Serial Data Interface S942SI

PROTOCOL

Mitel®

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1 SCOPE

This document describes the serial protocol implemented in CPDM/S942SI. This software runs on T942SI, it is also an integrated part of the CPDM hard- and software. The ESPA protocol is a superset of ESPA 4.4.4 and is fully compatible with ESPA 4.4.4 except that multi-drop connection is not supported, i.e. only point-to-point can be used. It is also compatible with the protocol T940SI from Ascom (see Appendix C).

It also supports the protocol with an additional Carriage Return added after each sending and the Ericsson dialects of ESPA 4.4.4 (see Appendix C).

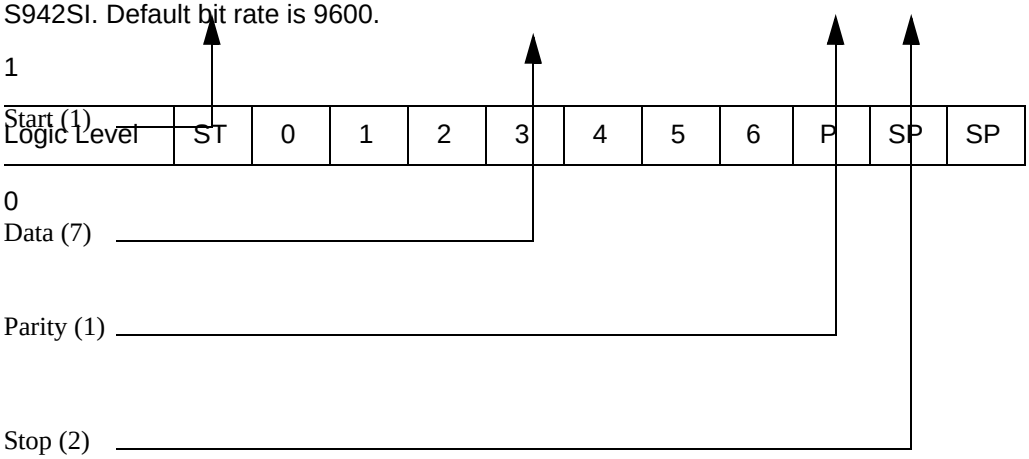
Speech calls are not supported.

CPDM/T942SI also supports a simpler line protocol (see Appendix A).

2 CHARACTER DESCRIPTION

2.1 CHARACTER STRUCTURE

The data communication is a serial, bit synchronous, character asynchronous format as defined by ISO 1177 utilizing one start bit, eight information bits, one even parity bit and one stop bits. The character format can be modified by parameters in CPDM/ S942SI. Default bit rate is 9600.



2.2 THE CHARACTER SET

The Character set conforms to the international alphabet number 5 (CCITT V3 & ISO 646, (see appendix A) referred to in this text as IA5.

2.3 CONTROL CHARACTERS

Informational Separator Characters

Control Characters that are used to separate and qualify data logically.

IS1	US	unit separator
IS2	RS	record separator

Transmission Control Characters

The following Control Characters have special meaning to the protocol and shall be referred to as Transmission Control Characters.

TC1 SOH start of header
Start of a header message

TC2 STX start of text
Precedes a text field and terminates a header

TC3 ETX end of text
Terminates a text field

TC4 EOT end of transmission
Terminates a transaction of one or more texts. Returns control to Control Station

TC5 ENQ enquiry
Requests a response from a remote station, may include station Identity and/or station status

TC6 ACK acknowledge
Transmitted by the receiving station as a positive response to the sender

TC7 DLE data link escape
Not used

TC8 NAK negative acknowledge
Transmitted by the receiving station as a negative response to the sender

TC9 SYN synchronous idle
Not used

TC10 ETB end of transmission block
Not used

2.4 TRANSMISSION CONTROL PREFIXES

Certain of these characters may be prefixed with control information at various stages during the protocol:

ENQ	Shall be prefixed with the device address for polling and selecting
NAK	May be prefixed with an error identifier if known

The presently defined errors are:

‘1’ Transmission error
Corrupt character(s) or BCC received by the station.
BCC Block Checking Character, ISO 1155

‘2’ Busy
Unable to accept a transaction e.g. queue full etc.

‘3’ Invalid message
Type or content of message not recognized by this station

Note: ACK and EOT are not prefixed within this protocol. Character with ‘ ‘ means character according to IA5.

3 THE PROTOCOL

The protocol used conforms to International Standard ISO 1745 “Information processing – Basic mode control procedures for data communication systems.” The external equipment (telephone exchange or computer system) acts default as control station (this can be changed by parameters so that CPDM/T942SI acts as control station). The address of the external equipment is default ‘1’. The paging system has default address ‘2’.

3.1 POLLING

The Control Station polls a device on the communication line with the sequence <address> ENQ. On receipt of this sequence, the polled device becomes Temporary Master Station. This means that also the control station must start by polling itself to become the master of the communication link.

A polling sequence always follows an EOT (see Termination). **It is strongly recommended to always precede the polling by sending EOT 2-3 times to guarantee that the communication link is in the idle state.**

<Address> is the address of the device being polled

3.2 SELECTING

The polled device sends <address> ENQ, to select the device to which it has data to transfer, or EOT to indicate that it does not have data to transfer (see Termination). When the polled device sends <address> ENQ, then the selected device sends ACK if it is ready to receive data. The Temporary Master Station may now communicate with the selected device which now has become Slave station. If the selected device is not ready to receive data it send NAK with an appropriate prefix. Followed by an EOT from the Temporary Master Station.

