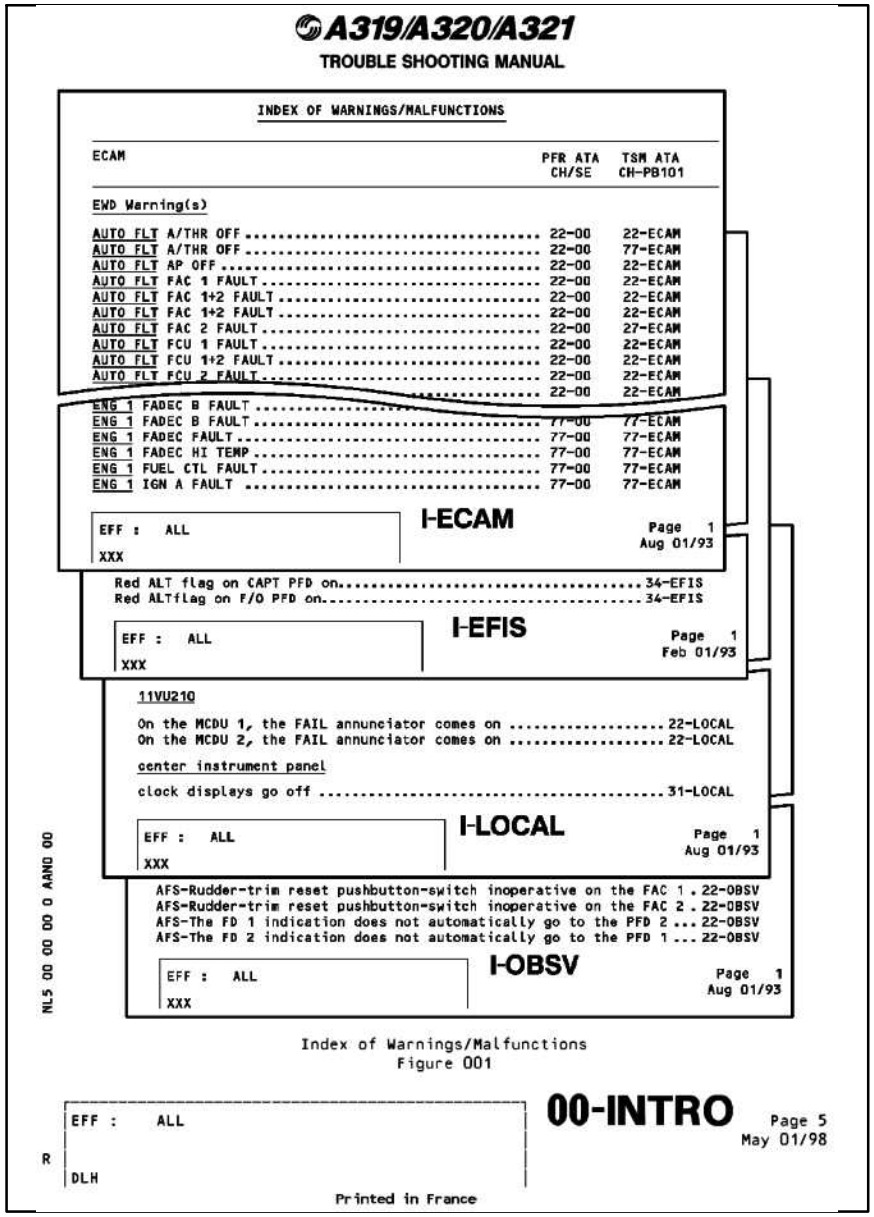
Those lists then refer to the relevant trouble shooting procedures.

Three types of monitored faults (ECAM, EFIS and Local) usually generate a CMS / CFDS Fault Message as well.

The connection of a malfunction with a CMS / CFDS Fault Message can be found in the so called **Post Flight Report**. The reference to the ATA chapter (Chapter / Subject) included in the PFR allows for the direct access to the correct fault symptoms.

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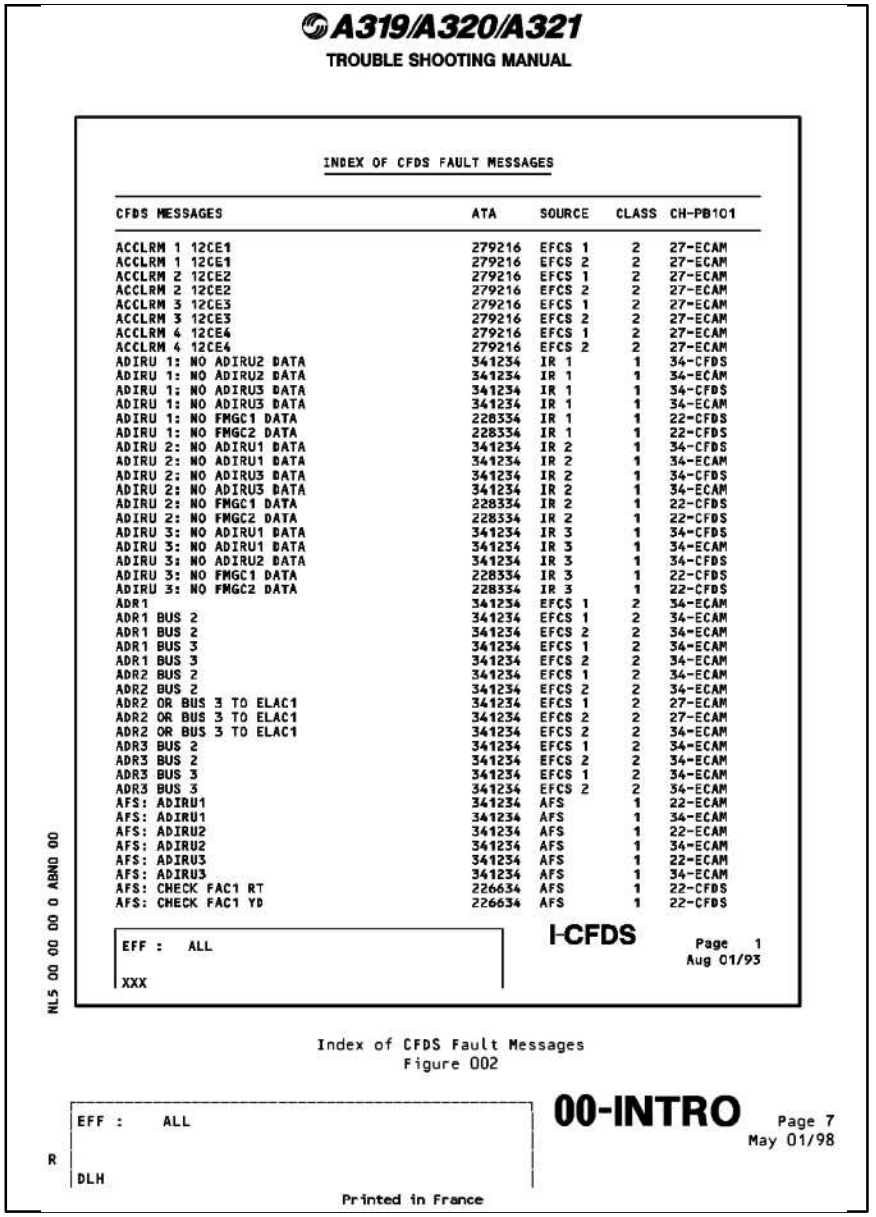


Figure 13 Index - Examples

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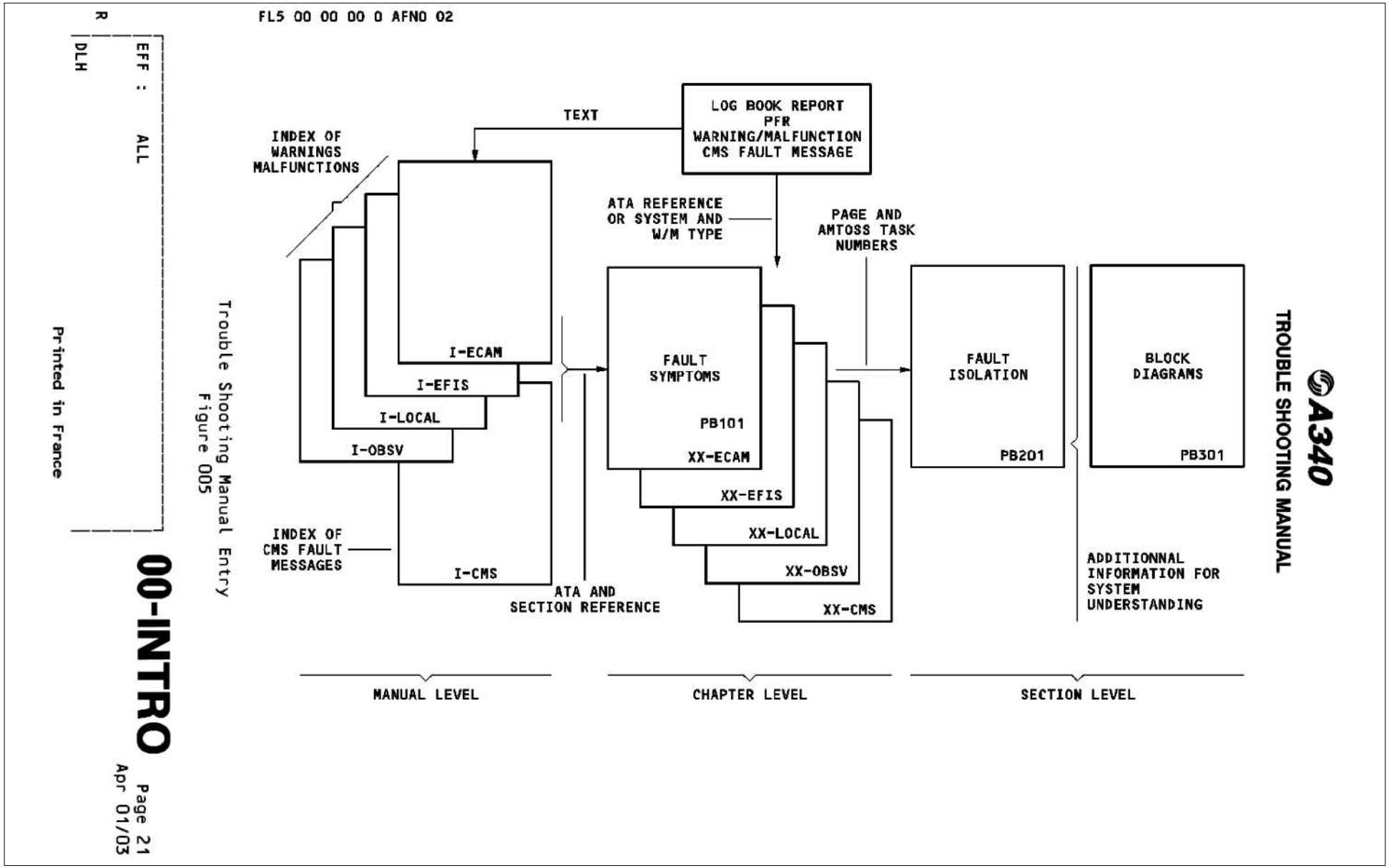


