

Contents

1. INTRODUCTION	1-1
1.1 Purpose and Description	1-1
1.2 Changes from TA-TSY-000029, Issue 2	1-2
1.3 Definitions-Terminology	1-2
1.4 Document Organization	1-2
2. NETWORK PLAN	2-1
2.1 General	2-1
2.2 CCS Network	2-2
2.2.1 Protocol	2-2
2.2.2 Architecture	2-2
2.2.3 Message-Processing Network	2-3
2.3 RBOC Public Packet Switched Network	2-4
2.3.1 Protocol	2-4
2.3.2 Architecture	2-4
2.3.3 Message Processing	2-5
2.4 Service Management System	2-6
2.5 The SEAS System	2-7
2.6 Maintenance System and Local Maintenance Interfaces	2-7
3. SYSTEM ARCHITECTURE	3-1
3.1 General	3-1
3.2 Node/Application Distinction	3-2
3.3 Support of Multiple Applications	3-3
3.3.1 Application Duplication	3-3
3.4 User Programmability	3-4
4. FEATURES	4-1
4.1 Feature List and Functional Guide	4-1
4.1.1 Applications as Features	4-1
4.1.2 Node Capabilities	4-1
4.2 Feature Definitions/Descriptions	4-1
4.2.1 Line Information Database	4-1
4.2.2 Business Services Database	4-2
4.2.3 PPSN User Identifier Database	4-2
4.3 Node Capabilities	4-2
4.3.1 Multiple Communications Interfaces	4-2
4.3.2 Message Handling	4-2
4.3.3 Measurements and Sampling	4-3
4.3.4 Maintenance	4-3
4.3.5 Overload	4-3
5. MESSAGE PROCESSING	5-1
5.1 General	5-1
5.2 Message Treatment	5-1
5.2.1 Basic Message Handling	5-2

5.2.1.1	Message Addressing	5-3
5.2.1.2	Incoming Messages	5-3
5.2.1.3	Outgoing Messages	5-4
5.2.2	Measurements	5-6
5.2.3	Message Priority	5-6
5.2.4	Signaling Network Testing and Maintenance Functions	5-7
5.2.5	Failure/Recovery Actions	5-7
5.2.5.1	Mate Application Procedures	5-7
5.2.5.2	Internal SCP Procedures	5-7
5.3	Internal Call Processing Functions	5-8
6.	SIGNALING	6-1
6.1	The SS7 Protocol	6-1
6.1.1	SS7 Protocol Description	6-1
6.1.2	Link-Level Controls	6-2
6.1.3	SS7 Message Formats	6-3
6.1.4	MTP Message Handling	6-4
6.1.4.1	Message Discrimination and Distribution	6-5
6.1.4.2	Message Routing	6-5
6.1.4.3	Message Sequencing	6-6
6.1.5	SS7 Network Traffic Management	6-6
6.1.5.1	Message Priorities and Congestion Control	6-6
6.1.5.2	Signaling Link Availability and Unavailability	6-8
6.1.5.3	Signaling Link Tests	6-9
6.1.5.4	Notification of Failure or Congestion in the COS Network	6-10
6.1.6	SCCP Message Handling	6-11
6.1.6.1	Connectionless and Connection-Oriented Service	6-11
6.1.6.2	Connectionless Signaling Procedures	6-12
6.1.6.3	SCCP Routing and Management	6-13
6.1.7	TCAP Data Transfer	6-14
6.1.7.1	TCAP Procedures	6-14
6.2	The X.25 Protocol	6-15
6.2.1	X.25 Protocol Description	6-16
6.2.2	X.25 Message Handling	6-17
6.2.2.1	Message Discrimination and Distribution	6-17
6.2.2.2	Message Routing	6-18
6.2.2.3	Message Sequencing	6-18
6.2.3	X.25 SCCP Message Handling	6-18
6.2.3.1	Connectionless Service	6-18
6.2.3.2	X.25 SCCP Routing and Management	6-19
6.2.4	Network Determination	6-21
7.	TRANSMISSION	7-1
8.	OPERATIONS AND ADMINISTRATION	8-1
8.1	Memory Administration	8-1
8.1.1	Generalized NEMA Functions and Features	8-1

