U S WEST Communications, Inc. Technical Publication

U S WEST 500 Locator Service

77387
Issue A
June 1996

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NOTICE

This publication provides a brief product description and application information on 500 Locator Service. The technical description of this service may be found in Chapter 2 of this Technical Publication 77387. Much of the material in this document was found in the references listed in Chapter 4. Network Channel Codes/Network Channel Interface combinations and Network Interfaces for 500 Locator Service can be found in Technical Publication 77342.

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Throughout this publication, the term U S WEST signifies U S WEST Communications, Inc.

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1. Introduction

1.1 General

This publication provides a brief product description and application information on 500 Locator Service. In addition, technical information is provided on a new type of message content that is used in the wireless network when processing calls to subscribers who have 500 numbers. The reason for issuing the Technical Publication is to inform customers of the method of interfacing to U S WEST Communications Inc. for 500 Locator Service using the IS-41 (Interim Standard-41) protocol. The technical description of this service may be found in Chapter 2 of this Technical Publication 77387. Much of the material in this document was found in the references listed in Chapter 4. Network Channel Codes/Network Channel Interface (NC/NCI) combinations and Network Interfaces (NI) for 500 Locator Service can be found in Technical Publication 77342.

1.2 Reason For Reissue

This is a new publication. If it is reissued, the reason will be noted in this paragraph.

1.3 Scope

This publication provides:

- 500 Locator Service Description
- Network Interconnection information for this service
- 500 Locator Service Messages
- Typical 500 Locator Service applications
- Message Timer Values

This publication does not provide:

- NC/NCI Codes- Refer to Chapter 1 of Technical Publication 77342, Issue C or most recent issue. General information about NC and NCI codes along with definitions of the codes that will relate to the 500 Locator Service can be found in Chapter 1 of Technical Publication 77342, Issue C or most recent issue.
- NC/NCI Combinations - Refer to Chapter 1 of Technical Publication 77342, Issue C or most recent issue. Lists can be found of the applicable combinations of NC and NCI codes that relate to the 500 Locator Service in this document.

1.4 Organization of Document

This document is organized as follows:

Chapter 1 **Introduction,** provides the purpose and scope of the publication, and its organization.

Chapter 2 **Service Description**, provides the description of the service and its options.

Chapter 3 **Definitions**, includes a list of acronyms and a glossary of terms used in this publication.

Chapter 4 **References**, provides a list of documents referenced in this publication along with ordering information.

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2. Service Description

This chapter describes methods by which U S WEST will provide 500 Locator Service. A service description of this offering is also provided. In addition, information on interconnection, message formats, service operation, call routing and wireless communication service functions and features are discussed.

2.1 General

U S WEST Communications provides an extension to the currently tariffed 500 Access Service to include a Locator Feature for Wireless Service Providers. This enhancement provides more efficient routing that results in lower cost routing of calls to wireless subscribers using a 500 number. This capability will be available to Wireless Service Providers who use Home Location Registers on their Signaling System 7 (SS7) network. Interconnection to the U S WEST Common Channel Signaling (CCS) network is obtained by purchasing Common Channel Signaling Access Capability links to the U S WEST STPs.

2.2 Service Synopsis

500 Access Service is a service which allows access from the local network to service providers offering wireless service utilizing 500 numbers. Wireless Service Providers supply a personal telephone number regardless of the geographic location of their subscriber. 500 Locator Service offers a subscriber the combination of personal mobility, terminal mobility, and/or service profile management. 500 Access Service provides the routing, billing, and completion of calls to a Wireless Service Provider based upon the prefix dialed. Currently, Wireless Service Providers who own 500-Area Codes can receive 500 calls using trunk groups at a U S WEST Access Tandem. Once these calls are received at the provider's Mobile Switching Centers, the Wireless Service Providers can query their own Home Location Registers to determine the current location of the wireless subscriber.