A selecting sequence never follows an EOT

<Address > is the address of the device being selected

3.3 TERMINATION

Upon completion of its transaction(s), the Master Station sends EOT which both indicates to the Slave Station that transactions are now complete and returns control to the Control Station. If the Control Station does not detect valid transactions on the communication line, within 10 seconds, then it send EOT to terminate the communication.

3.3.1 EXAMPLES OF POLL AND SELECT SEQUENCE

Control Station		Polled Station	Selected Station
No data to be transferred			
EOT EOT EOT	—>		
Poll seq.<address>	—>		
ENQ	—>		
	<—	EOT Negative reply to polling	
Data is to be transferred			
EOT EOT EOT	—>		
Poll seq. <address>	—>		
ENQ	—>	Becomes Temporary Master	
		Select seq. <address> —>	
		ENQ —>	
		<—	ACK Becomes Temporary Slave
		Comm. Line Utilized by Polled device <—>	
	<—	EOT End of usage EOT —>	

Control returns to Control Station

3.4 TRANSFER OF DATA BLOCKS

When a device has control of the communication line, it may transfer data to the other devices. When the receiving device correctly receives a block of data it acknowledges receipt with the ACK character. If however the receiving station is unable to accept the message, it will send NAK (negative acknowledgement) and the sending device may then retransmit the block. If, after two attempts, the transmission still fails, then the sending device will terminate transmission with the EOT character. In this example, the Control Station with address ‘1’ (External equipment) polls itself and is thus able to transmit to the Slave Station with address ‘2’ (paging system).

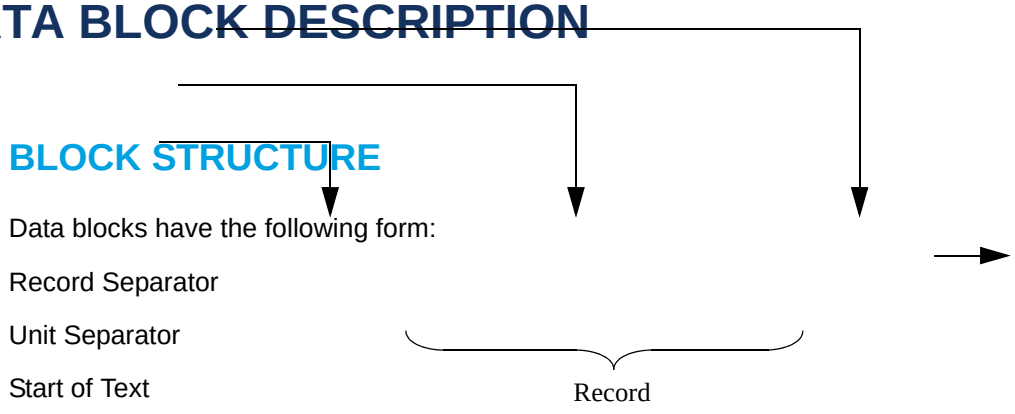
3.4.1 EXAMPLE OF TRANSMISSION, BLOCK OF DATA

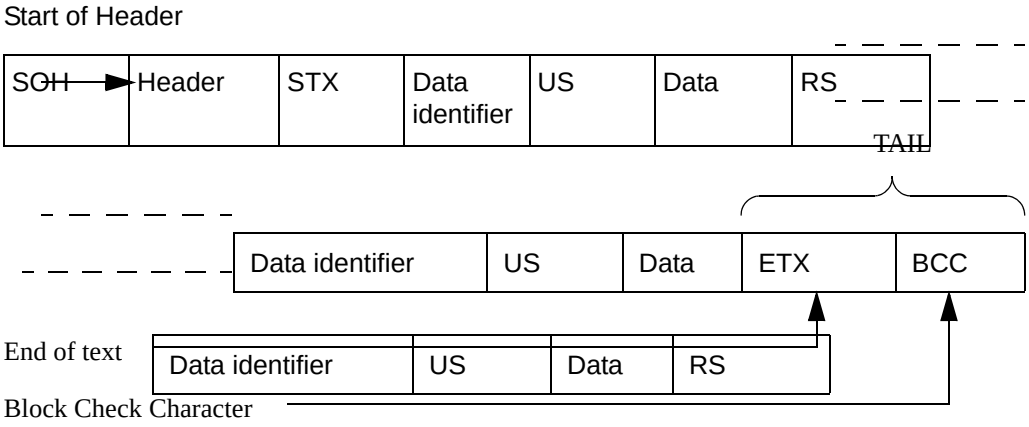
Control Station (external equipm.)	**Code**		**Code**	**Selected Station** (paging system)
EOT EOT EOT		<—>		
Poll sequence	‘1’	<—>		
Becomes Temp. Master	ENQ	<—>		
		—>		
Selected sequence	‘2’	—>		
	ENQ	—>		
		<—	ACK	Becomes Slave
	Block 1	—>		
		<—	ACK	Accepted
	Block 2	—>		
		<—	‘1’	
		<—	NAK	Transmission error
Re transmission	Block 2	—>		
		<—	ACK	Accepted
	Block N	—>		
		<—	ACK	Accepted
Terminates	EOT	<—>		Terminates

4 DATA BLOCK DESCRIPTION

4.1 BLOCK STRUCTURE

Data blocks have the following form:





The Block Check Character shall be the module 2 binary sum of the characters in the transmitted block excluding the SOH.
This means in practice that all characters starting with the header and ending with ETX are “exclusived-or’ed” with each other. This is then the BCC. Note that the BCC may take any value, also the value of a control character. The implementation must there for accept all values of the character following the ETX and not interpret it as a control character.