8.1.2	Database Backup and Recovery	8-2
8.1.2.1	Database Backup Procedure	8-3
8.1.2.2	Recent Change Log	8-3
8.1.2.3	External Copies	8-4
8.1.2.4	Database Restoration	8-4
8.1.3	SCP Data Provisioning	8-4
8.1.3.1	Recent Change and Verify (RC&V) Functions	8-4
8.1.3.1.1	Database Concurrence	8-5
8.1.3.2	Specification Data	8-5
8.1.3.2.1	Node Specification Data	8-6
8.1.3.2.2	Application Specification File	8-8
8.2	Surveillance and Maintenance	8-9
8.3	Testing	8-9
8.3.1	System Testing and Integration	8-9
8.3.1.1	General	8-9
8.3.1.2	Benchmark Testing	8-10
8.3.1.3	RBOC Testing	8-10
8.3.1.4	New Features	8-10
8.3.1.5	Sample Tests	8-10
8.4	Network Traffic Management	8-11
8.5	Network Data Collection	8-11
8.5.1	Traffic Measurements	8-11
8.5.1.1	Base Measurements	8-11
8.5.1.1.1	Data Types	8-11
8.5.1.2	SCP Measurement Data	8-12
8.5.1.2.1	Office Totals	8-13
8.5.1.2.2	Component Measurements	8-13
8.5.1.3	Network Routing Data	8-15
8.5.1.4	Record Base Measurements	8-16
8.5.1.5	Data Accuracy	8-16
8.5.1.5.1	Peg Counts	8-16
8.5.1.5.2	Usage Counts	8-16
8.5.1.6	Input/Output (I/O) Capabilities	8-17
8.5.1.6.1	General	8-17
8.5.1.6.2	Data Output	8-17
8.5.2	Service Measurements	8-17
8.5.2.1	Introduction	8-17
8.5.2.2	Relationship to Plant and Traffic Measurements	8-18
8.5.2.2.1	Measurements	8-18
8.6	Billing	8-19
8.6.1	SCP Node and Applications	8-19
8.6.2	AMA Output Functionality	8-19
8.6.3	AMA Segregation	8-20
8.6.4	AMA R&Q	8-21
8.6.4.1	Overview	8-21
8.6.4.2	SCP Node and Applications	8-21
8.6.4.3	AMA Data Accuracy	8-22

8.6.4.4	SCP Applications	8-22
8.7	Generic Program Alteration	8-22
8.8	Security	8-23
8.8.1	Login Procedures	8-23
8.8.1.1	General	8-23
8.8.1.2	Definition of Terms	8-23
8.8.1.3	Authorization Process	8-24
8.8.1.4	Enforcement Process	8-24
8.8.2	Dedicated Line Interface	8-25
8.8.3	Dialup Line Interface	8-25
8.8.4	Network Interface	8-25
8.9	Supplier Support	8-25
8.9.1	General	8-25
8.9.2	Documentation	8-25
8.9.3	Installation and Testing	8-26
8.9.3.1	Installation Handbook	8-26
8.9.3.2	System Testing and Integration	8-26
8.9.4	Maintenance	8-26
8.9.4.1	Documentation	8-26
8.9.4.2	Training	8-26
8.9.4.3	Trouble Escalation	8-26
8.9.4.4	Warranty Specification	8-26
8.9.4.5	Spare Circuit Packs Procedure	8-27
8.9.5	Technical Assistance Availability	8-27
8.9.6	Training	8-27
8.9.6.1	Administrative Training	8-27
8.9.6.2	Maintenance Training	8-27
8.9.6.3	Engineering Training	8-27
8.9.7	Service Proposals and Improvements	8-27
8.9.8	Interface Requirements	8-28
8.9.9	Traffic Engineering	8-28
8.9.9.1	Component Sizing	8-29
8.9.9.2	Capacity Determination	8-29
8.9.9.3	Load Versus Service Relationships	8-29
8.9.9.4	System Traffic Sensitivities	8-30
8.9.9.5	Engineering Algorithms	8-30
8.9.9.6	Mechanized Engineering Support	8-30
8.9.10	Central Office Equipment Engineering	8-30
8.9.10.1	Job Planning Requirements	8-30
8.9.10.2	Detail Engineering	8-31
8.9.10.3	Intervals	8-31
8.9.10.4	Pricing Information	8-31
8.9.10.5	Equipment Ordering	8-31
8.9.10.6	Job Control	8-32
8.9.10.7	Cost Control	8-32
8.9.10.8	Engineering Support	8-32