Figure 14 Introduction to the TSM

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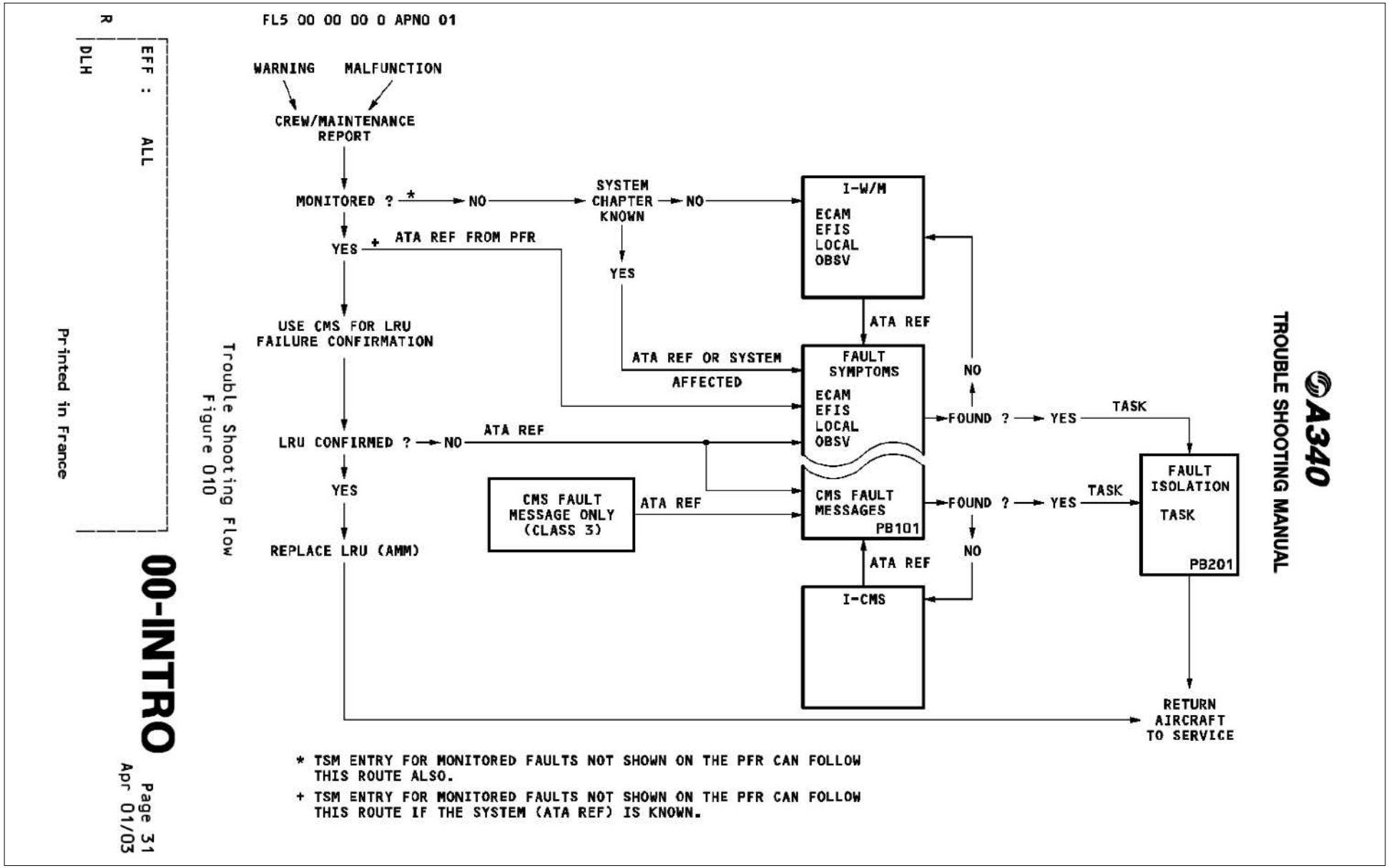


Figure 15 Trouble Shooting Flowchart

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TROUBLE SHOOTING

When looking for a specific trouble shooting procedure, there are three different methods:

- Trouble Shooting of Faults Reported on the PFR,
- Trouble Shooting of Faults not Reported on the PFR and
- Trouble Shooting CMS / CFDS fault messages.

Realization:

- **Trouble Shooting of Faults Reported on the PFR**

  This method is chosen with all fault messages listed in the **Post Flight Report**.

  – The ECAM warning or status message is compared to the CMS / CFDS fault message in the Post Flight Report to receive the ATA chapter reference and the relevant Fault Symptoms (PB 101).

  – In the respective ATA chapter, the suitable reference to a task number of the Fault Isolation Procedures can be found in the Fault Symptoms (PB 101).

  – The stated task can be found in the Fault Isolation Procedures (PB 201) as instructions for the fault isolation and trouble shooting.

- **Trouble Shooting Faults not Reported on the PFR**

  This method is chosen with Inop System Messages, Lower ECAM DU flags / advisories, local warnings and crew or maintenance observations which are not included in the PFR.

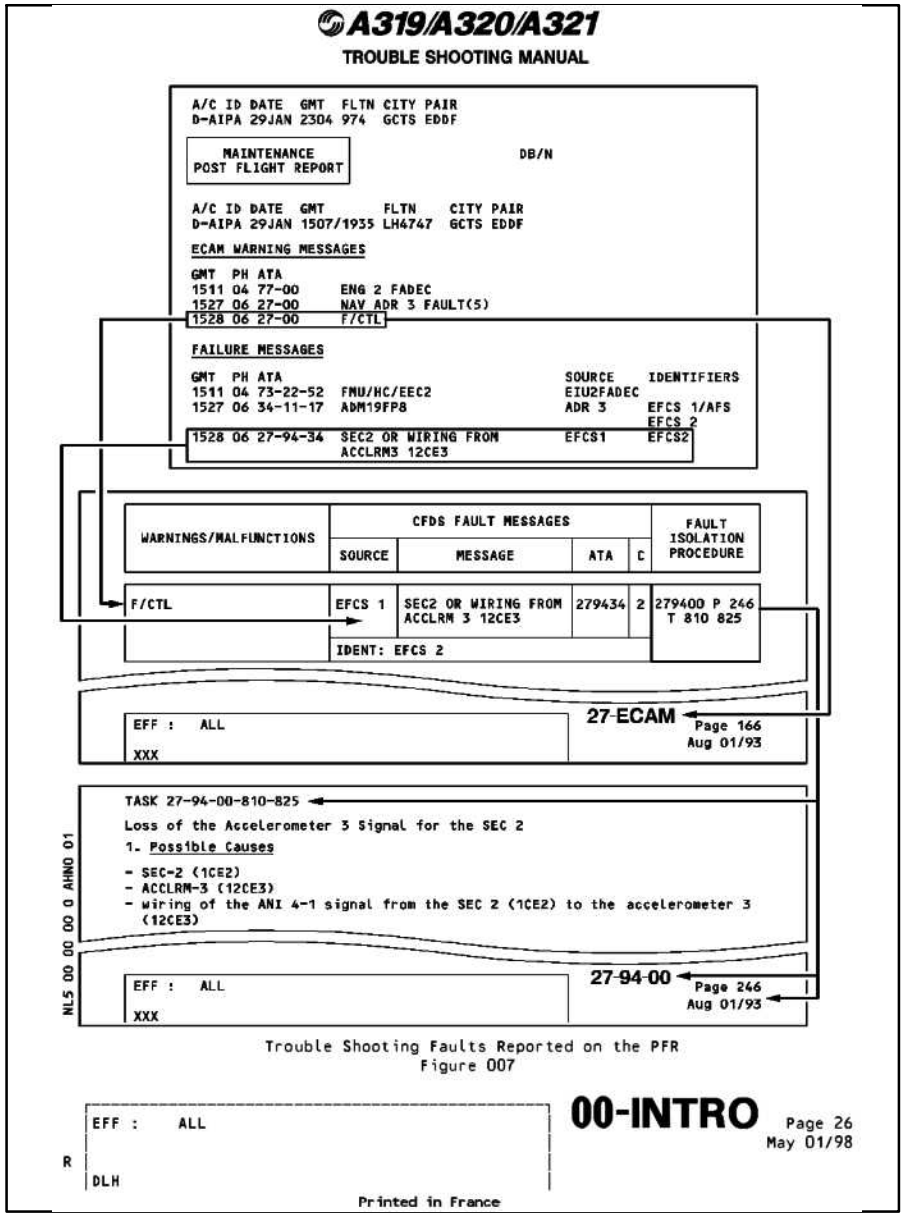
  – Here trouble shooting starts with the Index of Warnings / Malfunctions. In the index, the suitable fault text is located and thus the relevant ATA chapter reference and the respective Fault Symptom (PB 101) can be found.

  – Next, the index of the relevant chapter (Fault Symptoms) is used to find the fault message. There, a reference is made to the respective chapter / section, page and task number.

  – The last step is to find the stated page and to carry out the fault isolation procedure.

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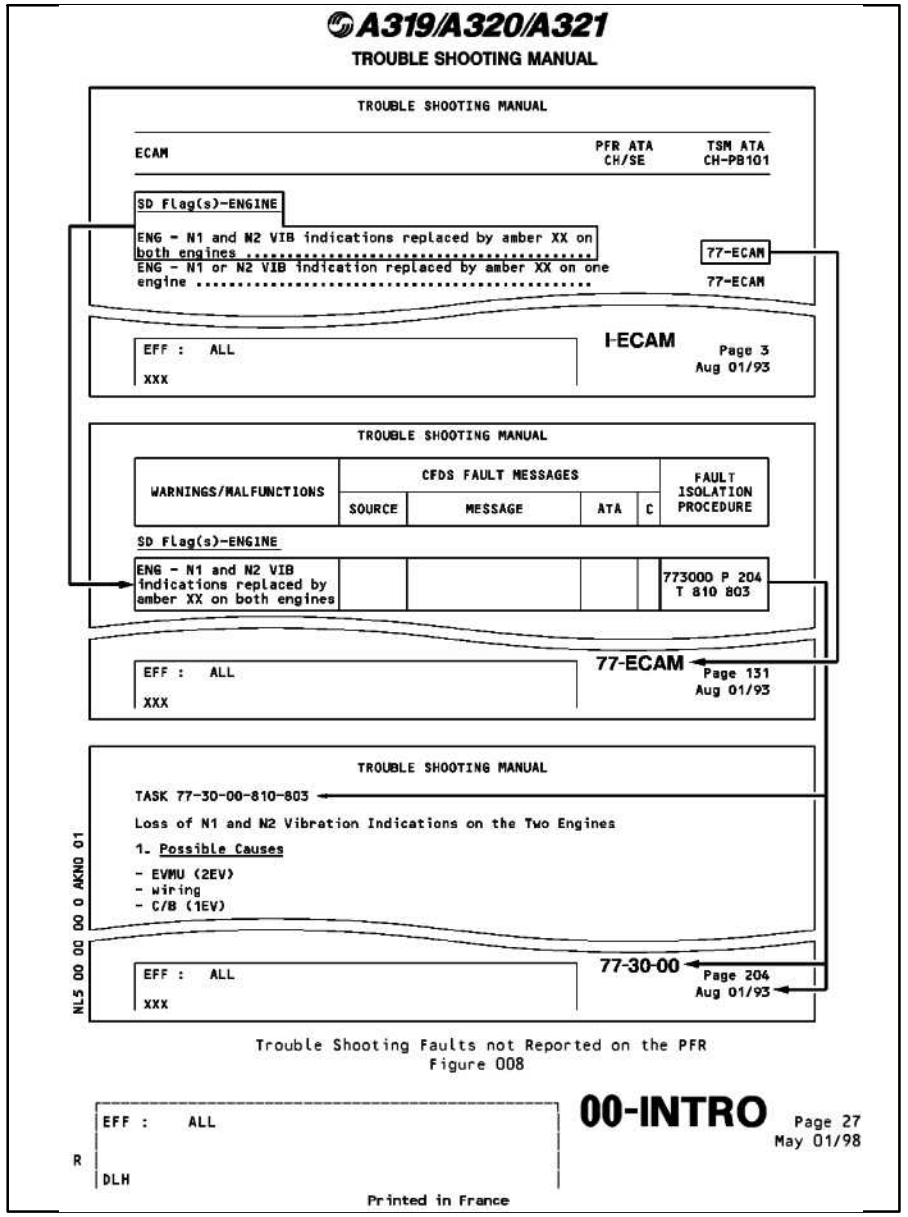


Figure 16 Introduction to the TSM with / without Post Flight Report

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Realization (Continued) :

- **Trouble Shooting CMS / CFDS Fault Messages**
  This method is chosen when a CMS / CFDS fault message (incl. Class 3 Fault) is present. Class 3 fault messages are listed on the SYSTEM / REPORT TEST CLASS 3 FAULT pages.
  - First, the ATA chapter reference of the fault message is noted.
  - Then the task and page number is looked up with the aid of the fault message text (in the CMS- / CFDS list of the relevant ATA chapter).
  - Afterwards the task number on the stated page is checked and the Fault Isolation Procedure is carried out.

