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Hands-Free Profile 1.5

Application Guideline

Version 1.51

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Contents

1. Introduction

The Car-Communication-Application-Promotion group (CCAP) is concerned that Car-WG profiles may not provide sufficient definition to assure interoperability of Bluetooth devices supporting these profiles. CCAP believes that this application guide for the Bluetooth Hands-Free applications will improve the interoperability between handheld devices and the car, and help implementers understand the Hands-Free profiles for user convenience. This guideline provides:

- Recommended values of parameters
- Recommended sequence charts
- Basic philosophy
- Option usage
- New scenarios not included in the HFP

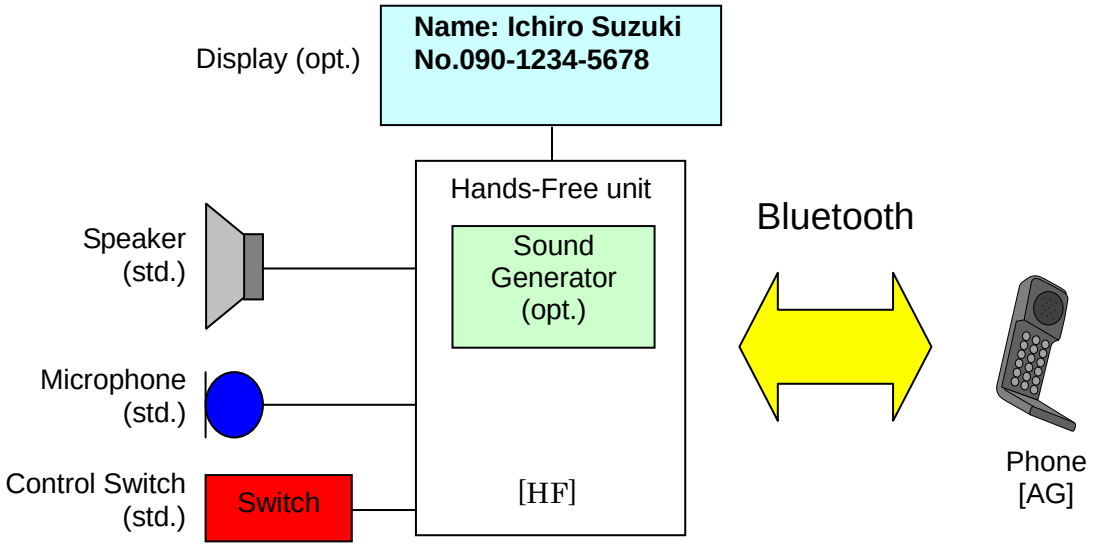
The intent is that this guideline be applied to the application layer above the Hands-Free Profile (HFP). The CCAP may also provide additional guidelines in the future such as the Phonebook Access Profile (PBAP), the Message Access Profile (MAP) etc. and future versions of these profiles.

CCAP released the Application Guideline Ver1.0 for the Hands-Free Profile Ver1.0 in June 2003. This guideline is based on the Hands-Free Profile Ver1.5. There indicates newly added and changed features from the Hands-Free Profile Ver1.0 and the CCAP Application Guideline Ver1.0.

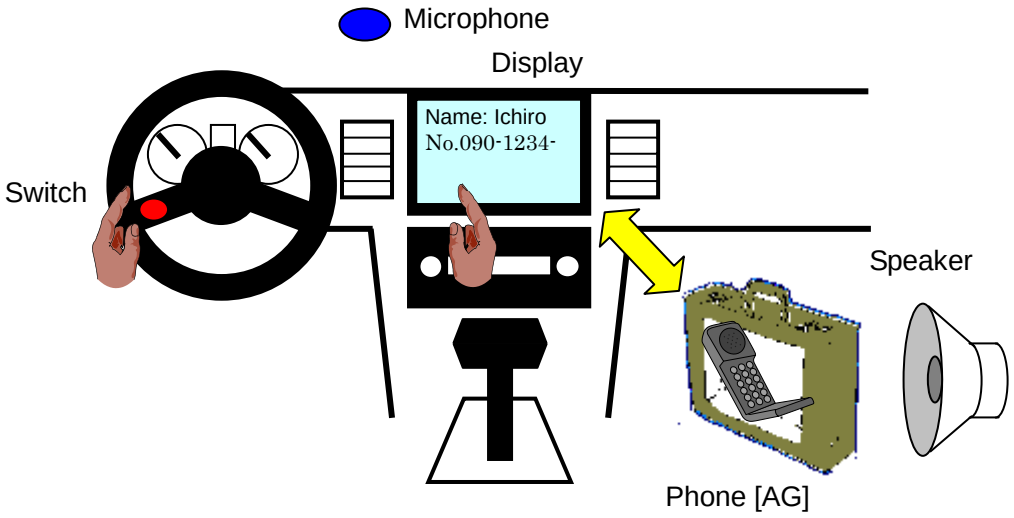
NOTE: CCAP does not intend to replace or enhance the Hands-Free Profile. CCAP intends this guideline can complement the Hands-Free Profile.

1.1 Target system

The figure below shows a system diagram that this guideline specifies. The minimum functionality of the Hands-Free unit (HF) is a speaker, microphone and control switch. The Display and Sound Generator are optional.



1.2 Example of the system



1.3 Added/Changed features from HFP 1.0 to HFP 1.5

Feature	Procedure	Ref.	Remarks
Phone Status Information	Transfer of Signal Strength Indication	4.5	Newly added
	Transfer of Roaming Status Indication	4.6	
	Transfer of Battery Level Indication	4.7	
	Query of Operator Selection	4.8	
	Extended Audio Gateway Error Codes	4.9	
	Transfer of Call Held Status	4.10	
Three Way Calling	Three way calling	4.22	Changed
Enhanced Call Status	Query Call List	4.31	Newly added
	Indication of Held Call Status	4.31	
Enhanced Call Control	Release Specified Call	4.32	
	Private Consult Mode	4.32	
Response and Hold	Query response and hold status	4.29	
	Put an incoming call on hold from HF	4.29	
	Put an incoming call on hold from AG	4.29	
	Accept a held incoming call from HF	4.29	
	Accept a held incoming call from AG	4.29	
	Reject a held incoming call from HF	4.29	
	Reject a held incoming call from AG	4.29	
	Held incoming call terminated by caller	4.29	
Subscriber Number Information	Subscriber Number Information	4.30	

1.3.1 Phone Status Information

HFP 1.0 supports “service”, “call” and “callsetup” indications. CCAP Application Guideline 1.0 adds “signal” and “battchg” indications in Appendix A. HFP 1.5 covers these indications and the further status indications.

1.3.2 Three Way Calling

HFP 1.0 specifies the basic Three Way Calling features. HFP 1.5 adds some parameters of control commands and result indications for matching the status between the AG and the HF.

1.3.3 Enhanced Call Status

These features inform the HF of each call status in the AG. The HF can detect either the AG has multiple calls or not, and what kind of calls the AG have and which status each call is through a query command and unsolicited result codes. These features are effective for matching the status between the AG and the HF in Three Way Calling.

1.3.4 Enhanced Call Control

These features are extension of Three Way Calling and shall be considered all together.

1.3.5 Response and Hold

CCAP Application Guideline 1.0 specifies the same features in Appendix A. HFP 1.5 covers these features and a query command for the AG status.

The Response and Hold features depend on the cellular network. All operators and phone manufacturers in Japan implement these features into their networks and products.

The Response and Hold features seem to be similar to the Three Way Calling. However these two features are absolutely different. The Response and Hold features are applicable only for an incoming call. The AG with a held incoming call does not accept an additional incoming call and an outgoing call. The cellular network denies any additional calls if the AG is in the Response and Hold state. On the other hand the Three Way Calling commands shall be applied when the AG has multiple calls. The Three Way Calling features shall not affect a held incoming call through the Response and Hold commands.

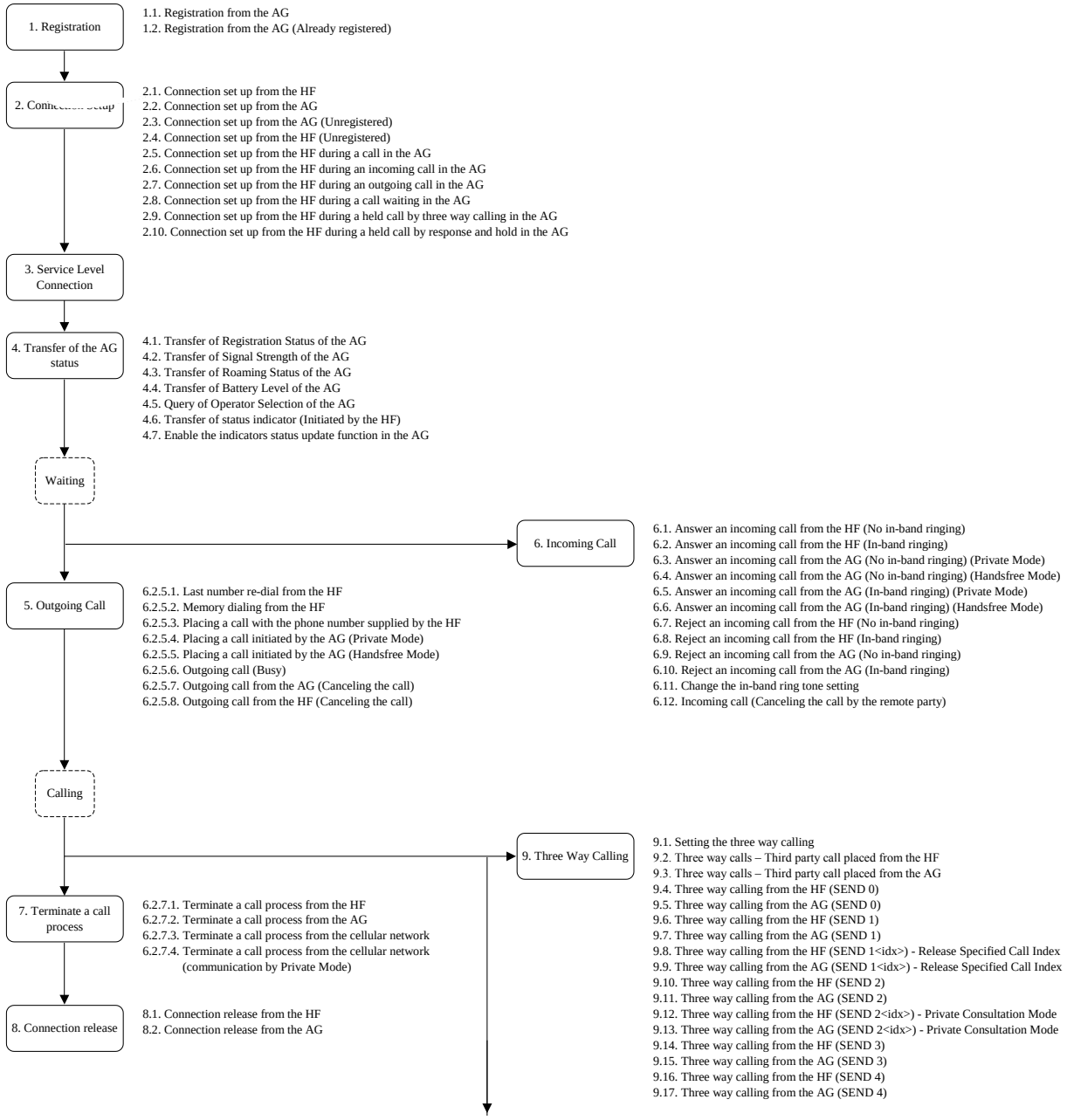
Therefore the Response and Hold state shall be independent with the held state through the Three Way Calling features either in the AG or the HF.

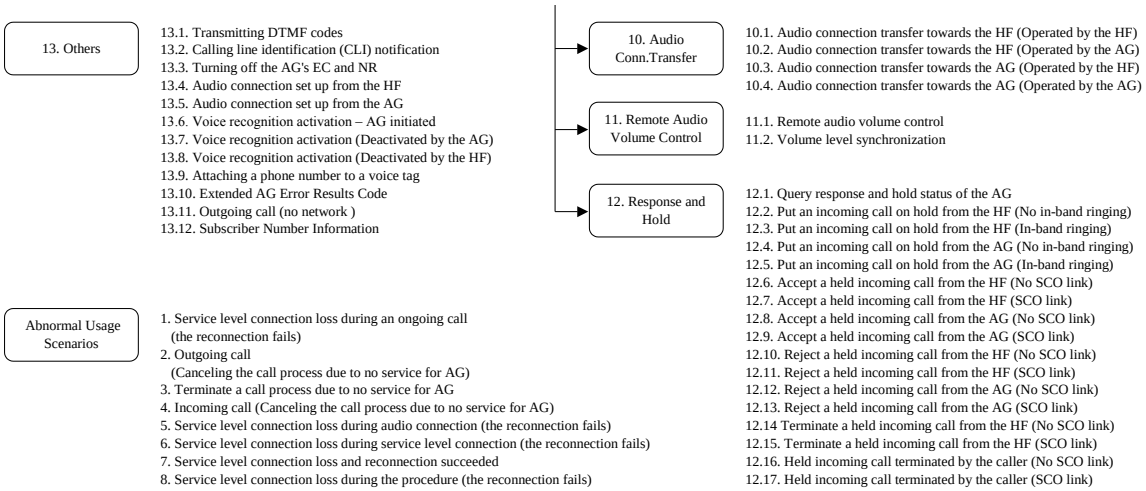
1.3.6 Subscriber Number Information

CCAP Application Guideline 1.0 specifies the same feature in Appendix A.

2. State transition assumed with Application Guideline

Following figure represents the state transition diagram that this guideline assumes when the AG (cellular phone) and the HF (hands-free Unit) operate with each other according to the Hands-Free Profile.





3. Usage scenarios

This section presents usage scenarios that illustrate specific behaviors of the AG and HF when operating in compliance with the HFP.

The objectives in showing these usage scenarios are:

- To clarify the features of the profile so as to improve the HFP for readers understanding
- To prevent readers from misunderstanding the sequence charts and parameters and thus ensure interoperability

The first table shows the proposed normal usage scenarios and the second table the abnormal scenarios. The scenarios that are not defined in HFP 1.5 are colored yellow.

Normal / Additional Usage Scenarios

E : Exist M: Mandatory
X : Not Exist O: Option
?: Both case are assumed

Scenario Category	Scenario Name	Initial Status			Support in HF	Support in AG	Scenario Description	HFP Sect.
		SLC	SCO	Call				
6.2.1 Registration[*1]	6.2.1.1 Registration from the AG	?	X	X	M	M	The AG discovers the HF, and the AG and the HF register the other side.	-
	6.2.1.2 Registration from the AG (Already registered)	X	X	X	M	M	The AG tries to register the HF, but the AG has already been registered in the HF.	-
6.2.2 Connection Setup	6.2.2.1 Connection set up from the HF	X	X	X	M	M	The HF sets up the connection to the registered AG.	4.2
	6.2.2.2 Connection set up from the AG	X	X	X	M	M	The AG sets up the connection to the registered HF.	4.2
	6.2.2.3 Connection set up from the AG (Unregistered)	X	X	X	M	M	The AG tries to set up the connection to the HF, but the AG has not been registered in the HF.	4.2
	6.2.2.4 Connection set up from the HF (Unregistered)	X	X	X	M	M	The HF tries to set up the connection to the AG, but the HF has not been registered in the AG.	4.2
	6.2.2.5 Connection set up from the HF during a call in the AG	X	X	E	M	M	The HF tries to set up the connection to the AG which an ongoing call exists.	4.2
	6.2.2.6 Connection set up from the HF during an incoming call in the AG	X	X	X	M	M	The HF tries to set up the connection to the AG alerting an incoming call.	4.2
	6.2.2.7 Connection set up from the HF during an outgoing call in the AG	X	X	X	M	M	The HF tries to set up the connection to the AG processing an outgoing call.	4.2
	6.2.2.8 Connection set up from the HF during a call waiting in the AG	X	X	E	M	M	The HF tries to set up the connection to the AG which an ongoing call exists and another call is incoming.	4.2
	6.2.2.9 Connection set up from the HF during a held call by three way calling in the AG	X	X	E	M	M	The HF tries to set up the connection to the AG which a held call created by three way calling exists.	4.2
	6.2.2.10 Connection set up from the HF during a held call by response and hold in the AG	X	X	E	M	M	The HF tries to set up the connection to the AG which a held call created by response and hold exists.	4.2
	6.2.3 Service level connection setup	X	X	X	M	M	The HF or the AG sets up the Service Level Connection.	4.2
6.2.4 Transfer of the AG status	6.2.4.1 Transfer of Registration Status of the AG	E	?	?	M	M	The AG transfers a service indicator whenever the AG's registration status changes.	4.4
	6.2.4.2 Transfer of Signal Strength of the AG	E	?	?	O	M	The AG transfers a signal indicator whenever the AG's signal strength changes.	4.5
	6.2.4.3 Transfer of Roaming Status of the AG	E	?	?	O	M	The AG transfers a roam indicator whenever the AG's roaming status changes.	4.6
	6.2.4.4 Transfer of Battery Level of the AG	E	?	?	O	M	The AG transfers a battchg indicator whenever the AG's battery level changes.	4.7
	6.2.4.5 Query of Operator Selection of the AG	E	?	?	O	M	The HF queries the AG about the currently selected operator.	4.8
	6.2.4.6 Transfer of status indicator (Initiated by the HF)	E	?	?	M	M	The HF gets the status indicator of the AG.	4.2.1
	6.2.4.7 Enable the indicators status update function in the AG	E	?	?	M	M	The HF requests the AG notify the status indicator.	4.2.1
6.2.5 Outgoing call	6.2.5.1 Last number re-dial from the HF	E	?	X	O	M	Last number re-dialing is initiated by the HF. The AG starts an outgoing call, using the last dialed number.	4.20
	6.2.5.2 Memory dialing from the HF	E	?	X	O	M	Memory dialing is initiated by the HF. The AG starts an outgoing call, using the phone number stored in the AG.	4.19
	6.2.5.3 Placing a call with the phone number supplied by the HF	E	?	X	O	M	Placing a call with the phone number is initiated by the HF. The AG starts an outgoing call, using the phone number.	4.18
	6.2.5.4 Placing a call initiated by the AG (Private Mode)	E	?	X	O	M	The AG initiates an outgoing call.	-
	6.2.5.5 Placing a call initiated by the AG (Handsfree Mode)	E	?	X	O	O	The AG initiates an outgoing call and the call is transferred to the HF.	-
	6.2.5.6 Outgoing call (Busy)	E	?	X	O	M	An outgoing call is initiated by the HF ,but the network is in the state of busy.	-
	6.2.5.7 Outgoing call from the AG (Canceling the call)	E	?	X	O	M	An outgoing call is initiated by the AG ,but the outgoing call is cancelled.	-
	6.2.5.8 Outgoing call from the HF (Canceling the call)	E	?	X	O	M	An outgoing call is initiated by the HF ,but the outgoing call is cancelled.	-
6.2.6 Incoming call	6.2.6.1 Answer an incoming call from the HF (No in-band ringing)	E	?	X	M	M	The HF answers an incoming call with no in-band ringing.	4.13.2
	6.2.6.2 Answer an incoming call from the HF (In-band ringing)	E	?	X	M	O	The HF answers an incoming call with in-band ringing.	4.13.1
	6.2.6.3 Answer an incoming call from the AG (No in-band ringing) (Private Mode)	E	?	X	M	M	The AG answers an incoming call with no in-band ringing.	4.13.3
	6.2.6.4 Answer an incoming call from the AG (No in-band ringing) (Handsfree Mode)	E	?	X	M	O	The AG answers an incoming call with no in-band ringing and the call is transferred to the HF.	4.13.3
	6.2.6.5 Answer an incoming call from the AG (In-band ringing) (Private Mode)	E	?	X	M	O	The AG answers an incoming call with in-band ringing.	4.13.3
	6.2.6.6 Answer an incoming call from the AG (In-band ringing) (Handsfree Mode)	E	?	X	M	O	The AG answers an incoming call with in-band ringing and the call is transferred to the HF.	4.13.3
	6.2.6.7 Reject an incoming call from the HF (No in-band ringing)	E	?	X	M	O	The HF rejects an incoming call with no in-band ringing.	4.14.1
	6.2.6.8 Reject an incoming call from the HF (In-band ringing)	E	?	X	M	O	The HF rejects an incoming call with in-band ringing.	4.14.1
	6.2.6.9 Reject an incoming call from the AG (No in-band ringing)	E	?	X	M	O	The AG rejects an incoming call with no in-band ringing.	4.14.2
	6.2.6.10 Reject an incoming call from the AG (In-band ringing)	E	?	X	M	O	The AG rejects an incoming call with in-band ringing.	4.14.2
	6.2.6.11 Change the in-band ring tone setting	E	?	X	M	O	The AG informs the HF whether the AG sends in-band ring tone or not.	4.13.4
	6.2.6.12 Incoming call (Canceling the call by the remote party)	E	?	X	M	M	An incoming call comes the HF, but the incoming call is cancelled by the remote party.	4.13

Scenario Category	Scenario Name	Initial Status			Support in HF	Support in AG	Scenario Description	HFP Sect.
		SLC	SCO	Call				
6.2.7 Terminate a call process	6.2.7.1 Terminate a call process from the HF	E	?	E	M	M	A call process is terminated from the HF.	4.15.1
	6.2.7.2 Terminate a call process from the AG	E	?	E	M	M	A call process is terminated from the AG.	4.15.2
	6.2.7.3 Terminate a call process from the cellular network	E	E	E	M	M	A call process is terminated from the cellular network.	4.15.2
	6.2.7.4 Terminate a call process from the cellular network (communication by Private Mode)	E	X	E	M	M		4.15.2
6.2.8 Connection release	6.2.8.1 Connection release from the HF	E	?	?	M	M	The Service Level Connection is released by the HF.	4.3
	6.2.8.2 Connection release from the AG	E	?	?	M	M	The Service Level Connection is released by the AG.	4.3
6.2.9 Three way calling	6.2.9.1 Setting the three way calling	E	?	?	O	O	Three way calling is set from the HF.	4.21
	6.2.9.2 Three way calls – Third party call placed from the HF	E	E	E	O	O	The current call is put on hold and the HF is connected to the directed terminal.	4.22
	6.2.9.3 Three way calls – Third party call placed from the AG	E	E	E	O	O		-
	6.2.9.4 Three way calling from the HF (SEND 0)	E	E	E	O	O	The held call is released.	4.22
	6.2.9.5 Three way calling from the AG (SEND 0)	E	E	E	O	O		-
	6.2.9.6 Three way calling from the HF (SEND 1)	E	E	E	O	O	The active call is released and the other call is accepted.	4.22
	6.2.9.7 Three way calling from the AG (SEND 1)	E	E	E	O	O		-
	6.2.9.8 Three way calling from the HF (SEND 1<idx>) - Release Specified Call Index	E	E	E	O	O	The HF releases a specific call in the AG and the AG reports the change in call status.	4.32.1
	6.2.9.9 Three way calling from the AG (SEND 1<idx>) - Release Specified Call Index	E	E	E	O	O	The AG releases a specific call in the AG and reports the change in call status.	-
	6.2.9.10 Three way calling from the HF (SEND 2)	E	E	E	O	O	The active call is placed on hold and the other call is accepted.	4.22
	6.2.9.11 Three way calling from the AG (SEND 2)	E	E	E	O	O		-
	6.2.9.12 Three way calling from the HF (SEND 2<idx>) - Private Consultation Mode	E	E	E	O	O	The HF places all parties of a multiparty call on hold with the exception of the specified call and the AG reports the change in status of the held parties.	4.32.2
	6.2.9.13 Three way calling from the AG (SEND 2<idx>) - Private Consultation Mode	E	E	E	O	O	The AG places all parties of a multiparty call on hold with the exception of the specified call and reports the change in status of the held parties.	-
	6.2.9.14 Three way calling from the HF (SEND 3)	E	E	E	O	O	The held call is added the conversation.	4.22
	6.2.9.15 Three way calling from the AG (SEND 3)	E	E	E	O	O		-
	6.2.9.16 Three way calling from the HF (SEND 4)	E	E	E	O	O	Two calls are connected an the subscriber is disconnected from the both calls.	4.22
	6.2.9.17 Three way calling from the AG (SEND 4)	E	E	E	O	O		-
6.2.10 Audio connection transfer	6.2.10.1 Audio connection transfer towards the HF (Operated by the HF)	E	?	E	M	M	The audio connection is transferred from the AG to the HF, operated by the HF.	4.16
	6.2.10.2 Audio connection transfer towards the HF (Operated by the AG)	E	?	E	M	M	The audio connection is transferred from the AG to the HF, operated by the AG.	4.16
	6.2.10.3 Audio connection transfer towards the AG (Operated by the HF)	E	E	E	M	M	The audio connection is transferred from the HF to the AG, operated by the HF.	4.17
	6.2.10.4 Audio connection transfer towards the AG (Operated by the AG)	E	E	E	M	M	The audio connection is transferred from the HF to the AG, operated by the AG.	4.17
6.2.11 Remote audio volume control	6.2.11.1 Remote audio volume control	E	?	?	O	M	The HF's volume is controlled by the AG.	4.28.1
	6.2.11.2 Volume level synchronization	E	?	?	O	M	The HF informs the AG of the volume level.	4.28.2
6.2.12 Response and Hold	6.2.12.1 Query response and hold status of the AG	E	?	?	O	O	The HF queries the AG about the current Response and Hold state of the AG.	4.29.1
	6.2.12.2 Put an incoming call on hold from the HF (No in-band ringing)	E	?	X	O	O	An incoming call is put on hold via the HF operation with no in-band ringing and the AG sends the response to the HF.	4.29.2
	6.2.12.3 Put an incoming call on hold from the HF (In-band ringing)	E	?	X	O	O	An incoming call is put on hold via the HF operation with in-band ringing and the AG sends the response to the HF.	4.29.2
	6.2.12.4 Put an incoming call on hold from the AG (No in-band ringing)	E	?	X	O	O	An incoming call is put on hold via the AG operation with no in-band ringing and the AG sends the response to the HF.	4.29.3
	6.2.12.5 Put an incoming call on hold from the AG (In-band ringing)	E	?	X	O	O	An incoming call is put on hold via the AG operation with in-band ringing and the AG sends the response to the HF.	4.29.3
	6.2.12.6 Accept a held incoming call from the HF (No SCO link)	E	?	E	O	O	A held incoming call is accepted via the HF operation with no SCO link and the AG sends the response to the HF.	4.29.4
	6.2.12.7 Accept a held incoming call from the HF (SCO link)	E	?	E	O	O	A held incoming call is accepted via the HF operation with SCO link and the AG sends the response to the HF.	4.29.4
	6.2.12.8 Accept a held incoming call from the AG (No SCO link)	E	?	E	O	O	A held incoming call is accepted via the AG operation with no SCO link and the AG sends the response to the HF.	4.29.5
	6.2.12.9 Accept a held incoming call from the AG (SCO link)	E	?	E	O	O	A held incoming call is accepted via the AG operation with SCO link and the AG sends the response to the HF.	4.29.5
	6.2.12.10 Reject a held incoming call from the HF (No SCO link)	E	?	E	O	O	A held incoming call is rejected via the HF operation with no SCO link and the AG sends the response to the HF.	4.29.6
	6.2.12.11 Reject a held incoming call from the HF (SCO link)	E	?	E	O	O	A held incoming call is rejected via the HF operation with SCO link and the AG sends the response to the HF.	4.29.6
	6.2.12.12 Reject a held incoming call from the AG (No SCO link)	E	?	E	O	O	A held incoming call is rejected via the AG operation with no SCO link and the AG sends the response to the HF.	4.29.7
	6.2.12.13 Reject a held incoming call from the AG (SCO link)	E	?	E	O	O	A held incoming call is rejected via the AG operation with SCO link and the AG sends the response to the HF.	4.29.7
	6.2.12.14 Terminate a held incoming call from the HF (No SCO link)	E	?	E	O	O	A held incoming call is terminated via the HF operation with no SCO link.	4.29.6
	6.2.12.15 Terminate a held incoming call from the HF (SCO link)	E	?	E	O	O	A held incoming call is terminated via the HF operation with SCO link.	4.29.6
	6.2.12.16 Held incoming call terminated by the caller (No SCO link)	E	?	E	O	O	A held incoming call is terminated by the remote party with no SCO link and the AG sends the response to the HF.	4.29.8
	6.2.12.17 Held incoming call terminated by the caller (SCO link)	E	?	E	O	O	A held incoming call is terminated by the remote party with SCO link and the AG sends the response to the HF.	4.29.8

Scenario Category	Scenario Name	Initial Status			Support in HF	Support in AG	Scenario Description	HFP Sect.
		SLC	SCO	Call				
6.2.13 Others	6.2.13.1 Transmitting DTMF codes	E	E	E	O	M	During an ongoing call, the HF transmits DTMF codes to the cellular network via the AG.	4.27
	6.2.13.2 Calling line identification (CLI) notification	E	?	?	O	M	The HF enables the AG to notify the calling line identification.	4.23
	6.2.13.3 Turning off the AG's EC and NR	E	?	?	O	O	The HF turns off the AG's EC and NR.	4.24
	6.2.13.4 Audio connection set up from the HF	E	X	X	M	M	The audio connection is set up from the HF. (Not depending on a call)	4.11
	6.2.13.5 Audio connection set up from the AG	E	X	X	M	M	The audio connection is set up from the AG. (Not depending on a call)	4.11
	6.2.13.6 Voice recognition activation – AG initiated	E	?	X	O	O	The AG activates the voice recognition function in the AG.	4.25.2
	6.2.13.7 Voice recognition activation (Deactivated by the AG)	E	?	X	O	O	The HF activates the voice recognition function in the AG, and its function is deactivated by the AG.	4.25.3
	6.2.13.8 Voice recognition activation (Deactivated by the HF)	E	?	X	O	O	The HF activates the voice recognition function in the AG, and its function is deactivated by the HF.	4.25.3
	6.2.13.9 Attaching a phone number to a voice tag	E	?	X	O	O	The HF requests a phone number from the AG and attaches the phone number to a voice tag.	4.26
	6.2.13.10 Extended AG Error Results Code	E	?	?	O	M	The HF activates/deactivates the Extended AG Error result code notification.	4.9
	6.2.13.11 Outgoing call (no network)	E	?	X	O	M	A sample of Extended AG Error result code notification.	-
	6.2.13.12 Subscriber Number Information	E	?	?	O	M	The HF queries the AG about the subscriber number information.	4.30

Abnormal Usage Scenarios

Scenario Category	Scenario Name	Initial Status			Support in HF	Support in AG	Scenario Description	HFP Sect.
		SLC	SCO	Call				
6.3 Abnormal	6.3.1 Service Level Connection loss during an ongoing call (reconnection fails)	E	E	E	O	O	Service Level Connection loss during an ongoing call exists and reconnection fails.	-
	6.3.2 Outgoing call (canceling the call process due to no service for the AG)	E	?	X	O	O	An ongoing call is cancelled due to no service for the AG.	-
	6.3.3 Terminate a call process due to no service for the AG	E	E	E	O	O	A call process is terminated due to no service for the AG.	-
	6.3.4 Incoming call (canceling the call process due to no service for the AG)	E	?	X	O	O	An incoming call is cancelled due to no service for the AG.	-
	6.3.5 Service Level Connection loss during audio connection (reconnection fails)	E	E	X	O	O	Service Level Connection loss during audio connection exists and reconnection fails.	-
	6.3.6 Service Level Connection loss during Service Level Connection (reconnection fails)	E	X	X	O	O	Service Level Connection loss during Service Level Connection exists and reconnection fails.	-
	6.3.7 Service Level Connection loss and reconnection succeeded	E	X	X	O	O	Service Level Connection loss during Service Level Connection exists and reconnection succeeds.	-
	6.3.8 Service Level Connection loss during the procedure (reconnection fails)	E	?	?	O	O	Service Level Connection loss during the procedure occurs and reconnection fails.	-

Note: Usage Scenarios colored yellow are not defined in the HFP.

*[1] Registration from the HF is not depicted because inquiry from the HF is not defined in the HFP.

4. Basic philosophy

This section states Bluetooth connection philosophy that provides a basis for the sequence charts presented in section 6.

The objectives of this section are to:

- Help readers understand the sequence charts
- Provide guidance for sequences that are not contained in the HFP Ver1.5.

The tables in this section, have a column headed “HFP” in which the corresponding section in the Hands-Free Profile document is indicated. A dash (“-”) in the “HFP” column means that there is no corresponding description in the HFP.

4.1 Recommendations for GAP

Recommendations for GAP

Item	HFP	Recommendation	Reason
Inquiry Scan (registration mode)	-	The AG/HF executes inquiry scan in the registration mode. It is recommended the HF would execute inquiry scan only in the registration mode, which is usually entered by explicit user input.	From a security point of view, it is not desirable that other devices can easily obtain information to be identified.
No ACL status (normal mode)	-	When there is not an ACL, it is recommended that both the AG and the HF execute page scan.	Both the AG and the HF may establish an ACL if necessary.
ACL status (normal mode)	-	When an ACL exists, it is recommended that the AG take a low power consumption mode (i.e. park mode, sniff mode, or hold mode). The details are described in “Recommendations for No-audio connection status”.	It is desirable that the HF support all of park mode, sniff mode or hold mode so that the AG use power conserving mode(s) preserving its battery life.

