

**Enclosure 2
TVA Letter Dated December 3, 2010
Attachments**

Attachment 1

WCAP-17351-NP, Revision 0, "Post Accident Monitoring System – Common Q Software Requirements Specification," dated November 2010

Westinghouse Non-Proprietary Class 3

WCAP-17351-NP
Revision 0

November 2010

Post Accident Monitoring System – Common Q Software Requirements Specification



Westinghouse

WCAP-17351-NP
Revision 0

Post Accident Monitoring System – Common Q Software Requirements Specification

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November 2010

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ABSTRACT**Revision 0**

Initial Issue. This document is a replica of 00000-ICE-3238, Rev.5, and was created for docketing purposes for the WBN2 PAMS project.

1 INTRODUCTION

1.1 PURPOSE

This document is a copy of 00000-ICE-3238, Rev. 5, "Software Requirements for the Common Q Post Accident Monitoring System." It was created to submit to the Nuclear Regulatory Commission for the Watts Bar Nuclear Unit 2 Post Accident Monitoring System.

This document provides a description of the software requirements for the Common Q Post Accident Monitoring System (PAMS). This document contains design information that would normally not exist in a requirements specification. The identification of specific equipment and communications is usually reserved for design level documentation. However, in the case for the Common Qualified (Q) Platform, Westinghouse is licensing, through the Nuclear Regulatory Commission, a specific set of products for all safety-related systems. Design acceptability is contingent on certain platform-specific features. [

]^{a,c} The characteristics of each make them suitable for specific applications only, and they may not be interchanged. Therefore, in order to ensure Common Q standardization throughout the design life cycle, and to eliminate ambiguity and confusion, a limited number of specific common Q attributes, such as the programmable logic controller (AC160) and communications (AF100, HSL, etc.) are specified in this requirements document.

1.2 SCOPE

PAMS is a real time monitoring system for which provides:

- Information and alarms to assist the reactor operators in mitigating plant events or accidents which have the potential to result in inadequate cooling of the reactor core.
- Other post accident monitoring information per Reg. Guide 1.97.
- Information and data to the plant monitoring/SPDS computers for use in its Control Room Display.

PAMS is composed of two separate and independent channels of processing. [

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1.3 DEFINITIONS, ACRONYMS, AND ABBREVIATIONS

AC160	Advant Controller 160
Addressable Constants	Values defined in the OM/MTP and passed to the PM646A.
AMPL	ABB Master Programming Language
AO	Analog Output
API	Application Program Interface
CET	Core Exit Thermocouple
CI	Communication Interface (e.g., CI631)
Common Q	Common Qualified Platform
CONTRM	Control Module (PM646A application program)
DAT	AF100 Database Element
DB Element	Database Element
DSP	Data Set Peripheral (AF100 data set – up to 8 DATs)
ERR	Error terminal designation on a FCB.PC element
FCB	Function Chart Builder
FE	Function Enable
FPD	Flat Panel Display
GUI	Graphical User Interface
HDD	Hard Disk Drive
HJTC	Heated Junction Thermocouple
HMI	Human-Machine Interface
HSI	Human-System Interface
I&C	Instrumentation and Controls
ICC	Inadequate Core Cooling
IEEE	Institute of Electrical and Electronic Engineers
I/O	Input/Output
MTP	Maintenance and Test Panel
OM	Operators Module
PAMS	Post Accident Monitoring System

PC	Process Control
PC Element	Process Control Element
PM	Processor Module
PROM	Programmable Read Only Memory
QNX	Real-time operating system product provided by QNX Software Systems Ltd.
QSPDS	Qualified Safety Parameter Display System
RCS	Reactor Coolant System
RVL	Reactor Vessel Level
SBC	Single Board Computer
SCF	Single Channel Facility
SMM	Saturation Margin Monitoring
SLE	Software Load Enable
SRS	Software Requirements Specification
TCP/IP	Transmission Control Protocol/Internet Protocol
T _{CREP}	Representative Core Exit Thermocouple Temperature
UJTC	Unheated Junction Thermocouple in an HJTC sensor

Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

1.4 REFERENCES

- 1.4.1 "Application Builder Version 2.7 Users Guide," 3BSE 007 031R701.
- 1.4.2 "Common Qualified Platform Topical Report Post Accident Monitoring Systems," CENPD-396-P Appendix 1, Rev. 1.
- 1.4.3 "Common Q Core Protection Calculator System and Post Accident Monitoring System Phase 3 Proposal," PA-99-013-I&C, Rev. 1.
- 1.4.4 "ABB Combustion Engineering Nuclear Power Quality Procedures Manual," QPM-101, Rev. 5.
- 1.4.5 "Software Program Manual for Common Q Systems," CE-CES-195, Rev. 1.
- 1.4.6 "Software Requirements Specification for the Common Q Phase 3 Generic Flat Panel Display System," 00000-ICE-3239, Rev. 04.
- 1.4.7 "Clarification of TMI Action Plan Requirements," NUREG-0737.
- 1.4.8 "System Requirements Specification for the Common Q Phase 3 Post Accident Monitoring System," 00000-ICE-30156, Rev. 6.
- 1.4.9 "PC Element Description for Advant Controller 100 Series Version 4.7/0 Designer's Guide," 3BDS 000 617R201.
- 1.4.10 "Common Q Phase 3 Project Plan," PP-2009733, Rev. 00.

-
- 1.4.11 "System Requirements Specification for the Generic Flat Panel Display," 00000-ICE-30155, Rev. 3.
- 1.4.12 "QNX Operating System Utilities Reference for QNX 4.24 or later, Third Edition."
- 1.4.13 "Advant[®] Fieldbus 100 User's Guide," 3BSE 000 506R701.
- 1.4.14 "IEEE Standard Criteria for Protection Systems for Nuclear Power Generating Stations," IEEE Std 279-1971.
- 1.4.15 "AMPL Configuration Advant[®] Controller 100 Series Reference Manual," 3BSE 009 626R0401.
- 1.4.16 "Coding Standards and Guidelines for Common Q Systems," 00000-ICE-3889, Rev. 03.
- 1.4.17 "Guidelines for Emergency Response Facilities," NUREG-0696.
- 1.4.18 "Software Requirements Specifications for Digital Computer Software Used in Safety Systems of Nuclear Power Plants," RG 1.172.

1.5 OVERVIEW

In addition to the requirements stated herein, the requirements in Reference 1.4.16 shall apply.

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Introductory material is provided above in Section 1.

Section 2 of the SRS provides a general description of the PAMS, including:

- PAMS Perspective
- PAMS Functions
- User Characteristics
- General Constraints
- Assumptions and Dependencies

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- Performance Requirements
 - Design Constraints
- Attributes
- External Interface Requirements
- Other Requirements