Maintenance Message Classification

The maintenance messages are classified depending on their effects. There are 3 classes:

- Faults with OPERATIONAL COCKPIT EVENT,
- Faults triggering an ECAM MAINTENANCE STATUS and
- Faults WITHOUT COCKPIT EVENT.

The contents of the classes are described below:

- **Faults with operational cockpit event**
  - These faults are also described as faults with “cockpit effect“.
  - A cockpit effect can be an ECAM warning, a local warning, a flag or other limitations such as missing audio signals, amber crosses on a system page, and others.
  - Some of these faults are safety-relevant and can be classified in the Minimum Equipment List (MEL) as NO GO item (fault **must** be removed prior to the next flight) or as GO IF item (fault can be removed at a **later** stage provided the **requirements of the MEL are met**).
  - These faults are reported in the TLB by the cockpit crew.
  - Since it is very important to ensure a correct execution of the faults, they cause a **CLASS 1 Maintenance Message** which will be listed in the Post Flight Report (PFR).
- **Faults triggering an ECAM Maintenance Status**
  - These faults do not influence the system functions.
  - Basically these faults are classified as GO items without limitations. Still, a timely execution of those faults can improve the operating reliability (dispatch reliability) and thus reduce maintenance costs.
  - To reach this goal, **CLASS 2 Maintenance Messages** should be removed as soon as possible. They are also listed in the PFR. With every long maintenance sequence of an aircraft, the **MAINT STS pages** should be checked as well.
- **Faults without cockpit event**
  - These faults do not influence the system functions and the crew does not receive any information on the faults.
  - They are classified as **CLASS 3 maintenance messages** and saved in the system BITEs (Build-In-Test-Equipment).

Note:

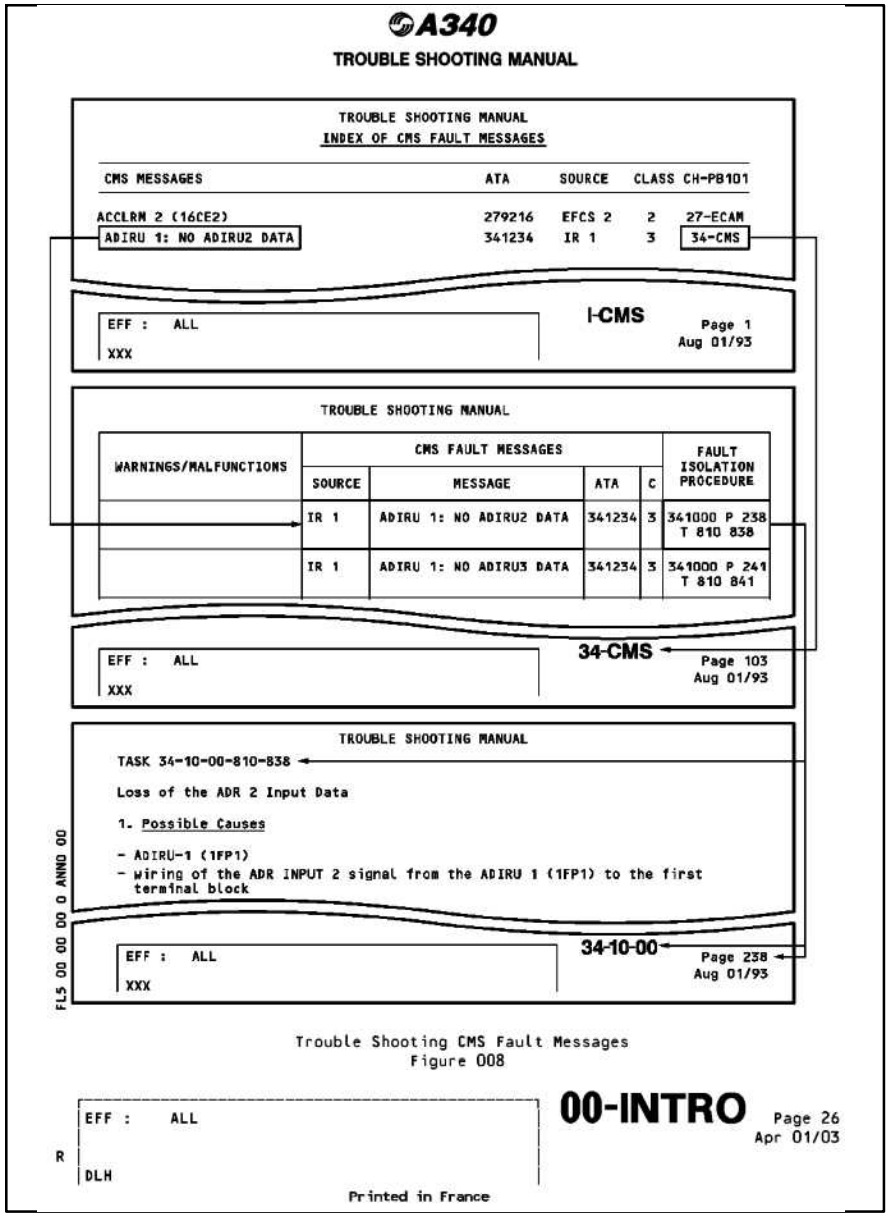
The engine-related Class 3 Messages are divided into:

- Time-Limited Dispatch Faults and
- Unlimited Time Dispatch Faults.

These faults can be viewed in FADEC BITE (Scheduled Maintenance Report) and are marked with the letter „S“ (with ⋆ unlimited, without ⋆ limited) in the Trouble Shooting Manual.

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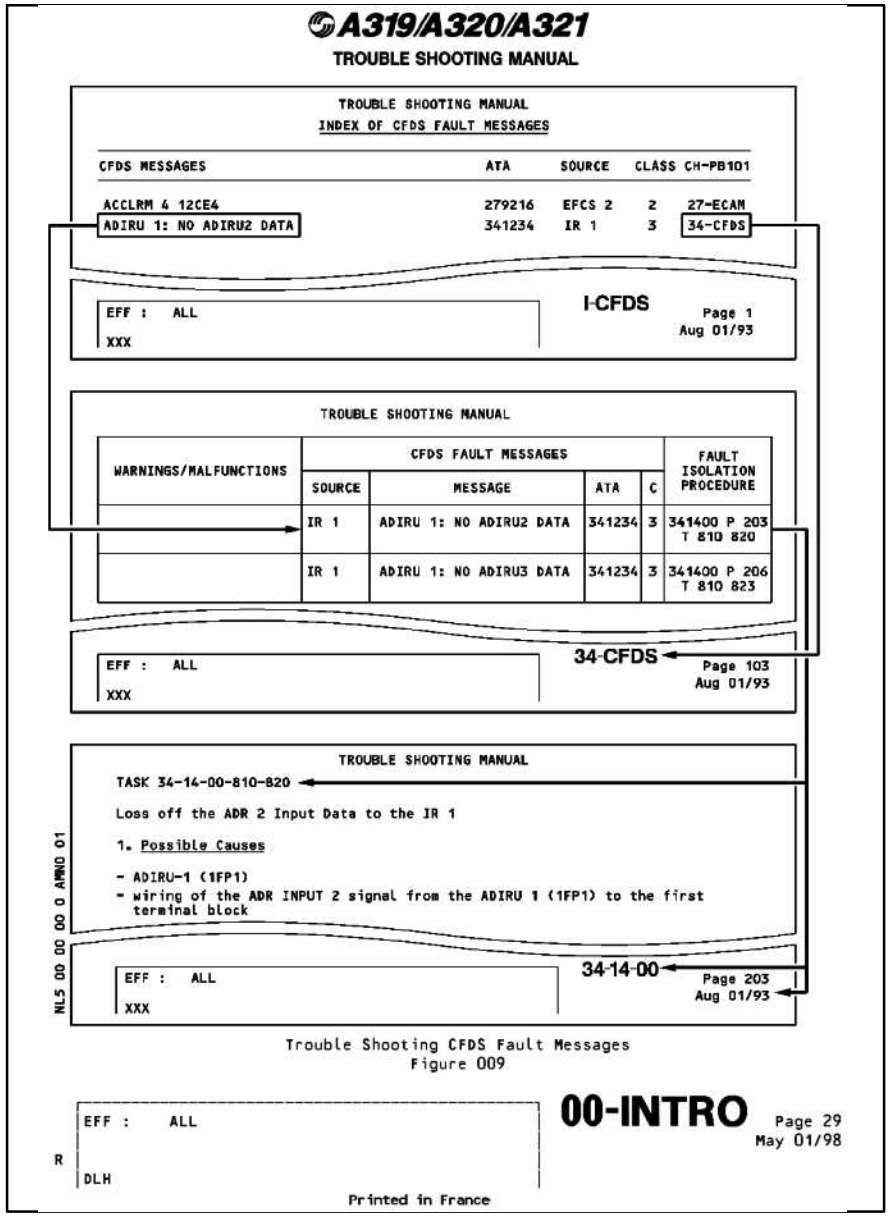


Figure 17 Introduction to the TSM with CMS / CFDS Fault Message

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STRUCTURE OF A FAULT ISOLATION PROCEDURE

General

Every Fault Isolation Procedure is divided into several sections.