(Note)
Both the HF and the AG can be enabled to use a registration mode, in addition to supporting normal mode. Inquiry scan by the HF can be performed in the registration mode only.

(Example)
After being powered on, a HF device should periodically alternately perform paging and page scan so that the HF can establish an ACL with the AG. In this case, the AG is preferable to be operated in page scan mode.
If an ACL exists but the HF has not taken any action for certain duration, the AG may release the established ACL to enter power conserving mode(s). In this case, it is not recommended that the HF execute further paging to the AG.

4.2 Recommendation for SDP

Recommendation for SDP

Item	HFP	Recommendation	Reason
SDP	-	It is recommended that both the AG and the HF get the Service Record on the other device, every time when each device tries to establish an ACL.	Service Record on the AG and the HF may be changed.

4.3 Recommendations for "No-audio" connection status

Recommendations for "No-audio" connection status (1/2)

Item	HFP	Recommendation	Reason
Normal Status	-	When any audio connection does not exist, it is recommended that the AG and the HF have an RFCOMM connection set up and the AG be in power conserving mode.	In order for the HF to receive an incoming call, it is desirable that the RFCOMM connection be kept. Power conserving mode(s) is desirable to reduce power consumption for the AG.
Master-slave role switch	-	The Bluetooth role (master or slave) is implementation dependent. It is recommended that the AG/HF issue a role switch command to/from master or slave and the receiver of the command accept the request. Even if the receiver cannot accept the request, the SLC should not be disconnected.	In order to ensure the behavior when the remote device requests to be master in multi-connection. Some devices tend to be master.
Park mode	-	It is recommended that the AG initiate the transition to park mode.	To reduce power consumption for the AG.
Sniff mode	-	It is recommended that both the AG and the HF support sniff mode.	To ensure power consumption reduction.
		It is recommended that the AG initiate the transition to sniff mode.	
Hold mode	-	It is recommended that the AG initiate hold mode.	

(Note)

It is recommended that the HF support all power consumption modes, the park mode, sniff mode and hold mode, and also the AG be enable to support one of those three modes at least.

Recommendations for “No-audio” connection status (2/2)

Item	HFP	Recommendation	Reason
ACL reconnection for an undesired release in park mode or sniff mode	-	If an AG/HF operating power conserving mode has an ACL, including RFCOMM connection and link loss causes the ACL to be dropped, it is recommended that the HF initiate re-establishing the ACL. Detecting of the link loss and release of the ACL is implementation dependent. An example would be the monitoring of HCI Disconnection Complete event parameters, namely 0x08 (Connection timeout). When link loss causes the release of the established ACL, it is recommended that the AG execute page scan and the HF execute both page scan and paging alternatively. If the ACL is established again, it is recommended that the HF unit do not believe previous AG status is valid. It is recommended that the HF initiate the Service Level Connection establishment procedure (AT+CIND=? etc.).	To ensure reconnection after the undesired ACL release in either park mode or sniff mode
Case of “no support of power conserving mode”	-	If either the AG or the HF does not support any power conserving modes, the AG may release the established ACL to reduce power consumption. If the HF has already established an ACL but there have not been any calls or data traffic for certain duration, the AG may release the ACL. In this case, it is recommended the HF execute page scan after detecting the ACL release and the AG should execute page scan. Furthermore, it is recommended that the HF do not execute paging after detecting the ACL release by the AG unless a call from the HF is initiated.	To cope with the case that both the AG and the HF do not support any power conserving mode(s).

4.4 Recommendation for Service Level Connection

Recommendation for Service Level Connection

Item	HFP	Recommendation	Reason
Service Level reconnection for an undesired release	4.2.3	When link loss happens to release the established Service Level Connection without a request from the AG or the HF, the HF reinitiates the Service Level Connection. [Defined in HFP 4.2.3] If the Service Level Connection is established again, the HF unit shall not believe that the Service Level Connection state from the previous connection is valid. [Defined in HFP 4.2.3] It is recommended that the HF initiate the Service Level Connection establishment procedure (AT+CIND=? etc.) [Undefined in HFP] It is implementation dependent that the method for detecting the Service Level Connection release led by link loss. An example method is through monitoring the status in one of HCI Disconnection Complete event parameters, namely 0x08 (Connection timeout). [Undefined in HFP] When link loss happens to release the Service Level Connection, it is recommended that the AG execute page scan and the HF execute both page scan and paging, respectively. [Undefined in HFP]	To ensure reconnection following undesired Service Level Connection release

4.5 Recommendations for normal / additional sequence

Recommendations for normal / additional sequence (1/2)

Item	HFP	Recommendation	Reason
Timing of audio connection set up in outgoing call	-	When the AG sets up an outgoing call based on a request from the HF and there is not an audio connection, it is recommended that the AG establish an audio connection before setting up the outgoing call to the cellular network.	The HF can confirm outgoing call status by detecting tones (ring back tone, busy tone, and so forth).
Timing of audio connection release in terminating a call and rejecting an incoming call with in-band ringing	-	When the user initiates the termination of a call or rejects an incoming call with in-band ringing at both the AG and the HF, it is recommended that the AG release the established audio connection before either terminating an ongoing call or rejecting an incoming call.	To avoid any uncomfortable noise in the HF.
AG timing of audio connection set up in incoming call (no in-band ringing, audio absent)	-	When there is an incoming call with no in-band ringing and there is not an audio connection and the HF requests that the call be answered, it is recommended that the AG establish an audio connection before answering the incoming call to the cellular network.	To avoid missing the beginning of the call.
HF timing of audio switching in incoming call (no in-band ringing, audio present)	-	When there is an incoming call with no in-band ringing and there is an audio connection, the HF outputs the local ring tone. To answer the incoming call from the HF, it is recommended that the HF switch its internal audio path from the sound generator to the Bluetooth audio when the HF receives +CIEV (call=1) from the AG.	To define the timing to switch the audio path in the HF.
HF timing of audio switching in incoming call (no in-band ringing, audio absent)	-	When there is an incoming call with no in-band ringing and there is not an audio connection, either the HF or the AG outputs the local ring tone. To answer the incoming call from the HF, it is recommended that the HF switch its internal audio path from the sound generator to the Bluetooth audio when the audio connection is established.	

Recommendations for normal / additional sequence (2/2)

Item	HFP	Recommendation	Reason
Stopping the local ring tone when canceling /rejecting an incoming call (no in-band ringing).	-	When either the AG or the HF terminates an incoming call with no in-band ringing via canceling /rejecting the incoming call, the local ring tone should be stopped. It is recommended that the local ring tone be stopped when the HF receives +CIEV (callsetup=0).	To define the timing to stop the local ring tone in the HF.
Stopping the local ring tone when answering an incoming call from the AG	-	When the AG answers an incoming call with no in-band ringing, the local ring tone should be stopped. It is recommended that the local ring tone be stopped when the HF receives +CIEV (callsetup=0).	
Behavior of the AG when the HF not supporting 3-way calling	-	When the HF does not support 3-way calling, it is recommended that the AG control the HF with regular commands which could be understood by the HF	To avoid state mismatch between the HF and the AG.
Handling of the audio connection when answering a call from the AG or the HF	-	When the AG answers an incoming call or a held incoming call, it is recommended that the audio connection be terminated. When the HF answers an incoming call or a held incoming call, it is recommended that the audio connection be established.	To define how to handle the audio connection when either the AG or the HF answers a call.
Handling of the audio connection when an incoming call is put on hold from the AG or the HF	4.29.3	When the AG puts an incoming call on hold, it is recommended that the audio connection state be not changed. When the HF puts an incoming call on hold, it is recommended that the audio connection be established.	To define how to handle the audio connection when either the AG or the HF puts an incoming call on hold.
Handling of the audio connection when a call is not active	-	When a call is not active, it is recommended that the audio connection be terminated except the case of voice recognition activation, AT+BVRA=1 or +BVRA:1.	To define how to handle the audio connection when a call is not active.

4.6 Recommendations for abnormal sequences

Recommendations for abnormal sequences

Item	HFP	Recommendation	Reason
Service Level Connection link loss during a call	4.2.3	When the Service Level Connection link loss occurs during a call, it is recommended that the HF try to establish the new Service Level Connection [Defined in HFP 4.2.3]. (see Note below)	-
Service Level Connection link loss during an audio connection	-	When the Service Level Connection link loss occurs during an audio connection and no call exists, it is recommended that the HF try to establish the new Service Level Connection and the AG wait for the service level reconnection to complete for the defined time (Twaitslc).	To re-establish of the audio connection following the Service Level Connection link loss
Service Level Connection link loss during Service Level Connection	-	If the Service Level Connection link loss occurs while no call is active, it is recommended that the HF initiate the establishment of the new Service Level Connection. If the Service Level Connection is established again, the HF unit shall not believe that the Service Level Connection state from previous connection is valid. It is recommended that the HF initiate the Service Level Connection establishment procedure (AT+CIND=? etc.).	To re-establish the Service Level Connection in the case of link loss

(Note)
When Service Level Connection link loss is detected, the AG may take one of the actions below:
- Terminate the ongoing call immediately.
- Keep the ongoing call active for certain duration. (It is implementation dependant.)
  (For example, some users may set specific time parameters on the AG, which define the duration until the ongoing call is terminated.)
- Maintain the ongoing call.

When the new Service Level Connection is established and there is an ongoing call, the AG is responsible for choosing whether the call is transferred from the AG to the HF or not. This is left as an implementation choice for the AG design. (It should be noted that the existing ongoing call is not always the same as the call before link loss). Following implementations are examples.
(1) The ongoing call may be transferred to the HF by user judgment and operation.
(2) If the existing ongoing call is same as the one before link loss by AG judgment, the audio connection may be transferred to the HF autonomously.
  - User may choose whether the audio connection is transferred to the HF autonomously or not.

4.7 Recommendations for Response and Hold

Recommendations for Response and Hold

Item	HFP	Recommendation	Reason
Holding tone	4.29.2	If the SDP record of the AG or +BSIR result code shows that in-band ring tone capability is off, it is recommended the HF generate holding tone.	If the AG cannot transmit its generating tone over audio connection, the HF generates holding tone.
Holding tone switch timing (no in-band ringing)	4.29.2	When there is an incoming call with no in-band ring and the HF puts an incoming call on hold, the HF switches generating tone from ring tone to holding tone. It is recommended the HF switch tone when a proper result code is transmitted to the HF.	To define the timing to switch audio path in the HF.
HF timing of audio switching in accepting a held call (no in-band ringing, audio present)	4.29.4	When there is audio connection and a HF held call with no in-band ringing, the HF outputs local holding tone. About accepting the held call from the HF, it is recommended the HF switch the audio path from local holding tone to audio on audio connection when a proper result code is transmitted to the HF.	To define the timing to switch audio path in the HF.
HF timing of audio switching in incoming call (no in-band ringing, audio absent)	4.29.4	When there is no audio connection and an incoming call with no in-band ringing, the HF outputs local holding tone. About accepting the held call from the HF, it is recommended the HF switch the audio path from local holding tone to audio on audio connection when audio connection is setup.	To define the timing to switch audio path in the HF.
HF timing of audio switching in rejecting or terminating a held call (no in-band ringing, audio present)	4.29.6	When there is audio connection and a HF held call with no in-band ringing, the HF outputs local holding tone. About rejecting the held call from the HF or terminating the held call from the caller, it is recommended the HF switch audio path from local holding tone to audio on audio connection when a proper result code is transmitted to the HF.	To define the timing to switch audio path in the HF.
HF timing to stop local holding tone (no in-band ringing, audio absent)	4.29.6	When there is no audio connection and a HF held call with no in-band ringing, the HF outputs local holding tone. About rejecting the held call from the HF or terminating the held call from the caller, it is recommended the HF stop local holding tone when a proper result code is transmitted from to the HF.	To define the timing to switch audio path in the HF.

5. Parameters

This section describes the CCAP recommendations for parameters and ranges.
The objective is to realize better connectivity between the AG and the HF.
The parameters indicated in this section are shown according to the scenario categories.

5.1 Registration

HF registration parameters

Item	Parameter	Value, range	Reason	Spec
Inquiry scan	Inquiry_scan_interval	Less than or equal to 1.28 sec	For fast connectivity	HCI 7.3.21
	Inquiry_scan_window	More than or equal to 11.25 msec		
Interlaced inquiry scan	Inquiry_scan_interval	Less than or equal to 2.56 sec		
	Inquiry_scan_window	More than or equal to 11.25 msec		
Page scan	Page_scan_interval	Less than or equal to 1.28 sec		HCI 7.3.19
	Page_scan_window	More than or equal to 11.25 msec		
Interlaced Page scan	Inquiry_scan_interval	Less than or equal to 1.28 sec		
	Inquiry_scan_window	More than or equal to 11.25 msec		
Device name	Name_length	Less than or equal to 20 characters	The AG can show the device name of the HF.	GAP 3.2.2
	Device name	US-ASCII printable code + blank		
Link policy setting	Master slave switch	Support	The AG can freely become a master or a slave and realize low power consumption.	HCI 7.2.9
	SCO packets	HV1/HV2/HV3 [*1]	HV1 is selected for better audio quality.	
	eSCO packets	EV3/2-EV3		
Link supervision timeout	Link_supervision_timeout	Less than or equal to 5.12 sec	To detect a link loss in the defined time.	HCI 7.3.43
Security	Security mode	Security mode 2/3 (It is recommended that the HF accept any security mode 1,2,3 the AG uses)	To ensure security	GAP 5.2
	Passcode length	Greater than or equal to 4	To ensure minimum security	GAP 3.2.3
	Passcode character code	0x30-0x39	The user can easily enter the Passcode.	

[*1] It is also recommended to support HV2 and HV3 considering multiple profiles. If the HF requires HV1 but the AG replies HV3, it is recommended the HF and the AG adopt HV3.

AG registration parameters

Item	Parameter	Value, range	Reason	Spec
Page scan	Page_scan_Interval	-	-	HCI 7.3.19
	Page_scan_Window	-		
Interlaced Page scan	Inquiry_scan_interval	-		
	Inquiry_scan_window	-		
Device name	Name_length	Less than or equal to 12	The HF can show its device name.	GAP 3.2.2
	Device name	US-ASCII printable code + blank		
Link policy setting	Master slave switch	Support	The AG can freely become a master or a slave and realize low power consumption.	HCI 7.2.9
	SCO packets	HV1/HV2/HV3 [*1]	HV1 is selected for better audio quality.	
	eSCO packets	EV3/2-EV3		
Link supervision timeout	Link_supervision_timeout	Less than or equal to 5.12 sec	To detect a link loss in a defined time.	HCI 7.3.43
Security	Security mode	Security mode 2/3 (It is recommended that the AG accept any security mode 1,2,3 the HF uses)	To ensure security	GAP 5.2
	Passcode	AG shall accept the fixed Passcode the HF is adopting	The HF may have only fixed Passcode.	GAP 3.2.3
	Passcode length	Basically, the fixed Passcode of the HF is used. If Passcode of the AG is used, its length is greater than or equal to 4.	User can easily enter the Passcode	
	Passcode character code	Basically, the fixed Passcode of the HF is used. If Passcode of the AG is used, the character codes for the Passcode is from 0x30 to 0x39.	To ensure the user entering the Passcode	

[*1] It is also recommended to support HV2 and HV3 considering multiple profiles. If the AG requires HV1 but the HF replies HV3, it is recommended the HF and the AG adopt HV3.

5.2 Connection set up

AG, HF park, sniff, hold parameters

Item	Parameter	Value, range	Reason	Spec
Park mode	Beacon_max_interval	Less than or equal to 1.28 sec	For fast connectivity	HCI 7.2.4
Sniff mode	Sniff_max_interval	Less than or equal to 1.28 sec	For fast connectivity	HCI 7.2.2
Hold mode	Hold_mode_max_interval	Less than or equal to 1.28 sec	For fast connectivity	HCI 7.2.1

5.3 Outgoing call

Busy timeout time

Item	Parameter	Value, range	Reason	Spec
Busy timeout time	Tbusy	5 sec	To stop sending busy tone from the AG in the defined time	HFP 4.18

5.4 Incoming call

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.5 Terminate a call process

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.6 Connection release

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.7 Three way calling

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.8 Audio connection transfer

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.9 Remote audio volume control

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.10 Others

Item	Parameter	Value, range	Reason	Spec
Nothing				

5.11 Abnormal sequences

Waiting time in loss during Service Level Connection

Item	Parameter	Value, range	Reason	Spec
Waiting time in loss during Service Level Connection	Twaitslc	60 sec	To reinitiate Service Level Connection in the defined time.	-

5.12 Callsetup

Item	Parameter	Value, range	Reason	Spec
+CIND	callsetup indicator	It is desirable that the HF supports both “callsetup” and “call_setup” as the callsetup status indicator. It is also recommended the HF work correctly even if the AG supports neither “callsetup” nor “call_setup”.	For backward compatibility with previous versions of the profile	HFP 4.33.2

5.13 Signal strength and Battery level

Item	Parameter	Value, range	Reason	Spec
+CIND	Indicator <ind>	It is desirable that “signal” and “battchg” are supported by the AG in addition to “service”, “call” and “callsetup”	To indicate the signal strength and the battery level on the HF screen.	HFP 4.5 4.7
+CIEV	current status of the indicator <value>	0-5 *		

* For the AG or the HF that handles the signal strength and/or the battery level internally with value of 0-3, it is recommended that the internal value and the +CIEV parameter be converted as follows:

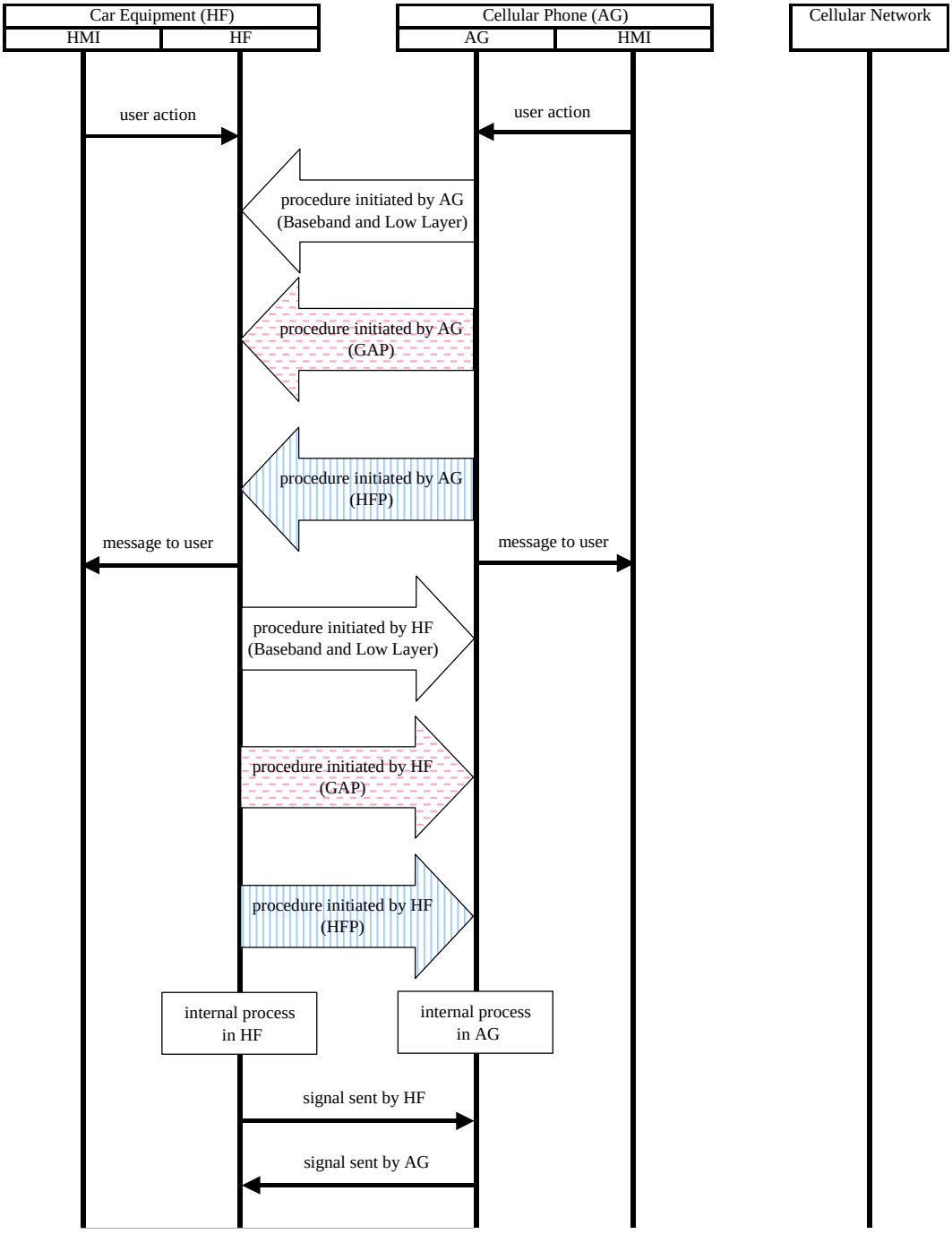
AG internal value	0	1		2		3
+CIEV parameter	0	1	2	3	4	5
HF internal value	0	1	1	2	2	3

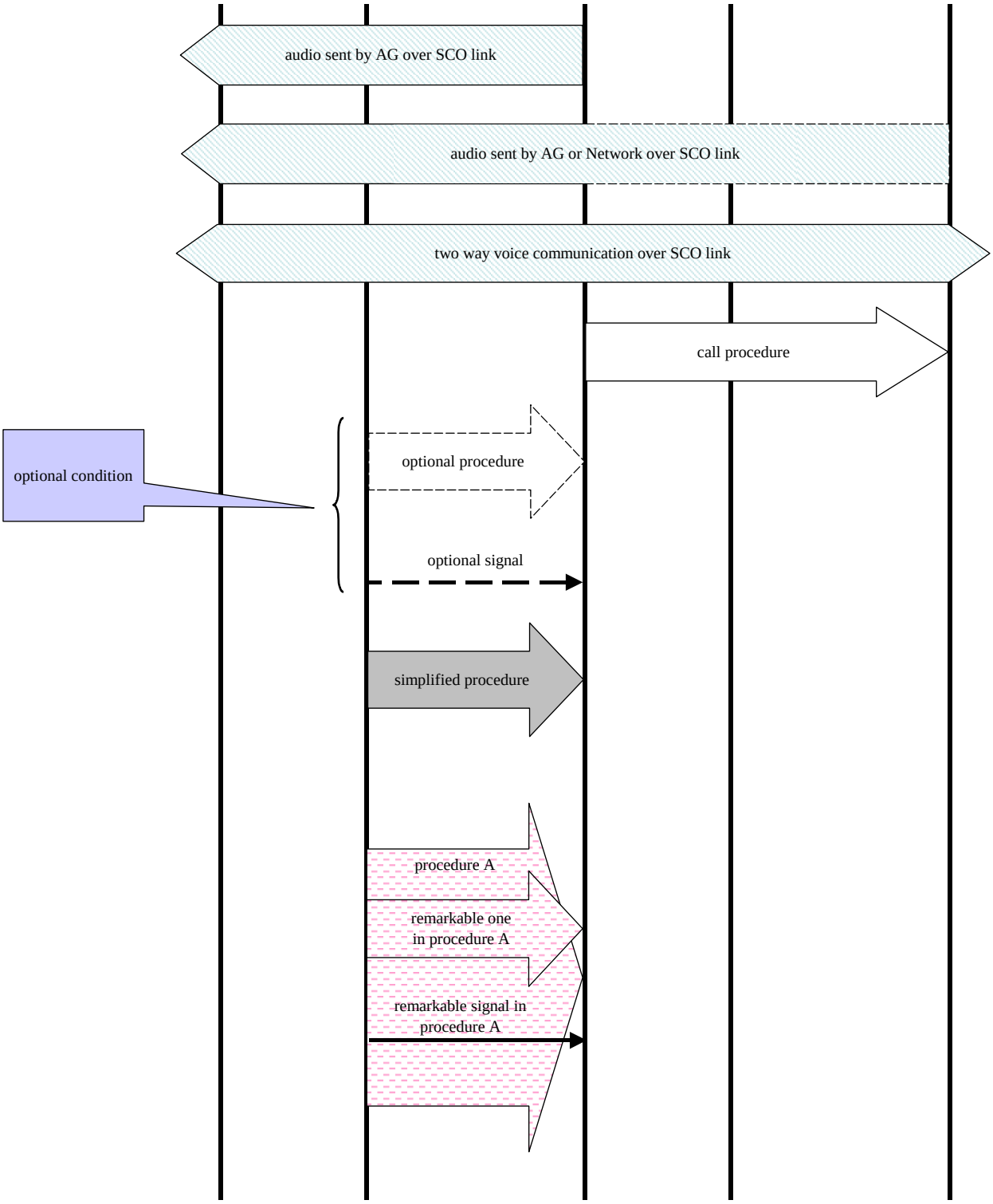
For example, if the signal strength is handled internally with value 0-3 in the AG and its current strength is 2, the parameter of +CIEV result code should be 3.
If the battery level is handled internally with value 0-3 in the HF and it received +CIEV with parameter “4”, it should be translated to 2 as an internal value of the HF.

6. Sequence charts

The following sequence charts are provided as the implementation references. These sequence charts shall not define transmission order of AT commands and indicators in each cases.

6.1 Conventions used in sequence charts

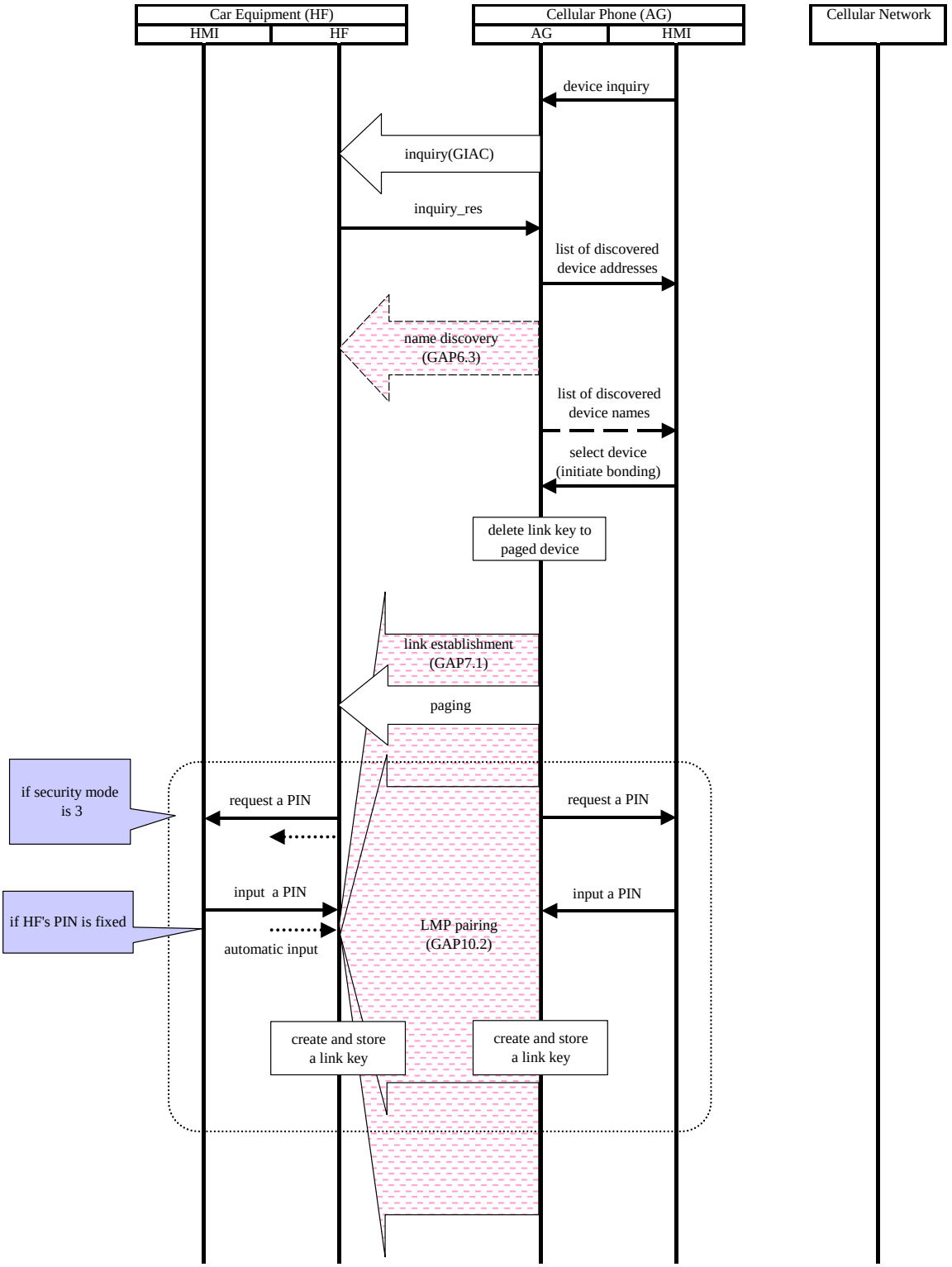


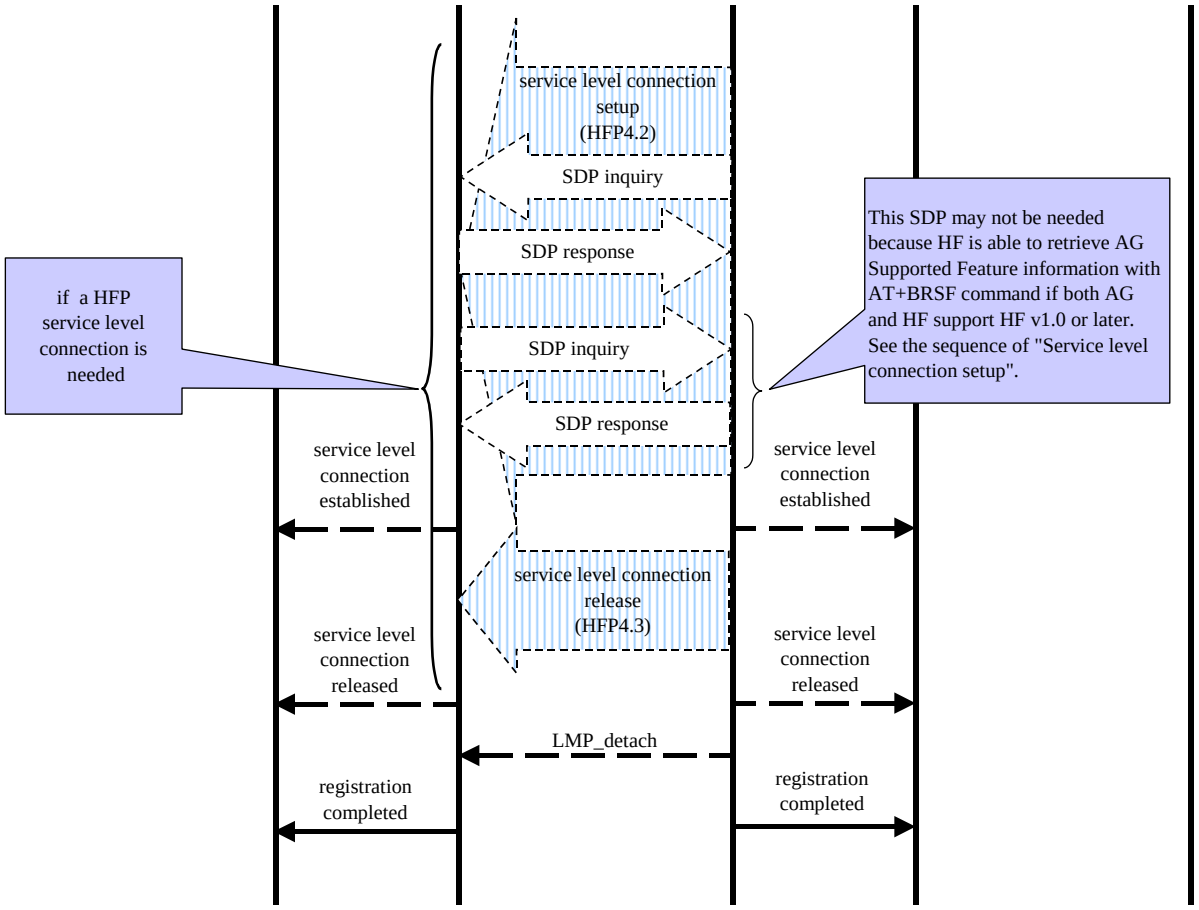

audio sent by AG over SCO link
audio sent by AG or Network over SCO link
two way voice communication over SCO link
call procedure
optional condition
optional procedure
optional signal
simplified procedure
procedure A
remarkable one
in procedure A
remarkable signal in
procedure A