4.1.1 EXAMPLE

‘1’	00110001
STX	00000010
‘1’	00110001
US	00011111
‘1’	00110001
‘2’	00110010
‘3’	00110011
ETX	00000011
BCC	00101110=2EH

4.2 HEADERS

The header specifies the type of block (transaction).

The headers are defined in the following table:

‘1’	Call to pager
‘2’	Status Information
‘3’	Status Request
‘4’	Call to subscriber line (not implemented)
‘7’-‘A’	Reserved

The contents and meaning of each record are defined in the following table. Note that data may have more figures, for example to indicate a type or subdivision in the data. The character ‘0’ is reserved for future expansion, e.g. ‘1’ is not the same as ‘01’ or ‘001’ etc. Note that not all receiver types have all the described features available.

Record type		**Data Identifier**	**Data**	**Meaning**
Call address		‘1’	1-7 digits	Address of the pager ‘A’ gives group call i.e. ‘1A’ calls receivers 10-19
Display message		‘2’	1-128 char.	The message to be displayed
			Different pocket units may be programmed for different beep codes.	(912T Default)
Beep coding	‘3’	‘0’	Beep code 7	(Siren) as 910 receiver
		‘1’	Beep code 1	1 beep
		‘2’	Beep code 2	2 beep
		‘3’	Beep code 3	3 tone chime
		‘4’	Beep code 4	Internal ring
		‘5 - 8’	Beep code 5	External ring
		‘9’	Beep code 6	(Siren)
Call type	‘4’	‘0’	Reserved	
		‘1’	Reset (cancel) call	
		‘2’	Speech call	
		‘3’	Standard call	

		‘4’	Alarm call	This type automatically adds the siren beep and a request for acknowledge
		‘5’	Remote ackn of paging in pocket unit	
		‘6’	Remote erase of paging in pocket unit	
		‘7 - 9’	Reserved	
		‘10’	Manual acknowledge	Standard paging with request for acknowledge
Number of transmission	‘5’	‘0’	Reserved	
		‘1’	1 transmission	
		‘2’	2 transmission	
		etc.	etc.	
Priority	‘6’	‘0’	Reserved	
		‘1’	Alarm (Emergency)	(priority 3)
		‘2’	High	(priority 5)
		‘3’	Normal	(priority 7)
Call Status	‘7’	‘0’	Reserved	
		‘1’	Busy	
		‘2’	In Queue	
		‘3’	Paged	
		‘4’	Absent	
		‘5’	Call terminated/ Ready	
		‘6’	ACK from called party	
		‘61’	NACK from called party	
System Status	‘8’	‘0’	Reserved	
		‘1’	Transmitter failure	
Message Reference ID	‘9’		Max 16 characters. Unique ID for paging, see appendix B for details.	
Infopage	‘C’		Specified if a paging is to be stored as an info paging in the mobile unit.	
		‘0’	No Infopage (default)	
		‘1’	‘1’ - ‘FFFF’ Identifies a paging in the paging system.	

Running number	‘D’	‘1’ - ‘FFFF’ (hex)	When the call type is ‘5’, Remote acknowledge of an old paging in the mobile unit, or 6, Erase of an old paging in mobile unit, the running number of the paging must be added to the ‘paging’ block. The CPDM/ S942SI parameter “Paging running number to external equipment” must be set to transfer the running number to the external equipment at paging status block. The Message Reference ID, can be used as an alternative.

A block consists of one or more of the above data beginning with a ‘block type’ header, with other data in any sequence separated by Record Separators.

In most systems, many of the data have prespecified default values. In these cases, only the information which is required to be different to the default value need to be transferred, e.g. for a standard priority call there is no need to send a ‘standard priority’ message.

4.2.1 EXAMPLE 1

Standard call to receiver number ‘123’ is to be transmitted 3 times at high priority.

External equipment (control station) **Paging System**

POLL SEQUENCE
Polls itself

EOT	EOT	EOT	‘1’	ENQ	<—>

SELECT SEQUENCE
Select Paging System

‘2’	ENQ	—>

POSITIVE REPLY TO SELECTING

<— ACK

Block 1: —>

HEADER
Type of block: Paging

SOH	'1'	STX	—>

RECORD 1
Call Address

—> | '1' | US | '1' | '2' | '3' | —>

RECORD SEPARATOR

—> | RS | —>

RECORD 2
Number of transmissions

—> | '5' | US | '3' | —>

RECORD SEPARATOR

—> | RS | —>

RECORD 3
Priority

—> | '6' | US | '2' | —>

TAIL

—> | ETX | BCC |

ACKNOWLEDGE (reply)

<— ACK

TRANSACTIONS COMPLETE

EOT <—>

4.2.2 EXAMPLE 2

The paging system automatically gives status information concerning the last 30 calls made by the External Equipment. If the external equipment is control station it must however poll the paging system to enable it to communicate.