9.	MAINTENANCE	9-1
9.1	SCP System Maintenance	9-1
9.1.1	Trouble Detection	9-1
9.1.1.1	Granularity	9-2
9.1.1.2	Continuous, Automatic Tests	9-2
9.1.1.3	Per-Operation or Per-Message Automatic Trouble Detection Tests	9-2
9.1.1.4	Periodic, Automatic Trouble Detection Tests	9-2
9.1.1.5	Semiautomatic Trouble Detection Tests	9-3
9.1.1.6	Manual Trouble Detection Tests	9-3
9.1.1.7	Remote Maintenance Center Interface Trouble Detection	9-3
9.1.2	Service Recovery	9-3
9.1.2.1	Hardware Redundancy	9-3
9.1.3	Trouble Notification	9-3
9.1.4	Trouble Verification	9-4
9.1.5	Trouble Isolation	9-4
9.1.5.1	Trouble Isolation Effect on Service	9-4
9.1.5.2	Repair	9-4
9.1.5.3	Maintenance Personnel/System Interface	9-4
9.2	CCS Signaling Link Maintenance	9-4
9.2.1	Trouble Detection	9-4
9.2.1.1	SS7 Trouble Detection Mechanisms	9-5
9.2.1.2	Signaling Link Test	9-5
9.2.1.3	Detecting Signaling Terminal Troubles	9-6
9.2.1.4	Marginal Signaling Performance Trouble Indicators	9-6
9.2.1.5	Periodic Switching and Testing of Standby Transmission Links	9-6
9.2.2	Service Recovery	9-6
9.2.2.1	Traffic Load Transfer	9-6
9.2.2.2	Link Set Emergency Restart	9-6
9.2.3	Trouble Verification	9-7
9.2.3.1	Automatic Prove-In Attempt After Signaling Link Changeover	9-7
9.2.3.2	Verification Thresholds for Marginal Signaling Link Performance	9-7
9.2.3.3	Periodic Verification of Standby Transmission Link Failures	9-7
9.2.4	Trouble Notification	9-7
9.2.4.1	Alarm Levels for Signaling Link Troubles	9-7
9.2.4.2	Signaling Link Alarm Inhibit	9-8
9.2.4.3	Marginal Performance Signaling Link Report	9-8
9.2.4.4	Signaling Link Maintenance States	9-8
9.2.4.5	Signaling Link Status Indicators	9-9
9.2.5	Trouble Isolation	9-9
9.2.5.1	Automatic Localization of Near-End Terminal Troubles	9-9

	9.2.5.2	Reporting Localization to Transmission Link or Far-End Terminal	9-9
	9.2.6	Signaling Link Maintenance Personnel Interface	9-9
9.3		Data Link Maintenance	9-9
	9.3.1	Trouble Detection	9-9
	9.3.2	Service Recovery	9-10
	9.3.3	Trouble Verification	9-10
	9.3.4	Trouble Notification	9-10
	9.3.4.1	Alarm Levels for Data Link Troubles	9-10
	9.3.4.2	Data Link Maintenance States	9-10
	9.3.4.3	9.8.4.3 Data Link Status Indicators	9-10
	9.3.5	Trouble Sectionalization and Isolation	9-11
	9.3.5.1	Automatic Sectionalization of Near-End Link Controller	9-11
	9.3.5.2	Data Link Transmission Testing	9-11
	9.3.6	Data Link Maintenance Personnel Interface	9-11
9.4		Maintenance Measurements	9-11
	9.4.1	General Requirements	9-12
	9.4.1.1	Measurement Accuracy	9-12
	9.4.1.2	Measurement Integrity	9-12
	9.4.1.3	Measurement Security	9-12
	9.4.1.4	Measurement Documentation	9-12
	9.4.1.5	Measurement Report Format	9-13
	9.4.1.6	Combined Output of SCP Node Measurements with Service Application Measurements	9-13
	9.4.1.7	Measurement Report Input and Output Capabilities	9-13
	9.4.2	Base Measurements	9-14
	9.4.3	Service Measurements	9-15
	9.4.3.1	Service Measurements to be Made by the Node Software	9-15
	9.4.3.2	Common Service Measurements to be Made by Each Application	9-15
	9.4.4	Performance Measurements	9-16
	9.4.4.1	System Performance	9-16
	9.4.4.2	Signaling Performance	9-17
9.5		Remote Maintenance	9-19
	9.5.1	Distance Restrictions	9-19
	9.5.2	Remote Maintenance Personnel I/O Interface	9-19
	9.5.3	Remote Maintenance Interface Control Capabilities	9-19
	9.5.3.1	Reconfiguration Capability	9-20
	9.5.3.2	System Initialization Controls	9-20
	9.5.3.3	Emergency Action Controls	9-20
	9.5.3.4	Operational Testing	9-20
	9.5.3.5	Changing System Software	9-20
	9.5.3.6	Changing Office-Dependent Data	9-20
	9.5.3.7	Remote Control Exceptions	9-21