Structure

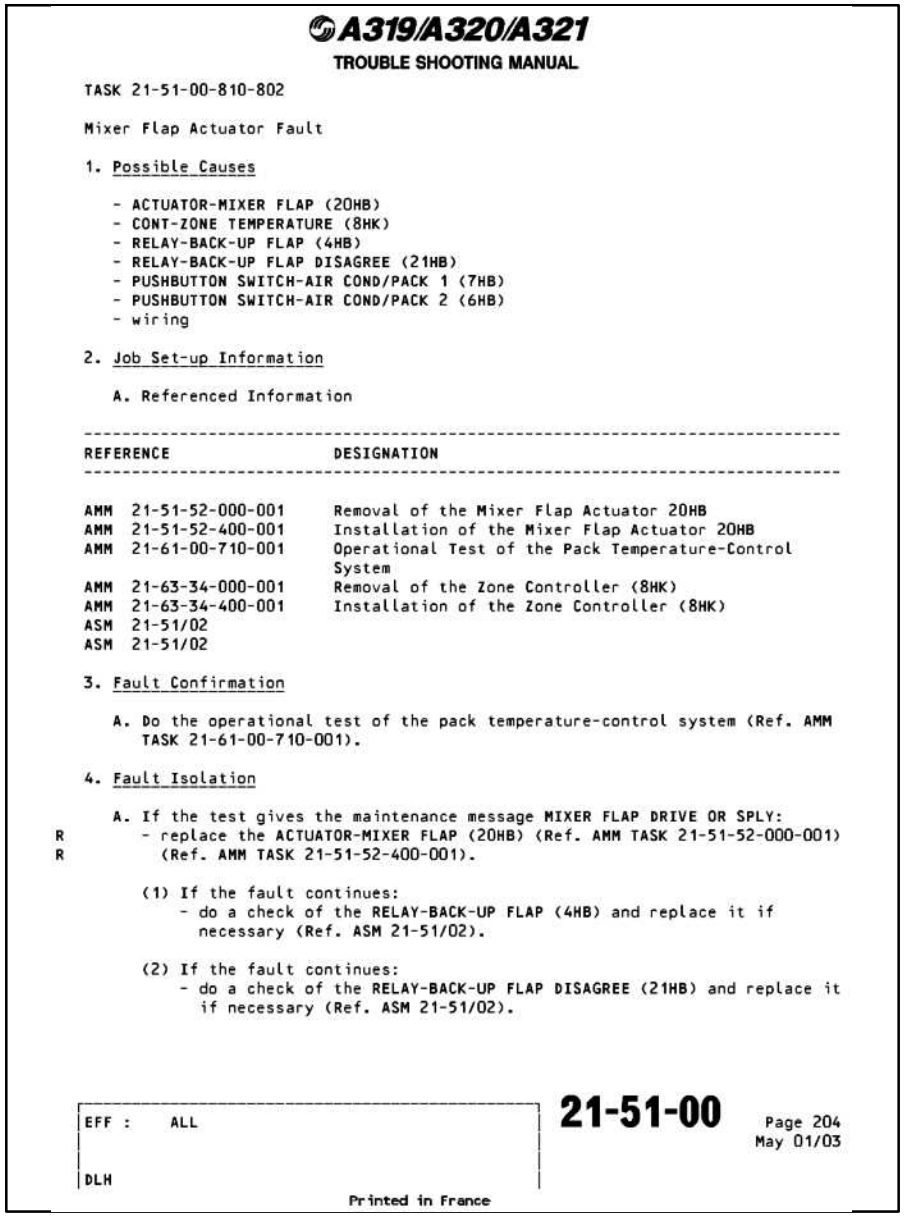
- Fault Identification
- Possible Causes
- Job Set-Up Information
- Fault Confirmation
- Fault Isolation
- Close–up

The contents of the sections are described below:

- **Fault Identification**
  - Title of the instruction
- **Possible Causes**
  - This list contains all components that may have caused the present fault.
  - These components are tested and/or replaced in the course of the fault isolation procedure.
  - There are no details provided on the electrical system. Only references to the Aircraft Wiring are made.
- **Job Set-Up Information**
  - This section, like in the AMM, contains information on additionally required instructions (references to AMM, WDM, ...).
- **Fault Confirmation**
  - There are two possibilities regarding the fault confirmation:
    - **Permanent Fault:** The performed test reports that the system is **not O.K**. The Fault Isolation Procedure is carried out.
    - **Intermittent Fault:** The performed test reports that the system is **O.K**.
    - In this case, the aircraft (in accordance with the requirements of the TSM) can be dispatched.
    - However the respective system must be observed closely during the following flights.
    - Should the same fault occur three times and provided the fault can not be confirmed on ground, the Fault Isolation Procedure must be carried out and the relevant components have to be replaced.
- **Fault Isolation**
  - The Fault Isolation includes the localization of the faulty component/wirings and the removal of that fault.
  - Measured values, plug and pin numbers are listed for the wiring checks.
- **Close-Up**
  - After the fault isolation and removal, it is necessary to bring the aircraft back into its original state. This is achieved with the aid of the instructions stated in this section.

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TASK 21-51-00-810-802

Mixer Flap Actuator Fault

1. Possible Causes

- ACTUATOR-MIXER FLAP (20HB)
- CONT-ZONE TEMPERATURE (8HK)
- RELAY-BACK-UP FLAP (4HB)
- RELAY-BACK-UP FLAP DISAGREE (21HB)
- PUSHBUTTON SWITCH-AIR COND/PACK 1 (7HB)
- PUSHBUTTON SWITCH-AIR COND/PACK 2 (6HB)
- wiring

2. Job Set-up Information

A. Referenced Information

REFERENCE	DESIGNATION
AMM 21-51-52-000-001	Removal of the Mixer Flap Actuator 20HB
AMM 21-51-52-400-001	Installation of the Mixer Flap Actuator 20HB
AMM 21-61-00-710-001	Operational Test of the Pack Temperature-Control System
AMM 21-63-34-000-001	Removal of the Zone Controller (8HK)
AMM 21-63-34-400-001	Installation of the Zone Controller (8HK)
ASM 21-51/02	
ASM 21-51/02	

3. Fault Confirmation

A. Do the operational test of the pack temperature-control system (Ref. AMM TASK 21-61-00-710-001).

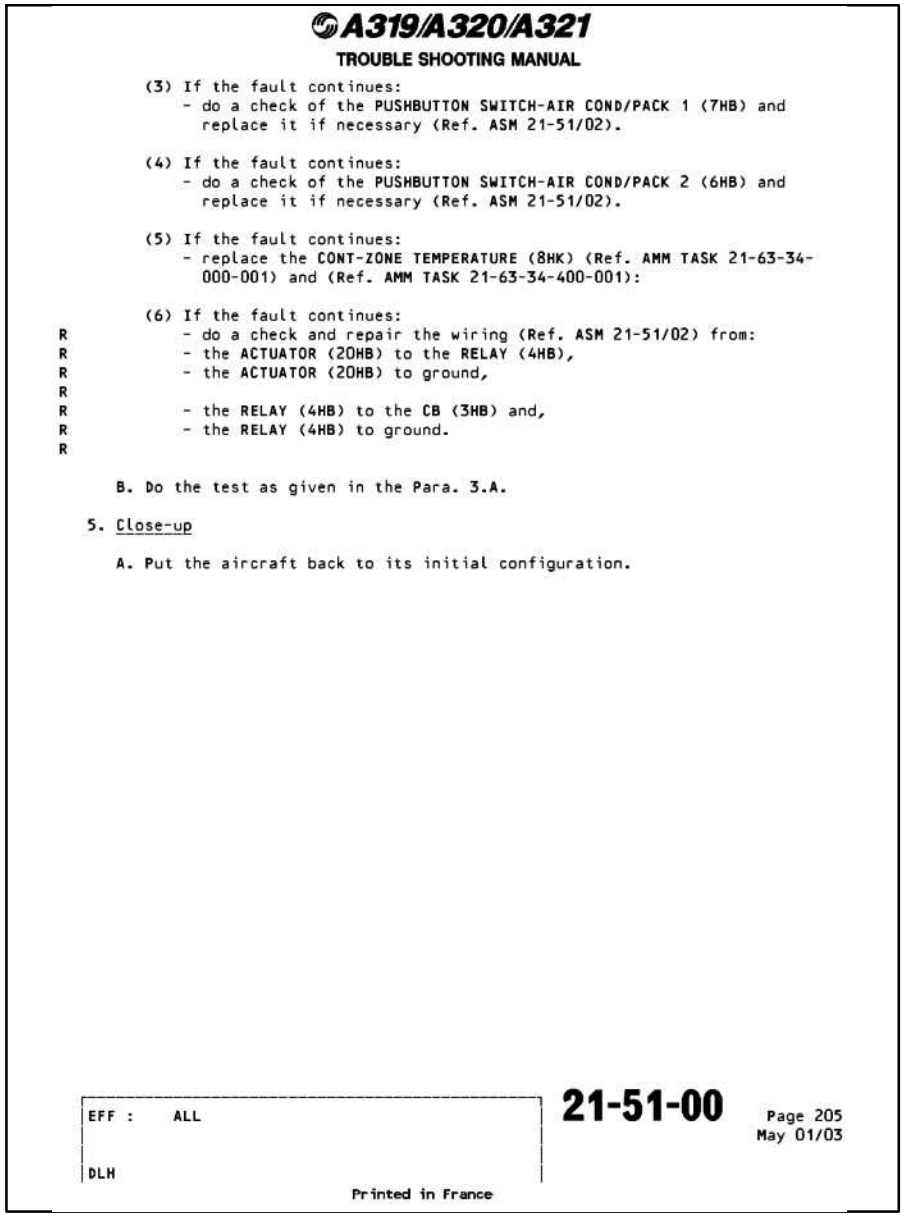
4. Fault Isolation

A. If the test gives the maintenance message MIXER FLAP DRIVE OR SPLY:
R - replace the ACTUATOR-MIXER FLAP (20HB) (Ref. AMM TASK 21-51-52-000-001)
R (Ref. AMM TASK 21-51-52-400-001).

(1) If the fault continues:
- do a check of the RELAY-BACK-UP FLAP (4HB) and replace it if necessary (Ref. ASM 21-51/02).

(2) If the fault continues:
- do a check of the RELAY-BACK-UP FLAP DISAGREE (21HB) and replace it if necessary (Ref. ASM 21-51/02).

EFF : ALL
DLH
21-51-00
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Printed in France



A319/A320/A321
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(3) If the fault continues:
- do a check of the PUSHBUTTON SWITCH-AIR COND/PACK 1 (7HB) and replace it if necessary (Ref. ASM 21-51/02).

(4) If the fault continues:
- do a check of the PUSHBUTTON SWITCH-AIR COND/PACK 2 (6HB) and replace it if necessary (Ref. ASM 21-51/02).

(5) If the fault continues:
- replace the CONT-ZONE TEMPERATURE (8HK) (Ref. AMM TASK 21-63-34-000-001) and (Ref. AMM TASK 21-63-34-400-001):

(6) If the fault continues:
R - do a check and repair the wiring (Ref. ASM 21-51/02) from:
R - the ACTUATOR (20HB) to the RELAY (4HB),
R - the ACTUATOR (20HB) to ground,
R
R - the RELAY (4HB) to the CB (3HB) and,
R - the RELAY (4HB) to ground.
R

B. Do the test as given in the Para. 3.A.

5. Close-up

A. Put the aircraft back to its initial configuration.

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21-51-00
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Figure 18 Fault Isolation Procedure

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Fault Isolation Manual (FIM)

BASICS - EXAMPLE BOEING

General

The FIM contains procedures regarding the systematic classification, isolation and trouble shooting of malfunctions.

The Fault Isolation Manual is the subsequent document of the Fault Reporting Manual (FRM) which includes methods for fault identification and reporting for crew members.

Effectivity

The FIM is an aircraft type-related and usually also an owner-related document.

Structure

The FIM is structured in accordance with the ATA iSpec. 2200.

Procedures

For the fault isolation and trouble shooting, the FIM refers to specific instructions included in other manuals (AMM, WDM, ...).

The reference is made by the specification of the ATA chapter / section / subject and the respective page block (only AMM).