6.2 Normal/Additional Usage Scenarios

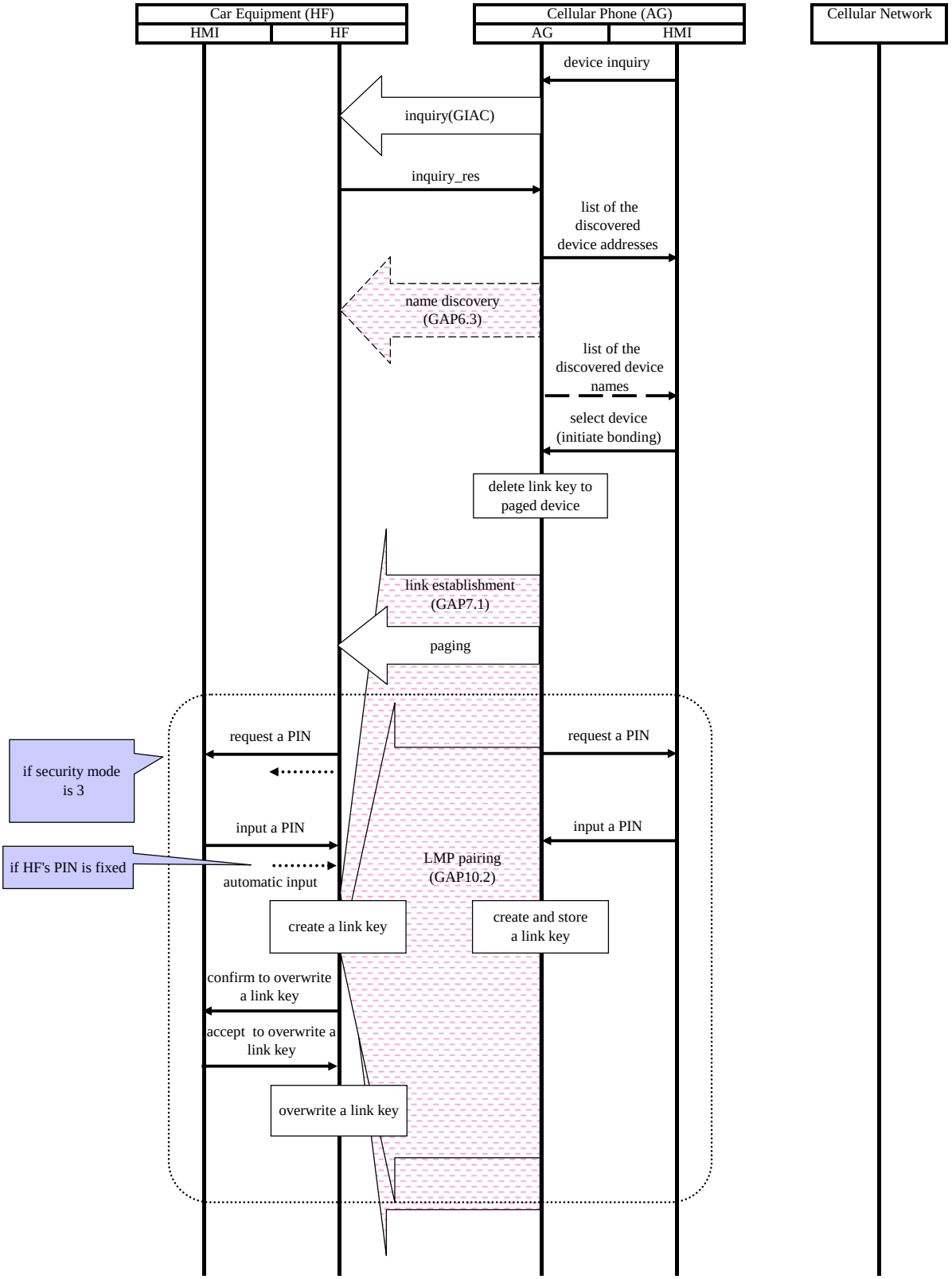
6.2.1 Registration

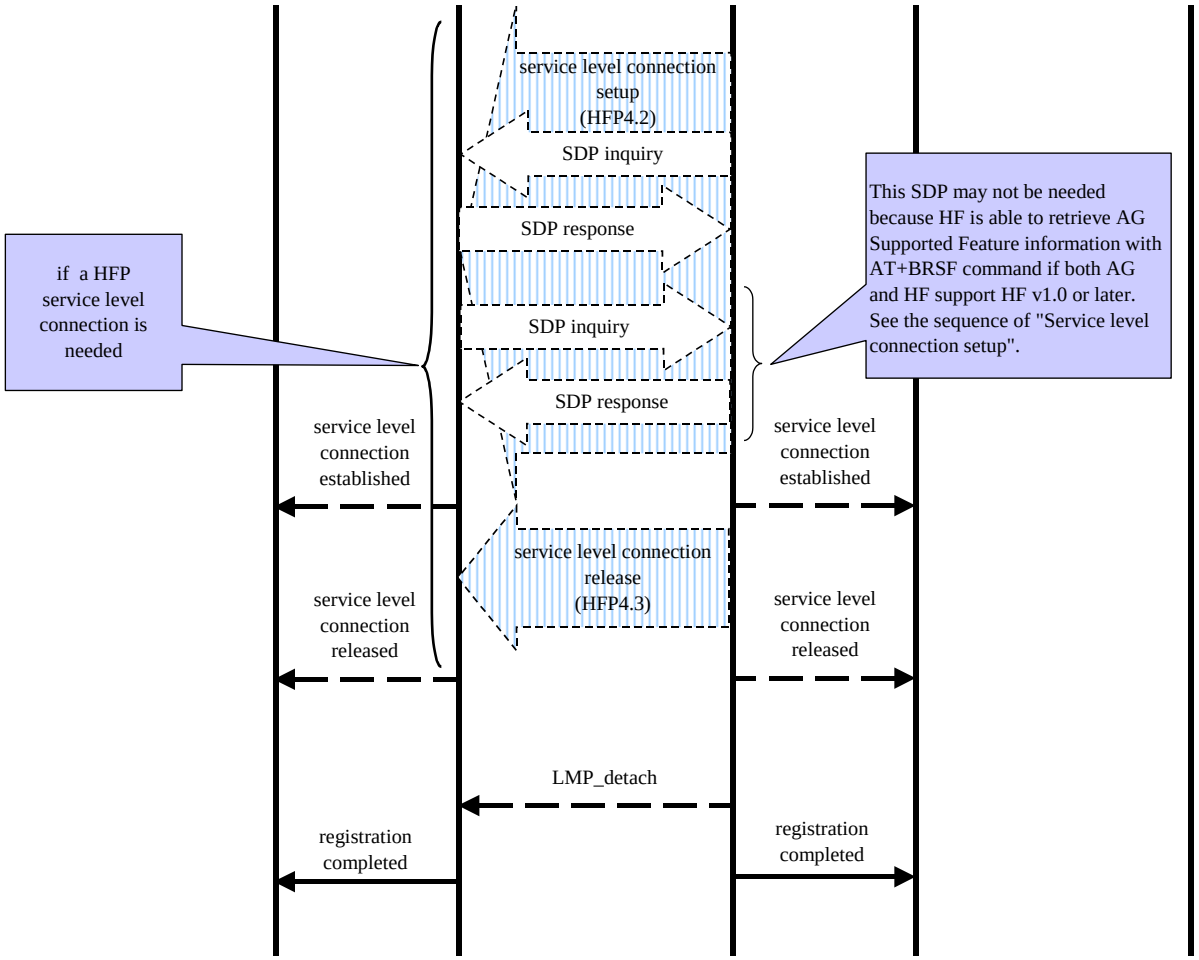
6.2.1.1 Registration from the AG





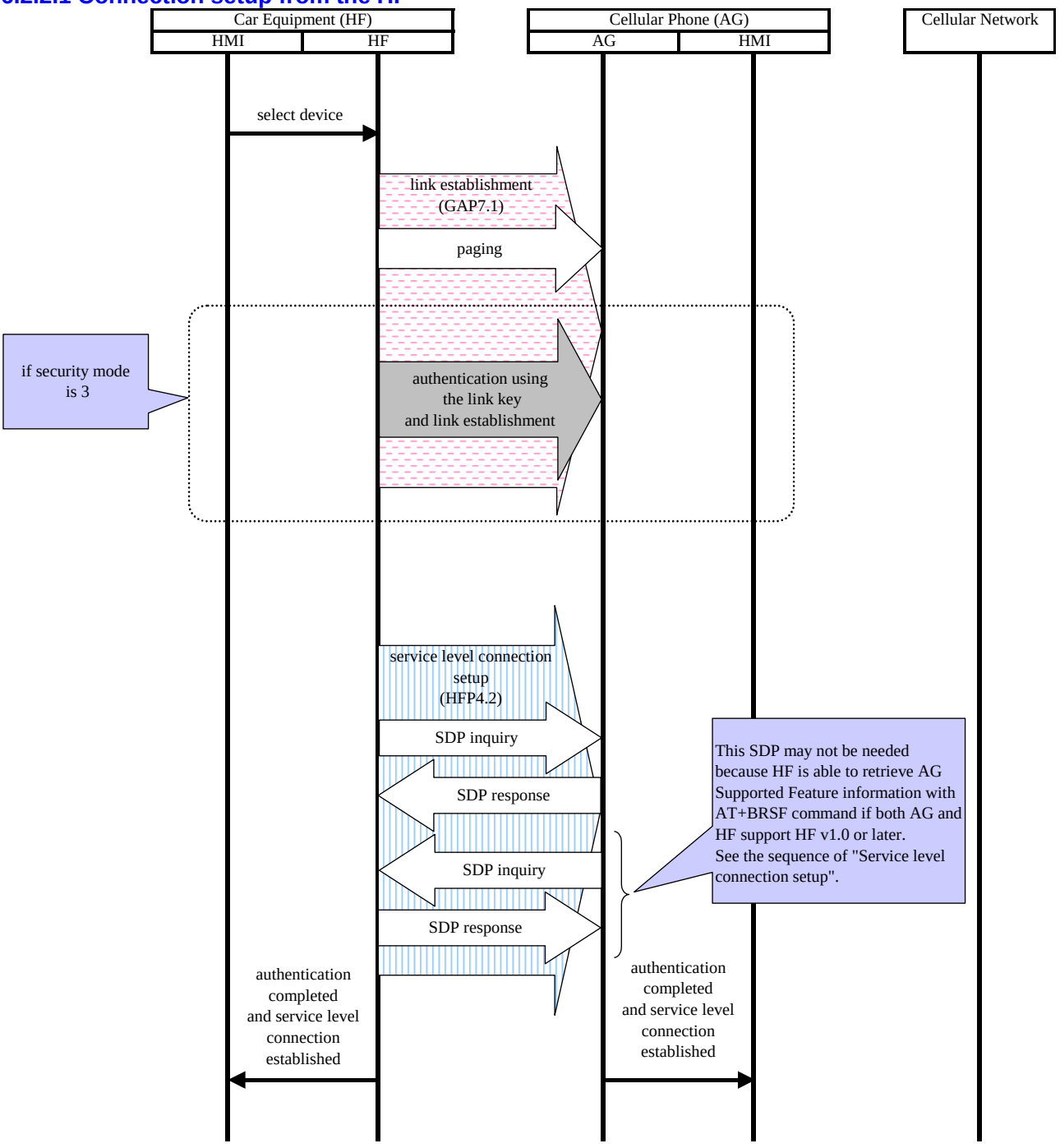
6.2.1.2 Registration from the AG (Already registered)



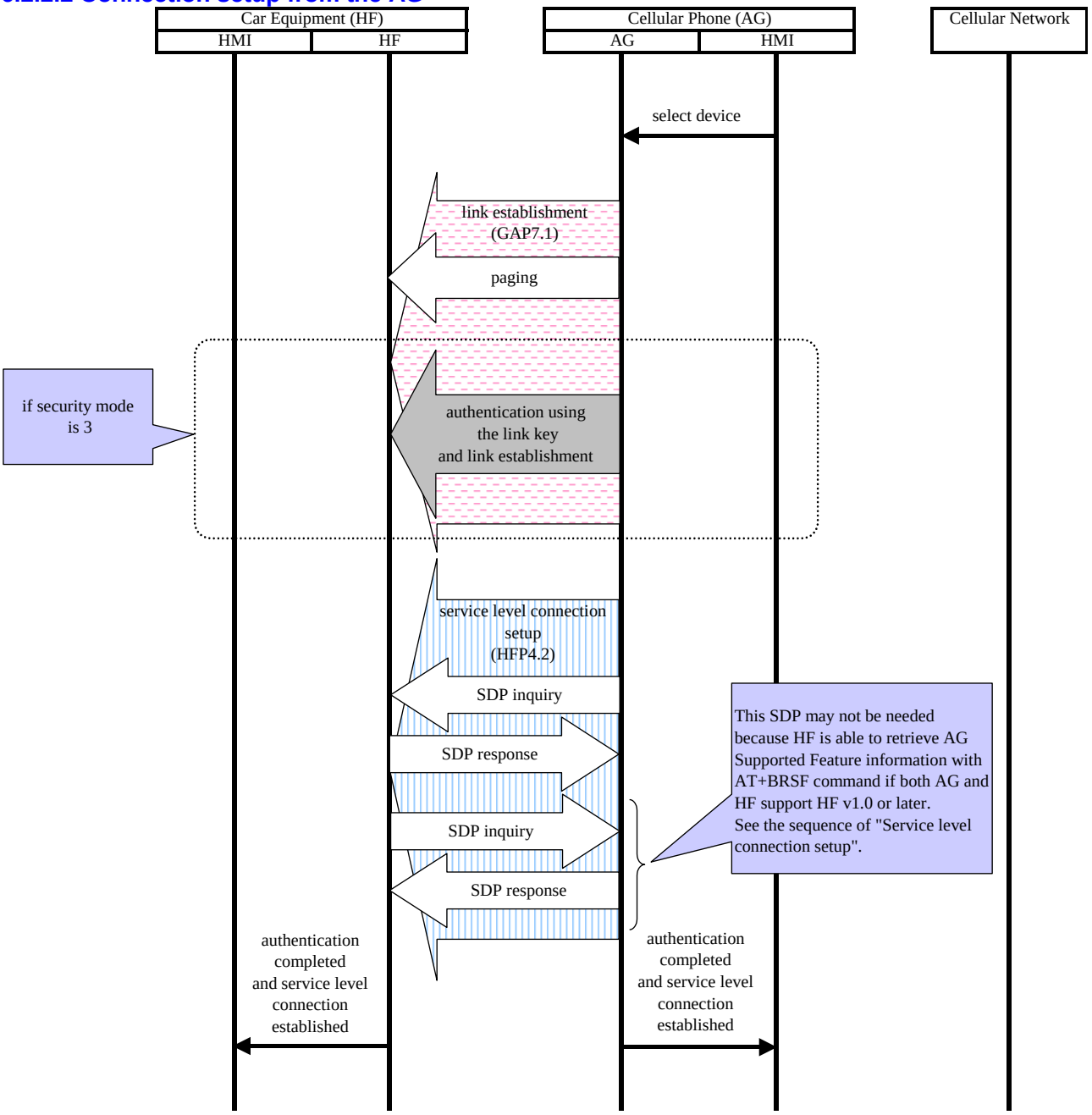


6.2.2 Connection setup

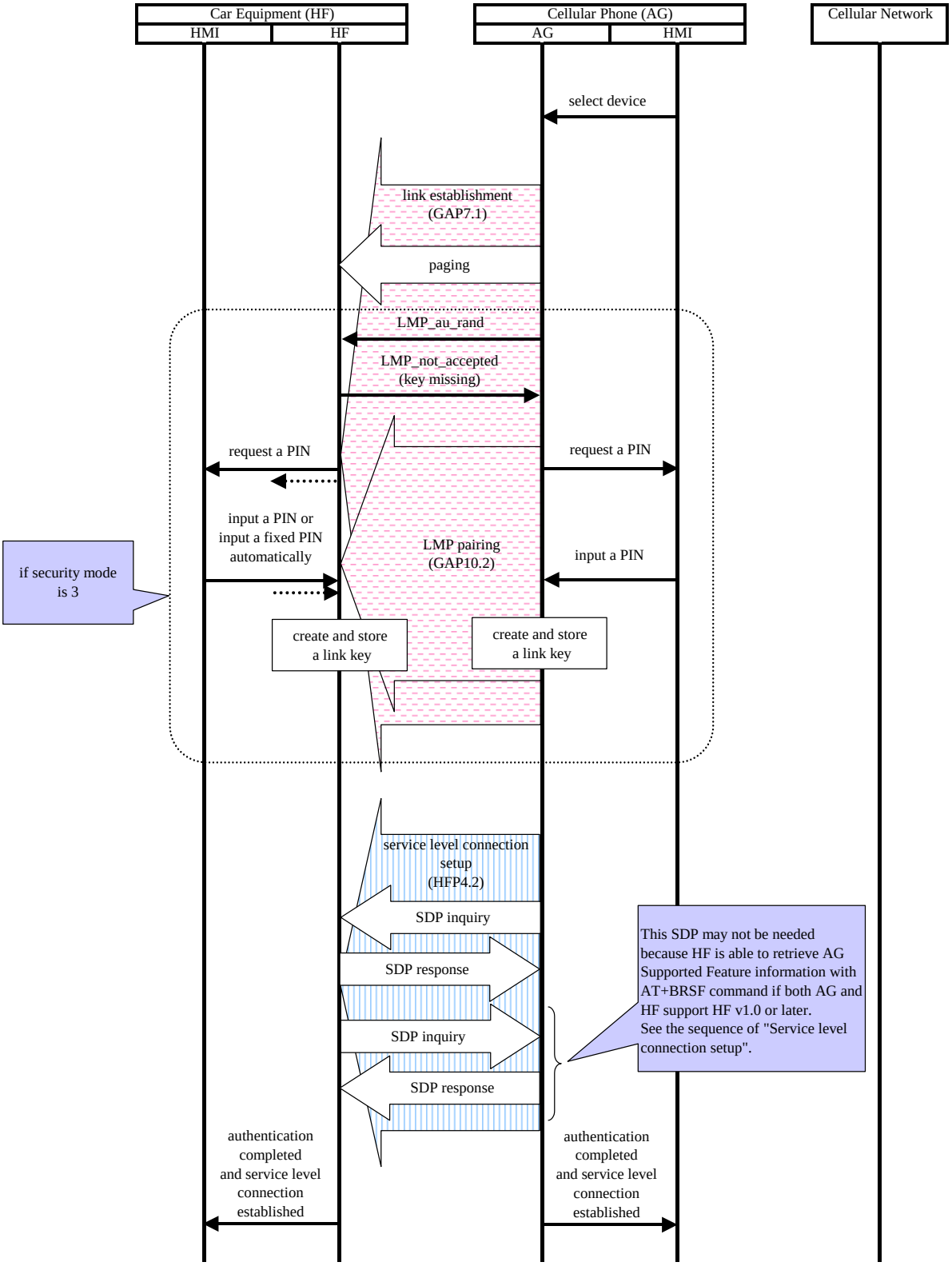
6.2.2.1 Connection setup from the HF



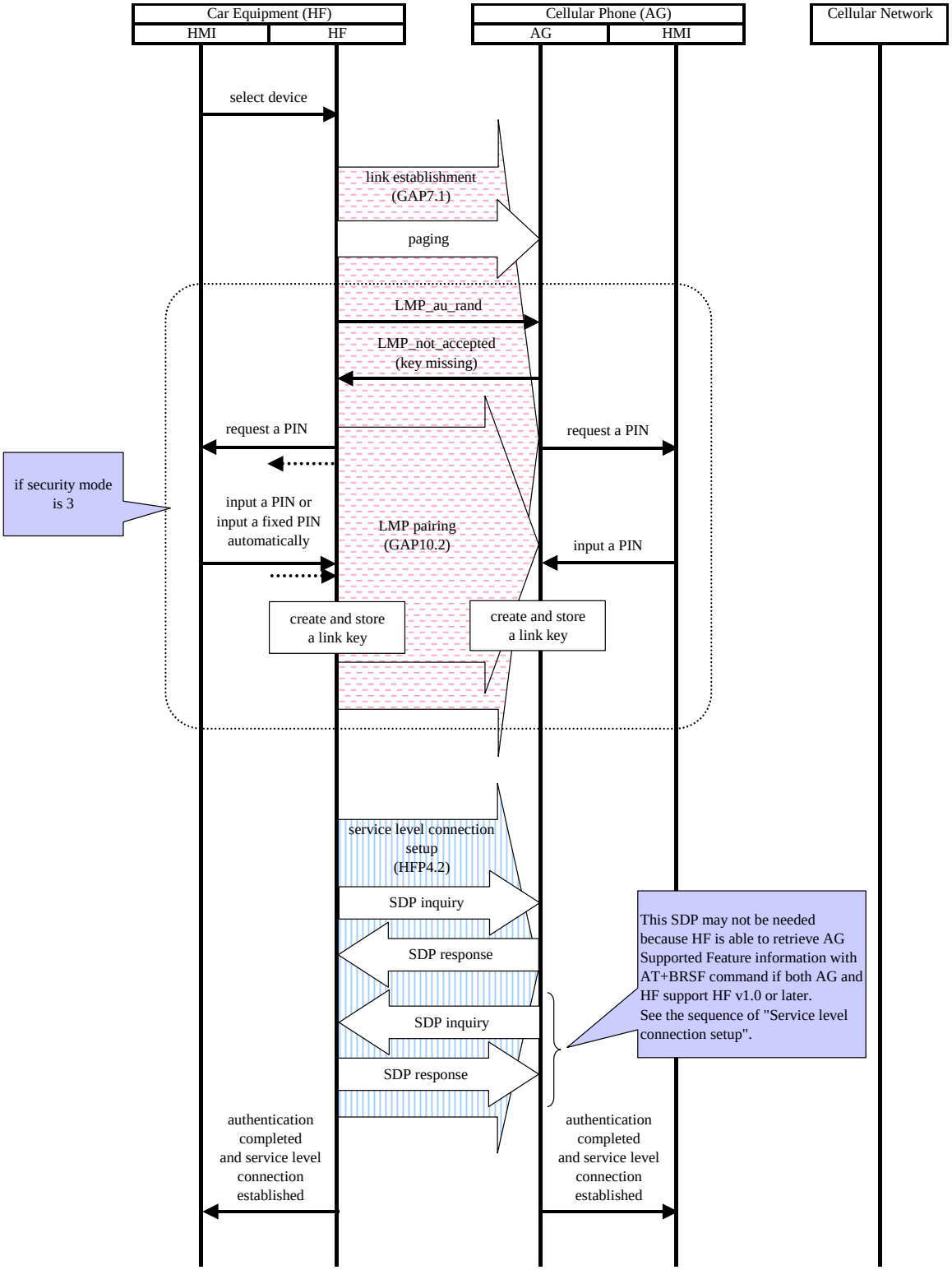
6.2.2.2 Connection setup from the AG



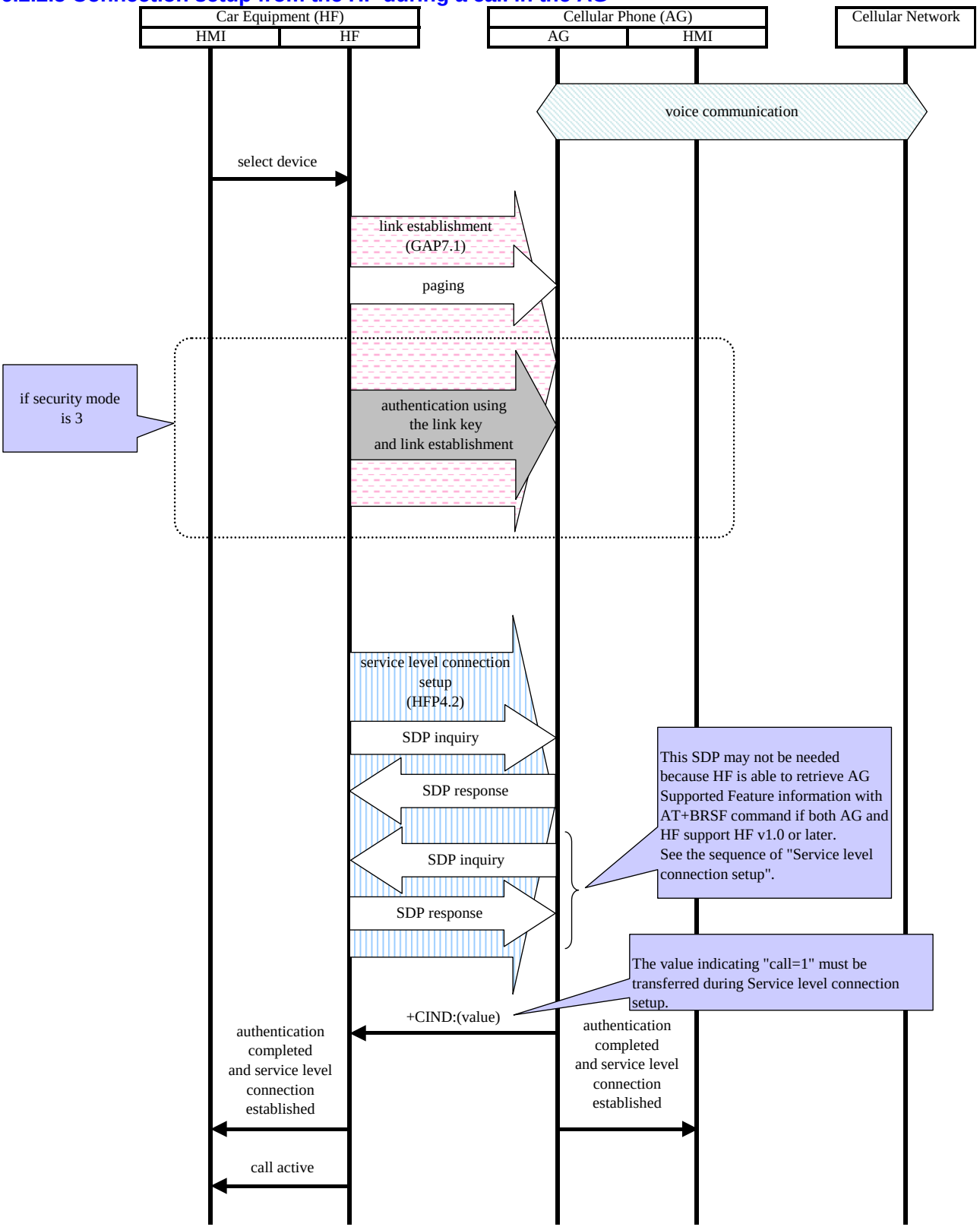
6.2.2.3 Connection setup from the AG (Unregistered)



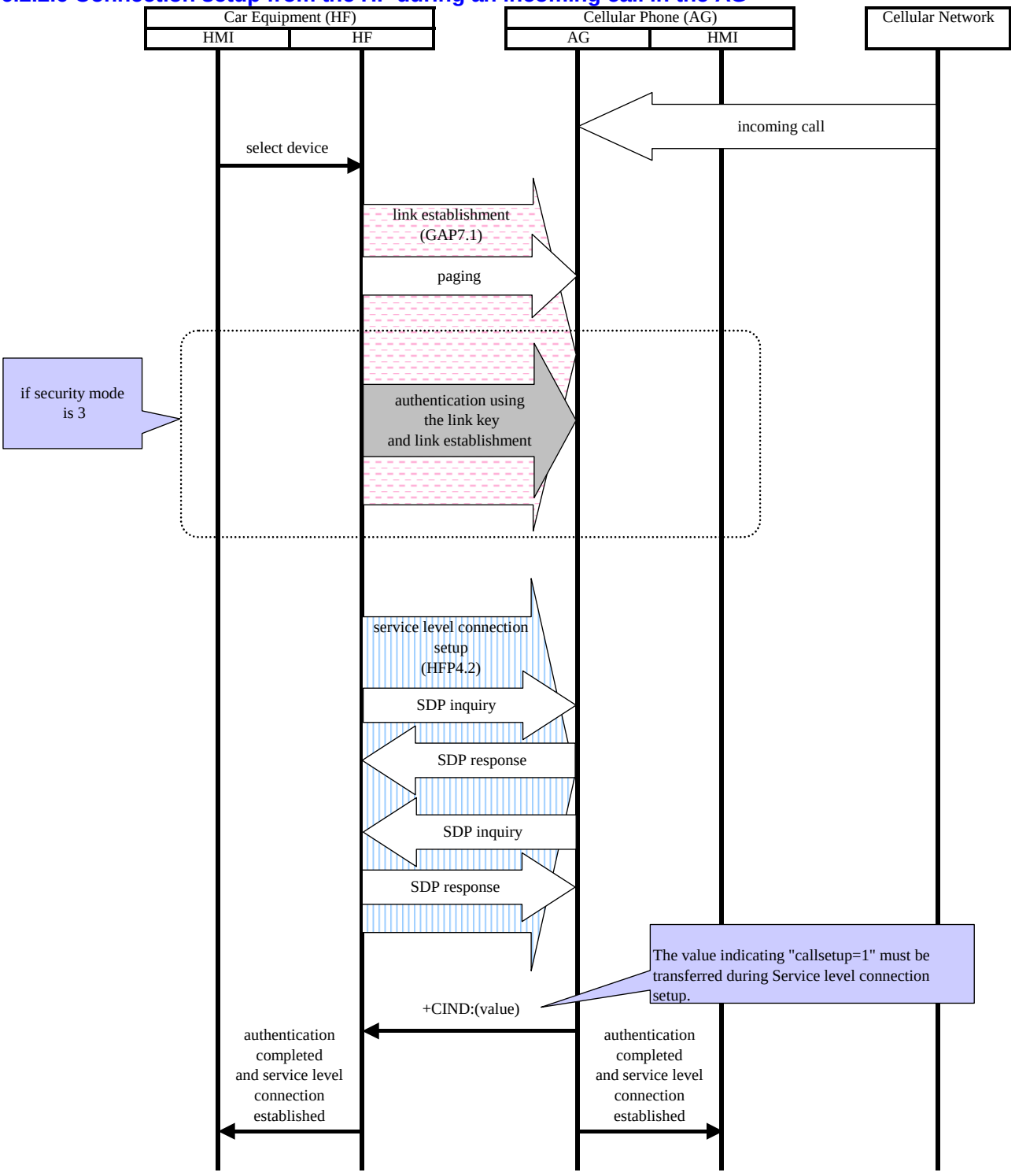
6.2.2.4 Connection setup from the HF (Unregistered)