The call is identified by call number (123), beep coding (1) and display message (4567).

External equipment (control station) **Paging System**

POLL SEQUENCE
Polls the Paging System

EOT	EOT	EOT	'2'	ENQ	<—>

SELECT SEQUENCE
Selects the External Equipment

<—	'1'	ENQ

POSITIVE REPLY TO SELECTING

ACK	—>

<— BLOCK 1:

HEADER

Type of block:
Status information

<—	SOH	'2'	STX

RECORD 1:
Call address (123)

<—	'1'	US	'1'	'2'	'3'

RECORD SEPARATOR

<— RS

RECORD 2
Beep coding (1)

<— ‘3’ | US | ‘1’

RECORD SEPARATOR

<— RS

RECORD 3
Display message (4567)

<— ‘2’ | US | ‘4’ | ‘5’ | ‘6’ | ‘7’

RECORD SEPARATOR

<— RS

RECORD 4
Status (paged)

<— ‘7’ | US | ‘3’

TAIL

<— ETX | BCC

ACKNOWLEDGE

ACK —>

TRANSACTIONS COMPLETE

4.2.3 EXAMPLE 3

The External Equipment can ask for status information concerning the progress of a paging call. In order to completely identify the paging, the External Equipment must transfer the same information as it did when the paging was initiated.

The transaction will be exactly the same as in example 1, except for the header. The header now specifies that the transaction is a status request.

The paging system will not send the paging status as a direct response to the status request but after the next polling. This possibility to request status has a limited value as all status is reported from the paging equipment anyway.

HEADER

Type of block (transaction): Status request

SOH	'3'	STX

4.2.4 EXAMPLE 4: MESSAGE REFERENCE ID

Standard call to receiver number '123' is to be transmitted 3 times at high priority. External equipment adds a message reference ID.

External equipment		**Paging System**
(control station)		
POLL SEQUENCE Polls itself		
1 ENQ	<—>	
SELECT SEQUENCE Select Paging System		
2 ENQ	—>	
		POSITIVE REPLY TO SELECTING
	<—	*ACK*
BLOCK 1:	—>	
HEADER Type of block: Paging		
SOH 1 STX	—>	

RECORD 1
Call Address

1 US 123 —>

RECORD SEPARATOR

RS —>

RECORD 2
Number of transmissions

5 US 3 —>

RECORD SEPARATOR

RS —>

RECORD 3
Priority

6 US 2 —>

RECORD SEPARATOR

RS —>

RECORD 4
Message Reference ID

9 US Process 1 —>

TAIL

ETX BCC —>

ACKNOWLEDGE (reply)

<— *ACK*

TRANSACTIONS

COMPLETE

EOT <—>

Paging System gives status information concerning a call made by the External Equipment. The call is identified by call number (123), beep coding (1) and display message (4567). If a Message Reference ID exists (Left Engine), it is added to the status block.

External equipment		**Paging System**
(control station)		
POLL SEQUENCE		
Polls the Paging System		
2 ENQ	<—>	
		SELECT SEQUENCE
		Selects the external equipment
	<—	*1 ENQ*
POSITIVE REPLY TO SELECTING		
ACK	—>	
	<—	BLOCK 1:
		HEADER
		Type of block:
		Status information
	<—	*SOH 2 STX*
		RECORD 1
		Call address (123)
	<—	*1 US 123*
		RECORD SEPARATOR
	<—	*RS*

RECORD 2
Beep coding (1)

<— *3 US 1*

RECORD SEPARATOR

<— *RS*

RECORD 3
Display message (4567)

<— *2 US 4567*

RECORD SEPARATOR

<— *RS*

RECORD 4
Status (paged)

<— *7 US 3*

RECORD SEPARATOR

<— *RS*

RECORD 5
Message Reference ID

<— *9 US Left Engine*

TAIL

<— *ETX BCC*

ACKNOWLEDGE

ACK —>

		TRANSACTIONS COMPLETE
	<—	*EOT*

4.2.5 EXAMPLE 5

External Equipment wants to erase a paging. Paging System receives a paging block with Call type 6 and the message reference ID for that paging.

External equipment		**Paging System**
(control station)		
POLL SEQUENCE Polls itself		
1 ENQ	<—>	
SELECT SEQUENCE Select Paging System		
2 ENQ	—>	
		POSITIVE REPLY TO SELECTING
	<—	*ACK*
BLOCK 1:	—>	
HEADER Type of block: Paging		
SOH 1 STX	—>	
RECORD 1 Call type		
4 US 6	—>	
RECORD SEPARATOR		

RS —>

RECORD 2
Message Reference ID

9 US Process 1 —>

TAIL

ETX BCC —>

ACKNOWLEDGE (reply)

<— *ACK*

TRANSACTIONS
COMPLETE

EOT <—>

Paging System gives status information for the erase paging. The call is only identified by the message reference ID.