Note:

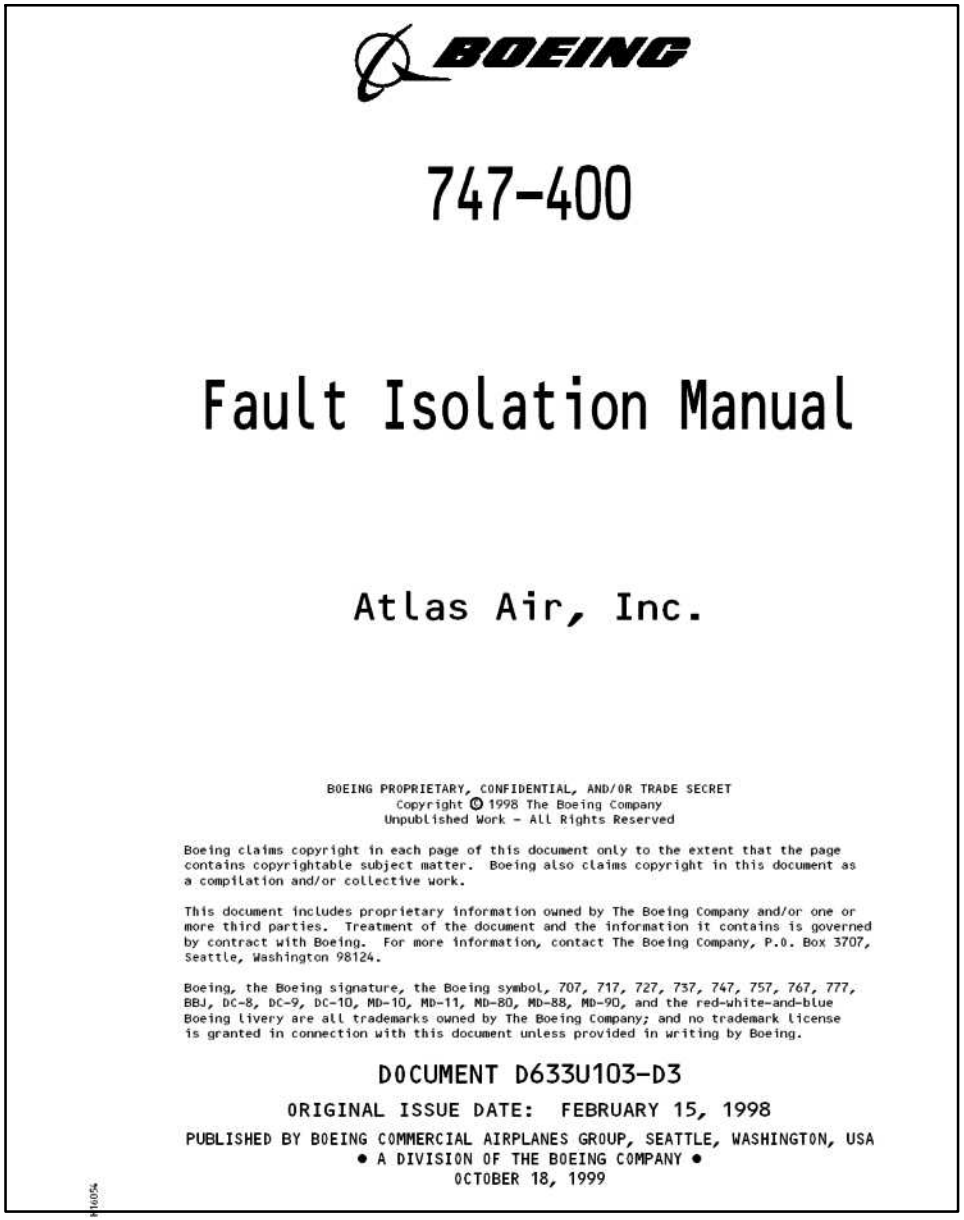
The contents of this document refer to the 747−400.

It is Boeing's most comprehensive Fault Isolation Manual.

Other FIMs may contain slight deviations and/or name changes.

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BOEING

747-400

Fault Isolation Manual

Atlas Air, Inc.

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ORIGINAL ISSUE DATE: FEBRUARY 15, 1998

PUBLISHED BY BOEING COMMERCIAL AIRPLANES GROUP, SEATTLE, WASHINGTON, USA
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OCTOBER 18, 1999

Figure 19 Title Page FIM

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GENERAL STRUCTURE OF THE FIM

Structure of the Manual

The following chapters can be found in the beginning of the FIM:

- **Front Matter** incl.:
  - Title Page
  - Transmittal Letter
  - Effective Pages
  - Revision Record
  - Record of Temporary Revisions
  - Index
  - Introduction
  - Quick Reference Guide
  - List of Airplanes
  - Abbreviation List
  - Panel Locations
  - List of Service Bulletins
  - List of Chapters
  - EICAS Message List

In the beginning of every chapter, lists relating to the respective chapter are included:

- Effective Pages
- ATA-Contents
- ATA-How to use the FIM
- ATA-FIM Contents
- ATA-EICAS Messages
- ATA-Fault Code Diagrams
- ATA-Fault Code Index
- ATA-CMCS Message Index

Every chapter is divided into:

- Chapter
- Section
- Subject

2 page blocks are allocated to every chapter/section in the FIM:

- PB 001 - 099:
  - Lists included in the beginning of every chapter
- PB 101 - 199:
  - Component location and
  - Fault isolation (subject level)

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FRONT MATTER

This chapter contains general information on the present FIM.

- **Title Page**
  - Cover page.
- **Transmittal Letter**
  - General information on the current revision.
- **Effective Pages**
  - List of the currently valid pages of the front matter in the present revision.
- **Revision Record**
  - List for entering the most recent revisions in the present manual.
- **Record of Temporary Revisions**
  - List for recording temporary revisions in the present manual.
- **Index (FIM)**
  - List of all system messages with information on the respective ATA chapter / section.
- **Introduction**
  - Introduction to the FIM (for the contents, see page 102).
- **Quick Reference Guide**
  - Information on how to quickly find the required information.
- **List of Airplanes**
  - List of all aircraft concerned with effectivities.
- **Abbreviation List**
  - List containing all abbreviations.
- **Panel Locations**
  - Drawings with panel locations and the description of the service panel location.
- **List of Service Bulletins**
  - The list of service bulletins contains all SBs the aircraft owner has chosen to carry out (provided BOEING was notified) as well as SBs that are mandatory to be carried out.
  - The SB number, the ATA chapter, the date of introduction into the FIM, the SB headline and the implementation code are stated in this list.
- **List of Chapters**
  - This list contains all ATA chapters included in this manual.
- **EICAS Message List**
  - List of all EICAS messages with the text of the EICAS message, the level (Warning, Caution, Advisory, Status and Memo), the description and the Fault Code.

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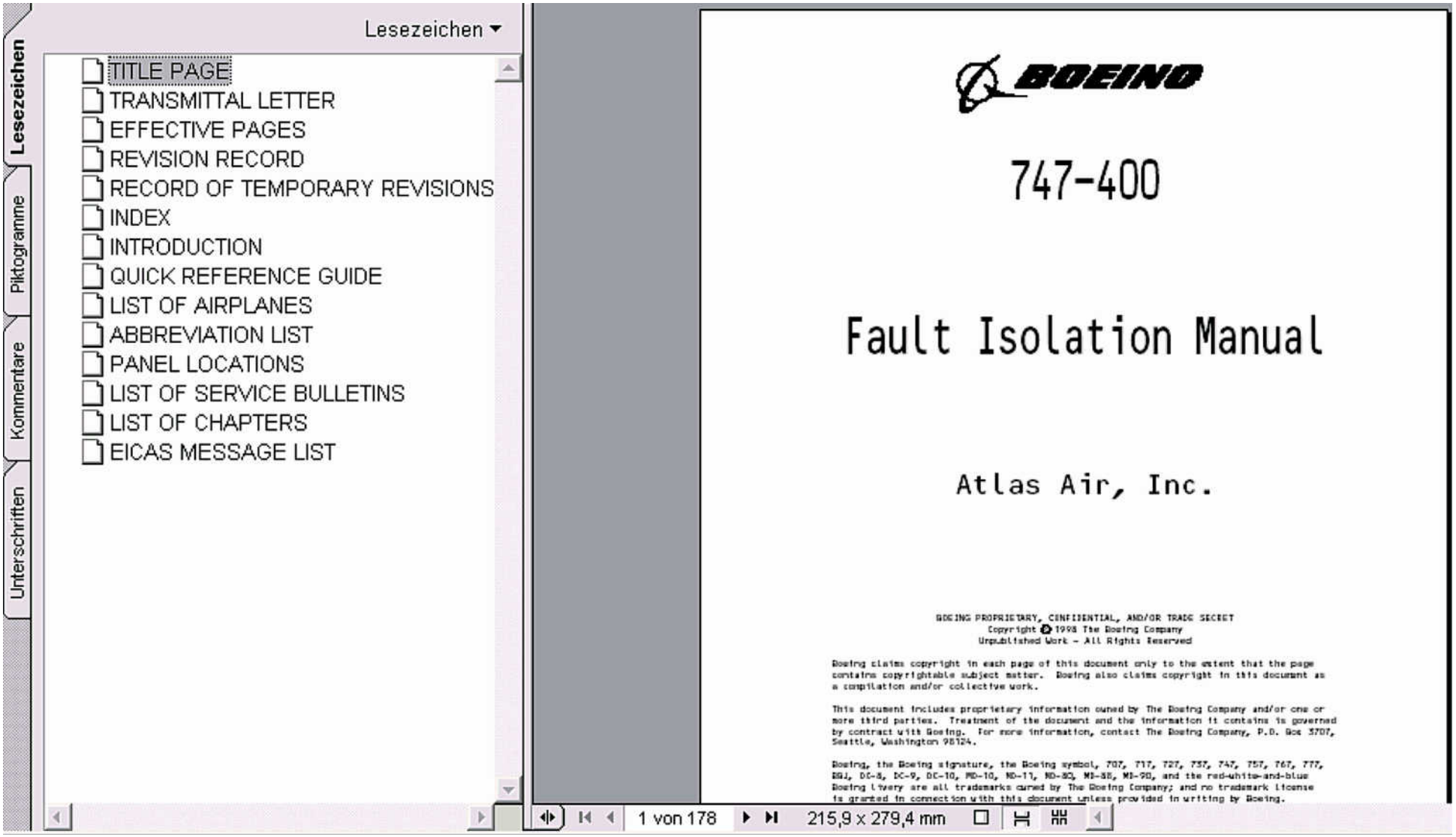


Figure 20 Front Matter

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INTRODUCTION

- **General**
  - General information on the content, the link to other manuals and on the publication.
- **Manual Arrangement and Numbering System**
  - Arrangements of chapters and the titles,
  - Effectivity and configuration identification and
  - Page numbering.
- **Use of the FIM**
  - General information on how to use the FIM,
  - Usage after the reporting of a fault code (FRM or CMCS (Central Maintenance Computer System)) by the crew and
  - Usage of the FIM without fault code.
- **FIM Content - Front Matter**
  - Detailed description of the front matter (see page 100).
- **FIM Content - Chapter Level**
  - Detailed description of the chapter contents.
- **FIM Content - Chapter/Section Level**
  - Component location information and
  - Fault isolation procedures.
- **FIM Procedures Standard Practices**
  - Detailed information on the standard procedures and the basic conditions of an aircraft to be able to carry out fault isolation procedures.
- **Equivalent Tools, Fixtures and Test Equipment**
  - Information on the usage of alternative tools, fixtures and test equipment.
- **Revision Service**
  - Comments on the manual revisions and
  - Temporary revisions.
- **Delivery of Data in Digital Format**
  - Information on maintenance documents in digital format.