2 OVERALL DESCRIPTION

2.1 PRODUCT PERSPECTIVE

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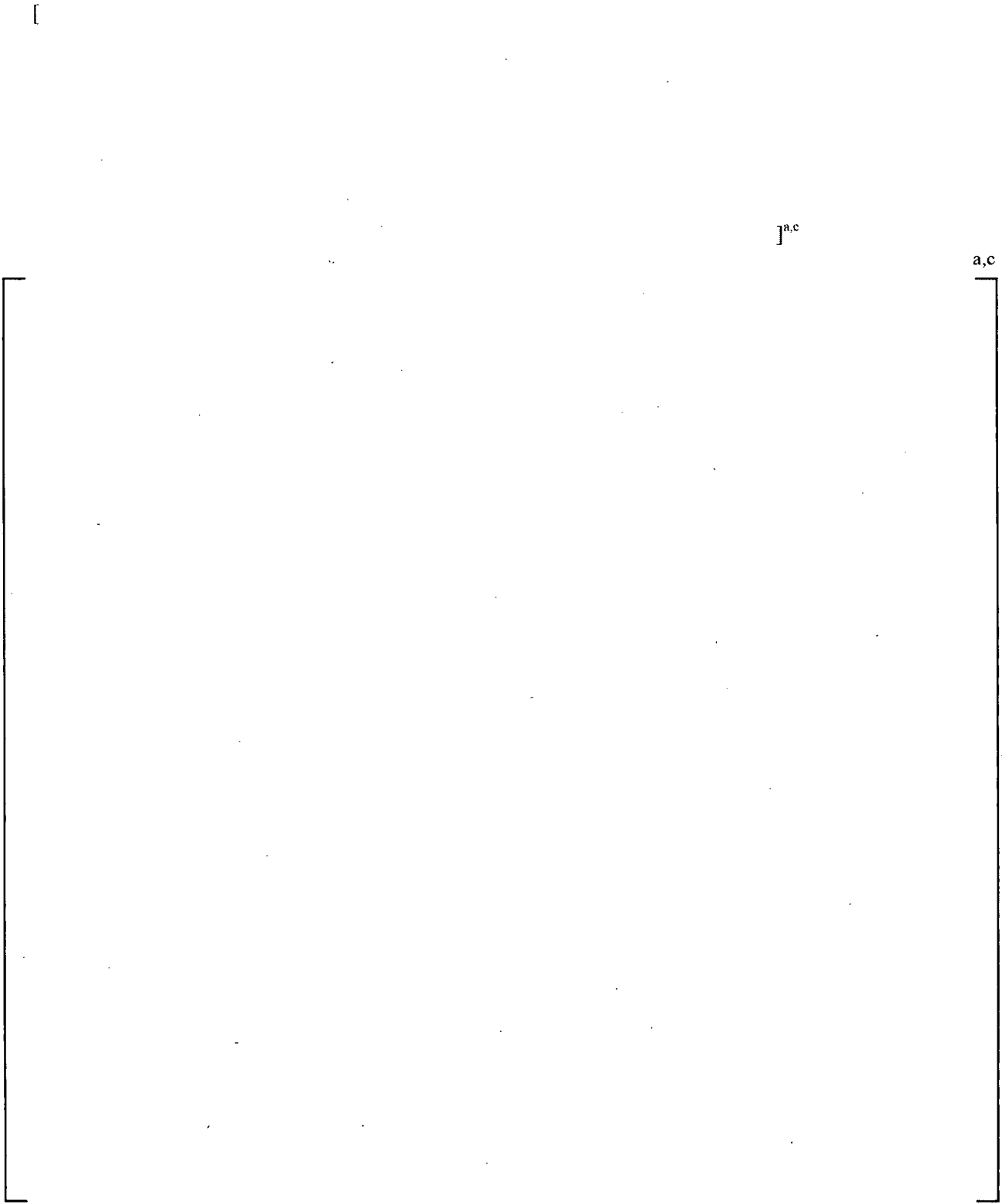


Figure 2-1. []^{a,c}

2.1.1 []^{a,c}

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2.1.2 []^{a,c}

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2.1.3 []^{a,c}

2.1.3.1 []^{a,c}

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2.1.3.2 []^{a,c}

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2.1.4 [] ^{a,c}

2.1.4.1 [] ^{a,c}

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2.1.4.2 [] ^{a,c}

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2.1.5 [] ^{a,c}

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2.1.6 [] ^{a,c}

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2.1.7 [] ^{a,c}

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2.1.8 [

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2.2 PRODUCT FUNCTIONS

The PAMS design shall conform to the regulatory requirements for inadequate core cooling monitoring as described in Reference 1.4.7.”

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Table 2-1. []^{a,c}

a,c

2.3 USER CHARACTERISTICS

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]a,c

2.4 CONSTRAINTS

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2.5.1 [

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2.6 [

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3 SPECIFIC REQUIREMENTS

This section provides the detailed software requirements for PAMS.