9.5.4	Remote Maintenance Interface Displays and Alarms	9-21
9.5.4.1	Functional Separation of Controls and Displays	9-21
9.5.4.2	Data Masking Restrictions	9-21
9.5.4.3	Similarity of Remote and Local Controls and Displays	9-21
9.5.5	Remote Maintenance Interface I/O Messages	9-21
9.5.5.1	Message Echoing	9-21
9.5.5.2	I/O Formats	9-22
9.5.5.3	Remote Control of Local Hard-Copy I/O Device	9-22
9.5.6	Remote Maintenance Data Link Protocol	9-22
9.6	Network Maintenance	9-22
9.6.1	Network Trouble Notification	9-22
9.6.1.1	Real-Time Network Trouble Message Content	9-23
9.6.1.2	Real-Time Network Trouble Types	9-23
9.6.1.3	Trapping Capabilities	9-24
9.6.2	Network Routing Tests	9-25
10	SYSTEM INTERFACES	10-1
10.1	CCS Interface	10-1
10.1.1	Signaling Link Interfaces	10-1
10.2	X.25 Interface	10-1
10.2.1	General Description	10-1
10.2.1.1	Terminology	10-2
10.2.2	X.25 Network Interface Overview	10-3
10.2.3	X.25 Services	10-3
10.2.3.1	Data Transfer Modes	10-3
10.2.3.2	User-Set Service Options	10-4
10.2.3.3	Access Line Addressing	10-8
10.2.3.4	Access Line Takedown	10-8
10.2.3.5	User Testing Capabilities	10-9
10.2.4	X.25 Interface Protocol	10-9
10.2.4.1	Physical Level	10-9
10.2.4.2	Link Level	10-9
10.2.4.3	Packet Level	10-11
10.3	Operations System Interfaces	10-21
10.3.1	Service Management System	10-21
10.3.1.1	General	10-21
10.3.1.2	Architecture	10-21
10.3.1.3	Protocol	10-22
10.3.2	The SEAS System	10-22
10.3.2.1	Interface Architecture	10-23
10.3.2.2	Interface Protocol, Language, and Application-Level Interactions	10-23
10.3.3	Remote Maintenance Center	10-24
10.3.3.1	Architecture	10-24
11	PERFORMANCE	11-1
11.1	SCP Response Time	11-1

11.1.1	SCP Service-Related Message Response Time	11-1
11.1.1.1	Service-Defined Response Times	11-1
11.1.2	Administrative Message Response Times	11-2
11.1.2.1	Service Management System	11-2
12.	RELIABILITY AND QUALITY	12-1
12.1	General	12-1
12.2	Availability	12-1
12.3	Data Integrity	12-2
12.3.1	Queries	12-2
12.3.2	Operations	12-2
12.3.3	SCP Data Content	12-2
12.4	A Summary of the RQSSGR	12-3
12.4.1	System Design and Architecture	12-3
12.4.2	Manufacturing and Production	12-3
12.4.3	In-Service Performance and Product Support	12-4
13.	POWER	13-1
14.	EQUIPMENT	14-1
15.	ELECTROMAGNETIC AND ELECTRICAL ENVIRONMENT	15-1
16.	NETWORK TRAFFIC MANAGEMENT	16-1
16.1	SCP Overload	16-1
16.1.1	SCP Node Overload Control	16-1
16.1.1.1	Transmitting Overloads	16-1
16.1.1.2	Receiving Overloads	16-2
16.1.2	SCP Application Overload Control	16-2
16.2	NTM Surveillance Data	16-5
17.	SYSTEM CAPACITY	17-1
17.1	General	17-1
17.2	Messages	17-1
17.3	Adding Capacity	17-1
18.	SYNCHRONIZATION	18-1
18.1	Synchronization Requirements	18-1
18.2	Optional Synchronization Features	18-1
19.	DOCUMENTATION	19-1
19.1	General	19-1
19.2	Required Documentation	19-1
19.2.1	Documentation Standards	19-2
20.	DATA	20-1
	References	References-1
	GLOSSARY	Glossary-1

List of Figures

Figure 2-1.	CCS Network Service Architecture	2-4
Figure 2-2.	Potential RBOC PPSN Service Path	2-6
Figure 3-1.	SCP Architecture	3-2
Figure 6-1.	SS7 Protocol Structure	6-2
Figure 6-2.	SS7 Message Format	6-4
Figure 6-3.	Congestion Thresholds	6-8
Figure 6-4.	SCP Protocol Structure	6-17