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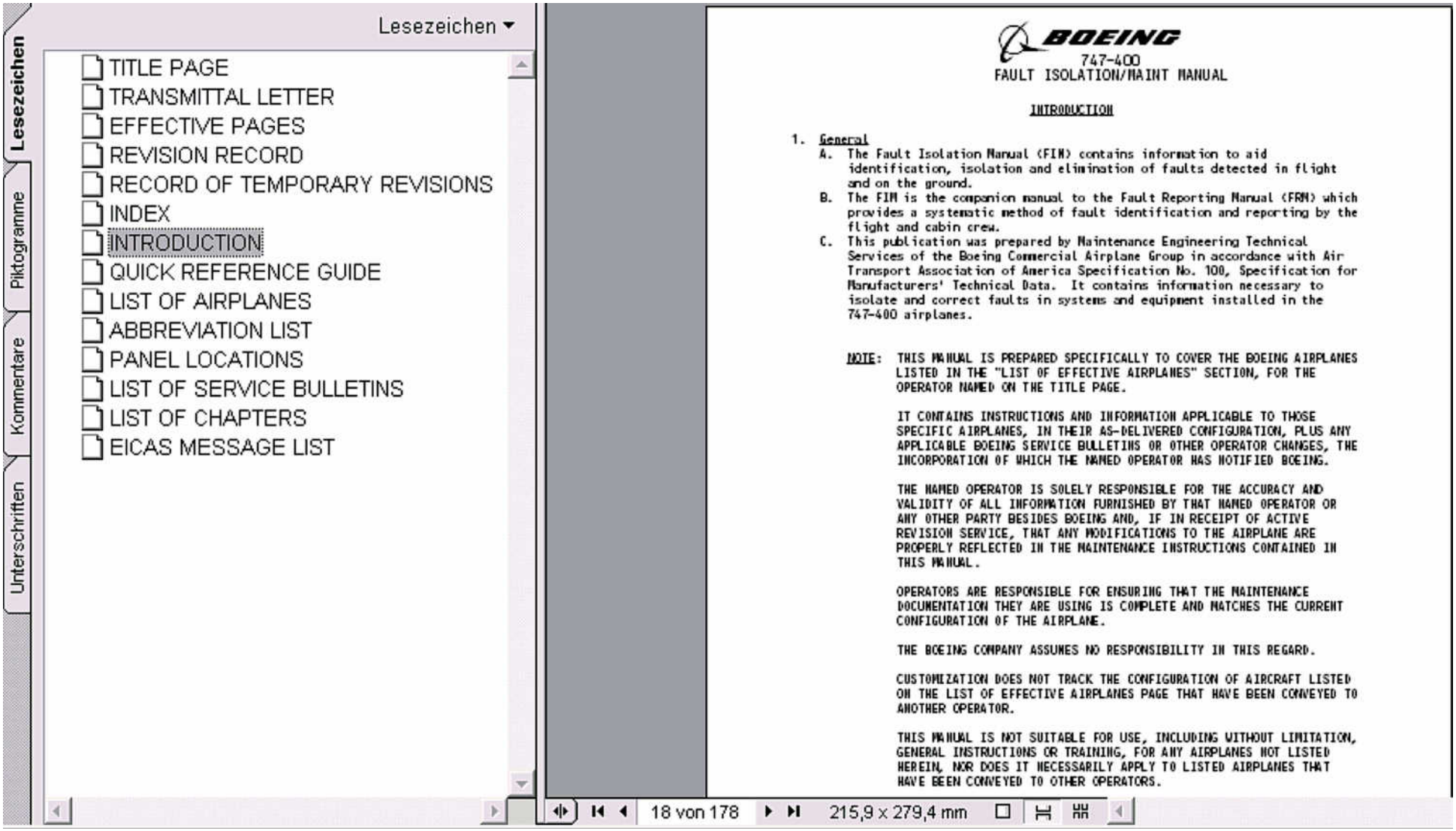


Figure 21 Introduction

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LISTS WITH REFERENCE TO CHAPTERS

In the beginning of every chapter, lists relating to the respective chapter are included.

These lists contain the following contents:

- **Effective Pages**
  - List of all the effective pages in this ATA chapter.
- **ATA-Contents**
  - A general as well as detailed table of content stating the ATA chapter / section / subject and page number.
- **ATA-How to use the FIM**
  - A short description on how to use the Fault Isolation Manual.
- **ATA-FIM Contents**
  - Short overview of the FIM contents.
- **ATA-EICAS Messages**
  - Introduction of the EICAS display and list of all possible EICAS messages including the level (Warning, Caution, Advisory, Status or Memo), the cause and the fault code.
- **ATA-Fault Code Diagrams**
  - Diagrams with flow chart with which the correct fault code can be determined.
- **ATA-Fault Code Index**
  - The Fault Code Index is a numerical list containing all fault codes with the corresponding log book reports and the corrective action.
    - The log book report contains a short description of the fault.
    - The corrective action specifies the fault isolation procedure and refers to the respective instructions in the AMM / WDM or to CMCS messages.
- **ATA-CMCS Message Index**
  - The CMCS Message Index is a numerical list containing all CMCS messages with the corresponding fault messages, the possible flight deck effects and the corrective action or a reference to a fault isolation procedure.

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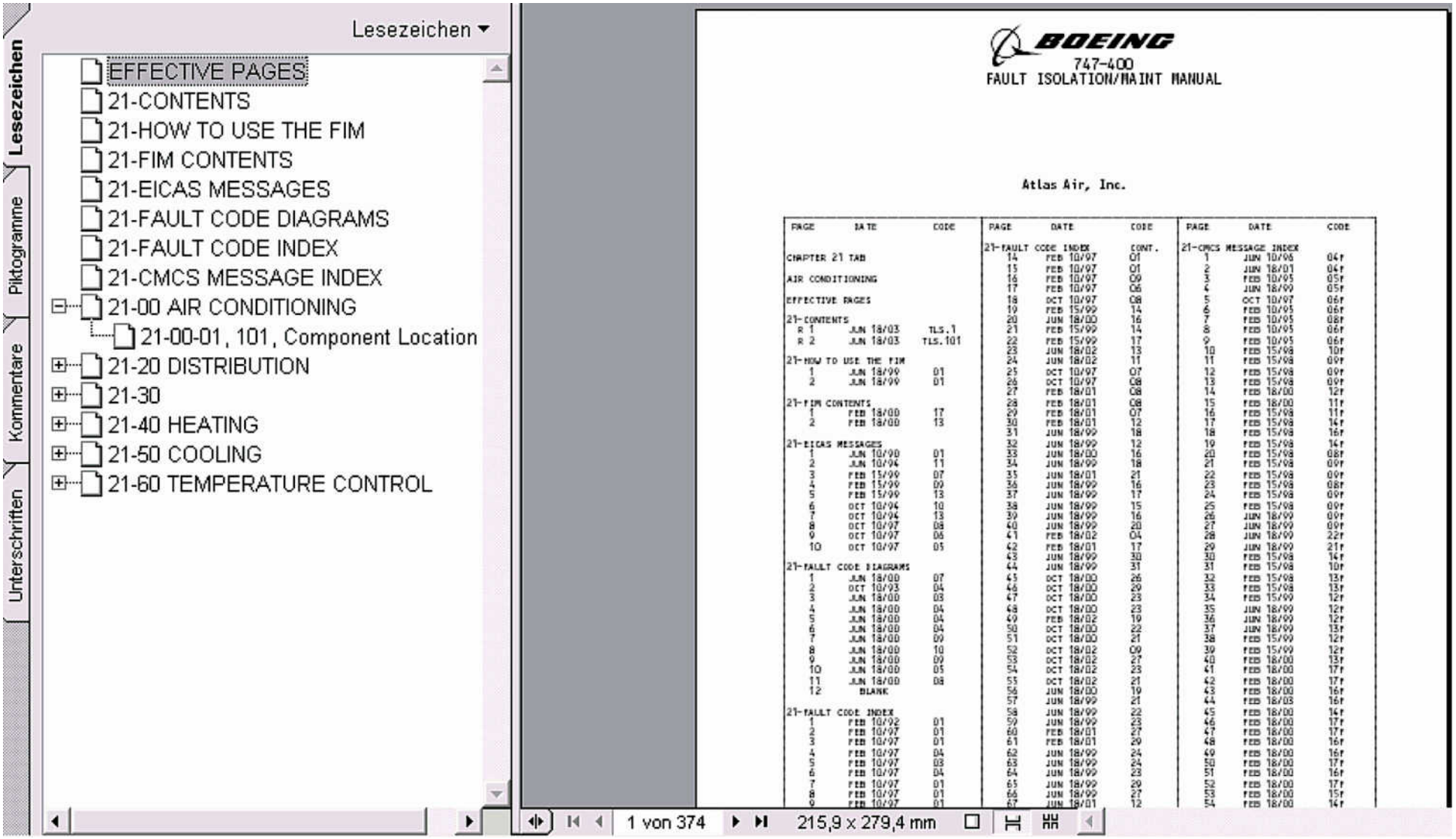


Figure 22 Chapter Structure

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USE OF THE FIM

General

The Fault Isolation Manual provides the user with information regarding the isolation of faults and trouble shooting of every (possible) malfunction on the aircraft.

The FIM can be used in the most efficient way, if the flight crew states a fault code while using the FRM (Fault Reporting Manual), the EICAS message or the CMCS (Central Maintenance Computer System).

The FIM may also be used when there is a log book entry without a stated fault code or if the maintenance personnel on the ground has detected a malfunction.

Introduction to the FIM:

There are two possibilities to begin working with the FIM:

- Using the FIM after a fault code was reported by the crew and
- Using the FIM without fault code.