3.1 EXTERNAL INTERFACE REQUIREMENTS

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3.1.1 [] ^{a,c}

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3.1.1.1 [] ^{a,c}

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3.1.1.2 [] ^{a,c}

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] ^{a,c}

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]a,c

3.1.2 []a,c

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]a,c

3.1.3 []a,c

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]a,c

3.2 []a,c

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]a,c

[]^{a,c}

3.2.1 []^{a,c}

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3.2.1.1 []^{a,c}

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a,c

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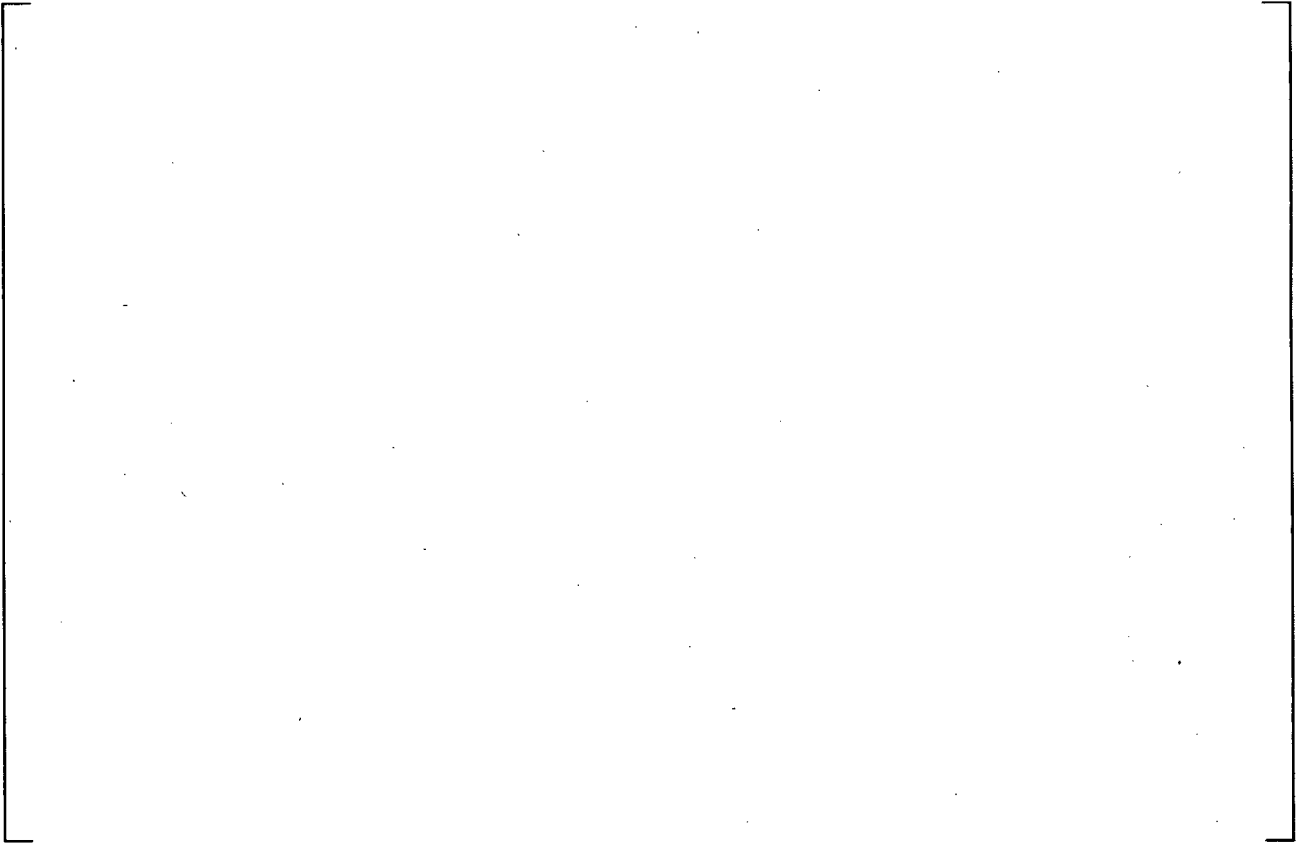
]a,c