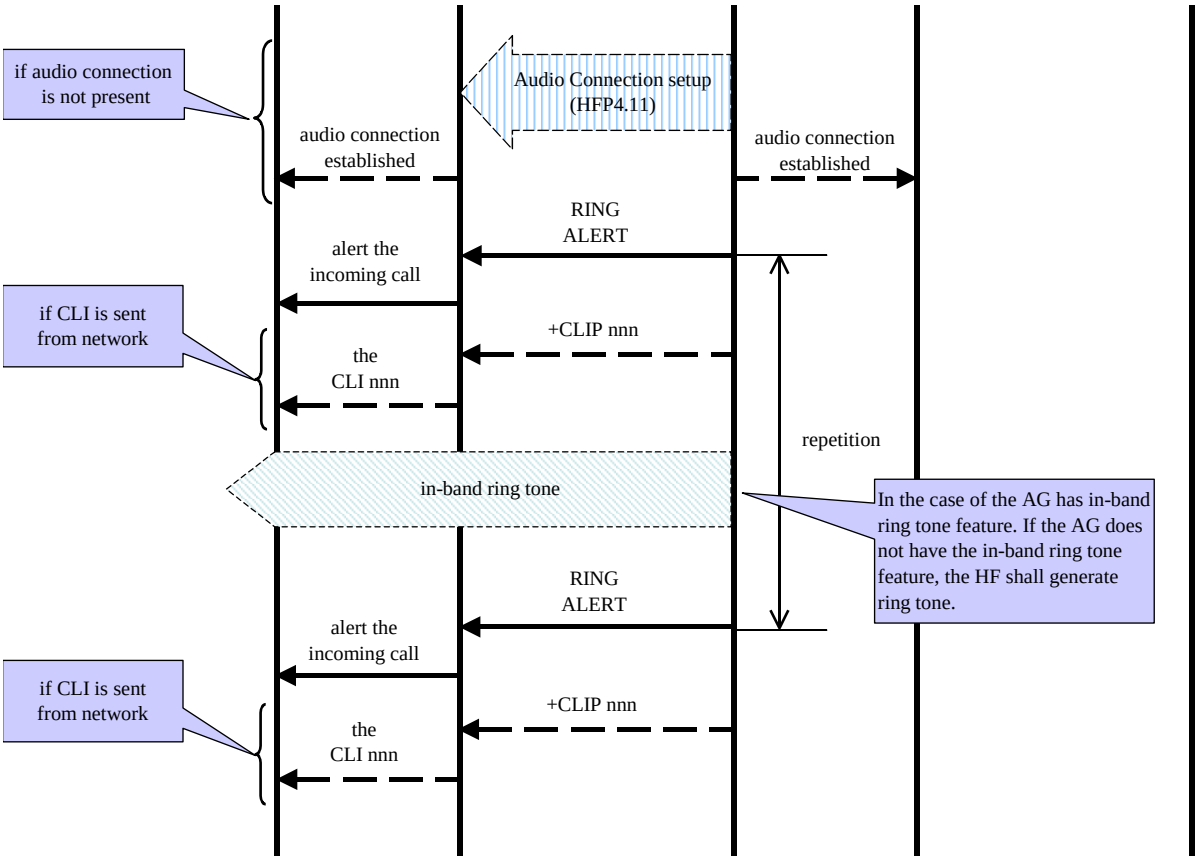


6.2.2.5 Connection setup from the HF during a call in the AG

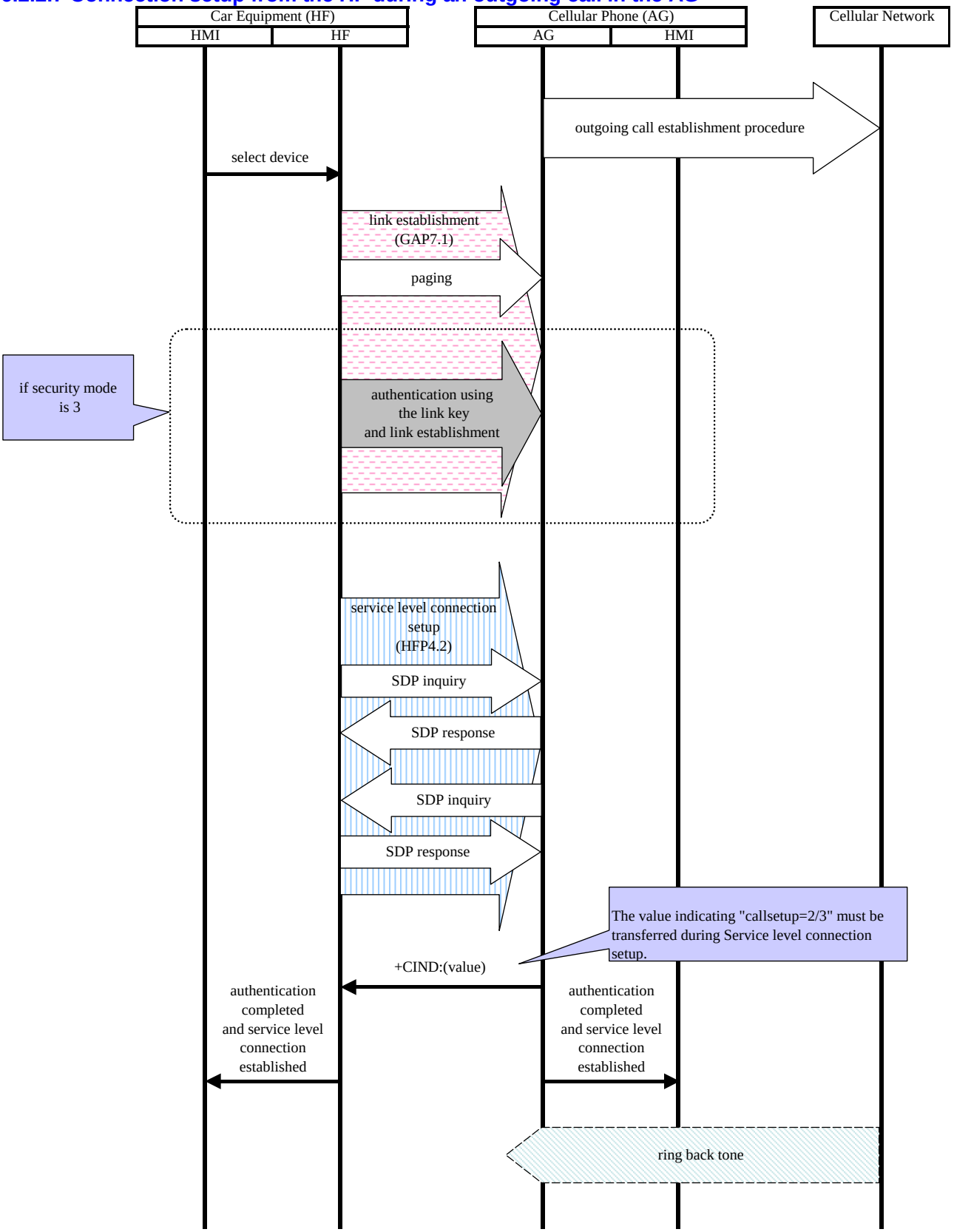


6.2.2.6 Connection setup from the HF during an incoming call in the AG

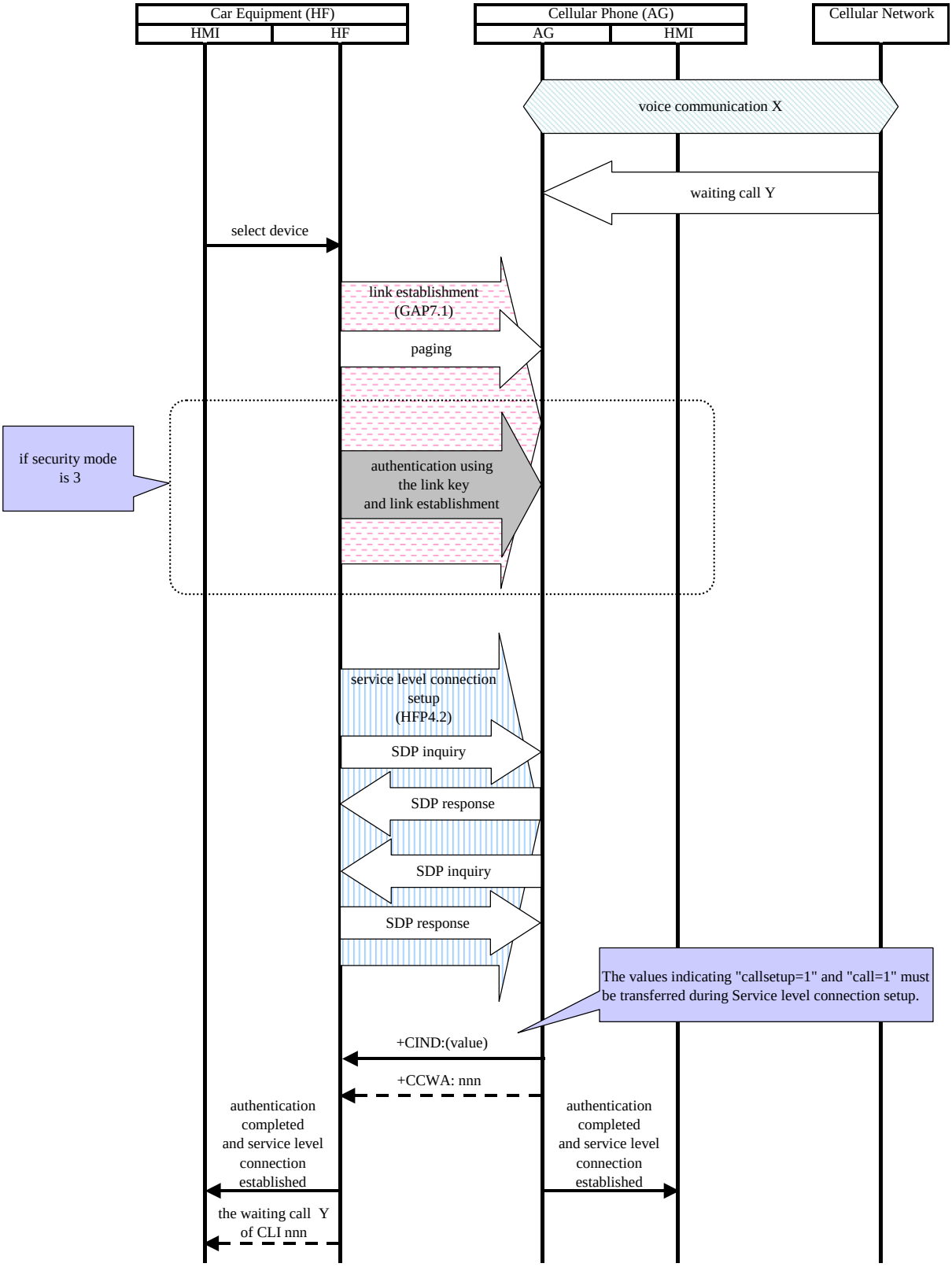



if audio connection is not present
Audio Connection setup (HFP4.11)
audio connection established
audio connection established
RING ALERT
alert the incoming call
if CLI is sent from network
+CLIP nnn
the CLI nnn
repetition
in-band ring tone
In the case of the AG has in-band ring tone feature. If the AG does not have the in-band ring tone feature, the HF shall generate ring tone.
RING ALERT
alert the incoming call
if CLI is sent from network
+CLIP nnn
the CLI nnn

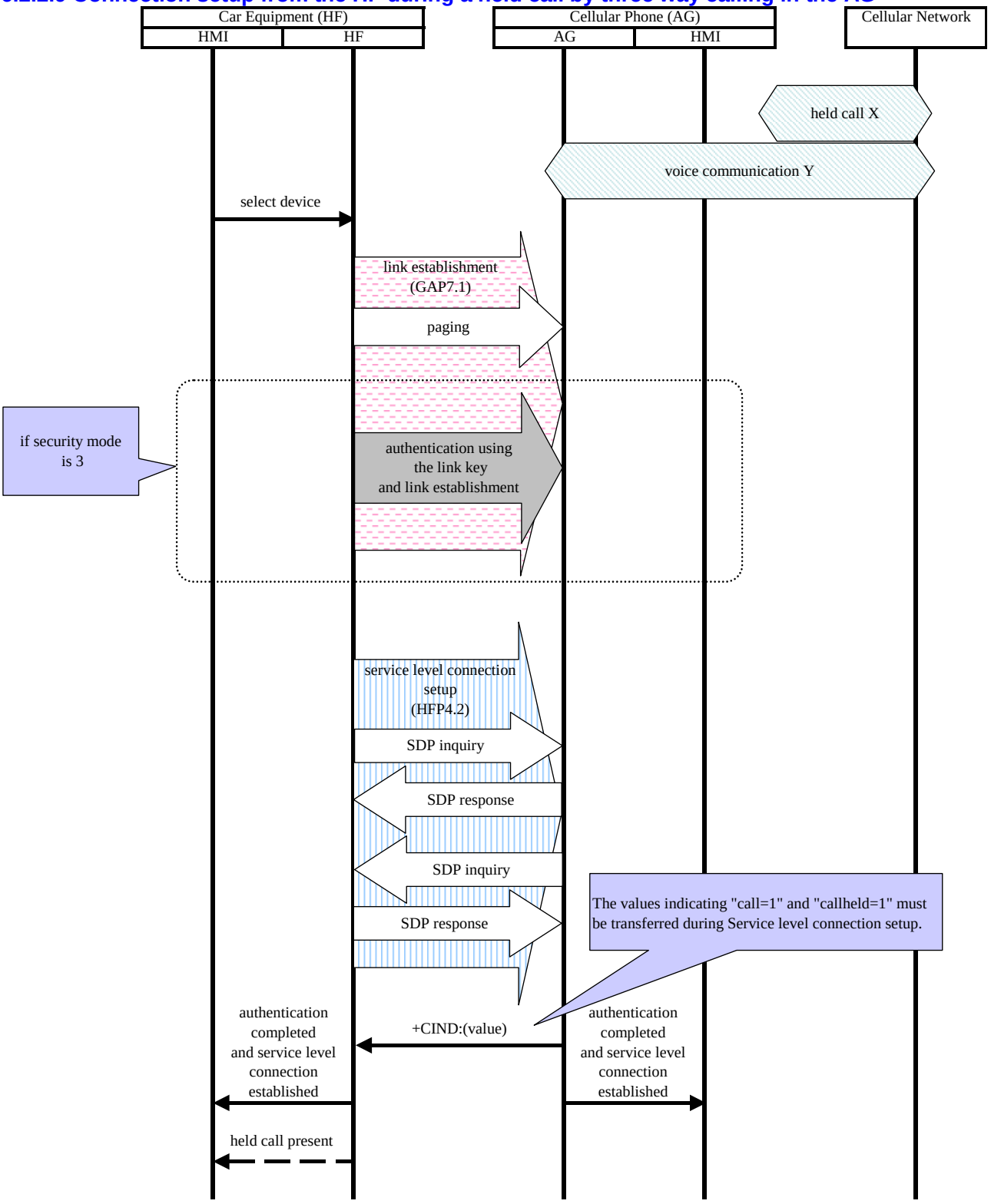
6.2.2.7 Connection setup from the HF during an outgoing call in the AG



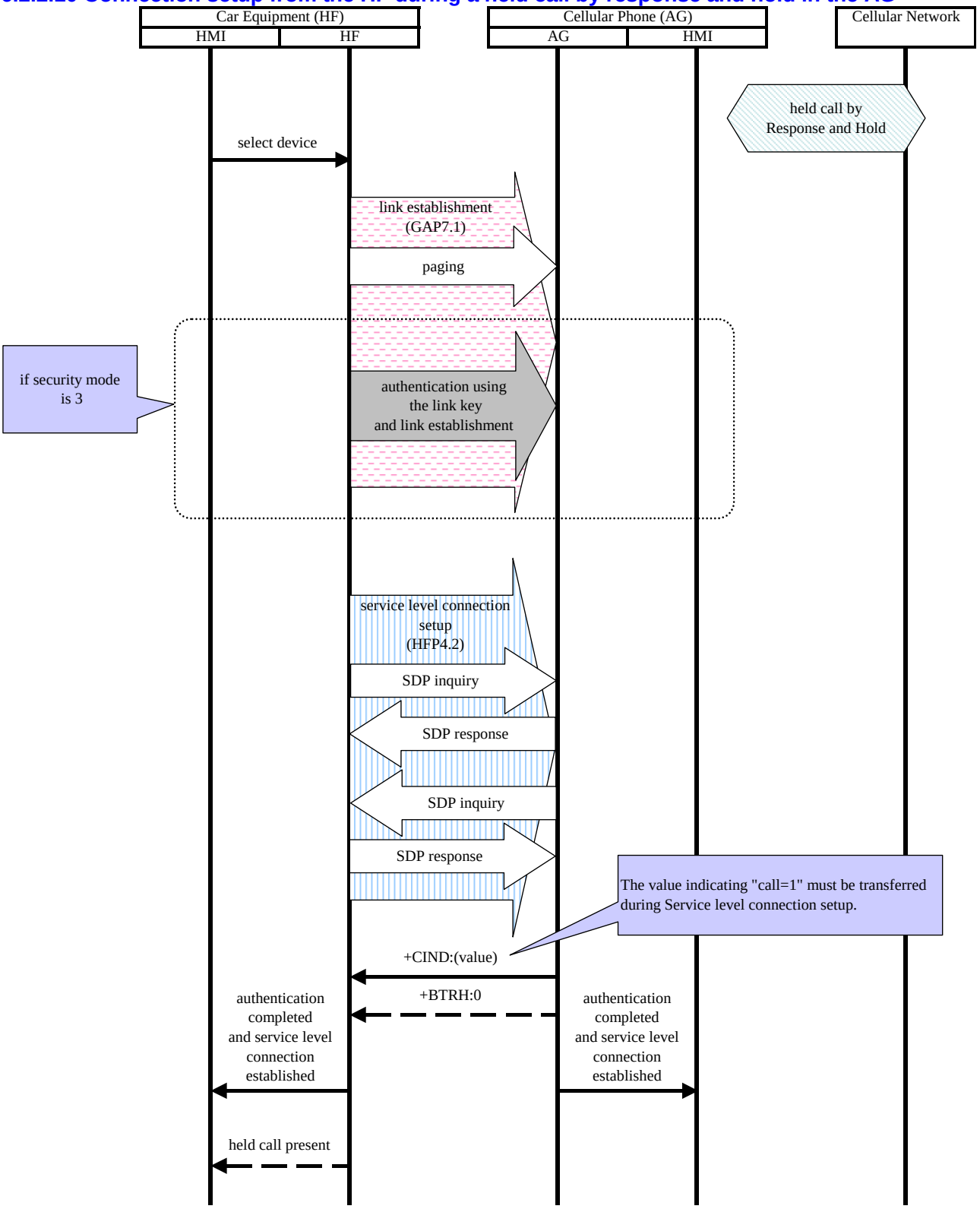
6.2.2.8 Connection setup from the HF during a call waiting in the AG



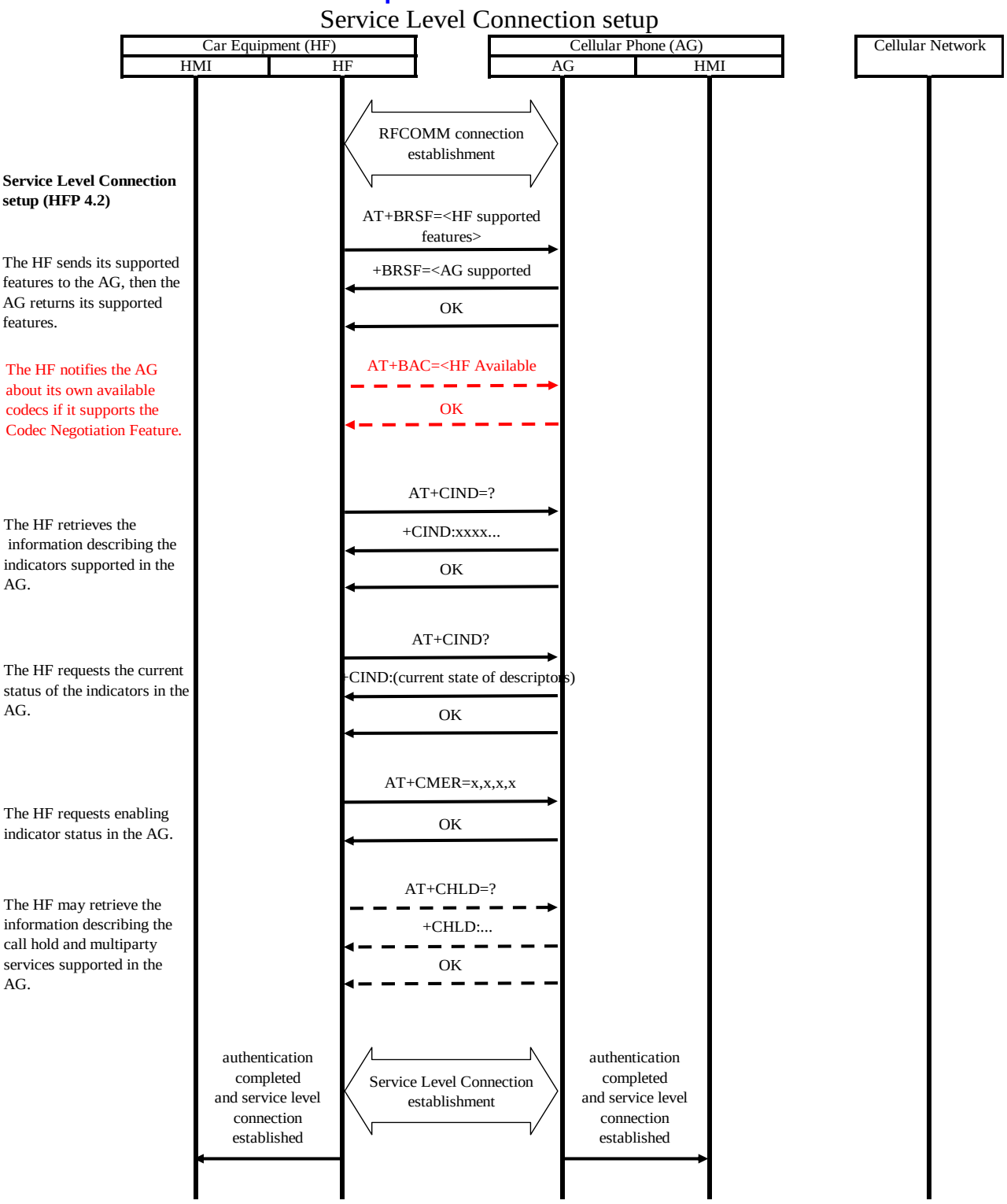
6.2.2.9 Connection setup from the HF during a held call by three way calling in the AG



6.2.2.10 Connection setup from the HF during a held call by response and hold in the AG

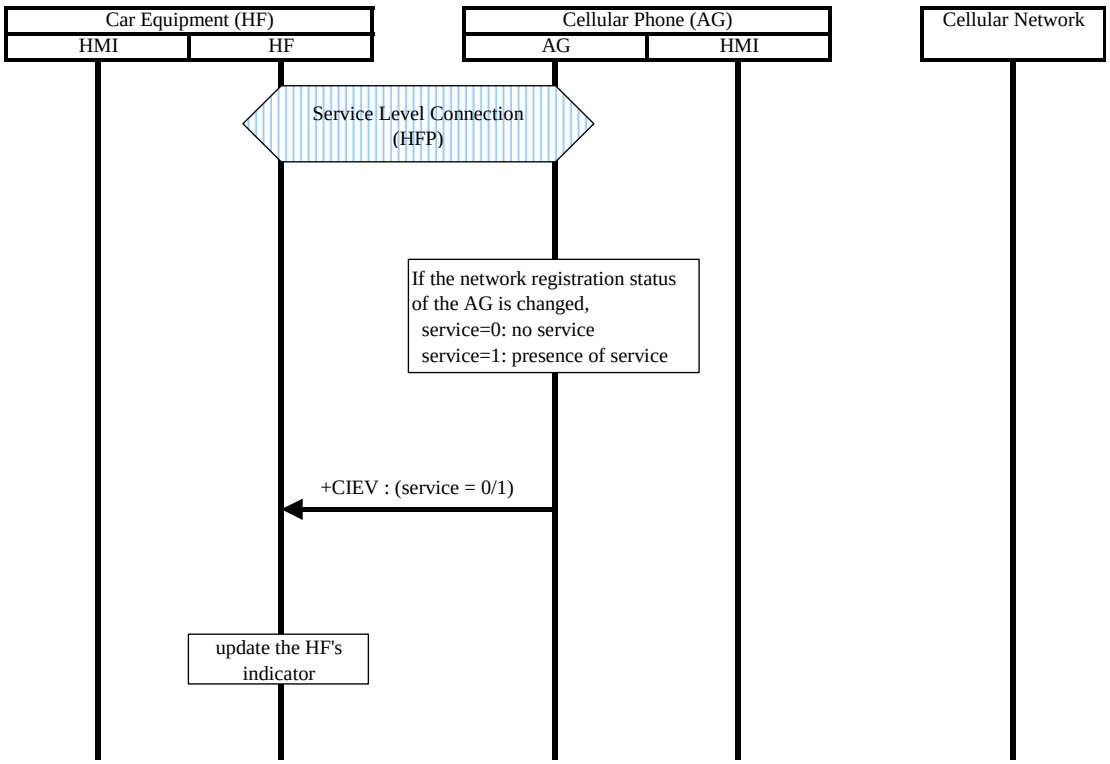


6.2.3 Service level connection setup

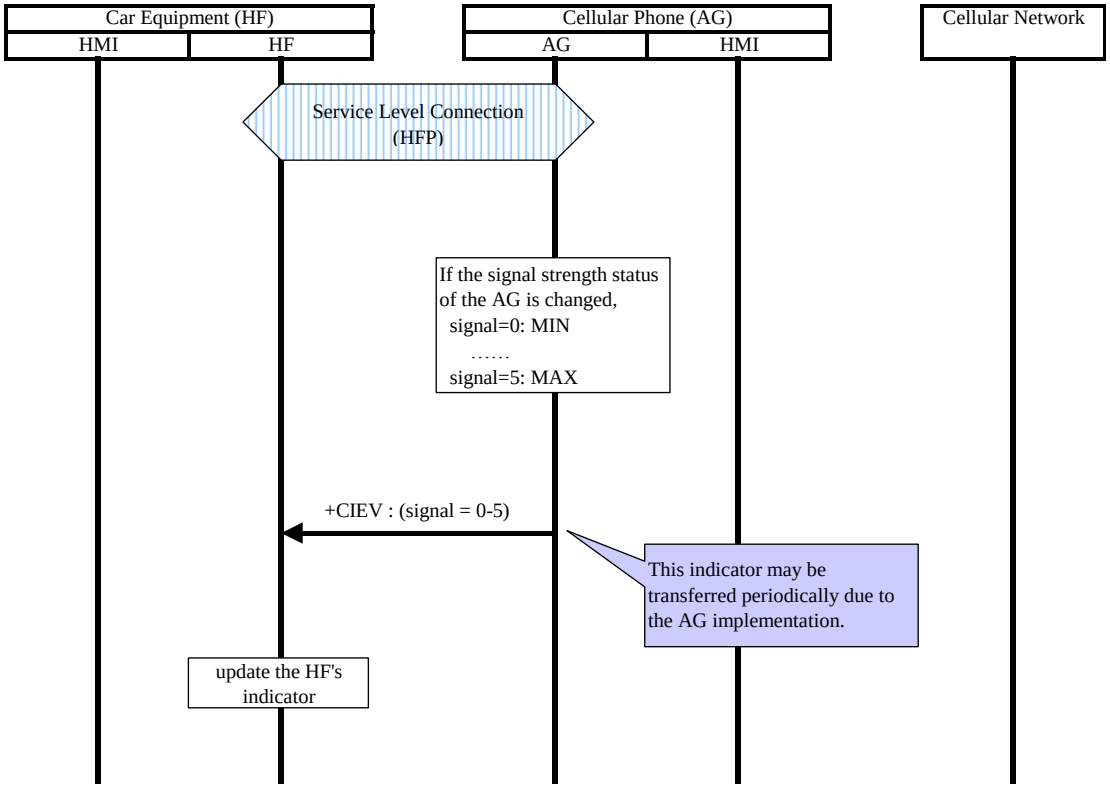


6.2.4 Transfer of the AG status

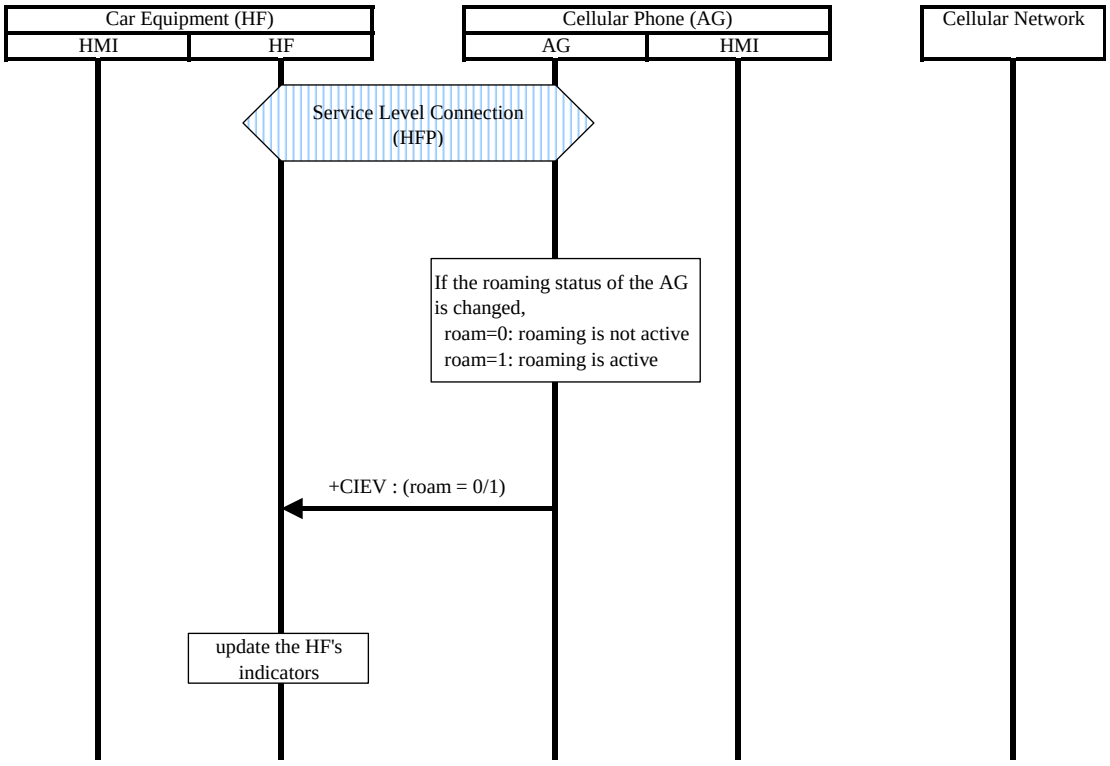
6.2.4.1 Transfer of Registration Status of the AG



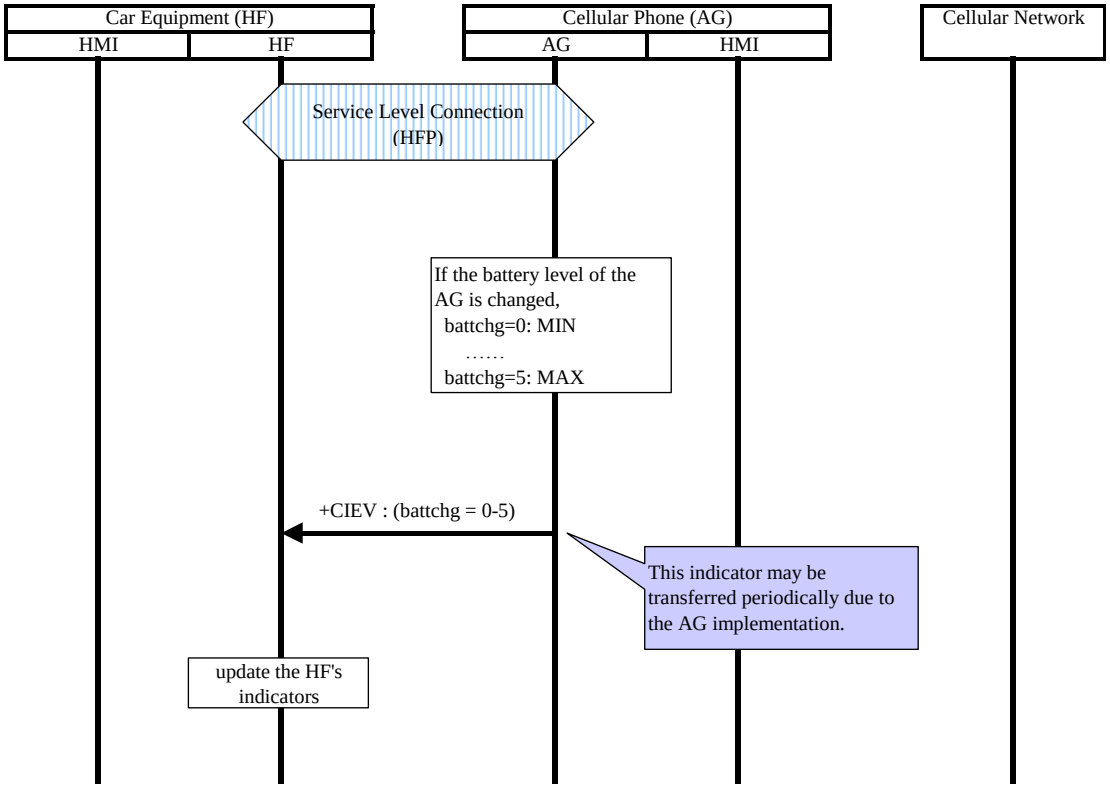
6.2.4.2 Transfer of Signal Strength of the AG



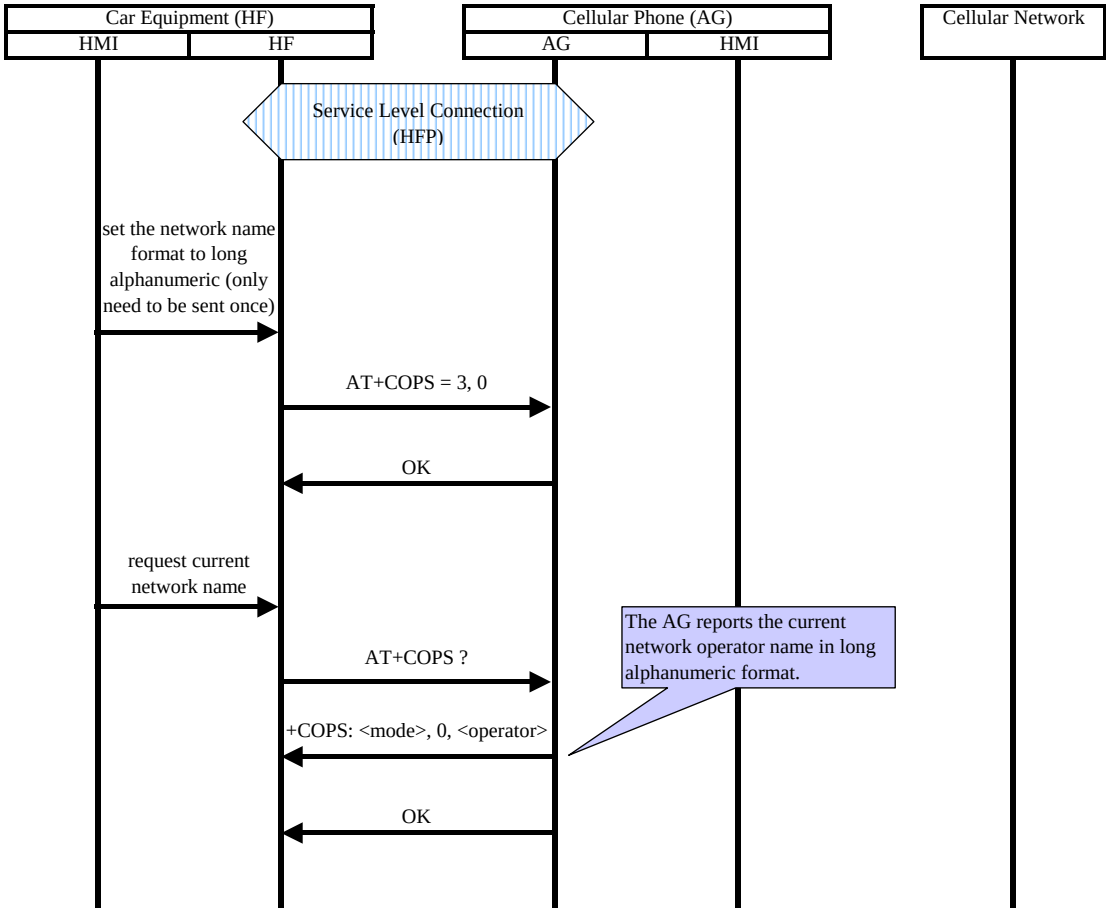
6.2.4.3 Transfer of Roaming Status of the AG