Using the FIM after a fault code was indicated by the crew:

The crew has 3 possibilities to detect a fault code:

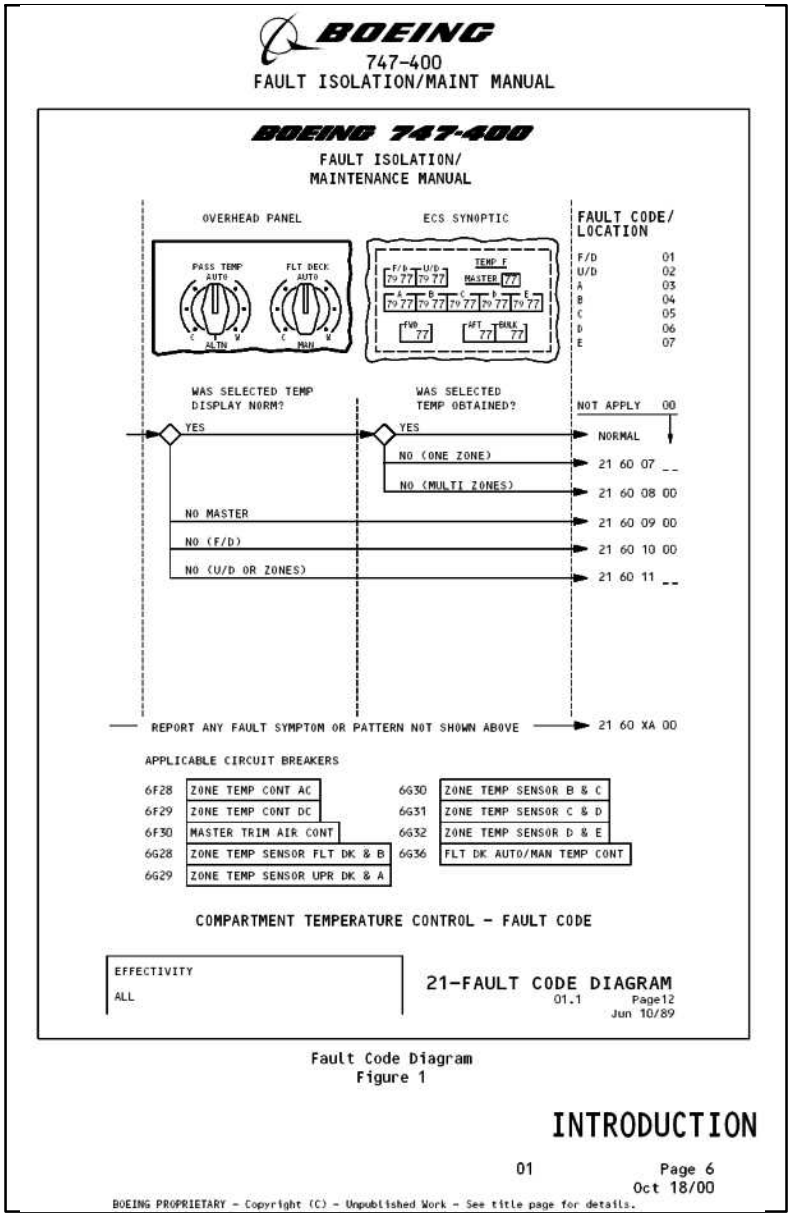
- **Usage of the FRM and detecting the fault code in a Fault Code Diagram:**
  - The first two digits of the fault code state the ATA chapter in which the fault is listed in the Fault Code Index. Here the fault codes are listed numerically.
  - Codes beginning with 001 (00 1# ## ##) are **Maintenance Page Snapshots**. The 4th and 5th digit of this code represent the ATA chapter. The code 00 1**2 8**1 01 thus stands for a Maintenance Page Snapshot in the ATA chapter 28. Accordingly, the procedure must be looked for in chapter 28. Based on the original code, a reference in this chapter is made to an EICAS message for which a fault isolation procedure exists.
- **Usage of the EICAS messages:**
  - Should an EICAS message exist, the EICAS Message Index of the respective ATA chapter is located to find the fault code. Afterwards, with the aid of the Fault Code Index, the correct procedure can be determined.
- **Usage of the automatic indication of the fault code by the CMCS:**
  - Should an CMCS message be present, the CMCS Message Index of the respective chapter is located to find the correct number. Here the corrective action is stated.

Note:

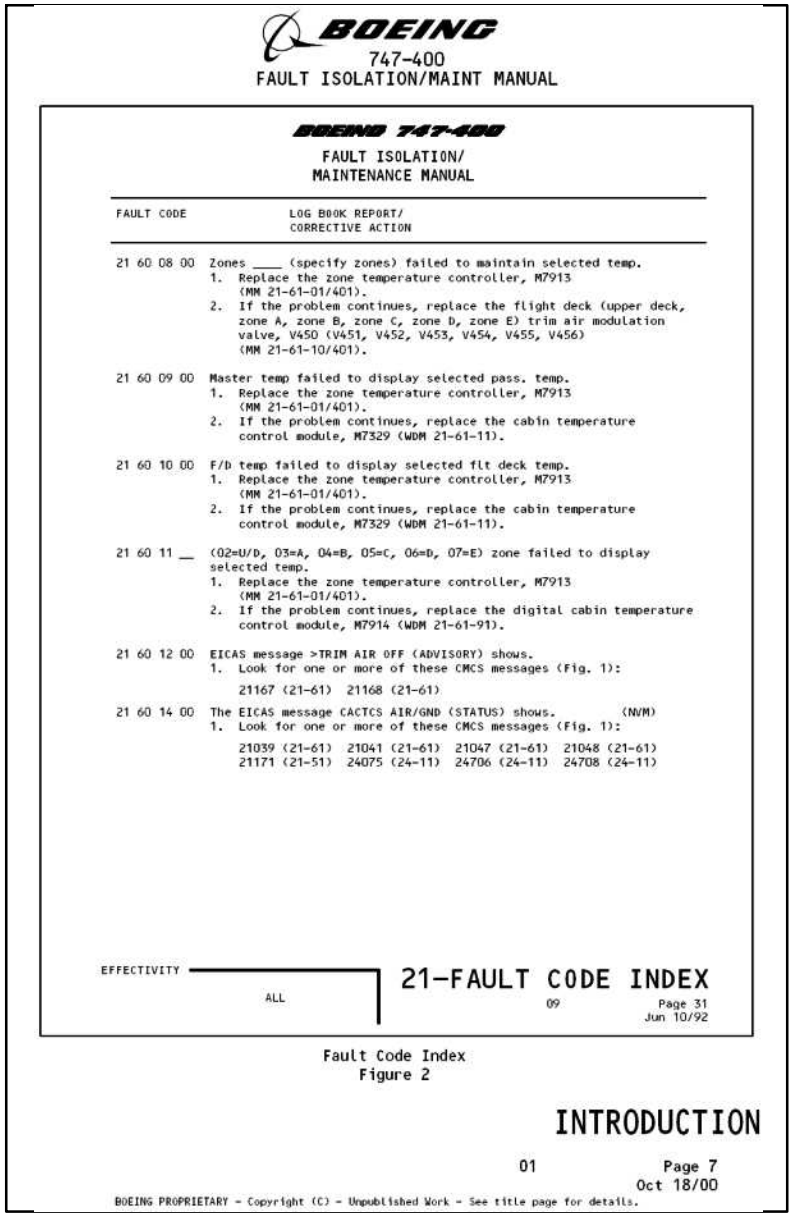
- If the number ranges from 21 to 52, the respective chapter is selected.
- If the number ranges from 71 to 80, the CMCS Message Index in chapter 71 is selected.