External equipment (control station)		**Paging System**
POLL SEQUENCE Polls the Paging System		
2 ENQ	<—>	
		SELECT SEQUENCE Selects the external equipment
	<—	*1 ENQ*
POSITIVE REPLY TO SELECTING		

ACK	—>	
	<—	BLOCK 1:
		HEADER
		Type of block:
		Status information
	<—	*SOH 2 STX*
		RECORD 1
		Status (paged)
	<—	*7 US 3*
		RECORD SEPARATOR
	<—	*RS*
		RECORD 2
		Message Reference ID
	<—	*9 US Process 1*
		TAIL
	<—	*ETX BCC*
ACKNOWLEDGE		
ACK	—>	
		TRANSACTIONS COMPLETE
	<—	*EOT*

4.2.6 EXAMPLE 6

External Equipment sends a standard paging with manual acknowledgement. Paging System receives a paging block with Call type 10 and a message reference ID for that paging.

External equipment (control station)		**Paging System**
POLL SEQUENCE Polls itself		
1 ENQ	<—>	
SELECT SEQUENCE Select Paging System		
2 ENQ	—>	
		POSITIVE REPLY TO SELECTING
	<—	*ACK*
BLOCK 1:	—>	
HEADER Type of block: Paging		
SOH 1 STX	—>	
RECORD 1 Call address		
1 US 420	—>	
RECORD SEPARATOR		
RS	—>	
RECORD 2 Display message		
2 US Alarm process 1	—>	
RECORD SEPARATOR		

RS —>

RECORD 3
Call type

4 US 10 —>

RECORD SEPARATOR

RS —>

RECORD 4
Priority

6 US 1 —>

RECORD SEPARATOR

RS —>

RECORD 5
Message Reference ID

9 US Process 1 —>

TAIL

ETX BCC —>

ACKNOWLEDGE (reply)

<— *ACK*

TRANSACTIONS
COMPLETE

EOT <—>

The Paging System sends back the acknowledgement as a status information block. The call is identified by the message reference ID and call number.

External equipment (control station)		Paging System
POLL SEQUENCE Polls the Paging System		
2 ENQ	<—>	
		SELECT SEQUENCE Selects the external equipment
	<—	*1 ENQ*
POSITIVE REPLY TO SELECTING		
ACK	—>	
	<—	BLOCK 1:
		HEADER Type of block: Status information
	<—	*SOH 2 STX*
		RECORD 1 Status (NACK from called party)
	<—	*7 US 61*
		RECORD SEPARATOR
	<—	*RS*
		RECORD 2 Call address
	<—	*1 US 420*

		RECORD SEPARATOR
	<—	*RS*
		RECORD 3 Message Reference ID
	<—	*9 US Process 1*
		TAIL
	<—	*ETX BCC*
ACKNOWLEDGE		
ACK	—>	
		TRANSACTIONS COMPLETE
	<—	*EOT*

5 CONVENTIONS

<>	Indicate that the value of the contents is to be considered: e.g. <address> indicates the address of something, not the word ‘address’.
‘ ‘	Character within ‘ ‘ indicates IA 5 characters: e.g. ‘0’ is the character zero which has the hexadecimal code 3/0
/	Used as a separator for the upper 3 bits and the lower 4 bits of an IA 5 code. When shown in this form, characters can be defined using either hex or decimal notation: e.g. character ‘K’ is 4/11 or 4/B.
—>	
<—	
<—>	Indicate the direction of data flow: <—> means bidirectional.

6 LIST OF REFERENCES

ISO 646	7 bit character set for information interchange.
ISO 1155	Information processing - Use of longitudinal parity to detect data errors in information messages.
ISO 1177	Information processing - Character structure for start/stop and synchronous transmission.
ISO 1745	Information processing - Basic mode control procedures for data communication systems.
ISO 2110	Data communication - 25 pin DTE/DCE interface connector and pin assignments.
ISO 2628	Basic mode control procedures - Complements.
CCITT V.21	300 Baud modem standardised for use in the general switched telephone network.
CCITT V.23	600/1200 Baud modem standardised for use in the general switched telephone network.
CCITT V.24	List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Circuit terminating Equipment (DCE).
CCITT V.28	Electrical characteristics for unbalanced double-current interchange circuits.
ESPA 4.4.4	Serial data interface for paging equipment.

Appendix A: Line Protocol

The line protocol is very simple alternative to ESPA 4.4.4 and can be activated in CPDM/S942SI by a parameter. It has a very limited status report but all basic features of a paging call is available. No data identifiers are used. Record types are identified by their order in the received block. CPDM/S942SI assumes record types are ordered as follows: Call address, Display message, Beep coding, Call type, Number of transmissions, Priority, Infopage.

Control characters

The control characters can be changed by parameters. These are the default values.

<	=	3CH	=	Start of string
/	=	2FH	=	Record separator
>	=	3EH	=	End of string
A	=	41H	=	Paging accepted
N	=	4EH	=	Paging not accepted

Example 1:

Standard call to receiver number ‘123’, display message ‘EXAMPLE 1’

External equipment		CPDM/T942SI
<’123’/’EXAMPLE1’>	—>	
	<—	A

Example 2:

Standard call to receiver number ‘123’, display message ‘EXAMPLE2’ is to be transmitted 3 times at high priority.