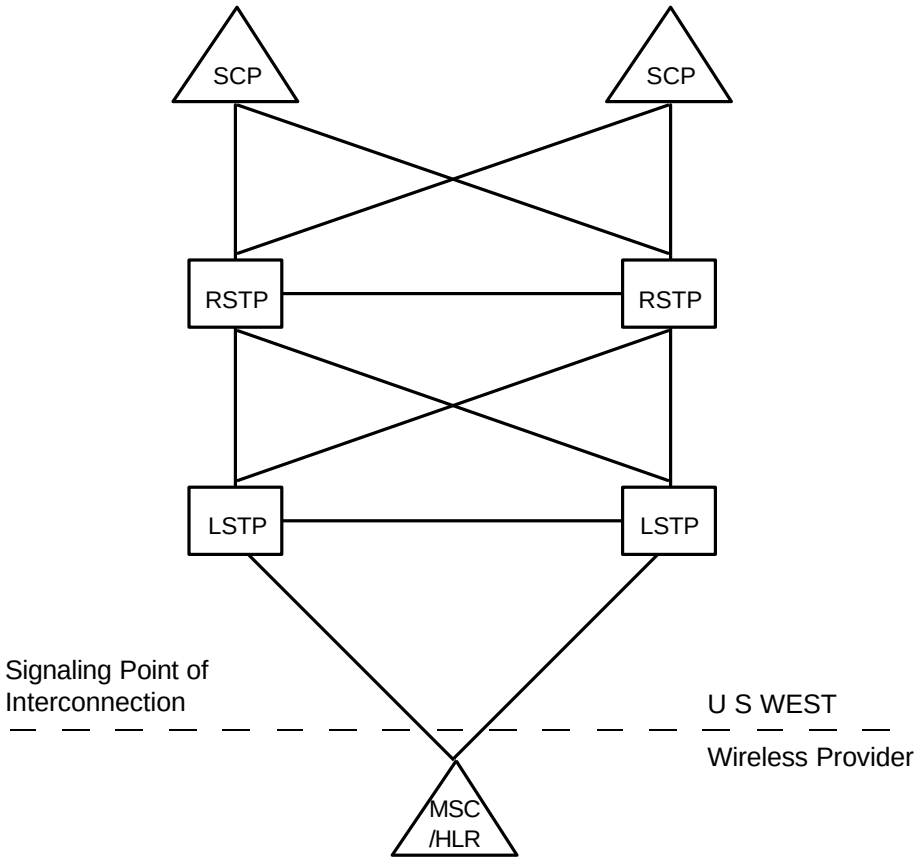
With 500 Locator Service, Wireless Service Providers who have Home Location Registers on their SS7 networks can reduce traffic through their Mobile Switching Centers by allowing U S WEST to query their Home Location Registers for 500 calls *before* routing. Queries to the Home Location Register (LOCREQs) utilize the IS-41 protocol encapsulated in a Transaction Capabilities Application Part (TCAP) message. Responses from the Home Location Register (locreq's) may specify fixed land-line destinations, Temporary Location Directory Numbers, or a routing denial. The Wireless Service Providers may additionally use Visitor Location Registers internal to their own signaling network.

2.3 CCS Interconnection

Wireless Service Providers may connect to the U S WEST CCS network using one of two methods:

- A-link interconnection,
- D-link interconnection.

With A-link interconnection, Wireless Service Providers are connected to the U S WEST CCS network with a pair of A-links to a U S WEST local Signal Transfer Point. Global Title Translation is performed in the U S WEST local Signal Transfer Point and queries are load shared between the two A-links. Failures on an individual A-link will result in query traffic being routed to the other A-link. A-link interconnection is illustrated in Figure 2-1.