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Fault Code Diagram
Figure 1



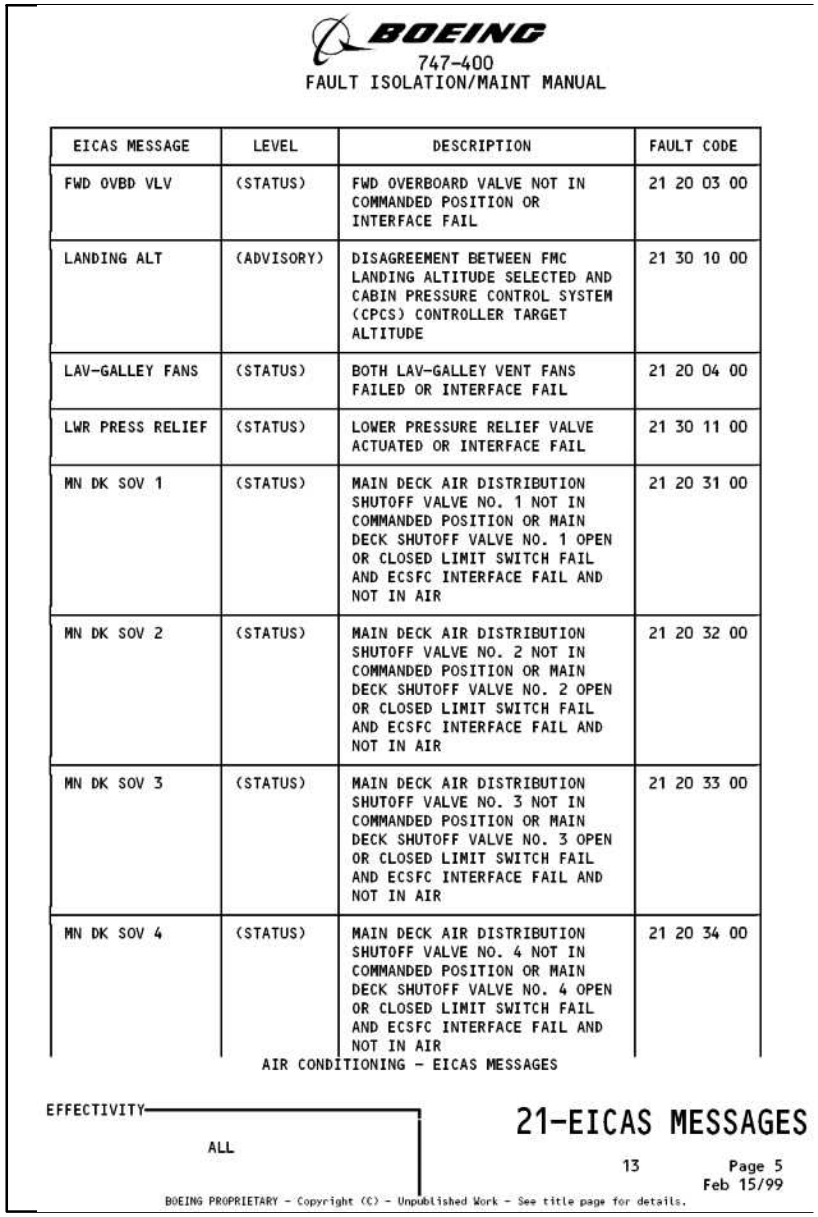
Fault Code Index
Figure 2

Figure 23 Introduction to the Fault Isolation Manual with Fault Code

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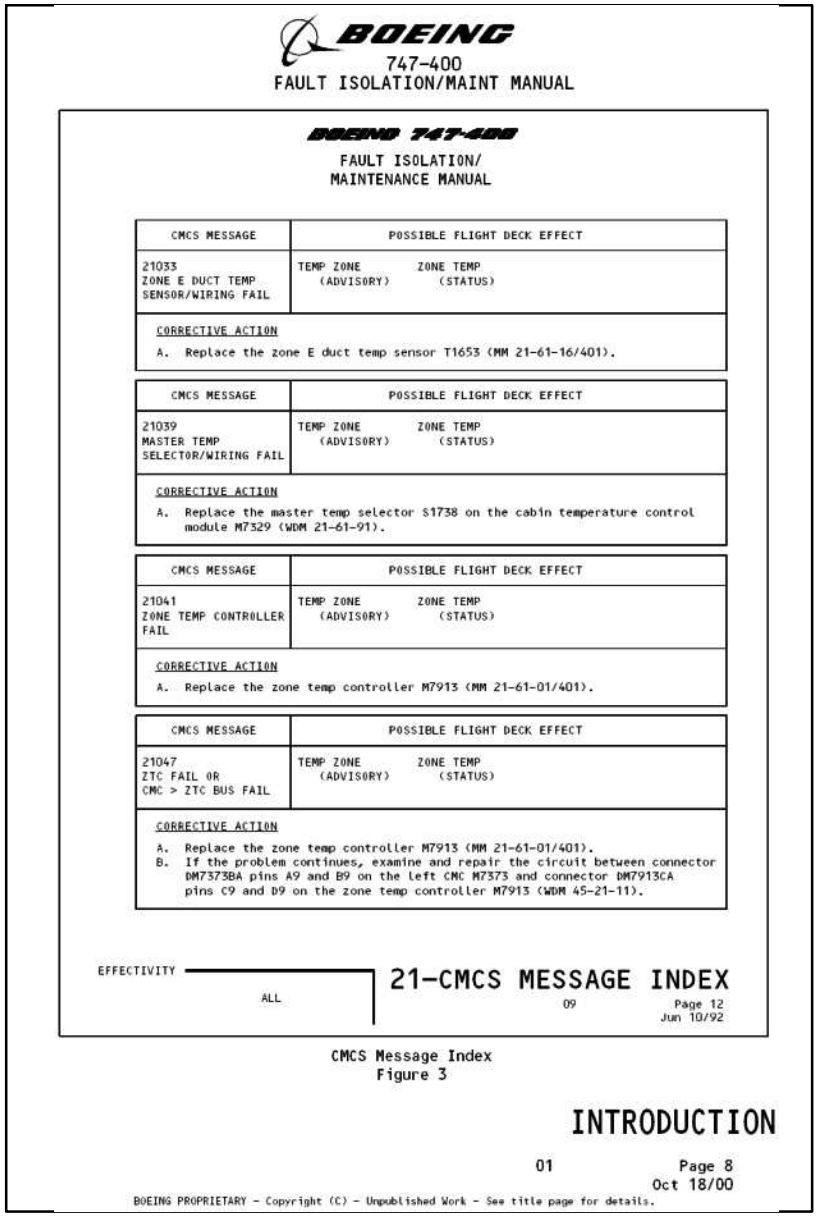
EICAS MESSAGE	LEVEL	DESCRIPTION	FAULT CODE
FWD OVBD VLV	(STATUS)	FWD OVERBOARD VALVE NOT IN COMMANDED POSITION OR INTERFACE FAIL	21 20 03 00
LANDING ALT	(ADVISORY)	DISAGREEMENT BETWEEN FMC LANDING ALTITUDE SELECTED AND CABIN PRESSURE CONTROL SYSTEM (CPCS) CONTROLLER TARGET ALTITUDE	21 30 10 00
LAV-GALLEY FANS	(STATUS)	BOTH LAV-GALLEY VENT FANS FAILED OR INTERFACE FAIL	21 20 04 00
LWR PRESS RELIEF	(STATUS)	LOWER PRESSURE RELIEF VALVE ACTUATED OR INTERFACE FAIL	21 30 11 00
MN DK SOV 1	(STATUS)	MAIN DECK AIR DISTRIBUTION SHUTOFF VALVE NO. 1 NOT IN COMMANDED POSITION OR MAIN DECK SHUTOFF VALVE NO. 1 OPEN OR CLOSED LIMIT SWITCH FAIL AND ECSFC INTERFACE FAIL AND NOT IN AIR	21 20 31 00
MN DK SOV 2	(STATUS)	MAIN DECK AIR DISTRIBUTION SHUTOFF VALVE NO. 2 NOT IN COMMANDED POSITION OR MAIN DECK SHUTOFF VALVE NO. 2 OPEN OR CLOSED LIMIT SWITCH FAIL AND ECSFC INTERFACE FAIL AND NOT IN AIR	21 20 32 00
MN DK SOV 3	(STATUS)	MAIN DECK AIR DISTRIBUTION SHUTOFF VALVE NO. 3 NOT IN COMMANDED POSITION OR MAIN DECK SHUTOFF VALVE NO. 3 OPEN OR CLOSED LIMIT SWITCH FAIL AND ECSFC INTERFACE FAIL AND NOT IN AIR	21 20 33 00
MN DK SOV 4	(STATUS)	MAIN DECK AIR DISTRIBUTION SHUTOFF VALVE NO. 4 NOT IN COMMANDED POSITION OR MAIN DECK SHUTOFF VALVE NO. 4 OPEN OR CLOSED LIMIT SWITCH FAIL AND ECSFC INTERFACE FAIL AND NOT IN AIR	21 20 34 00

AIR CONDITIONING - EICAS MESSAGES

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CMCS MESSAGE	POSSIBLE FLIGHT DECK EFFECT
21033 ZONE E DUCT TEMP SENSOR/WIRING FAIL	TEMP ZONE (ADVISORY) ZONE TEMP (STATUS)

CORRECTIVE ACTION
A. Replace the zone E duct temp sensor T1653 (MM 21-61-16/401).

CMCS MESSAGE	POSSIBLE FLIGHT DECK EFFECT
21039 MASTER TEMP SELECTOR/WIRING FAIL	TEMP ZONE (ADVISORY) ZONE TEMP (STATUS)

CORRECTIVE ACTION
A. Replace the master temp selector S1738 on the cabin temperature control module M7329 (WDM 21-61-91).

CMCS MESSAGE	POSSIBLE FLIGHT DECK EFFECT
21041 ZONE TEMP CONTROLLER FAIL	TEMP ZONE (ADVISORY) ZONE TEMP (STATUS)

CORRECTIVE ACTION
A. Replace the zone temp controller M7913 (MM 21-61-01/401).

CMCS MESSAGE	POSSIBLE FLIGHT DECK EFFECT
21047 ZTC FAIL OR CMC > ZTC BUS FAIL	TEMP ZONE (ADVISORY) ZONE TEMP (STATUS)

CORRECTIVE ACTION
A. Replace the zone temp controller M7913 (MM 21-61-01/401).
B. If the problem continues, examine and repair the circuit between connector DM7373BA pins A9 and B9 on the left CMC M7373 and connector DM7913CA pins C9 and D9 on the zone temp controller M7913 (WDM 45-21-11).

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CMCS Message Index
Figure 3

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Figure 24 Introduction to the Fault Isolation Manual with EICAS or the CMCS Message

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INTRODUCTION TO THE FIM (CONTINUED) :

Usage of the FIM without fault code:

When the crew makes a log book entry without fault code, the maintenance personnel must find the corresponding fault code first.

In order to do that, there are several possibilities:

- **Faults not reported by the CMCS:**
  - The ATA chapter / section, in which the fault is included, is determined (possibly with the aid of the FIM Index).
  - The **Fault Code Diagram** (Figure 57) is used in the respective ATA chapter.
  - Every Fault Code Diagram has a **title**. By means of this title, the correct diagram must be selected.
  - The correct diagram contains a flow chart which is then used to obtain the **Fault Code**.
  - With the help of the fault code, the corrective action can be found in the **Fault Code Index**.
  - An alternative option is to go through the Fault Code Index (Figure 57).
  - Final alternative: searching the **Fault Isolation Procedures** (Figure 59).
- **Faults also reported by the CMCS:**
  - The **CMC (Central Maintenance Computer)** can be selected from the CDUs (Control Display Units) in the cockpit (MENU key, 4L key ☞ CMC Menu).
  - Selection of the **Present Leg Faults** menu which lists all **EICAS messages** with the FRM code of the last flight. After choosing the correct message, the **CMCS message** appears.
  - Selection of the **Existing Faults** menu which lists all **ATA chapters** with faults. If the respective chapter is chosen, the **CMCS message** is obtained. Active faults are marked with an asterisk (*).
  - Afterwards the relevant corrective action is selected from the **CMCS Message Index**.

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ENGINE BLEED AIR DISTRIBUTION SYSTEM - FAULT ISOLATION

1. General
   A. Fault isolation for the engine bleed air distribution system uses these procedures and operations to isolate problems:
      - Messages shown on the CMCS
      - Operation of the system on the ground
      - System checks with and without the use of ground equipment.
   B. It is necessary to use electrical and pneumatic power during the fault isolation procedures.

WARNING: YOU MUST RELEASE THE PRESSURE IN THE PNEUMATIC SYSTEM BEFORE MAINTENANCE OPERATIONS CAN OCCUR. THE HOT, HIGH PRESSURE AIR CAN CAUSE DAMAGE AND INJURY.

WARNING: YOU MUST DISCONNECT THE POWER TO THE THRUST REVERSER BEFORE YOU DO WORK ADJACENT TO IT. OPERATION OF THE THRUST REVERSER DURING MAINTENANCE CAN CAUSE DAMAGE AND INJURY.

2. Fault Isolation Procedures

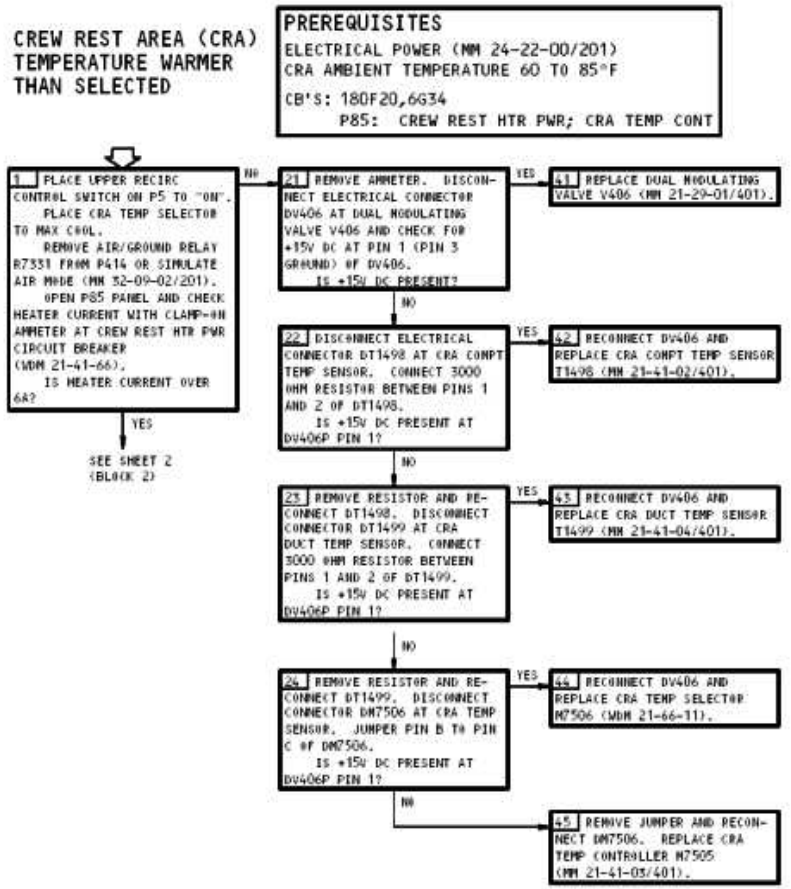
FIGURE	TITLE
Figure 103	Duct Pressure Was Low. No Applicable EICAS Message Was Shown. The APU Was The Duct Pressure Source.
Figure 104	Duct Pressure Was Low. No Applicable EICAS Message Was Shown. The Engines Were The Duct Pressure Source. The Wing Isolation Valves Were Closed One At A Time. The Left Or Right Duct Pressure Increased To Normal.
Figure 105	During Crossbleed Engine Start, The Engine Was Slow To Idle. Fuel Flow Was Normal. (L,R) Duct Pressure Was Low During The Crossbleed Start. No Applicable EICAS Message Was Shown.
Figure 106	During Crossbleed Engine Start, The Engine Was Slow To Accelerate To Idle. Fuel Flow Was Normal. (L,R) Duct Pressure Was Low. The APU Was The Duct Pressure Source. No Applicable EICAS Message Was Shown.
Figure 107	During Engine Start, Low Duct Pressure Caused An Impending Hot/Hot Start.
Figure 108	CMCS Message 36013, 36014, 36015, Or 36016 Is Shown: Pressure Regulating Valve/Controller Fail

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Crew Rest Area Temperature Warmer than Selected
Figure 103 (Sheet 1)

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Figure 25 Fault Isolation Procedures

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