External equipment		CPDM/T942SI
<’123’/’EXAMPLE2’/’2’/’3’3/’3’/’2’>	—>	
	<—	A

Appendix B: Function Description Extended ESP

Description

New functions are added to CPDM/S942SI (from V3.00) in order to make it easier to use and access our systems teleCOURIER, CTS and 9d. The new functionality consists of:

Possibility to give each paging a unique Message Reference ID.

- Erase of old paging in mobile unit.
- Remote acknowledge of old paging in mobile unit.
- Manual acknowledge.
- Negative acknowledge.
- Initiation of conference call.

The new features are only implemented for ESPA Ascom dialect.

Message Reference ID

In the original ESPA protocol, each paging is referred to by its call number, beep code and display message. A new record called ‘Message Reference ID’ has been added to the ESPA protocol to make it easier to use functions as erase and acknowledge pagings. The record is defined as:

Record type	Data identifier	Data
Message Reference ID	‘9’	Max 16 chars

The external equipment adds this new record to the paging block. The ID is later used by SI and external equipment in the following ways:

- Erase of old paging in mobile unit:
  External equipment uses the ID instead of sending call number and display message in a paging block with call type ‘6’ to SI. The SI sends back call status and the Message Reference ID in the status information block.

- Remote acknowledge of old paging in mobile unit:
  External equipment uses the ID instead of sending call number and display message in a paging block with call type ‘5’ to SI. The SI sends back call status and the Message Reference ID in the status information block.

- Standard call with manual acknowledgement:
  SI uses call status and the ID when sending back the acknowledge from mobile unit.

- Other call types in paging:
  SI appends the ID to each paging status block sent to external equipment.

The life time before the Message Reference ID is deleted in queue is set in SI (new parameter). It is possible to set from 1 to 15 minutes. But if an erase paging is sent from external equipment, the ID used is removed from queue even if the life time has not expired.

Standard paging

External equipment adds a Message Reference ID to the paging. SI appends this to all status blocks sent back

- External equipment sends a paging to SI using ESPA protocol:

<SOH> 1 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 9 <US> Mess ID string <ETX>

- SI sends paging to central on a-bus according to ascom system 900 protocol:

<SOH> 1 <STX> 1 <US> FFFFF420 <RS> 2 <US> FIRE! <ETX>

- For each paging status from central, SI sends back call status to external equipment with the Message Reference ID:

Accept:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 7 <US> 2 <RS> 9 <US> Mess ID string <ETX>

Paged:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 7 <US> 3 <RS> 9 <US> Mess ID string <ETX>

Ready:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 7 <US> 5 <RS> 9 <US> Mess ID string <ETX>

Erase of old paging in mobile unit

If the external equipment wants to erase a paging in the mobile unit, it sends a new paging block to SI containing call type ‘6’ and the ID of the paging that should be erased. If the ID is still in queue, the SI will send an erase paging to central with the correct call address and running number found in queue. The display message will be the same as default message (parameter in SI).

A typical paging sequence might look as below:

- External equipment sends erase paging to SI using ESPA protocol with an ID:

<SOH> 1 <STX> 9 <US> Mess ID string <RS> 4 <US> 6 <ETX>

- SI finds the correct call address and running number corresponding to the Message Reference ID and send erase paging to central according to system 900 protocol. Default display message is used:

<SOH> 1 <STX> 1 <US> FFFFF420 <RS> 2 <US> “BLANK “<RS> 7 <US> 5 <RS> C <US> 536C <ETX>

- For each paging status from central, SI sends back call status to external equipment with the Message Reference ID:

Accept:

<SOH> 2 <STX> 7 <US> 2 <RS> 9 <US> Mess ID string <ETX>

Paged:

<SOH> 2 <STX> 7 <US> 3 <RS> 9 <US> Mess ID string <ETX>

Ready:

<SOH> 2 <STX> 7 <US> 5 <RS> 9 <US> Mess ID string <ETX>

After the paging is ready, the Message Reference ID is deleted from queue and can no longer be used.

Remote acknowledge of paging in mobile unit

The use of remote acknowledge is very similar to the erase paging above when using a Message Reference ID.

The external equipment sends a new paging block to SI containing call type ‘5’ and the ID of the paging that should be acknowledged. If the ID is still in queue, the SI will send a paging to central with paging function ‘6’ and the call address and running number found in queue. The display message will be the same as default message (parameter in SI).

A typical paging sequence might look as below:

- External equipment sends remote acknowledge paging to SI using ESPA protocol with an ID:

<SOH> 1 <STX> 9 <US> Mess ID string <RS> 4 <US> 5 <ETX>

- SI finds the correct call address and running number corresponding to the Message Reference ID and send a remote acknowledge paging to central according to system 900 protocol. Default display message is used:

<SOH> 1 <STX> 1 <US> FFFFF420 <RS> 2 <US> “BLANK “<RS> 7 <US> 6 <RS> C <US> 536D <ETX>

- For each paging status from central, SI sends back call status to external equipment with the Message Reference ID:

Accept:

<SOH> 2 <STX> 7 <US> 2 <RS> 9 <US> Mess ID string <ETX>

Paged:

<SOH> 2 <STX> 7 <US> 3 <RS> 9 <US> Mess ID string <ETX>

Ready:

<SOH> 2 <STX> 7 <US> 5 <RS> 9 <US> Mess ID string <ETX>

The Message Reference ID will remain in queue until it is timed out, so it is possible to send several acknowledges or one erase paging for that particular ID.