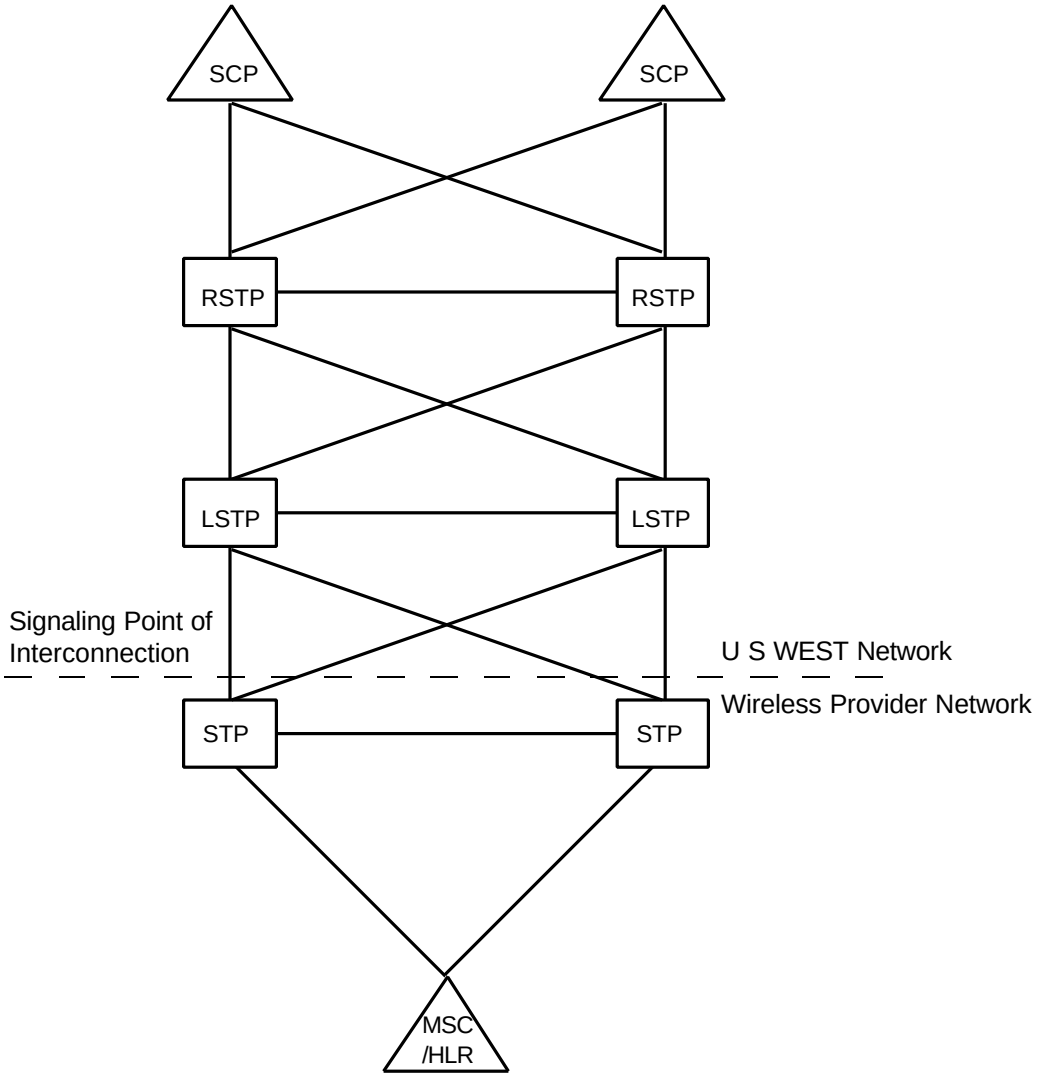


Key

SCP =	Service Control Point
RSTP =	Regional Signal Transfer Point
LSTP =	Local Signal Transfer Point
MSC =	Mobile Switching Center
HLR =	Home Location Register

Figure 2-1 Network Architecture - A-link Interconnection

With D-link interconnection, Wireless Service Providers are connected to the U S WEST CCS network from their Signal Transfer Point with a pair of D-links to a U S WEST local Signal Transfer Point. Final Global Title Translation is performed by the wireless service provider's Signal Transfer Point. This option allows the wireless providers greater control of their SS7 network configuration and operation. D-link interconnection is illustrated in Figure 2-2.



Key

SCP = Service Control Point
RSTP = Regional Signal Transfer Point
LSTP = Local Signal Transfer Point
STP = Signal Transfer Point
MSC = Mobile Switching Center
HLR = Home Location Register

Figure 2-2 Network Architecture - D-link Interconnection

2.4 Message Formats

Only a small portion of the IS-41 protocol is used by the 500 Locator Service Feature. U S WEST will deliver a Location Request query to the Home Location Register, and expects a Location Request response back from the Home Location Register. The complete specification of the protocol can be found in Bellcore Requirements "GR-001411-CORE, PCS Access Services Interface Specification in support of PCS Routing Service, PCS Home Database Service, and PCS IS-41 Message Transport Service," document.