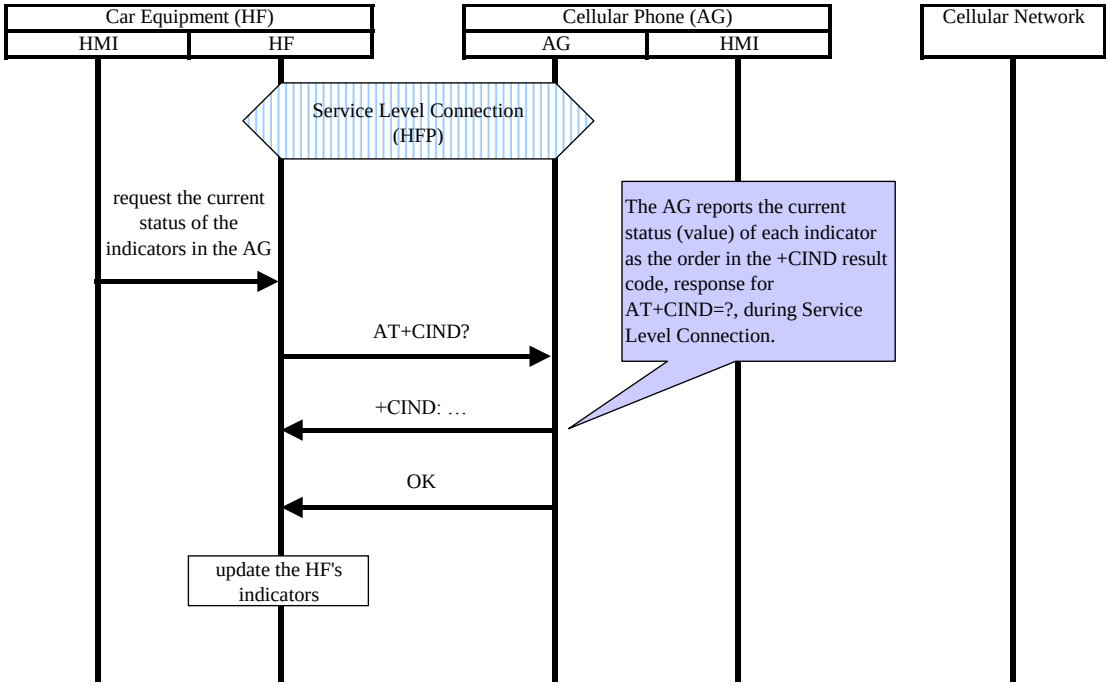
6.2.4.4 Transfer of Battery Level of the AG



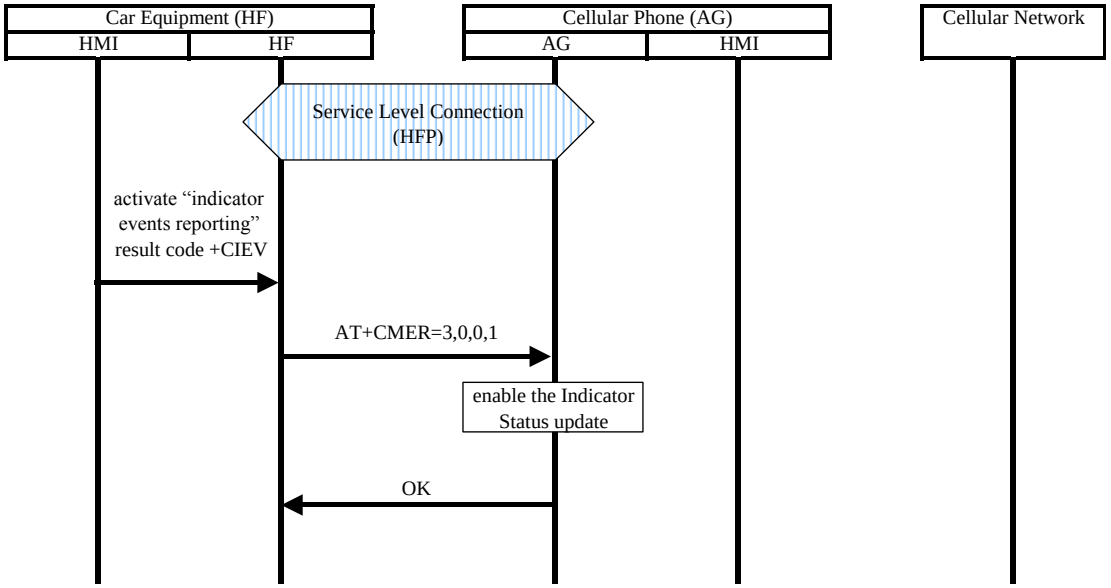
6.2.4.5 Query of Operator Selection of the AG



6.2.4.6 Transfer of status indicator (initiated by the HF)

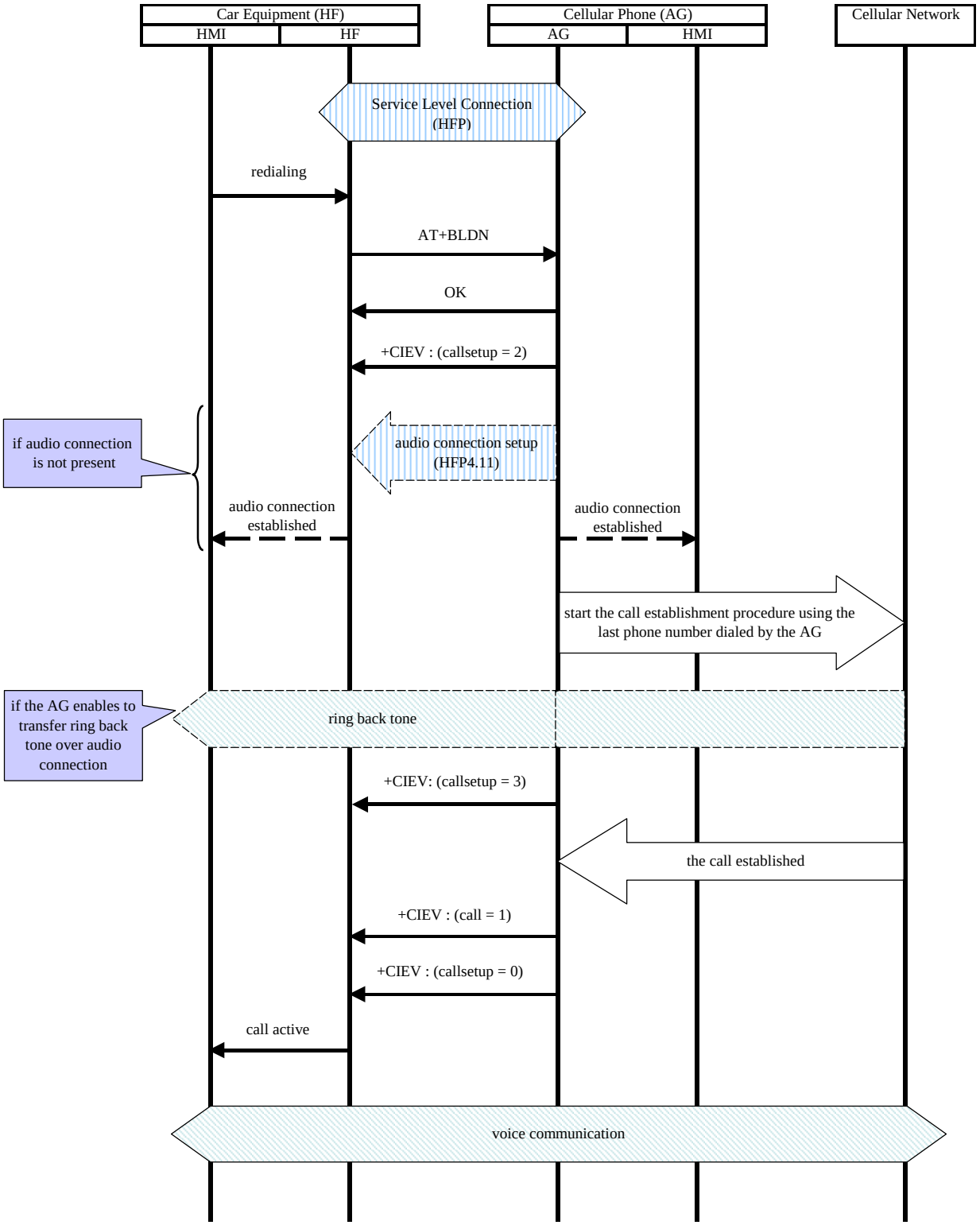


6.2.4.7 Enable the indicators status update function in the AG

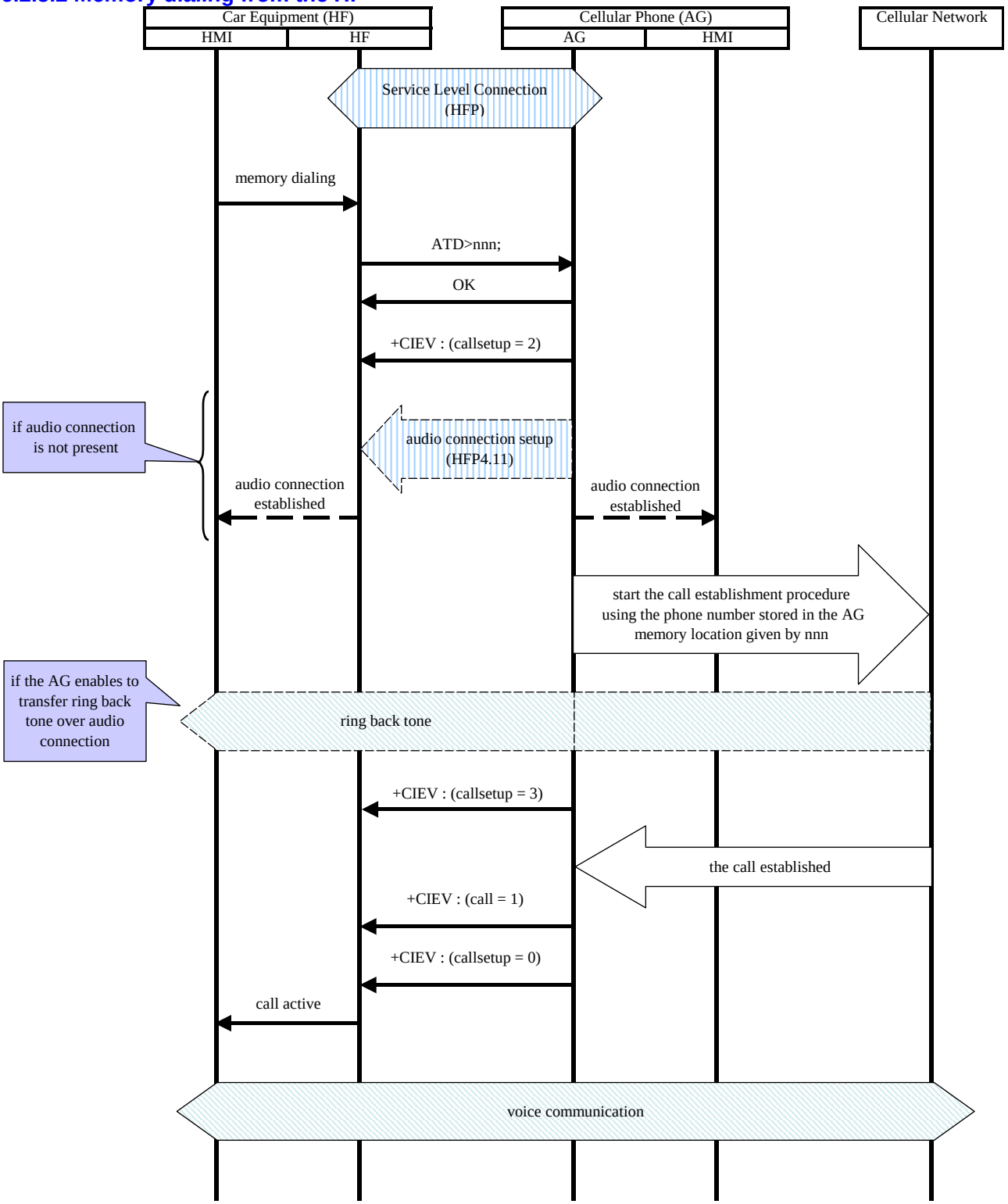


6.2.5 Outgoing call

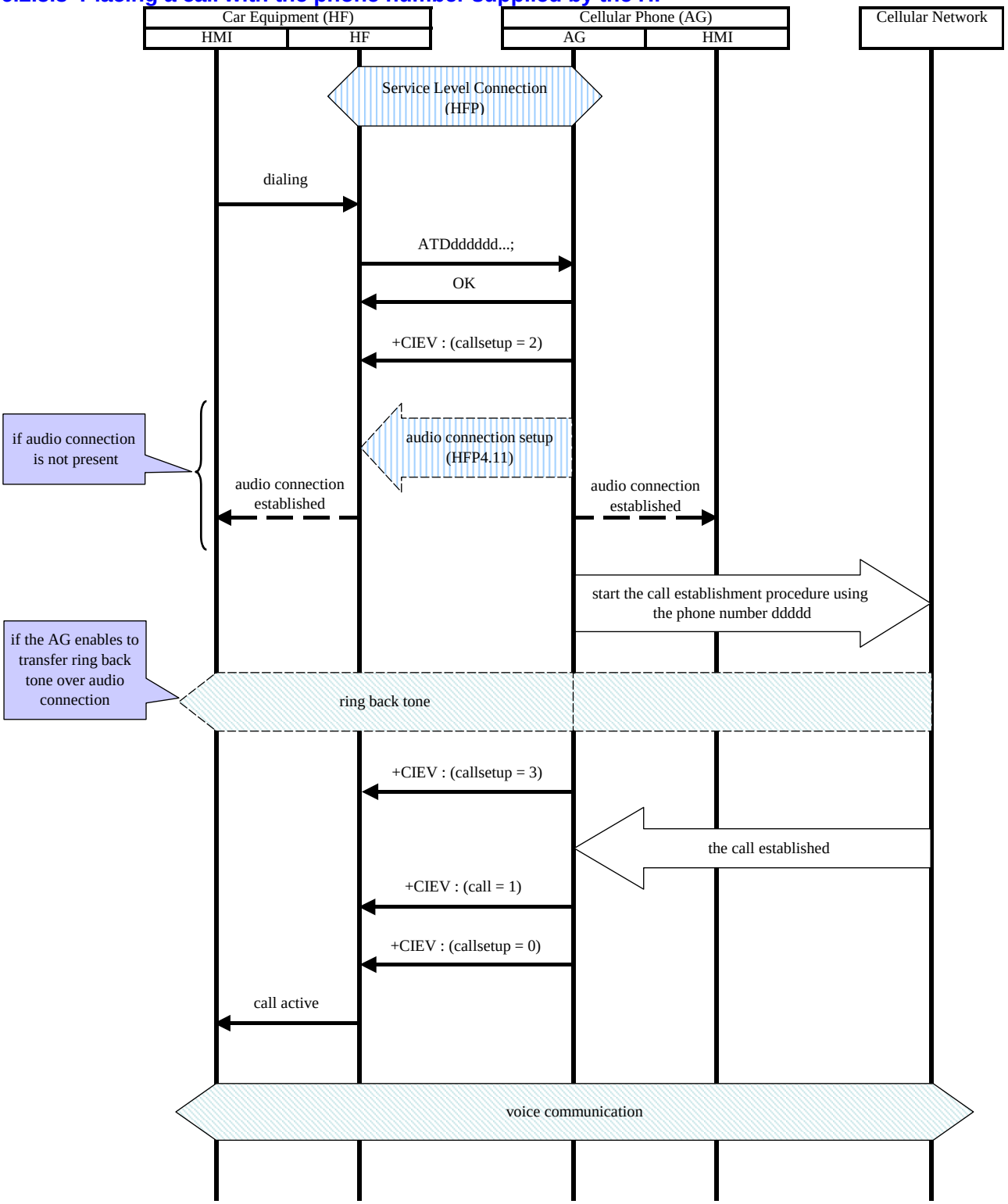
6.2.5.1 Last number re-dial from the HF



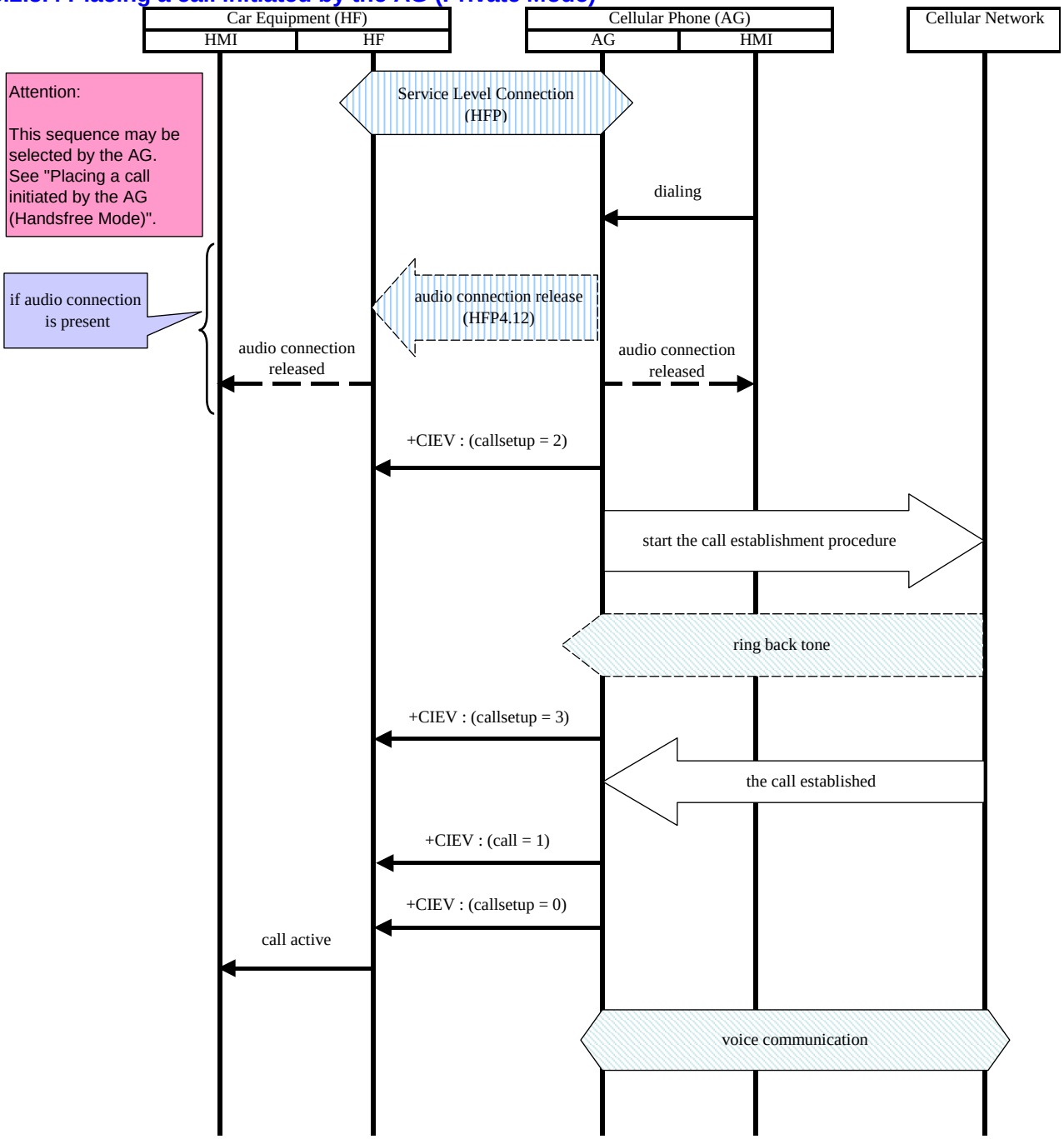
6.2.5.2 Memory dialing from the HF



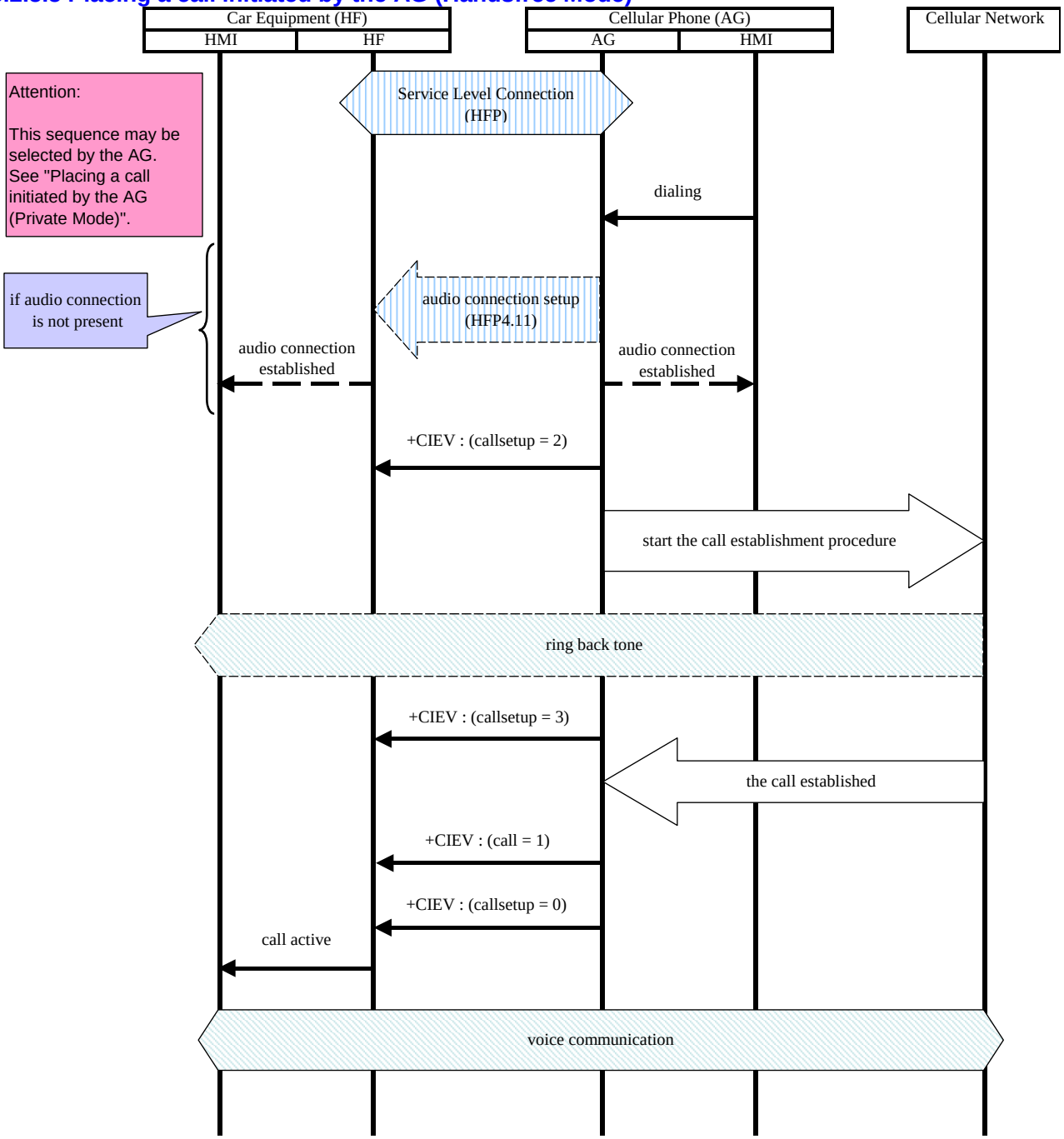
6.2.5.3 Placing a call with the phone number supplied by the HF



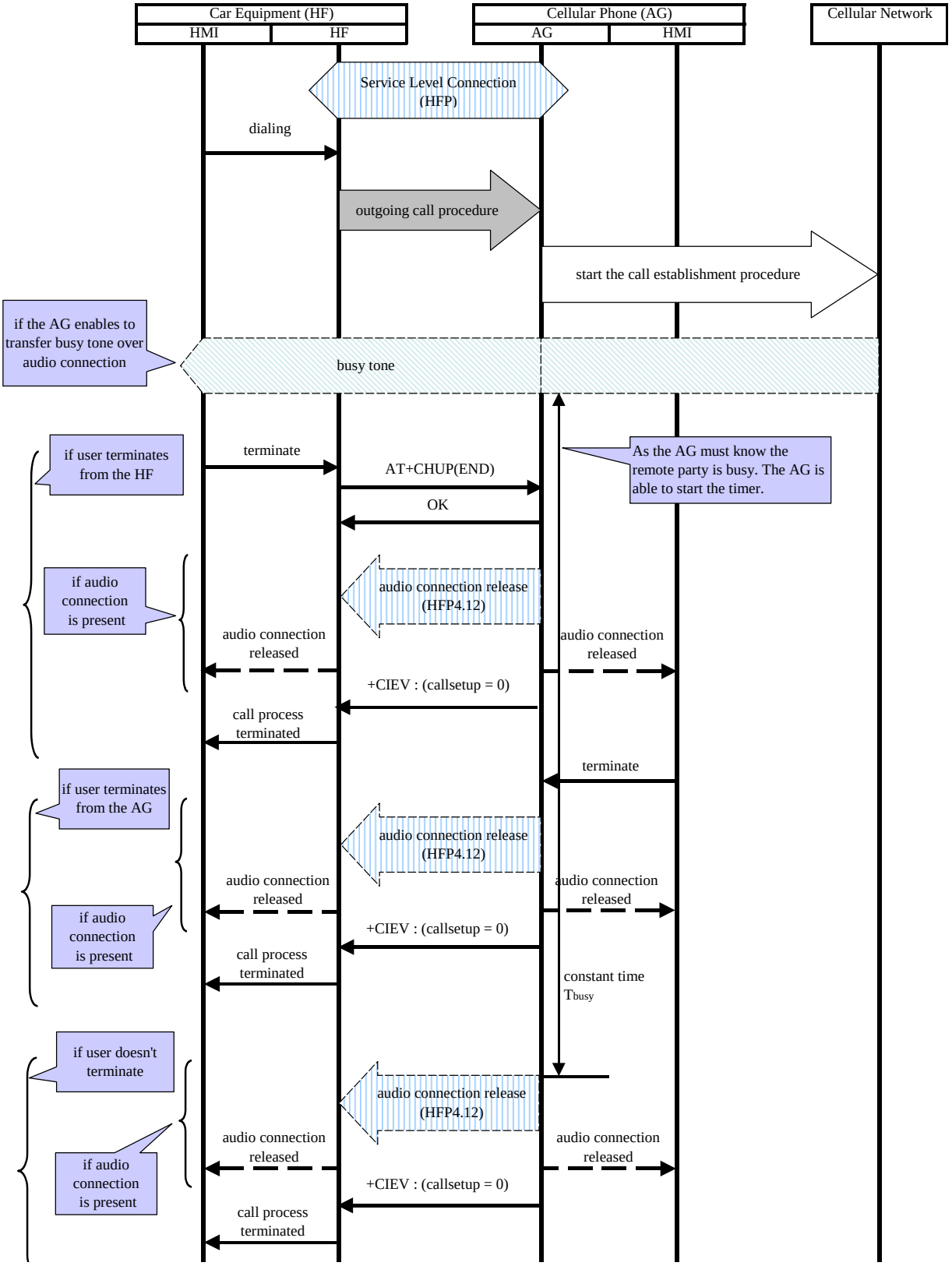
6.2.5.4 Placing a call initiated by the AG (Private Mode)



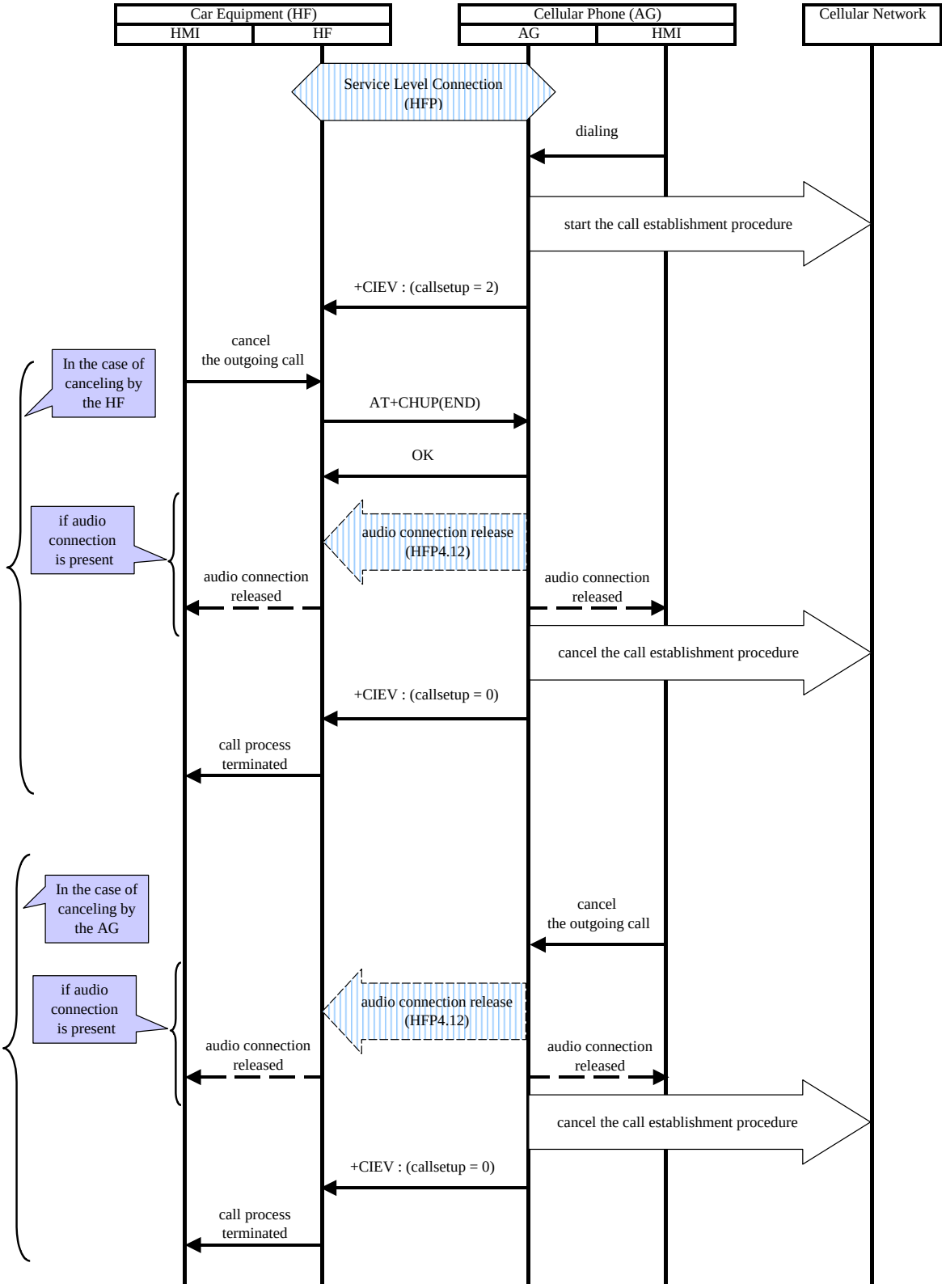
6.2.5.5 Placing a call initiated by the AG (Handsfree Mode)