Standard call with manual acknowledgement

This is a new call type for ESPA Tateco dialect for initiating a paging with manual acknowledge. The difference between this call type and the already existing Alarm call (call type ‘4’) is that the beep code is not set to ‘Siren’. Instead, it is possible to set the beep code to any valid value.

Record type	Data identifier	Data
Call Type	‘4’	‘10’

There is also a new parameter in SI defining if the acknowledge type sent on a-bus should be ‘Only positive acknowledge’ or ‘Positive and Negative acknowledge’. Use the last option when handset and external equipment can handle a negative acknowledge. Use the first for older equipment.

Another parameter sets queue time for pagings with acknowledgement. There are 6 possible values to choose from:

- 10 seconds.
- 30 seconds.
- 1 minute.
- 5 minutes.
- 10 minutes.
- 15 minutes.

The paging is deleted after this time has expired but the Message Reference ID for that paging will still exist in queue according to the parameter for life time of ID’s. This means that it might be possible to send ‘Erase of old paging in mobile unit’ using the ID and delete the paging in the mobile after the time of acknowledge has expired.

Typical paging sequence:

- External equipment sends a paging with manual acknowledge request to SI:

<SOH> 1 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 9 <US> Mess ID string <RS> 4 <US> 10 <ETX>

- SI send paging with Ack/Nack request to central on a-bus:

<SOH> 1 <STX> 1 <US> FFFFF420 <RS> 2 <US> FIRE! <RS> 8 <US> 4 <ETX>

- For each paging status from central, SI sends back call status to external equipment with the Message Reference ID:

Accept:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 9 <US> Mess ID string <RS> 7 <US> 2 <ETX>

Paged:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 9 <US> Mess ID string <RS> 7 <US> 3 <ETX>

Ready:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 9 <US> Mess ID string <RS> 7 <US> 5 <ETX>

- When the handset sends acknowledge, the SI sends call status ‘6’ if positive acknowledgement or ‘61’ if negative acknowledgement to external equipment. The Message Reference ID is used instead of call address and display message:

<SOH> 2 <STX> 1 <US> 420 <RS> 7 <US> 6 <RS> 9 <US> Mess ID string <ETX>

Speech paging

A new parameter has been added to CPDM/S942SI defining if a paging with call type ‘2’ from external equipment should be sent as a standard speech paging or as a mobile-to-mobile to central on a-bus. The reason for this is that the CTS central can not handle mobile-to-mobile pagings.

The SI sends back ordinary paging status to external equipment (i.e. not any information about speech channel open/closed in system 900).

- External equipment sends a speech paging to SI:

<SOH> 1 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 4 <US> 2 <ETX>

- SI sends mobile-to-mobile paging to central on a-bus:

<SOH> 1 <STX> 1 <US> FFFFF420 <RS> 2 <US> FIRE! <RS> 7 <US> 2 <ETX>

- For each paging status from central, SI sends back call status to external equipment with the Message Reference ID:

Accept:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 7 <US> 2 <ETX>

Paged:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 7 <US> 3 <ETX>

Ready:

<SOH> 2 <STX> 1 <US> 420 <RS> 2 <US> FIRE! <RS> 3 <US> 2 <RS> 7 <US> 5 <ETX>

Appendix C: Ericsson Dialect

Records, Ericsson dialect

The contents and meaning of each record are defined in the following table. Note that data may have more figures, for example to indicate a type or subdivision in the data. The character '0' is reserved for future expansion; e.g. '1' is not the same as '01' or '001' etc.

Record type	Data Identifier	Data	Meaning
Call address	'1'	max. 8 char.	Address of the pager or group of pagers
Display message	'2'	max 92 char.	The message to be displayed
Beep coding	'3'	'0'	Reserved
		'1'	- - - -
		'2'	– – – –
		'3'	— — — —
		'4'	————————
		'5'	- - = =
		'6'	-
		'7'	—
		'8'	Silent call
		'9'	Silent call
Call type	'4'	'0'	Reserved
		'1'	Reset (cancel) call
		'2'	Speech call
		'3'	Stand. call
		'4'	Group call
		'5'	Message clearance call
Number of transmissions	'5'	'0'	Reserved
		'1'	1 transmission
		'2'	2 transmissions
		etc.	etc.
Priority	'6'	'0'	Reserved
		'1'	Alarm (same as '47')
		'2'	High (same as '45')

		'3'	Normal (same as '43')
		'41'	HLM-priority's
		:	HLM-priority's
		'47'	HLM-priority's
Call Status	'7'	'0'	Reserved
		'1'	Busy
		'2'	In Queue
		'3'	Paged
		'4'	Absent
		'5'	Terminated
		'6'	Ack. from called party
		'7'	Speech channel open
		'71'	Speech channel open (paged)
		'72'	Speech channel open (absent)
		'8'	Fault indications
		'81'	Receiver unknown
		'82'	Call unknown
System Status	'8'	'0'	Reserved
		'1'	Transmitter failure
Message ID.	'9'	max 3 char	The identification of the message.
Mailbox number	'A'	'0'	No mailbox
		'1'	Mailbox 1
		:	
		'24'	Mailbox 24
Receiver type	'B'	'0'	Non existing receiver
		'10'	5D82xx Tone only
		'11'	5D82xx Top display
		'12'	5D82xx Front display
		'13'	5D82xx Dual display
		'14'	5D82xx Beep only speech
		'15'	5D82xx Top display speech
		'16'	5D82xx Front display speech
		'17'	5D82xx Top & front display speech