Tables 2-1 and 2-2 show the structure of a Location Request query sent from the U S WEST Service Control Point to the Provider's Home Location Register. The two tables differ in the Signaling Connection Control Part (SCCP) layer, depending on the CCS interconnection option chosen.

Tables 2-3 and 2-4 show the allowable Location Request responses sent from the Provider's Home Location Register to the U S WEST Service Control Point. The two responses differ in the TCAP layer; Table 2-3 shows the parameters expected for an acceptance to route a Temporary Location Directory Number, Table 2-4 shows the parameters expected for a denial of a location request.

Table 2-1 LOCREQ Query Format (A-Link Option)

Layer	Parameter	Value Sent
SCCP	Originating Code	Point Code of U S WEST SCP
	Destination Code	Point Code of Home Location Register
	Calling Party Address: Subsystem Number	 5 (MAP)
	Calling Party Address: Subsystem Number	 6 (Home Location Register)
TCAP	Package Type	Query with Permission
	Transaction ID	Assigned by U S WEST SCP
	Component Type	Invoke (last)
	Operation Code	Location Request
	Called Party Number	NPA-NXX-XXXX
	Mobile Switching Center ID (MSCID)	MSCID of U S WEST SCP
	SystemMyTypeCode	13 (Bellcore)
	Billing ID: MSCID Transaction ID Segment Counter	 MSCID of U S WEST SCP 000 OxFF

Table 2-2 LOCREQ Query Format (D-Link Option)

Layer	Parameter	Value Sent
SCCP	Originating Point Code	Point Code of U S WEST SCP
	Destination Point Code	Alias Point Code of Providers STP
	Calling Party Address: Point Code Subsystem Number	 Point Code of U S WEST SCP 5 (MAP)
	Called Party Address: Translation Type Global Title Value Subsystem Number	 3 NPA-NXX 0
TCAP	Package Type	Query with Permission
	Transaction ID	Assigned by U S WEST SCP
	Component Type	Location Request
	Called Party Number	NPA-NXX-XXXX
	MSCID	MSCID of U S WEST SCP
	SystemMyTypeCode	13 (Bellcore)
	Billing ID: MSCID Transaction ID Segment Counter	 MSCID of U S WEST SCP 000 OxFF

Table 2-3 locreq Response Format (Acceptance)

Layer	Parameter	Value Sent
SCCP	Originating Point Code	Point Code of Provider's SCP
	Destination Point Code	Point Code of U S WEST SCP
	Calling Party Address: Subsystem Number	 6 Home Location Register
	Called Party Address: Subsystem Number	 5 (MAP)
TCAP	Package Type	Response
	Component Type	Return Result
	Serving MSCID	
	Mobile Identification Number	
	Mobile Serial Number	
	Destination Digits	
	Carrier Digits	Carrier Identification Code

Table 2-4 locreq Response Format (Denial)

Layer	Parameter	Value Sent
SCCP	Originating Point Code	Point Code of Provider's SCP
	Destination Point Code	Point Code of U S WEST SCP
	Calling Party Address: Subsystem Number	 6 (Home Location Register)
	Called Party Address: Subsystem Number	 5 (MAP)
TCAP	Package Type	Response
	Transaction ID	As Assigned by U S WEST SCP
	Component Type	Return Result
	Serving MSCID	
	MobileIdentificationNumber	
	Mobile Serial Number	
	AccessDeniedReason	1 (Unassigned Directory Number) 2 (Inactive) 3 (Busy) 4 (Termination Denied)

2.5 Service Operation

When a user dials a 500 number in the U S WEST network, the switch end office or Access Tandem detecting the 500 number suspends call processing and launches a TCAP query to the U S WEST Service Control Point. The Service Control Point examines the dialed 500 number to determine the proper wireless provider, and launches the LOCREQ query through the Signaling Transfer Point(s) to the Home Location Register. The Home Location Register determines the current state and location of the mobile user, and returns the locreq response back to the Service Control Point.