3.2.1.2 [

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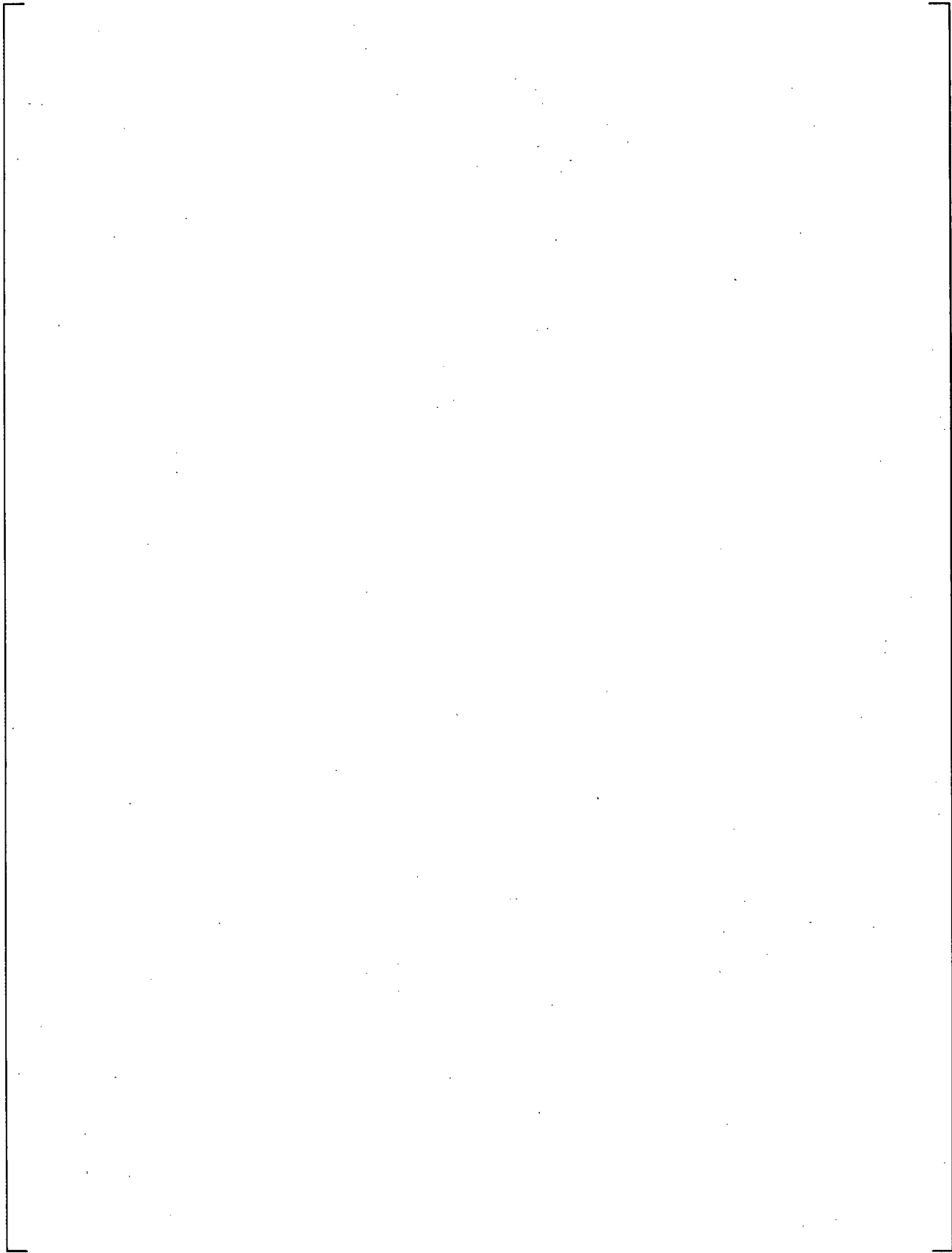
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3.2.2 []a.c