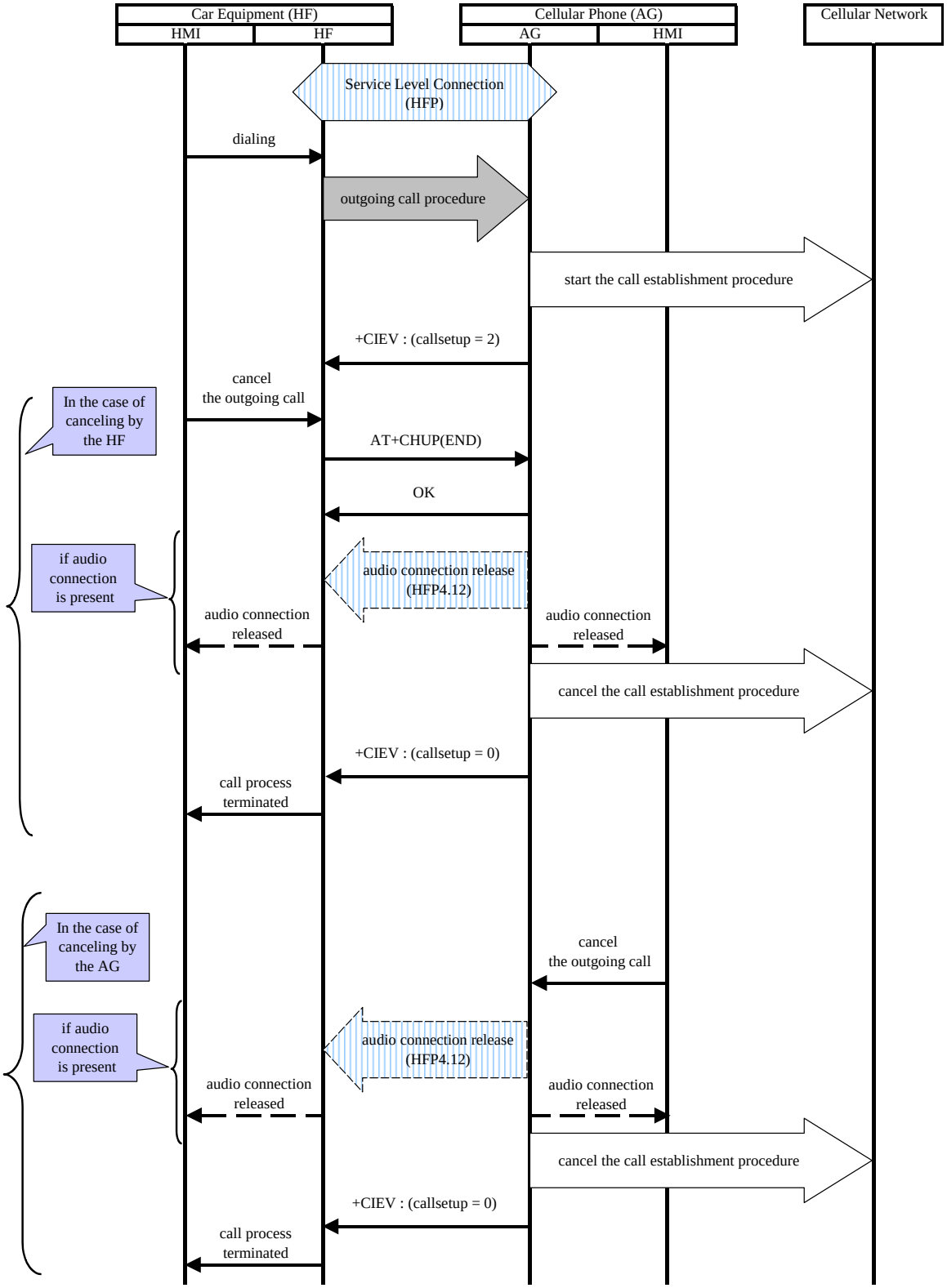
6.2.5.6 Outgoing call (Busy)



6.2.5.7 Outgoing call from the AG (Canceling the call)

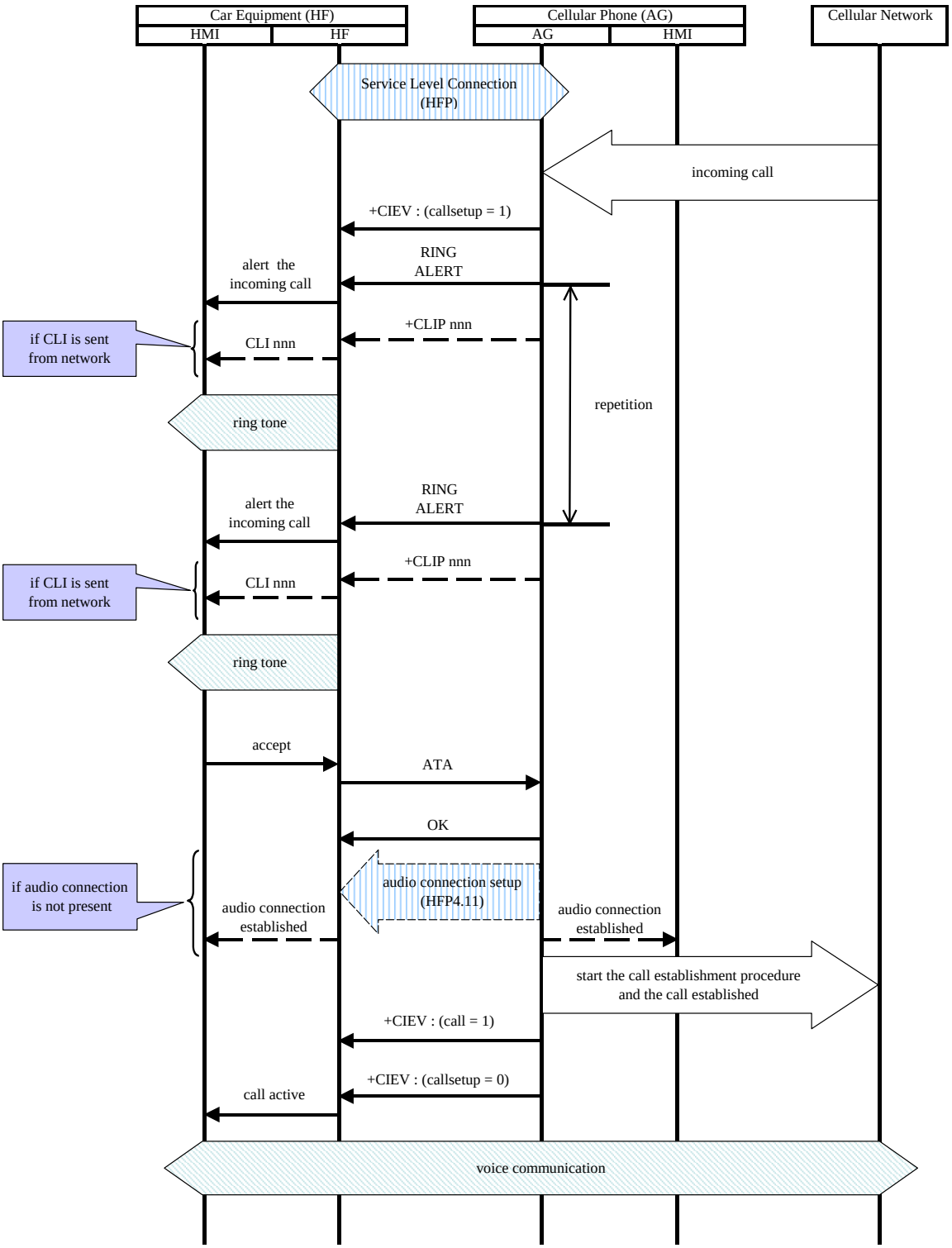


6.2.5.8 Outgoing call from the HF (Canceling the call)

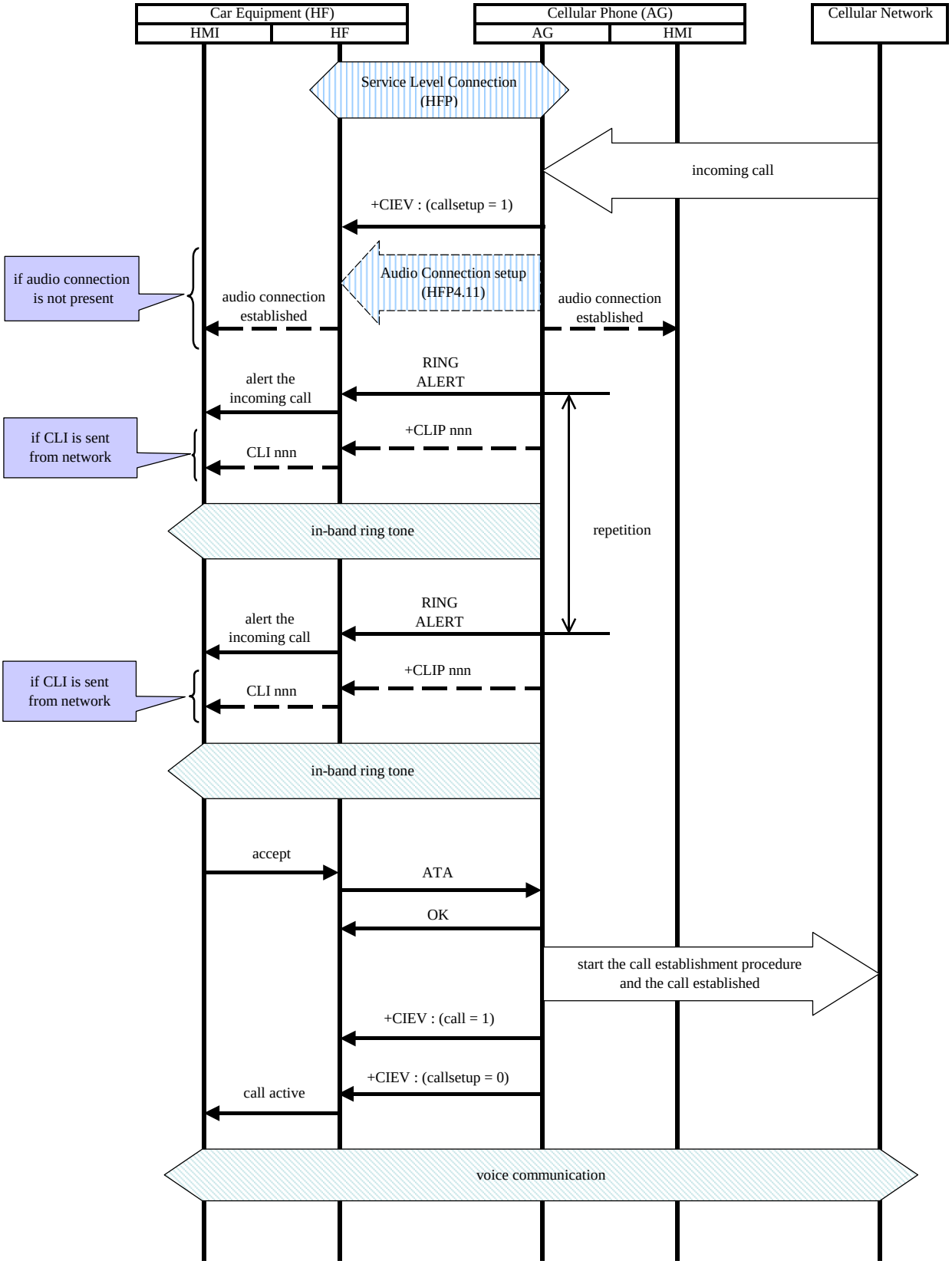


6.2.6 Incoming call

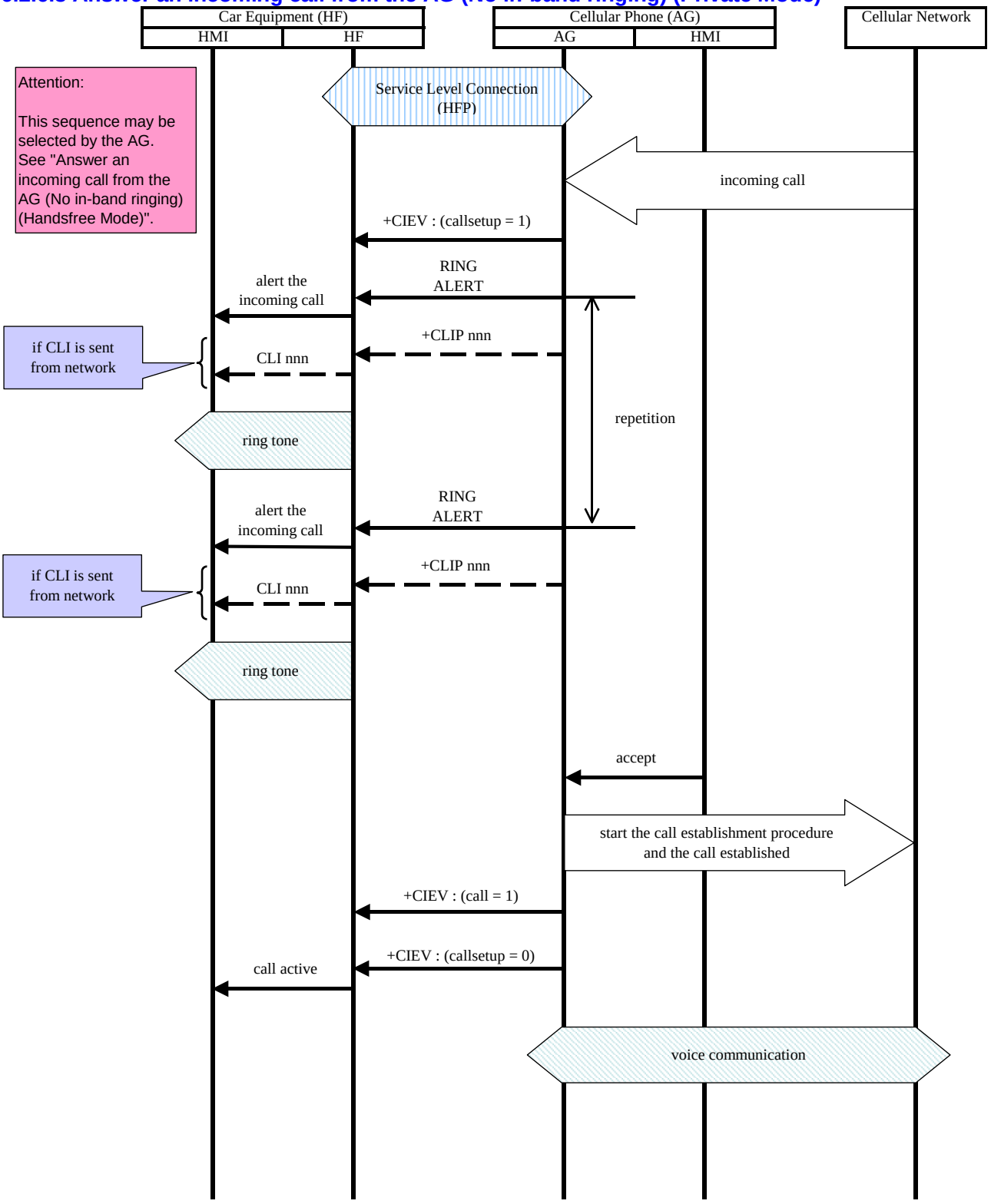
6.2.6.1 Answer an incoming call from the HF (No in-band ringing)



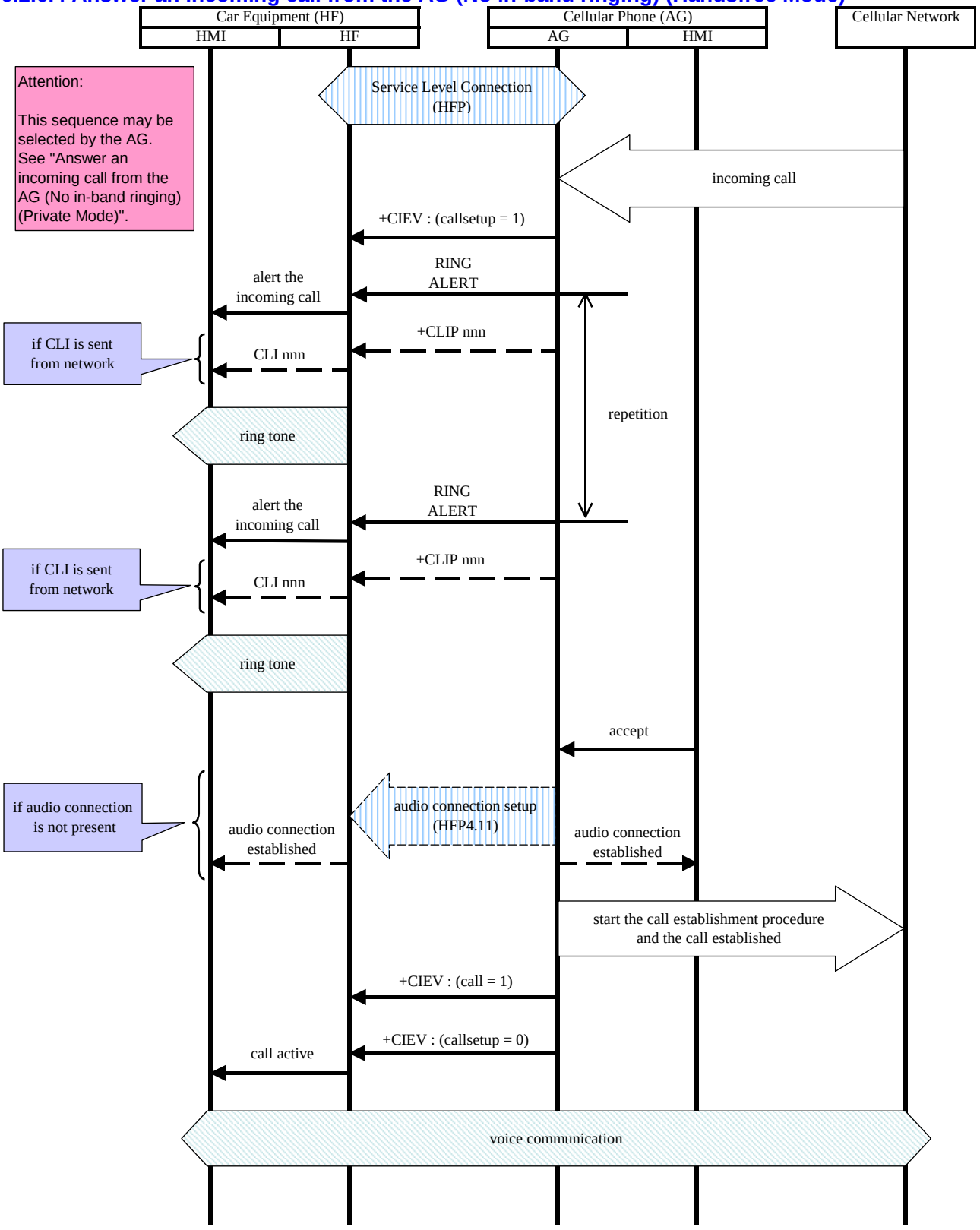
6.2.6.2 Answer an incoming call from the HF (In-band ringing)



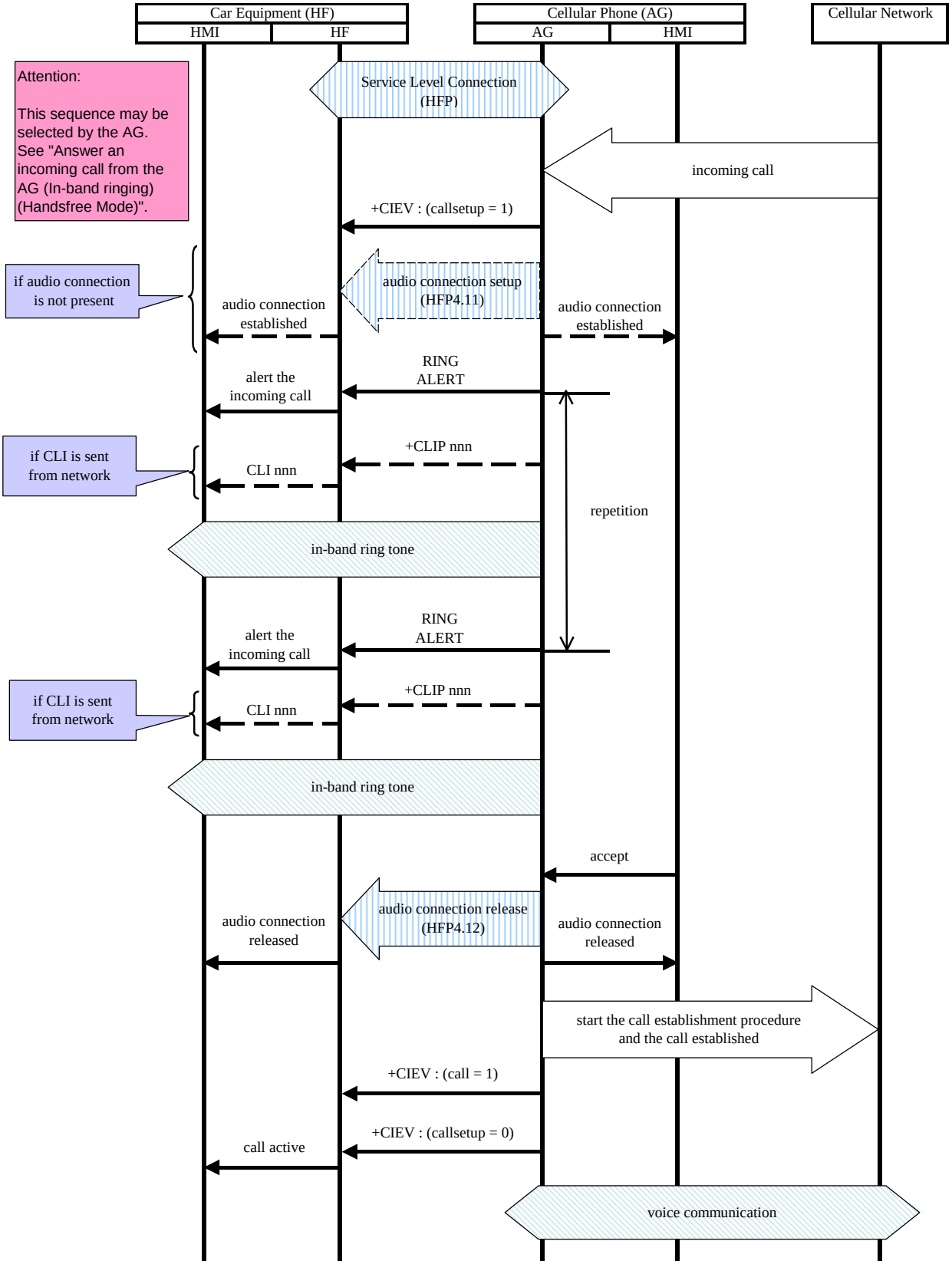
6.2.6.3 Answer an incoming call from the AG (No in-band ringing) (Private Mode)



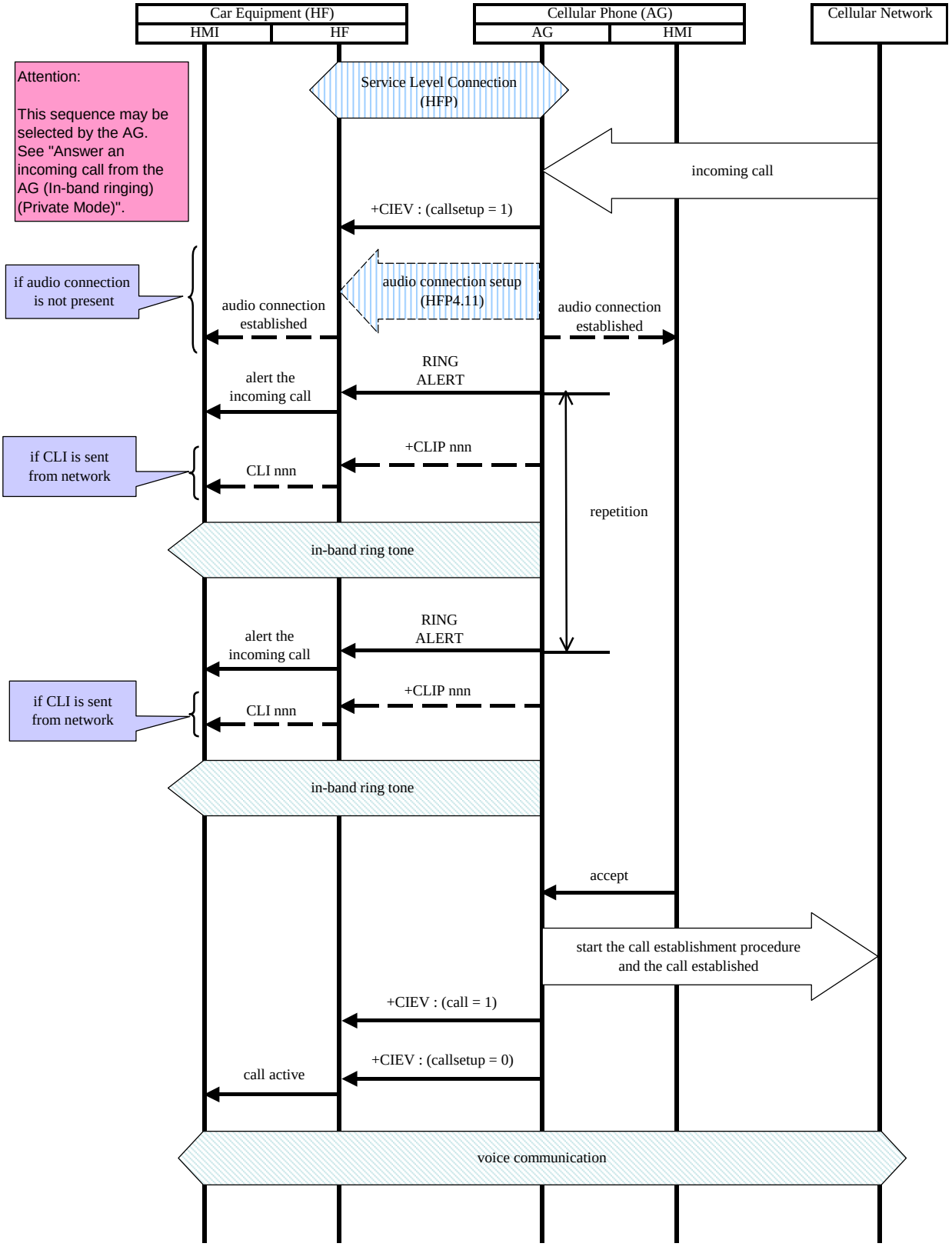
6.2.6.4 Answer an incoming call from the AG (No in-band ringing) (Handsfree Mode)



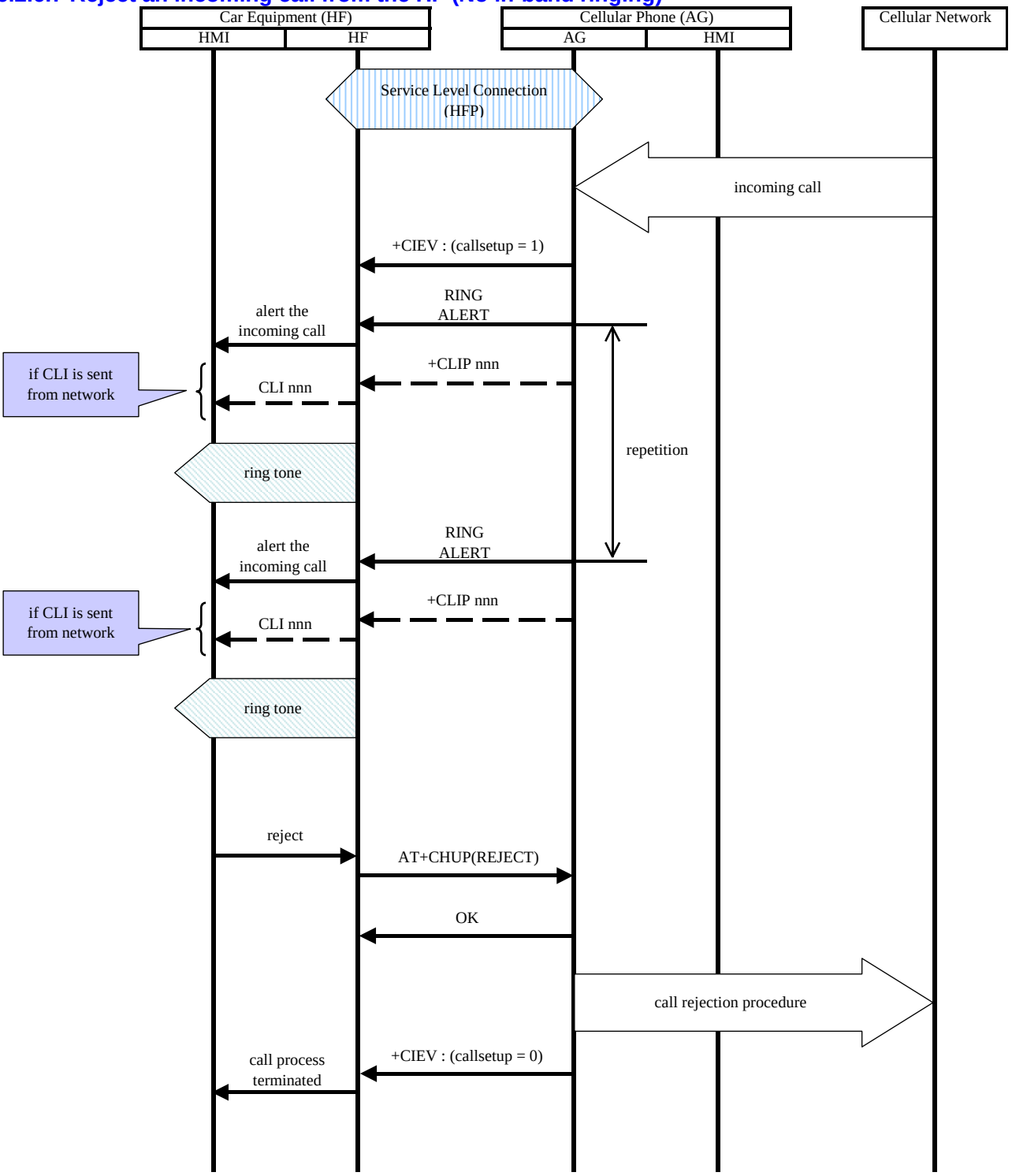
6.2.6.5 Answer an incoming call from the AG (In-band ringing) (Private Mode)



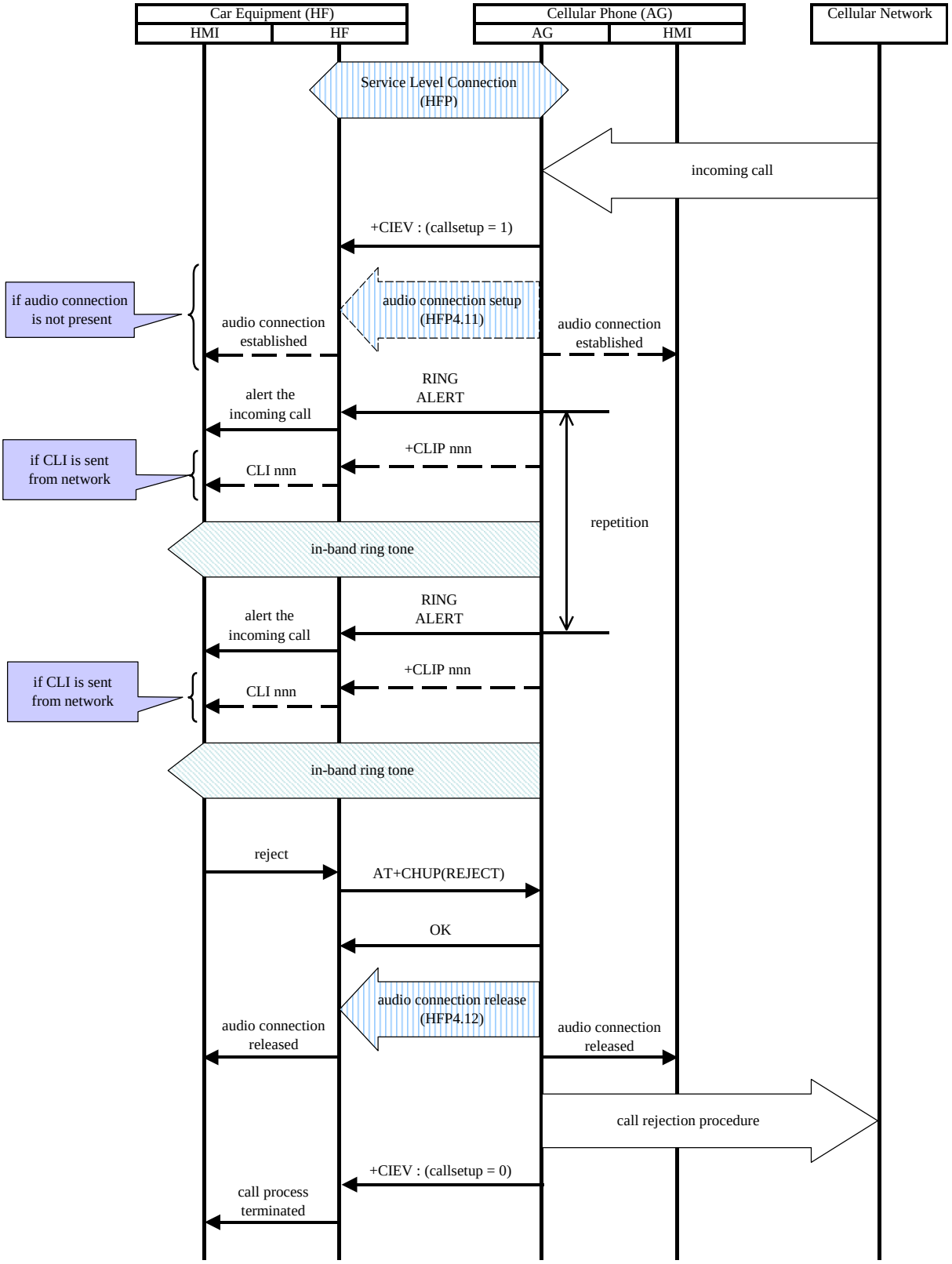
6.2.6.6 Answer an incoming call from the AG (In-band ringing) (Handsfree Mode)