If the Service Control Point receives a location request response, as shown in Table 2-3, the Service Control Point will direct the original switch to route the call to the destination indicated in the Destination Digits Parameter. These destination digits must be a geographic number. The destination may be either a fixed land-line number or a Temporary Location Directory Number associated with a Mobile Switching Center. If the number is in the same LATA as the calling party, the call will be routed over the U S WEST network to the indicated destination. If the number returned is located in a different LATA than the calling party, the call will be handed off to the Interexchange Carrier specified in the carrier digits.

If the Service Control Point receives a routing denial response, as shown in Table 2-4, the Service Control Point will direct the switch to provide appropriate feedback to the calling party. If the AccessDeniedReason is Unassigned Directory Number or Termination Denied, an announcement will be played to the calling party. If the AccessDeniedReason is inactive or busy, a busy tone will be returned from the originating office to the calling party.

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3. Definitions

3.1 Acronyms

ANSI	America National Standards Institute
AT	Access Tandem
Bellcore	Bell Communications Research, Inc.
CCS	Common Channel Signaling
CO	Central Office
FCC	Federal Communications Commission
GTT	Global Title Translation
HLR	Home Location Register
IS-41	Interim Standard - 41
LATA	Local Access and Transport Area
LOCREQ	Location Request Query
locreq	Location Request Response
MSC	Mobile Switching Center
MSCID	Mobile Switching Center Identifier
NC	Network Channel
NCI	Network Channel Interface
NI	Network Interface
PCS	Personal Communications Service
SCCP	Signaling Connection Control Parameter
SCP	Service Control Point
SS7	Signaling System 7
STP	Signal Transfer Point
TCAP	Transaction Capability Application Part
TLDN	Temporary Location Directory Number
VLR	Visitor Location Register

3.2 Glossary

Access Tandem (AT)

A U S WEST switching system that provides a concentration and distribution function for originating or terminating traffic between the U S WEST end-offices and an access customer's premises.

Carrier (CXR)

An organization whose function is to provide telecommunications services. Examples are: Local Exchange Carriers, Interexchange Carriers, Wireless Service Providers, etc.

Channel

An electrical or photonic, in the case of fiber optic based transmission systems, communications path between two or more points of termination.

Common Channel Signaling (CCS)

A signaling method in which a single channel conveys, by means of labeled messages, signaling information relating to a multiplicity of circuits or calls and other information, such as that used for network management. CCS is defined as a dedicated network for transporting signaling messages. The primary components of the network are STPs, signaling end points (including service control points and service switching points) and data links. The two basic types of CCS signaling are: 1) circuit-associated signaling, to support trunk signaling for call control; 2) and non-circuit associated signaling, to handle the exchange of queries and responses between CCS Switching Offices and data bases (SCPs) or between two CCS Switching Offices. This is also known as TCAP message routing.

Customer(s)

Denotes any individual, partnership or corporation who subscribes to the services provided by U S WEST. Customers are divided into two distinct and separate categories: (1) carriers, who provide interexchange services for hire for others or who provide wireless service for hire for others, and (2) end-users, who request services only for their own use.

Destination Digits Parameter

The Destination Digits Parameter contains the geographic number of the called party or Destination Address.

Federal Communications Commission (FCC)

A federal regulatory body in charge of overseeing telecommunications in the United States.

Global Title

An address such as customer dialed digits which does not explicitly contain information that would allow routing in the signaling network, i.e., the SCCP translation function (Global Title Translation), is required.

Global Title Translation (GTT)

A Global Title Translation provides the routing information for TCAP messages.

Home Location Register (HLR)

A central office equipment unit resident in a Mobile Switching Center that has recorded data on the current location of a wireless customer and whether they may be roaming. The Wireless Service Provider can query their own Home Location Registers to determine the current location of the wireless subscriber.