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]a.c



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] ^{a,c}

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] ^{a,c}

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]a,c

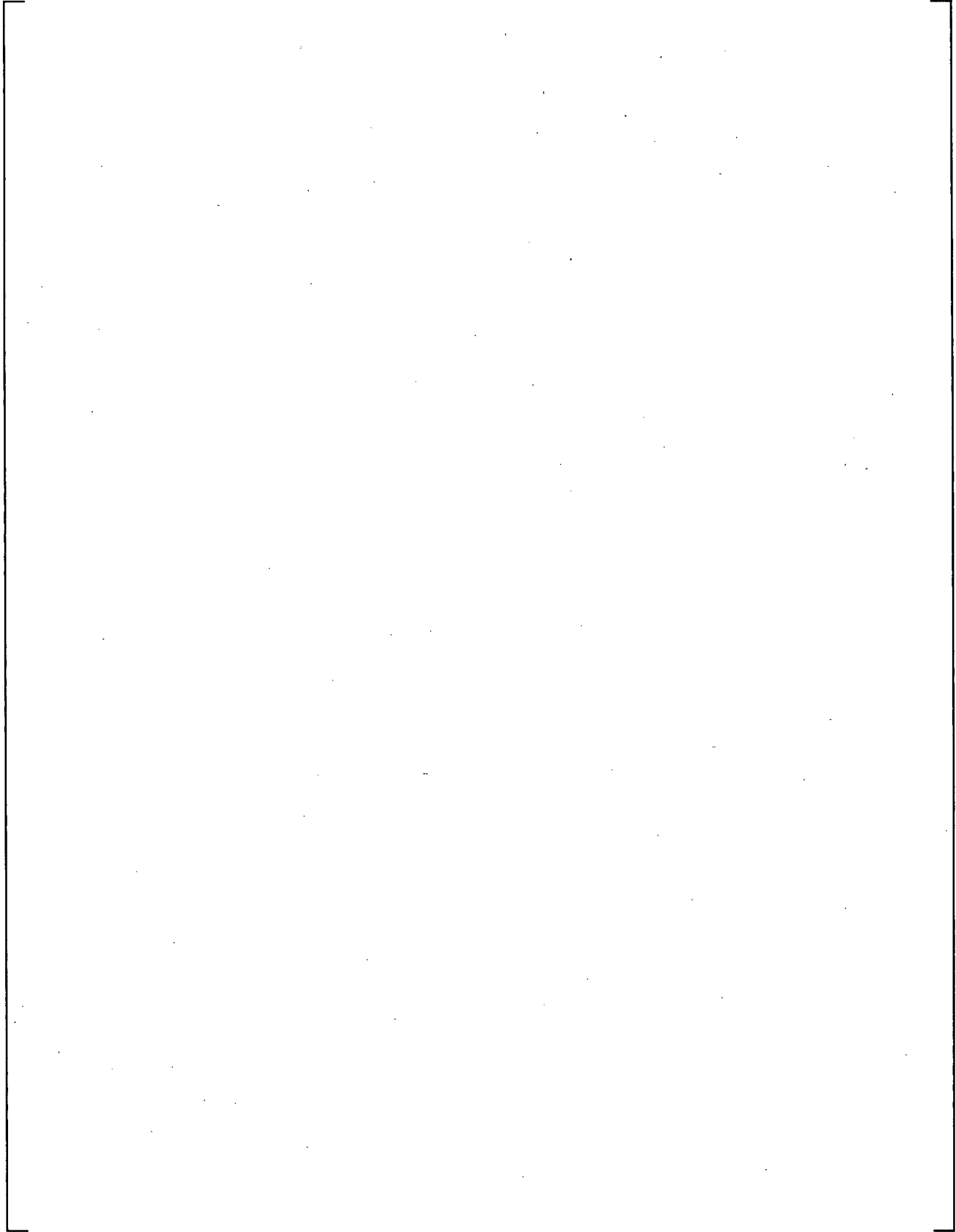
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]a,c