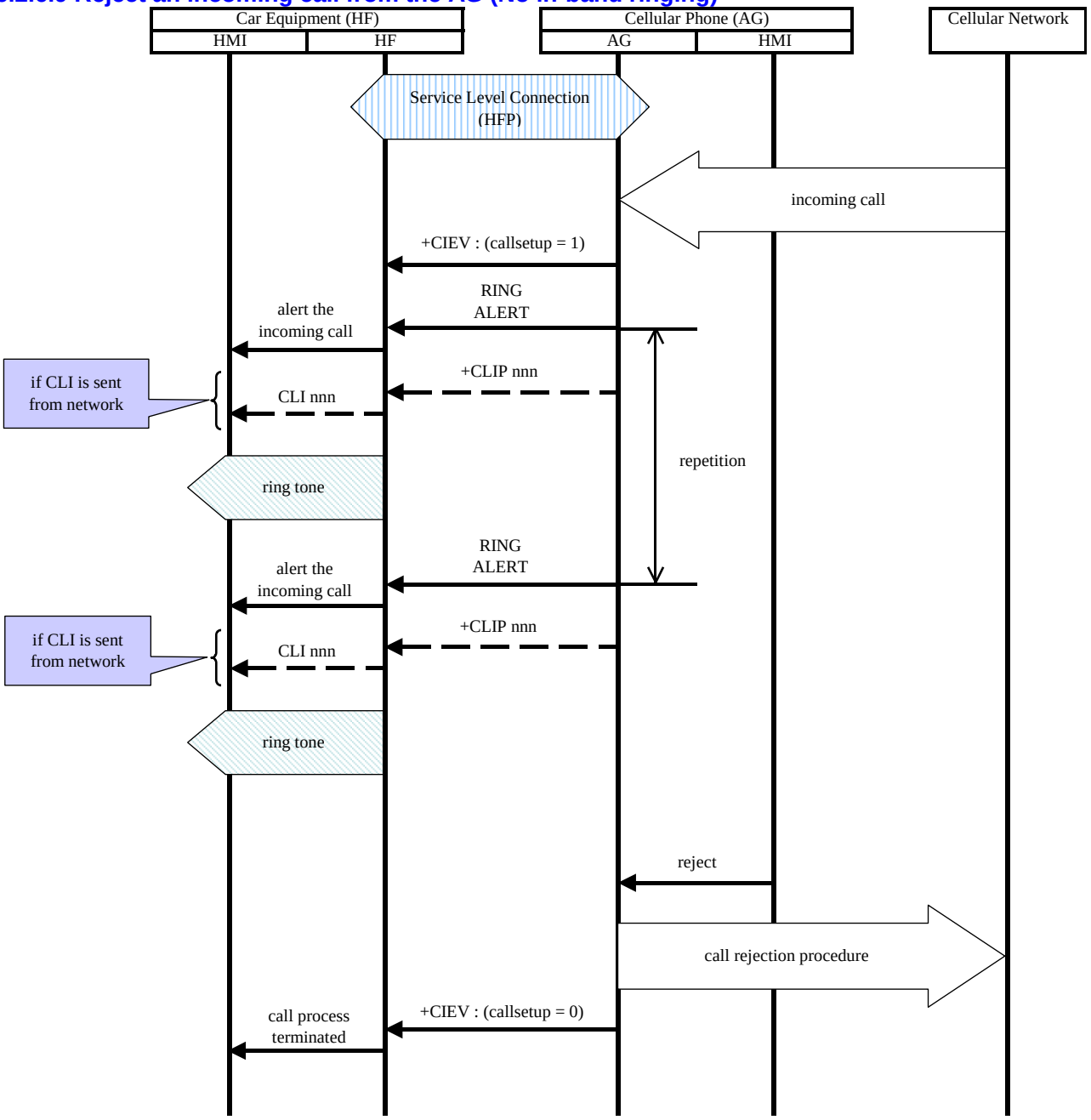
6.2.6.7 Reject an incoming call from the HF (No in-band ringing)



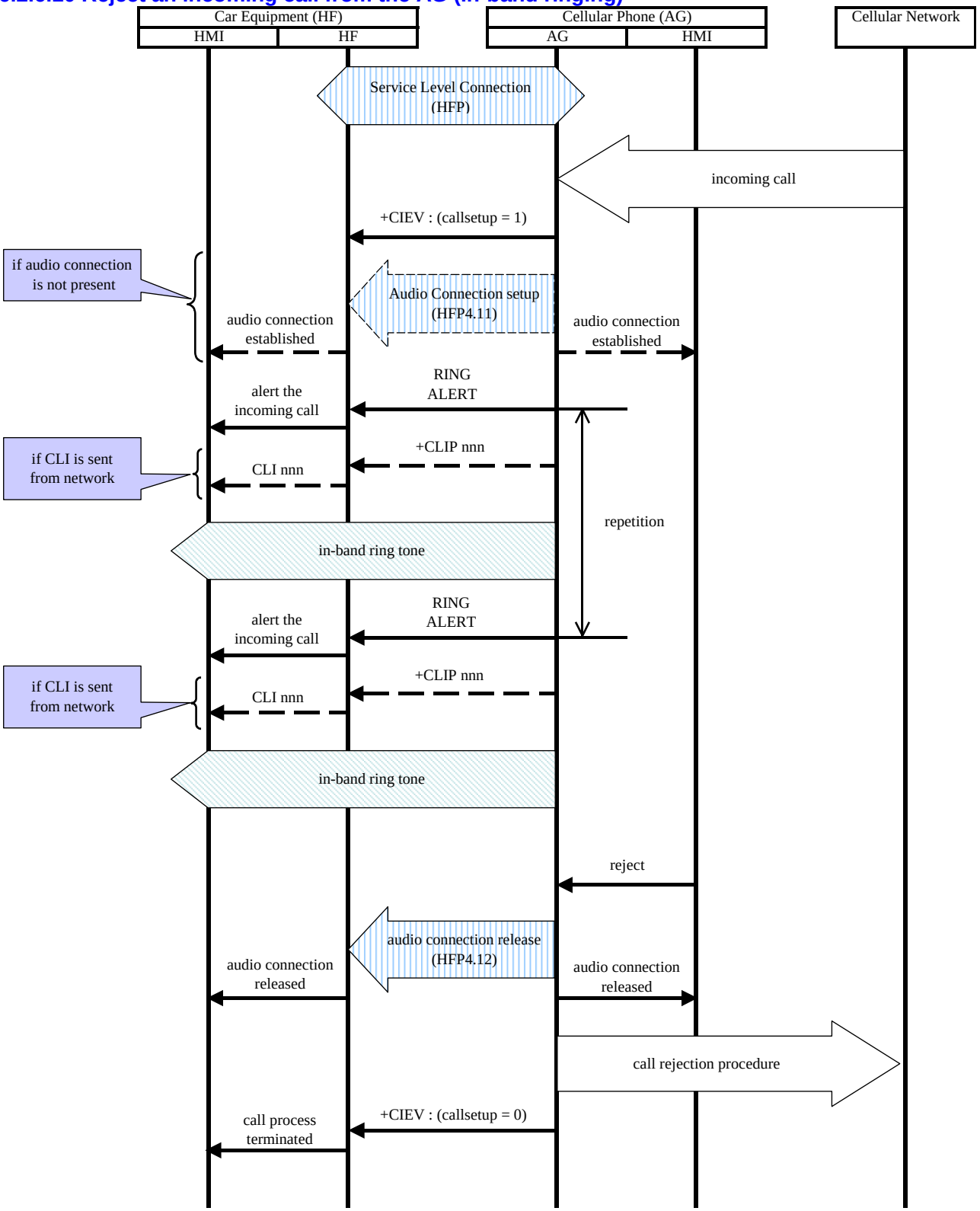
6.2.6.8 Reject an incoming call from the HF (In-band ringing)



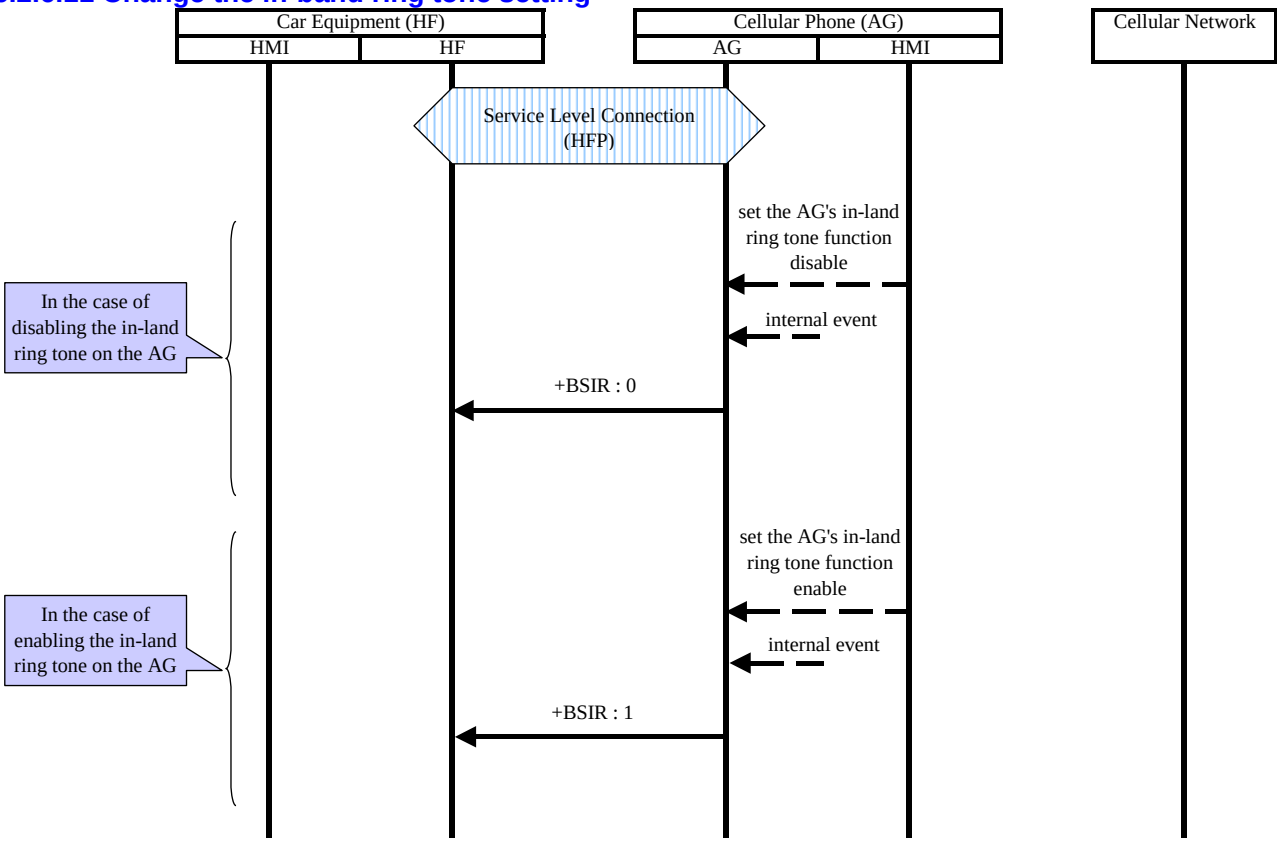
6.2.6.9 Reject an incoming call from the AG (No in-band ringing)



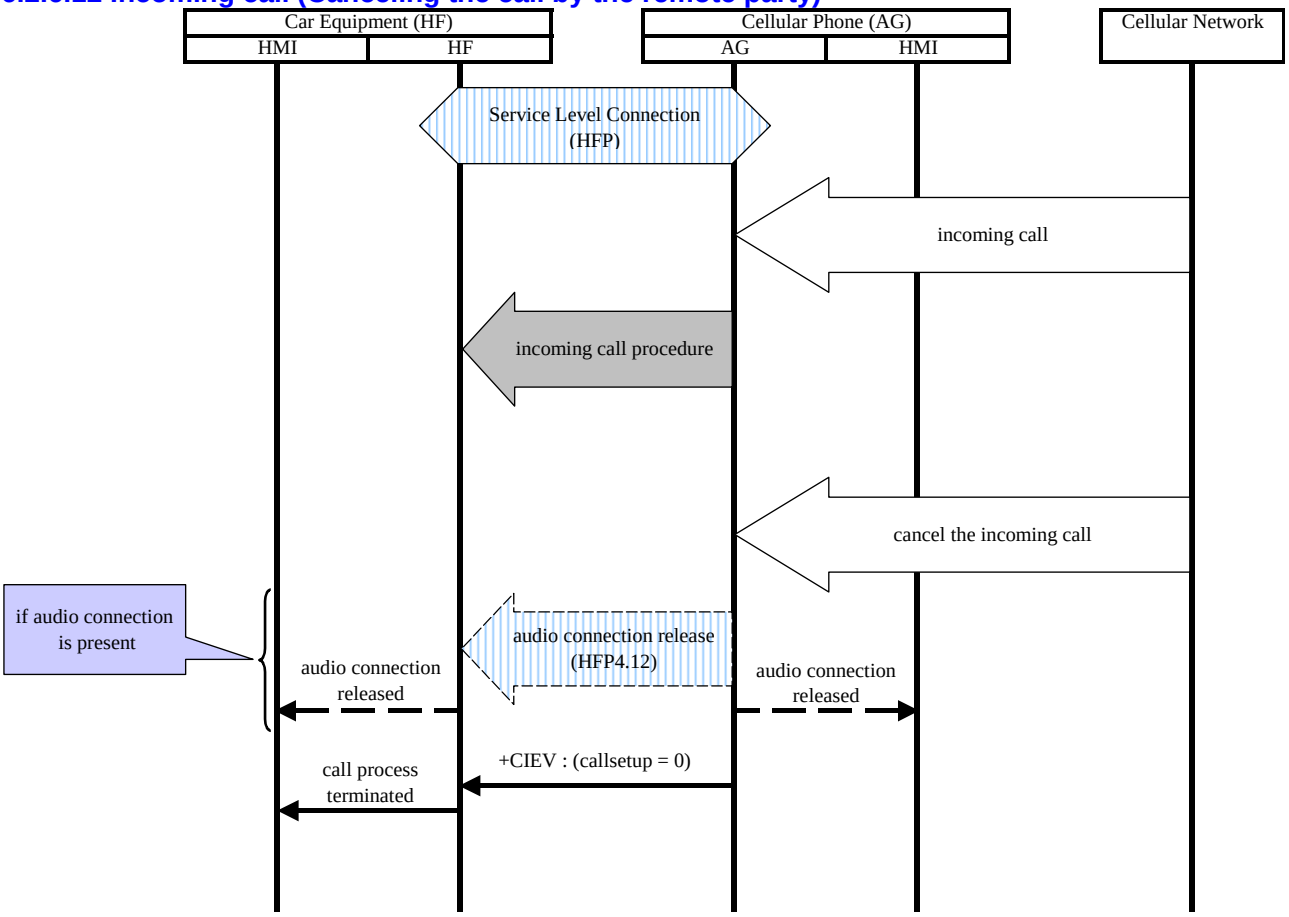
6.2.6.10 Reject an incoming call from the AG (In-band ringing)



6.2.6.11 Change the in-band ring tone setting

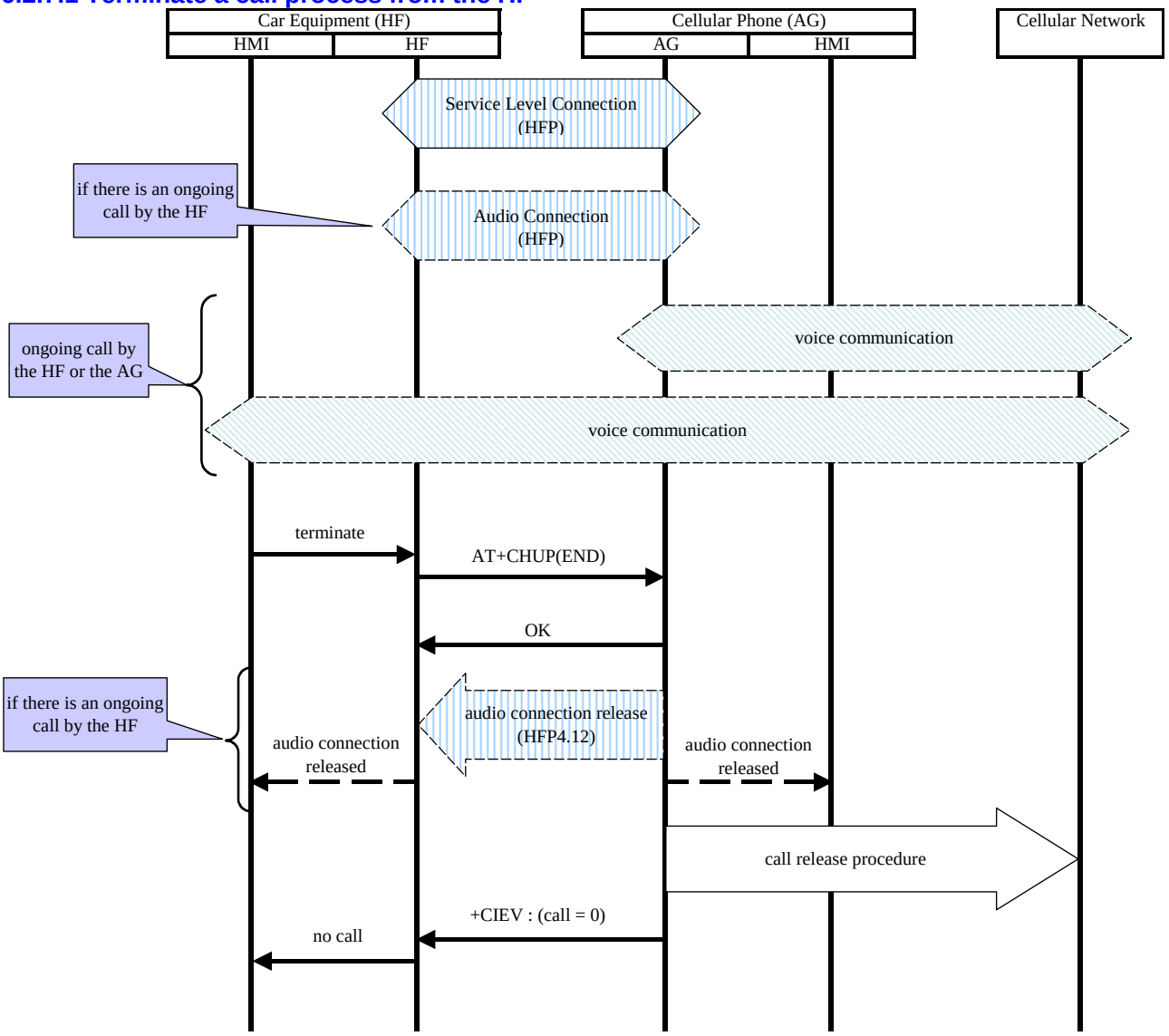


6.2.6.12 Incoming call (Canceling the call by the remote party)

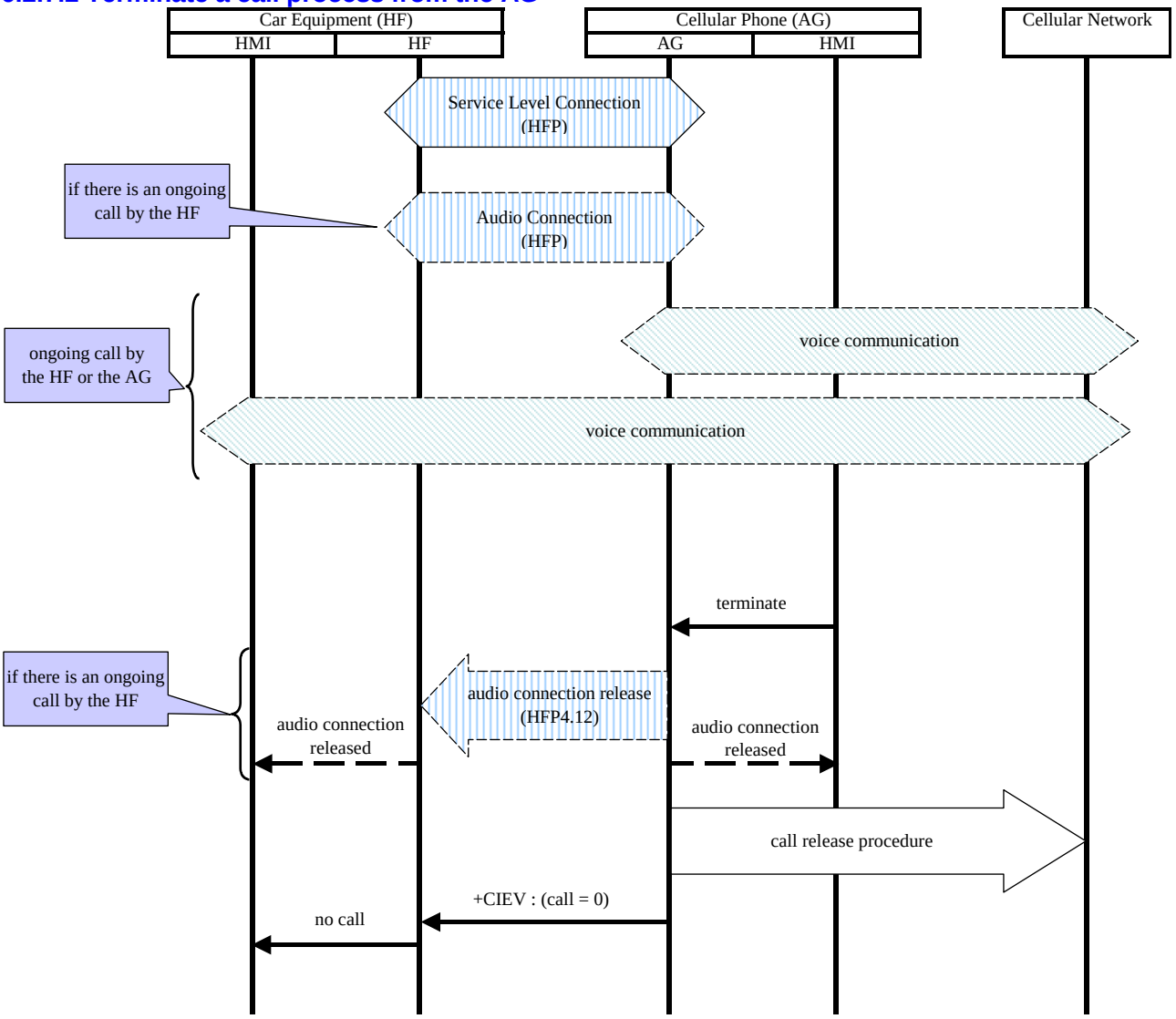


6.2.7 Terminate a call process

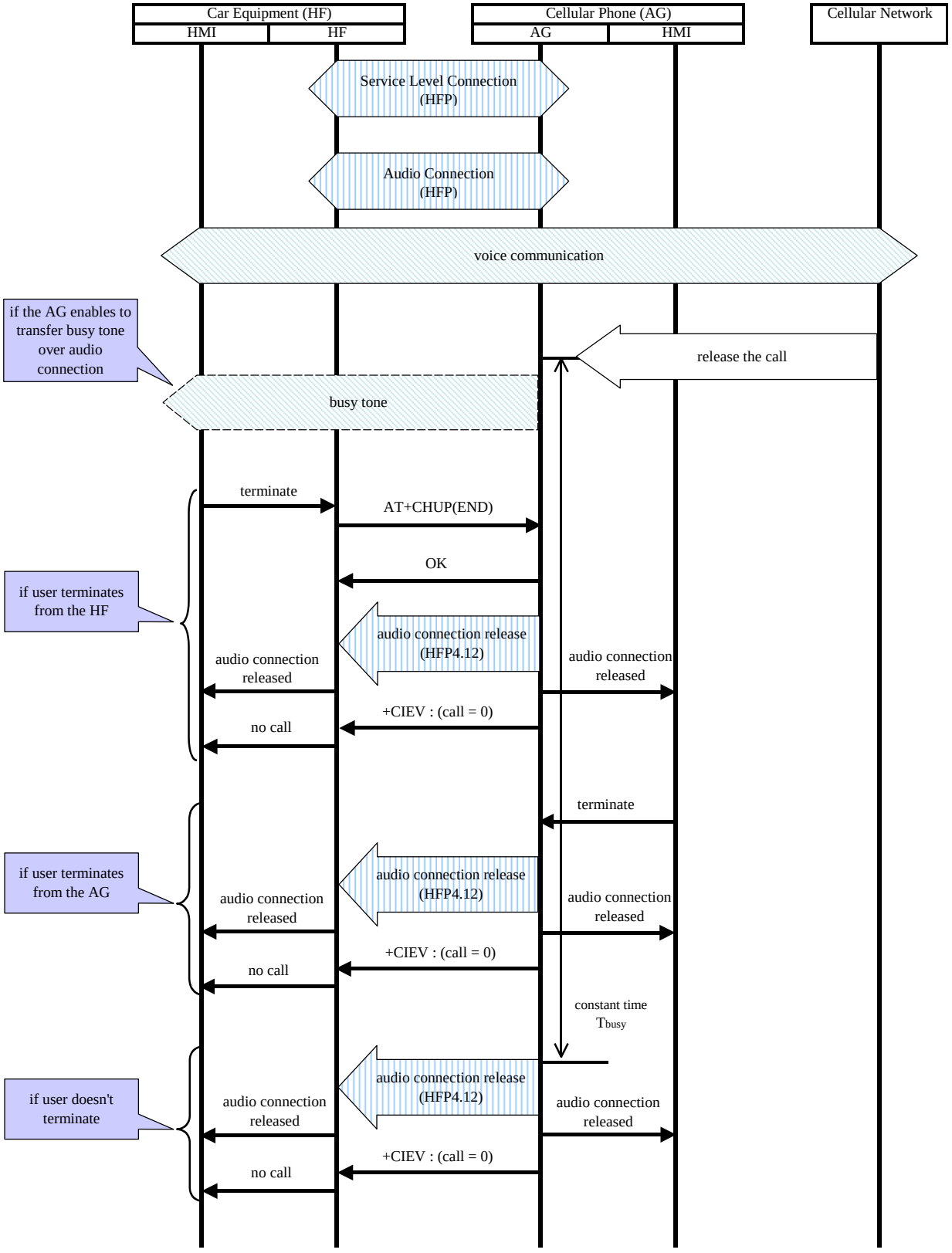
6.2.7.1 Terminate a call process from the HF



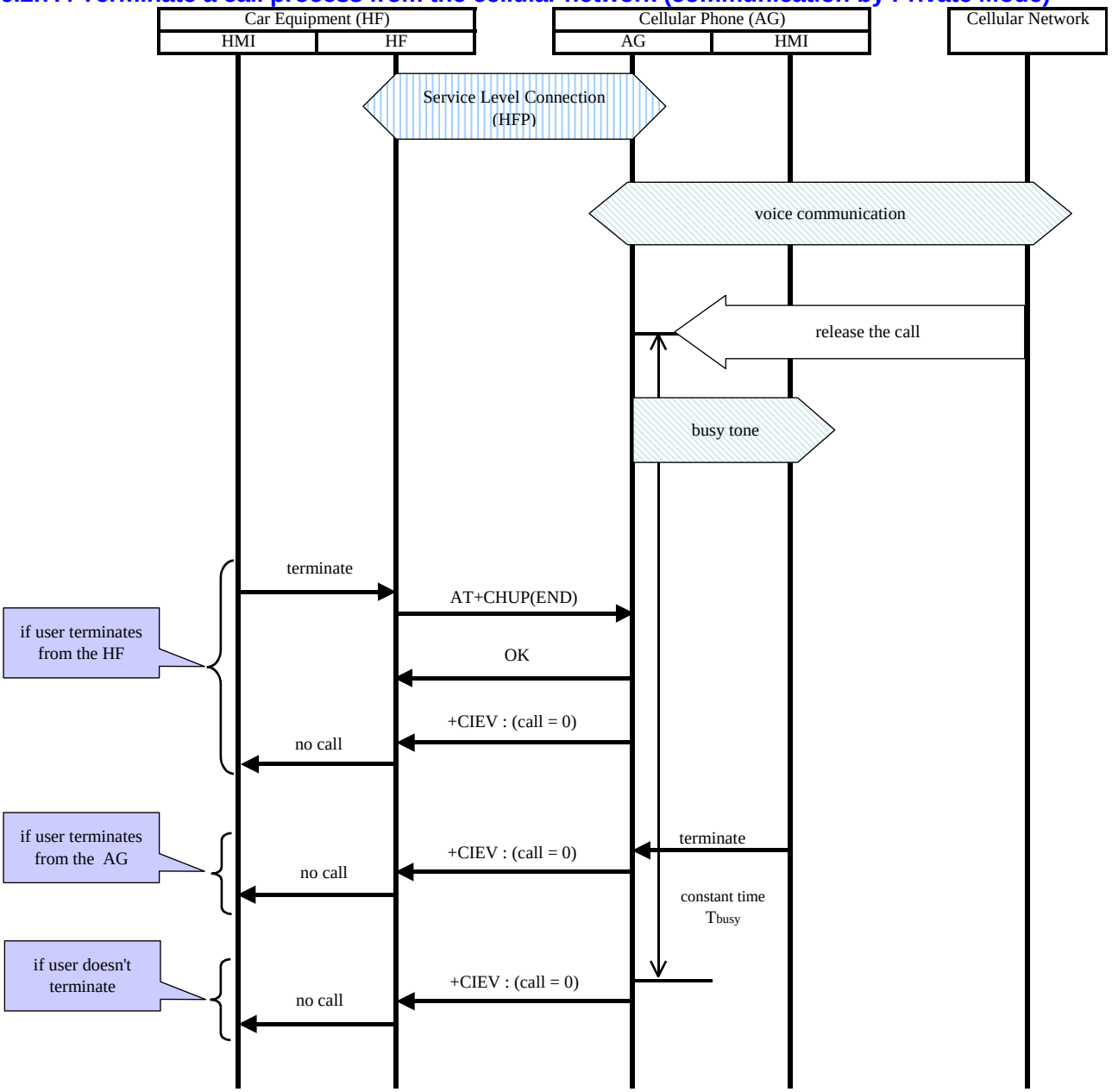
6.2.7.2 Terminate a call process from the AG