Interim Standard - 41 (IS-41)

Cellular Radiotelecommunications intersystem operations, was developed by the Telecommunications Industry Association (TIA). IS-41 was written because there was a need for standardized intersystem procedures. These included intersystem signaling, roamer fraud prevention, and simplified billing.

Local Access and Transport Area (LATA)

A geographic area for the provision and administration of communications service. It encompasses designated exchanges that are grouped to serve common social, economic and other purposes.

Location Request Query (LOCREQ)

An IS-41 query that is invoked for the purposes of finding the location of a wireless subscriber.

Location Request Response (locreq)

An IS-41 response that is provided to the mobile switch providing the current physical location of a wireless subscriber, i.e., serving wire center.

Mobile Switching Center (MSC)

A wireless switching center.

Mobile Switching Center Identifier (MSCID)

An identification code that identifies a particular mobile switching center.

Network Channel (NC) Code

The Network Channel (NC) code is an encoded representation used to identify both switched and non-switched channel services. Included in this code set are customer options associated with individual channel services, or feature groups and other switched services.

Network Channel Interface (NCI) Code

The Network Channel Interface (NCI) code is an encoded representation used to identify five (5) interface elements located at a Point of Termination (POT) at a central office or at the Network Interface at a customer location. The Interface code elements are: Total Conductors, Protocol, Impedances, Protocol Options, and Transmission Level Points (TLP). (At a digital interface, the TLP element of the NCI code is not used.)

Network Interface (NI)

The point of demarcation on the customer's premises at which U S WEST's responsibility for the provision of service ends.

Personal Communications Service (PCS)

A wireless telecommunications service utilizing bandwidth in the lower end of the spectrum, i.e., 1.9 GHz.

Service Control Point (SCP)

Serves as signaling nodes for access to data base information. Signaling messages usually consist of a query from any switch (End Office, Access Tandem, or Operator Services System, all of which can be SSPs) to a data base. The message is routed first to the STP which then forwards it to the SCP for access to the data base. The reply is passed from the SCP back to the STP which routes it back to the originating switching office.

Signaling Connection Control Part (SCCP)

The SCCP provides logical signaling connections within the CCS network as well as connectionless transfer capability for signal units. Either service may require translating information in the message to the routing address used by the Message Transport Part.

Signaling System 7 (SS7)

Signaling System 7 is the current state-of-the-art method of efficient processing of telephone calls in North America. SS7 cuts call set up time with out-of-band signaling and provides supervision, alerting, and addressing for those calls.

Signal Transfer Point (STP)

STPs are highly-reliable packet switches that route SS7 messages between network nodes.

Temporary Location Directory Number (TLDN)

A pseudo directory number that is used while a customer is roaming.

Transaction Capabilities Application Part (TCAP)

The TCAP message is the source and sink (originating and terminating) protocol level for: 800 Data Base Service, Alternate Billing Service and Advanced Intelligent Network Services.

Visitor Location Register

A central office equipment unit resident in a Mobile Switching Center that has recorded data on the current location of a wireless customer.

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4. References

4.1 Bellcore Documents

GR-905-CORE *Common Channel Signaling (CCS) Network Interface Specification (CCSNIS) Supporting Network Interconnection, Message Transfer Part (MTP) and Integrated Services Digital Network User Part (ISDNUP)* Issue 1, March 1995.

GR-954-CORE *Common Channel Signaling (CCS) Network Interface Specification (CCNIS) Supporting Line Information Database (LIDB) Services,* Issue 1, June 1994.

GR-001411-CORE *PCS Access Services Interface Specification in Support of PCS Routing Service, PCS Home Database Service, and PCS IS-41 Message Transport Service*, Issue 1, March 1994.

4.2 U S WEST Technical Publications

PUB 77342 *U S WEST Common Channel Signaling (CCS) Network Interface Specification (Addendum to TR-TSV-000905 and TR-TSV-000954)* Issue C, March 1993.

4.3 Telecommunications Standards Documents

IS-41 *Telecommunications Industry Association Group TR45 Technical Notes TSB-41,* October 1994.

4.4 Ordering Information

All documents are subject to change and their citation in this document reflects the most current information available at the time of printing. Readers are advised to check status and availability of all documents.

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