		'18'	5D82xx Tone only, speech and talk back
		'19'	5D82xx Top display, speech and talk back
		'20'	C.X. Beep only
		'21'	C.X. Alpha numeric display
		'22'	C.X. Alpha numeric display & mailbox
		'30'	C.L. Tone only
		'31'	C.L. Numeric display
		'32'	C.L. Tone only & speech
		'33'	C.L. Numeric display & speech
		'34'	C.L. Tone only, speech & talk back
		'35'	C.L. Numeric display, speech & talk back
		'36'	C.L. Alpha numeric display
		'37'	C.L. Alpha numeric display & mailbox
		'40'	WAP Beep only
		'41'	WAP Numeric display
		'42'	WAP Alpha numeric display
Protocol type	'C'	'ES4--D01'	
Top message	'D'	max 24 char	Top message to be displayed
Front message	'E'	max 80 char	Front message to be displayed
Overrule	'F'	'0'	No overrule
		'1'	Overrule beeper
		'2'	Overrule vibrator
		'3'	Overrule beeper and vibrator

Call address

If a call address with more than 8 char's is sent, only the 8 lowest significant char's will be used. Only character '0' to '9' is allowed.

Display message

The display message will be overruled as soon as a top and/or front message is sent. A specified display message will overrule the default settings for top and front message.

Call type “reset” (cancel call)

If the call has status “in queue” the call will never be transmitted.

If call status is “busy” at least on call will be sent, only repetitions will be stopped. Status information will be sent as if the call was completed normally.

Call type “standard call”

The call address is the address of a single receiver.

Call type “group call”

The call address is the logic address of a group of receivers.

Call type “Message clearance”

Only in combination with a 5D82xx HF receiver. For a C.L. receiver the call will be interpreted as a standard call. All areas of the receiver (FIFO, MEMO and MAILBOX) will be cleared.

Number of transmissions

A call will never be transmitted more than 9 times.
Status information will be returned after the first call has been transmitted.

Top message

If no top display is present the message will be shown on the front display.

Front message

If no front display is present the message will be shown on the top display.

A block consists of one or more of the above data beginning with a 'block type' header, with other data in any sequence separated by Record Separators.

In most systems, many of the data have prespecified default values, in these cases, only the information which is required to be different to the default value need to be transferred, e.g. for a standard priority call there is no need to send a 'standard priority' message.

Examples of transactions

Example 1

Standard call to receiver number '123' is to be transmitted 3 times at high priority.

External equipment (control station)		Paging System
POLL SEQUENCE Polls itself		
1 ENQ	<—>	
SELECT SEQUENCE Select Paging System		
2 ENQ	—>	
		POSITIVE REPLY TO SELECTING
	<—	*ACK*
BLOCK 1:	—>	
HEADER Type of block: Paging		
SOH 1 STX	—>	
RECORD 1 Call Address		
1 US 123	—>	
RECORD SEPARATOR		
RS	—>	
RECORD 2 Number of transmissions		
5 US 3	—>	

RECORD SEPARATOR

RS —>

RECORD 3
Priority

6 US 2 —>

TAIL

ETX BCC —>

ACKNOWLEDGE (reply)

<— *ACK*

TRANSACTIONS
COMPLETE

EOT <—>

Example 2

Paging System gives status information concerning a call made by the External Equipment. The call is identified by call number (123), beep coding (1) and display message (4567)

External equipment		**Paging System**
(control station)		
POLL SEQUENCE Polls the Paging System		
2 ENQ	<—>	
		SELECT SEQUENCE Selects the external equipment
	<—	*1 ENQ*

POSITIVE REPLY TO SELECTING

ACK	—>	
	<—	BLOCK 1:
		HEADER
		Type of block:
		Status information
	<—	*SOH 2 STX*
		RECORD 1
		Call address (123)
	<—	*1 US 123*
		RECORD SEPARATOR
	<—	*RS*
		RECORD 2
		Beep coding (1)
	<—	*3 US 1*
		RECORD SEPARATOR
	<—	*RS*
		RECORD 3
		Display message (4567)
	<—	*2 US 4567*
		RECORD SEPARATOR
	<—	*RS*
		RECORD 4
		Status (paged)

	<—	*7 US 3*
		TAIL
	<—	*ETX BCC*
ACKNOWLEDGE		
ACK	—>	
		TRANSACTIONS COMPLETE
	<—	*EOT*

Example 3

The External Equipment asks for status information concerning the progress of a paging call. In order to completely identify the paging, the External Equipment must transfer the same information as it did when the paging was initiated.

The transaction will be exactly the same as in example 1, except for the header. The header now specifies that the transaction is a status request.

HEADER

Type of block (transaction): Status request

SOH 3 STX	—>	

Appendix D: HLM 101 dialect

Identical with Ericsson dialect with following differences:

- Only paging status 3 “Paged” or 4 “Absent” is transferred to the external equipment.
- Message ID, Record 9. Max 3 digits. If no Message ID is included in the paging block, the SI will generate an ID and transfer to the paging status block.