3.2.3 []a,c

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3.2.4 [

] ^{a,c}

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]a,c

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]a.c

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]a.c

3.2.5 []^{a,c}

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] ^{a,c}

3.2.6 []^{a,c}

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] ^{a,c}

3.2.6.1 []^{a,c}

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] ^{a,c}

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] ^{a,c}



Figure 3-1. []^{a,c}

[]^{a,c}

3.2.6.2 []^{a,c}

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3.2.6.3 [

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3.2.6.4 []^{a,c}

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3.2.6.5 []^{a,c}

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3.2.6.5.1 []^{a,c}

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3.2.6.5.2 []^{a,c}

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3.2.6.5.3 []^{a,c}

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3.2.6.5.4 []^{a,c}

3.2.6.5.4.1 []^{a,c}

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]^{a,c}

3.2.6.5.4.2 []^{a,c}

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3.2.7 []^{a,c}

3.2.7.1 []^{a,c}

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]^{a,c}

3.2.7.2 []^{a,c}

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3.2.7.3 []^{a,c}

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]^{a,c}

3.2.7.4 []^{a,c}

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]^{a,c}

3.2.7.5 []^{a,c}

[]^{a,c}

3.3 []^{a,c}

[]^{a,c}

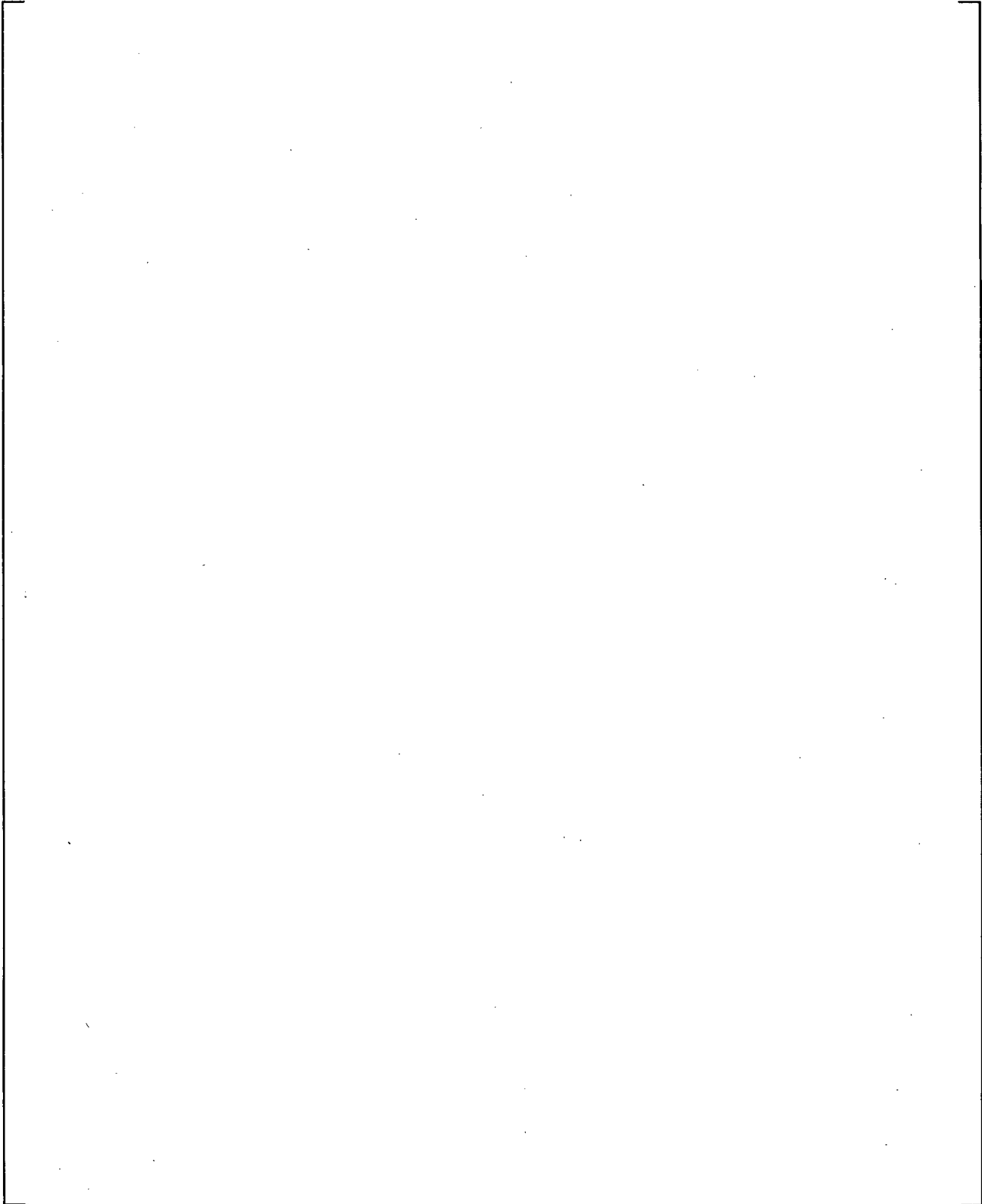


Figure 3-2. []^{a,c}

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3.4 []^{a,c}

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] ^{a,c}

3.4.1 []^{a,c}

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3.4.2 []^{a,c}

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] ^{a,c}

3.5 []^{a,c}

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] ^{a,c}

3.5.1 []^{a,c}

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3.6 []^{a,c}

3.6.1 []^{a,c}

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3.6.2 []^{a,c}

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3.6.3 []^{a,c}

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3.6.4 []^{a,c}

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]a,c

3.6.5 []a,c

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]a,c