6.2.7.3 Terminate a call process from the cellular network

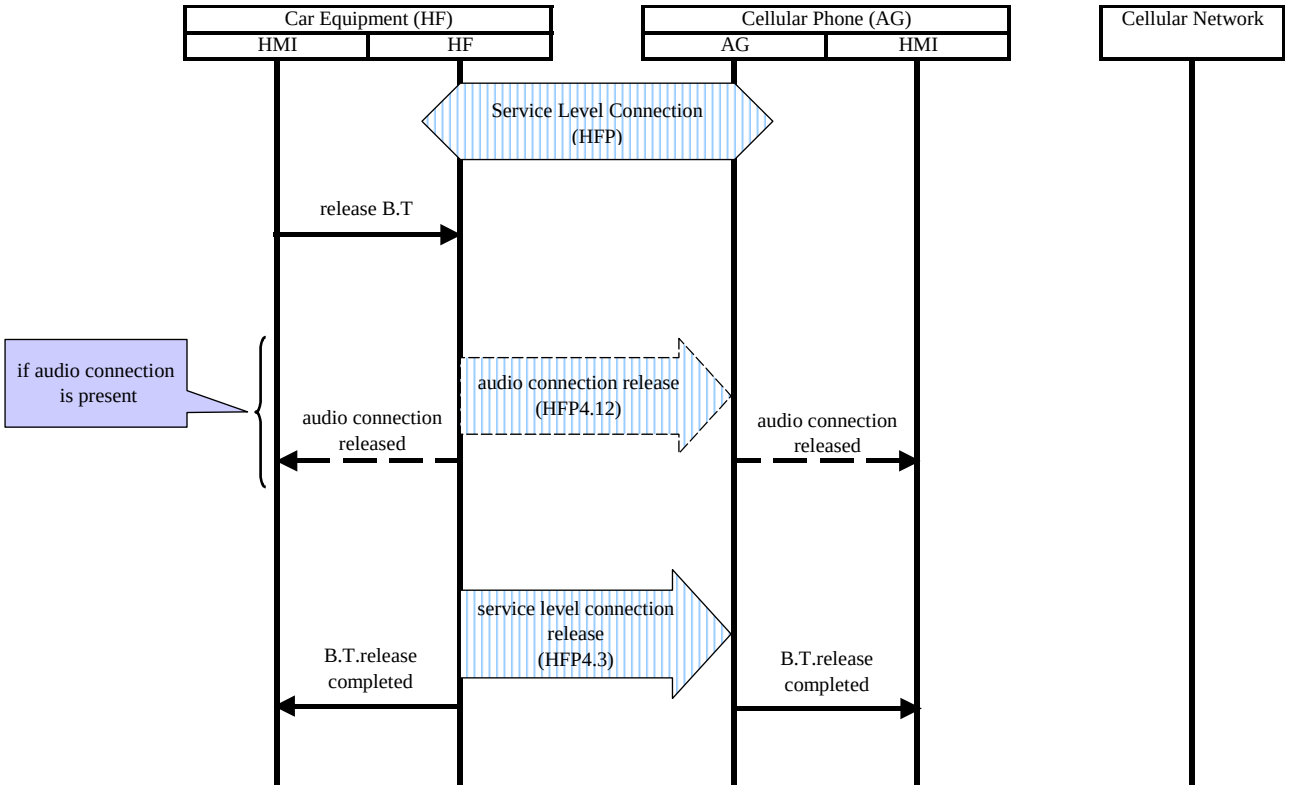


6.2.7.4 Terminate a call process from the cellular network (communication by Private Mode)

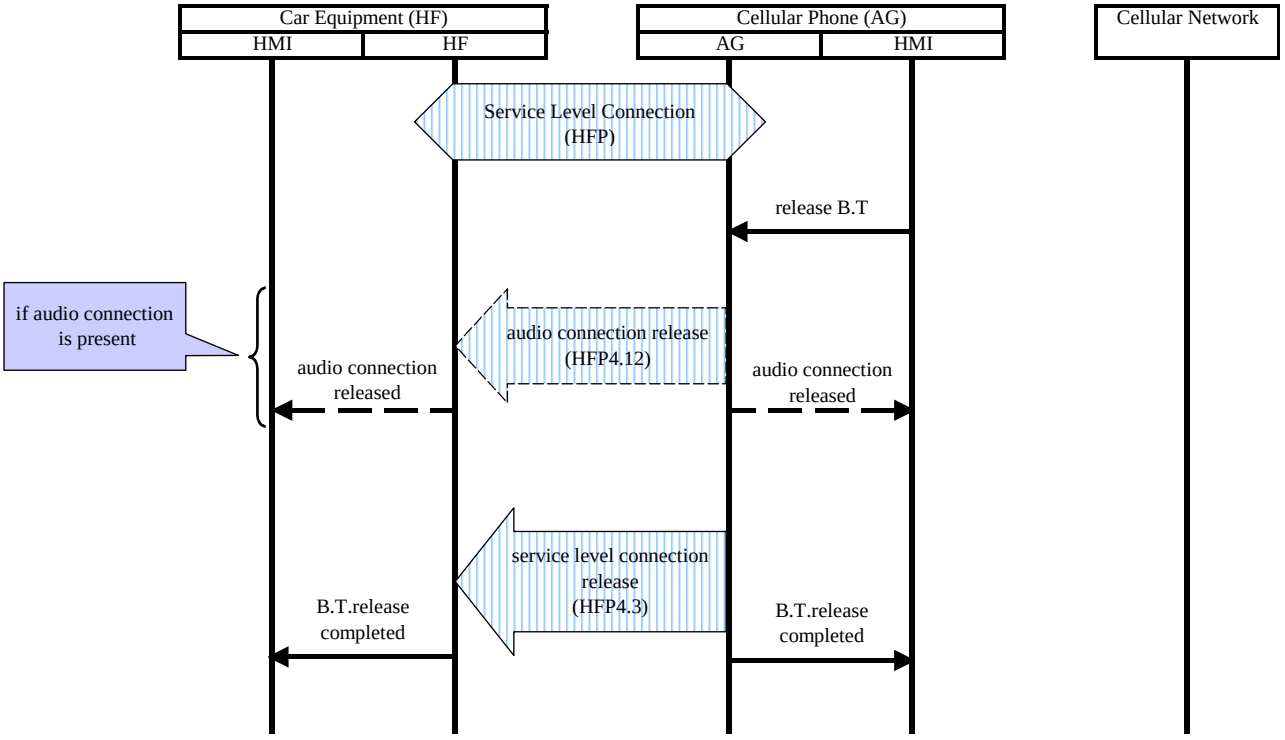


6.2.8 Connection release

6.2.8.1 Connection release from the HF

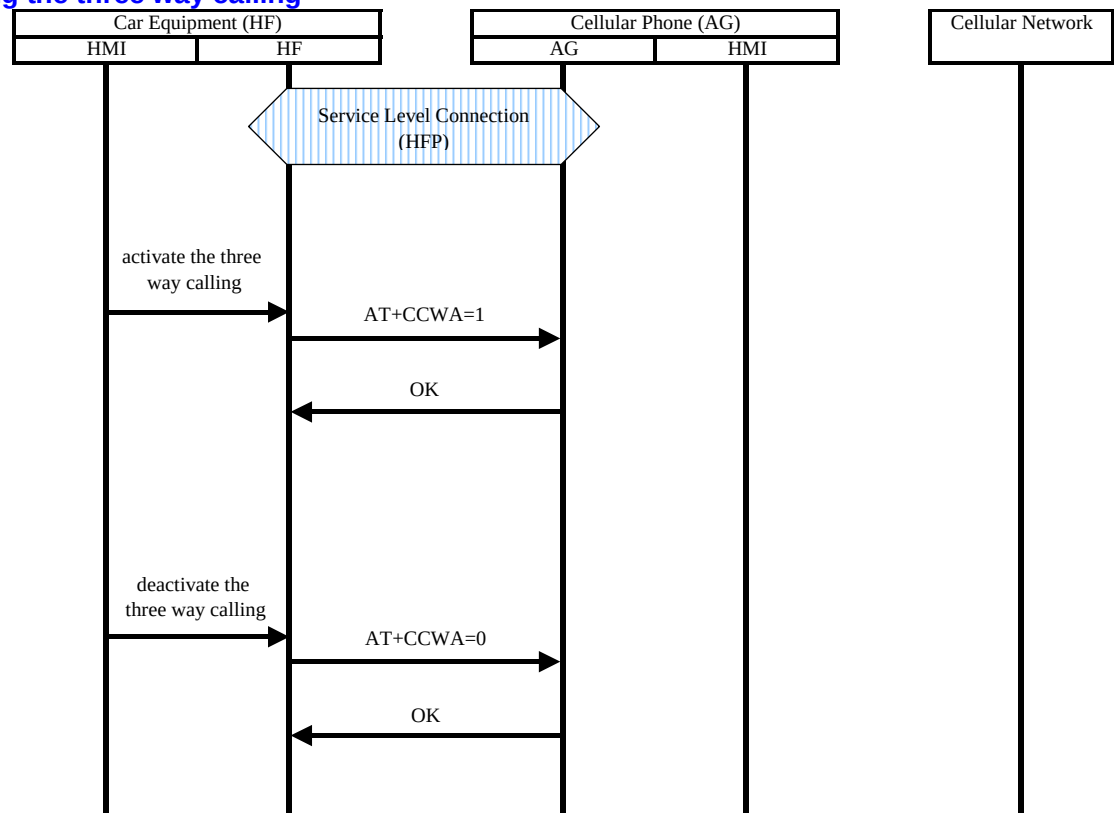


6.2.8.2 Connection release from the AG

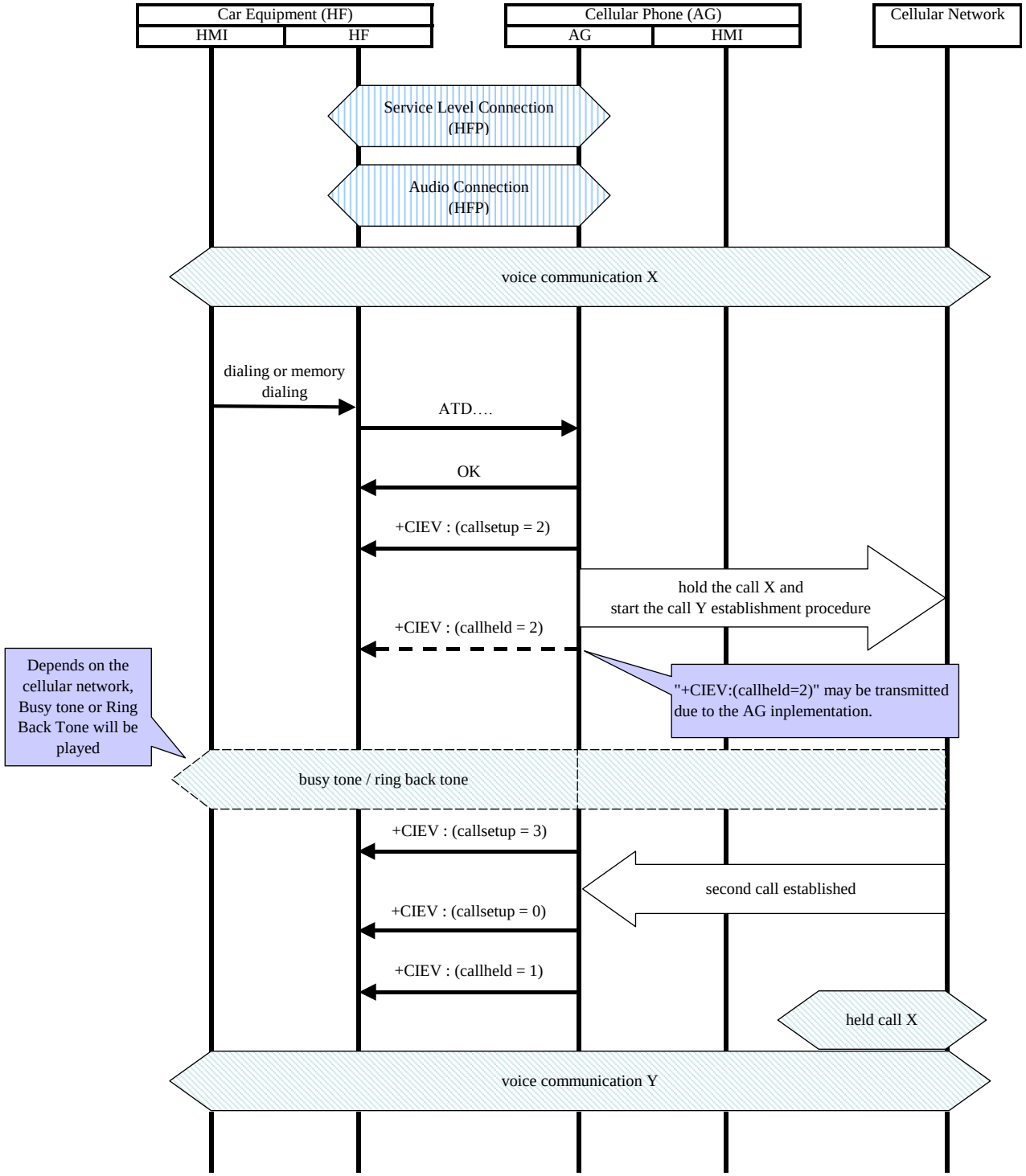


6.2.9 Three way calling

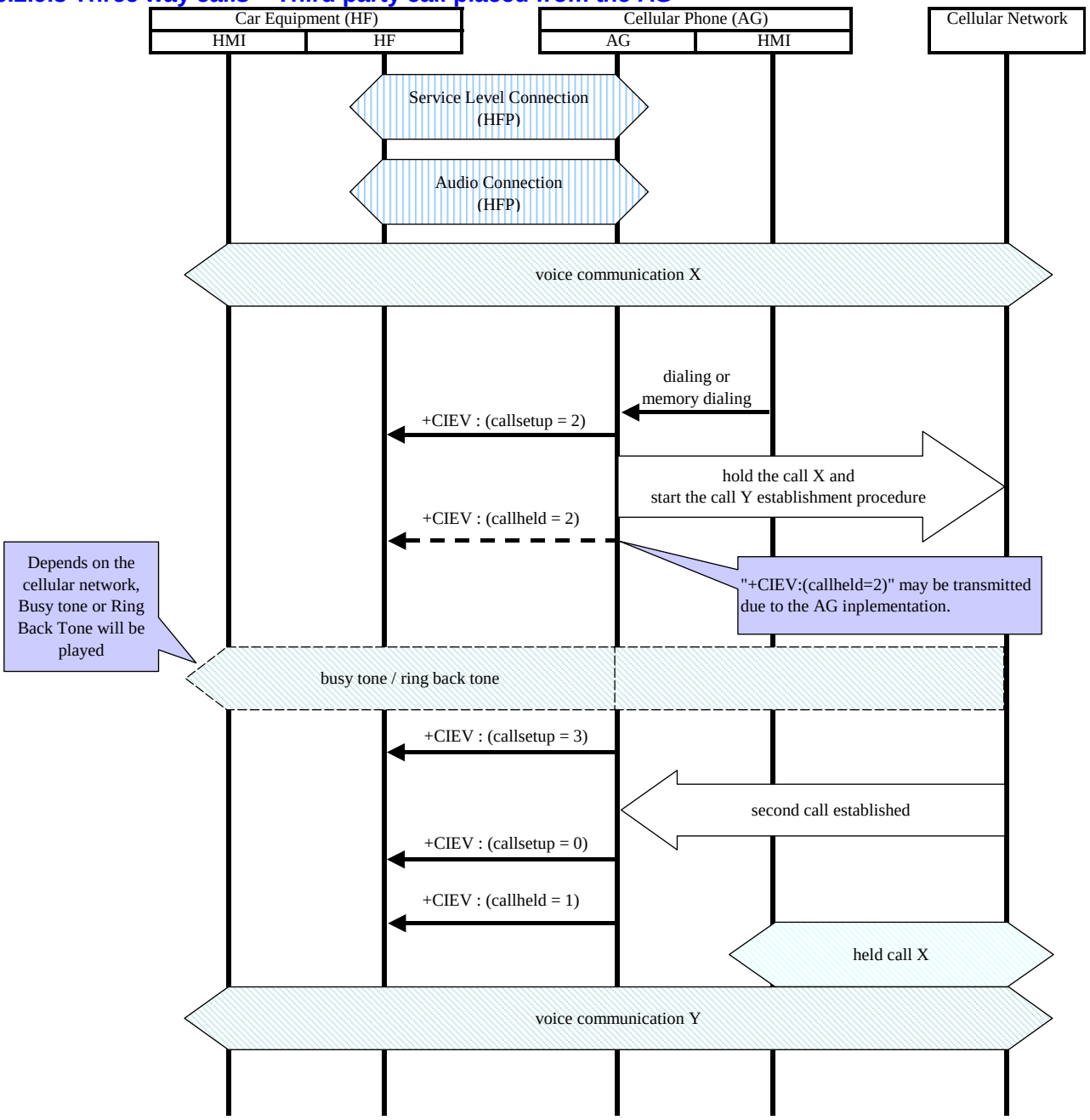
6.2.9.1 Setting the three way calling



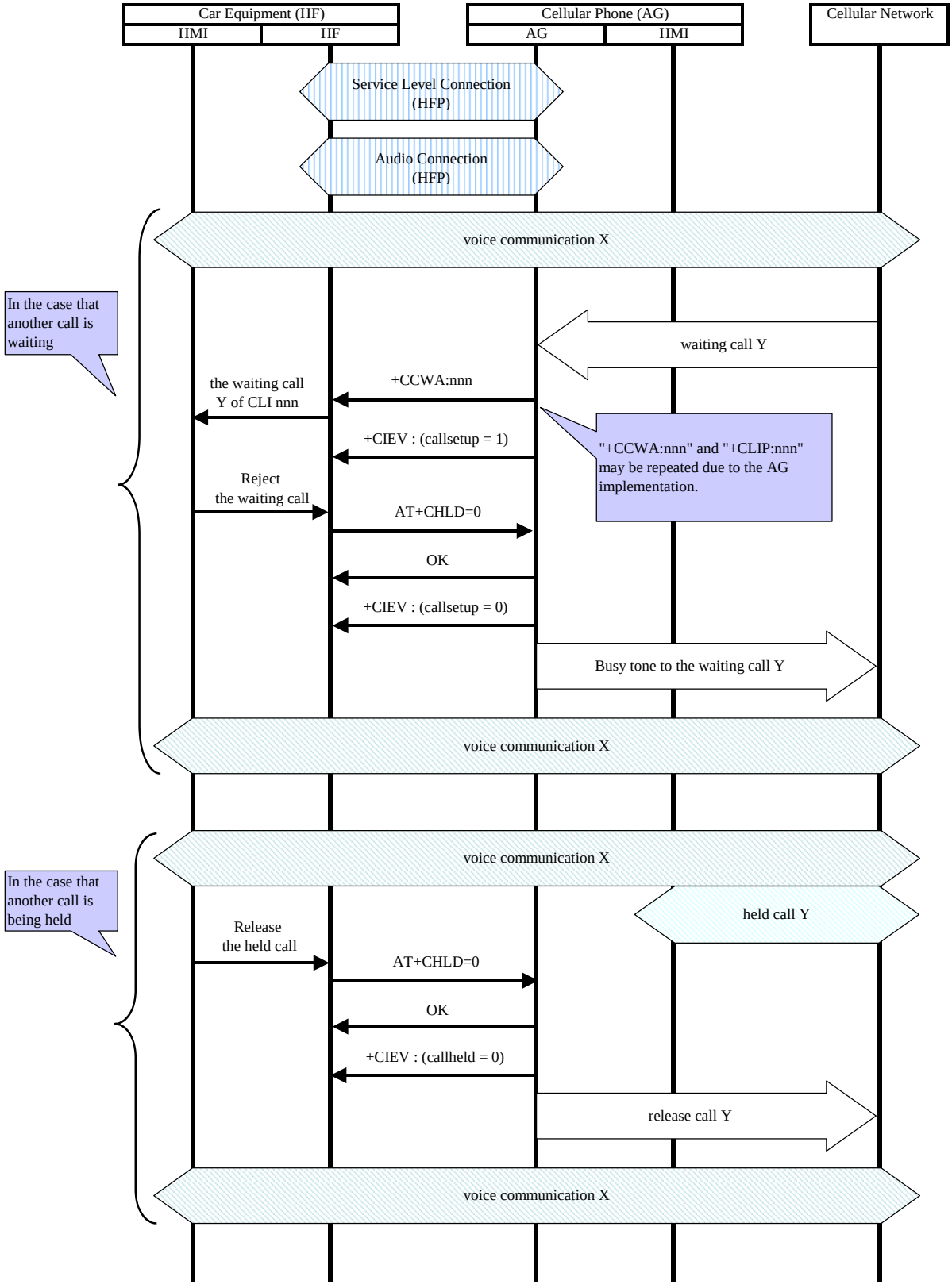
6.2.9.2 Three way calls – Third party call placed from the HF



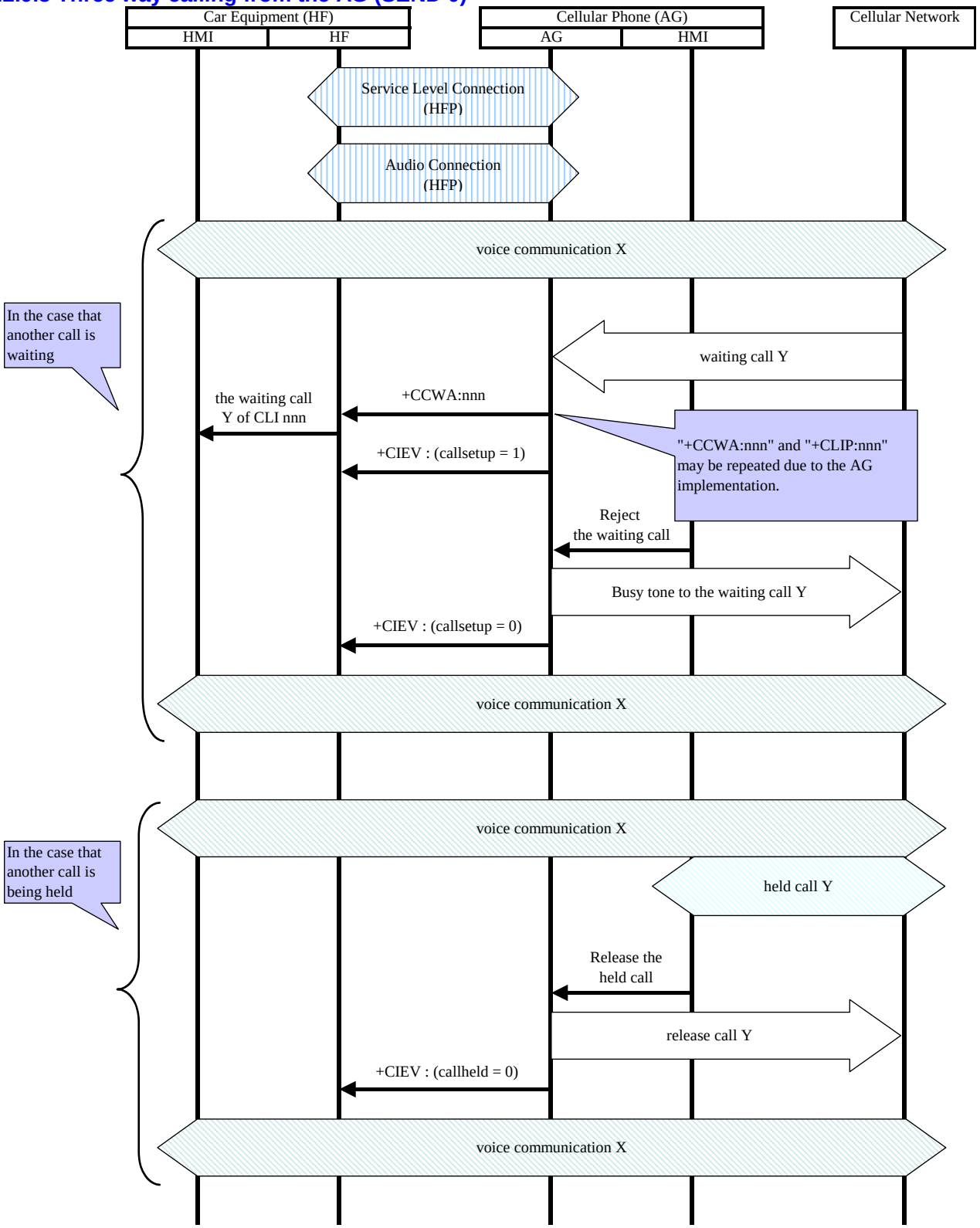
6.2.9.3 Three way calls – Third party call placed from the AG



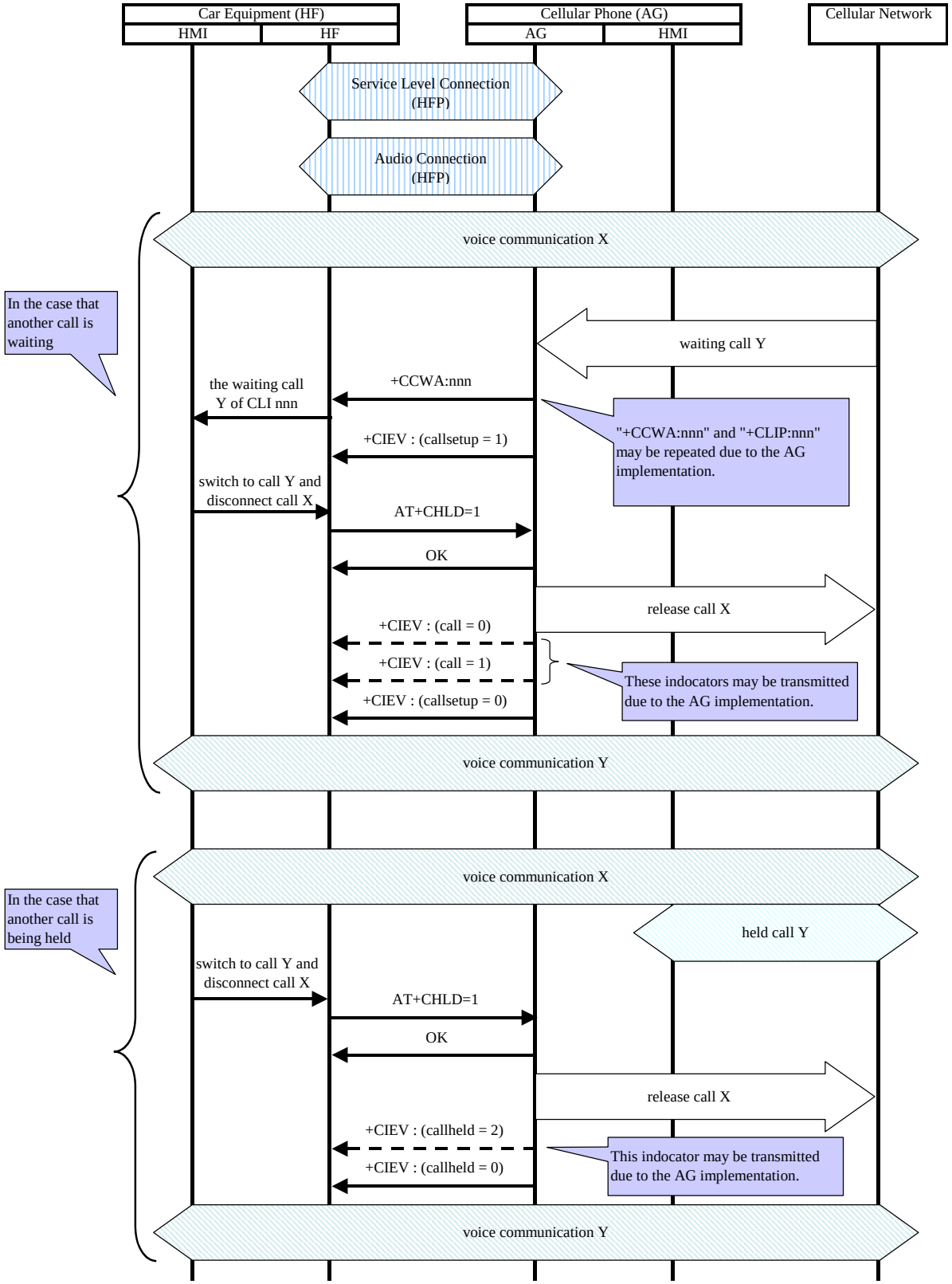
6.2.9.4 Three way calling from the HF (SEND 0)



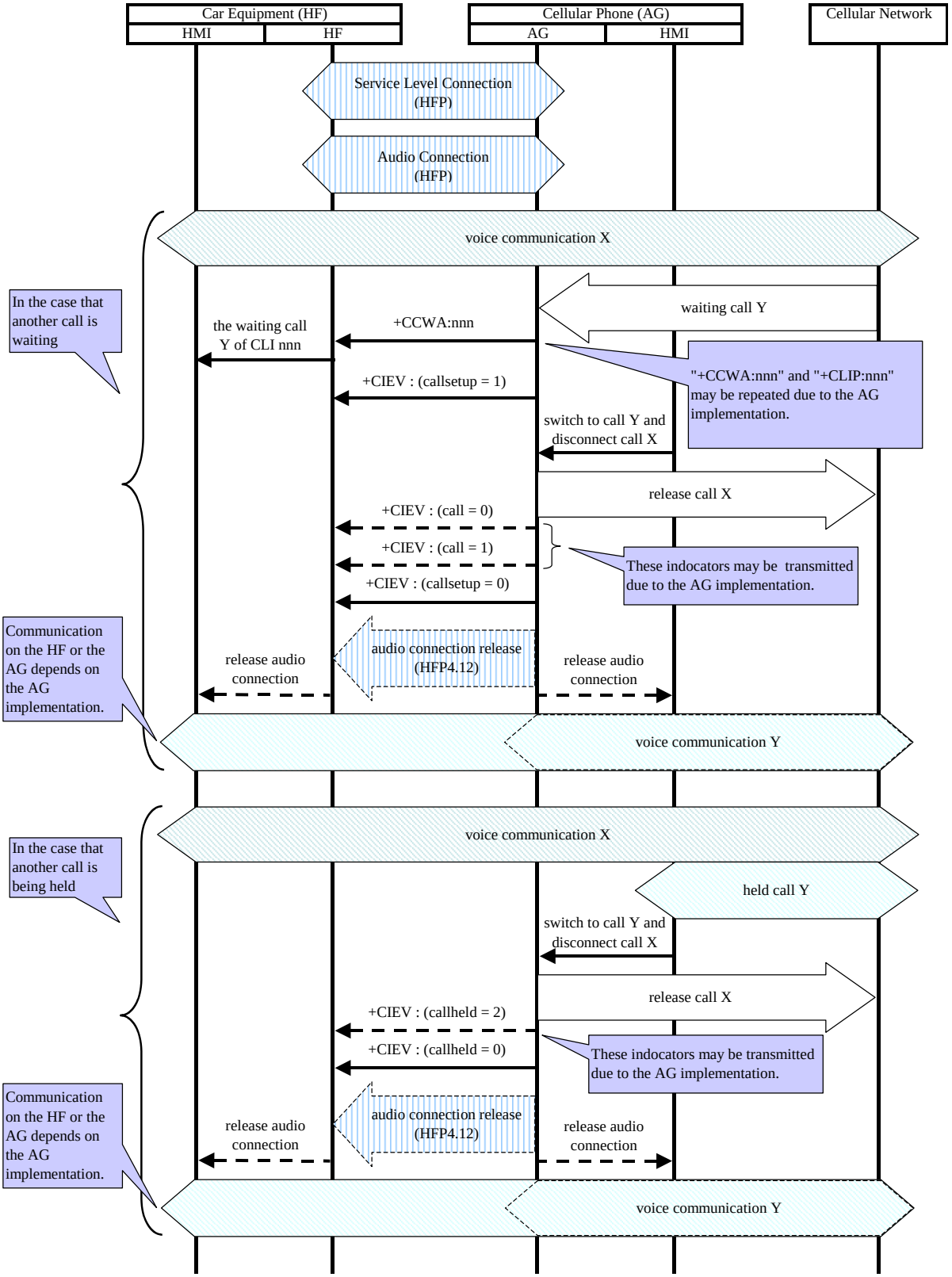
6.2.9.5 Three way calling from the AG (SEND 0)



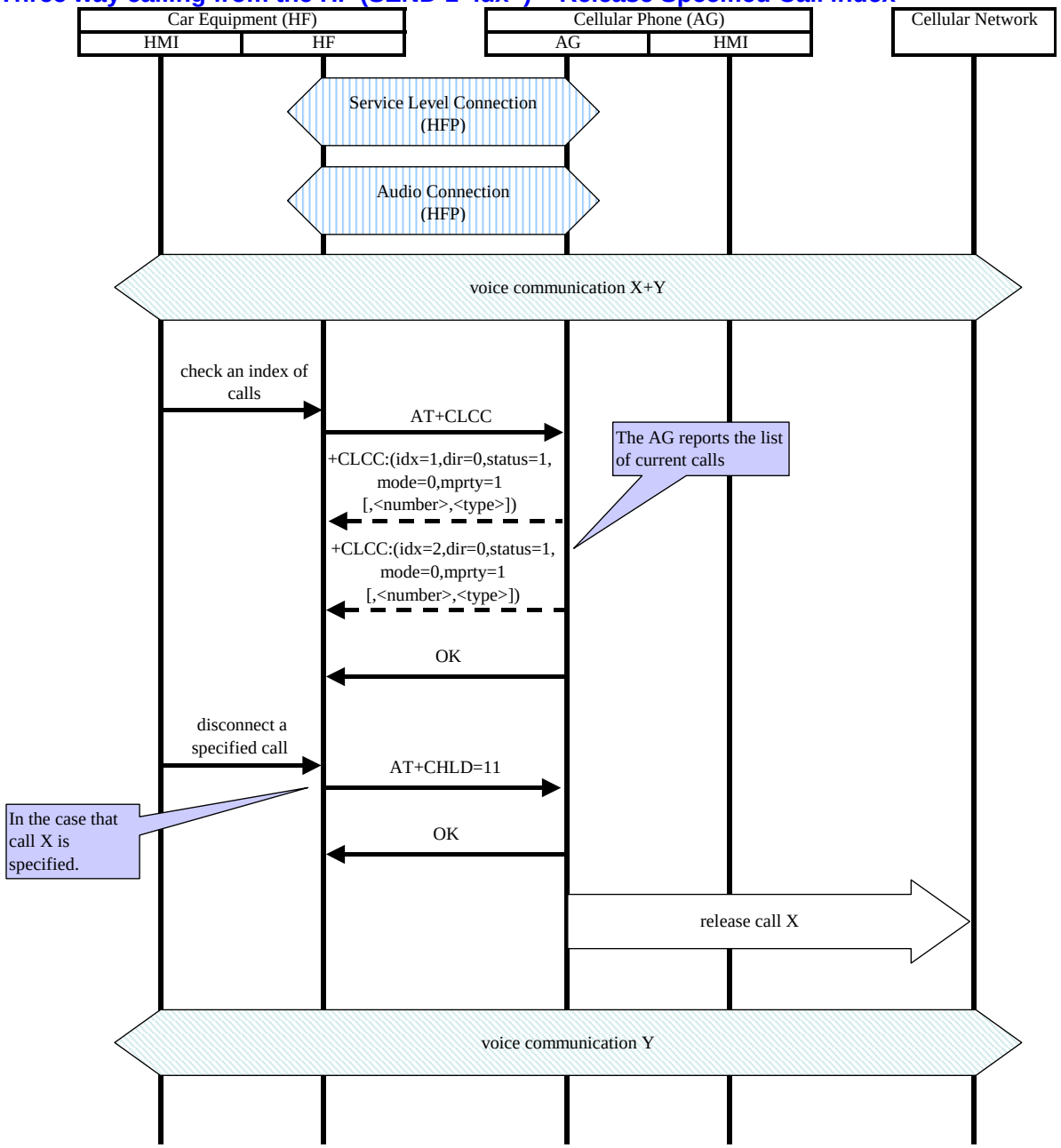
6.2.9.6 Three way calling from the HF (SEND 1)



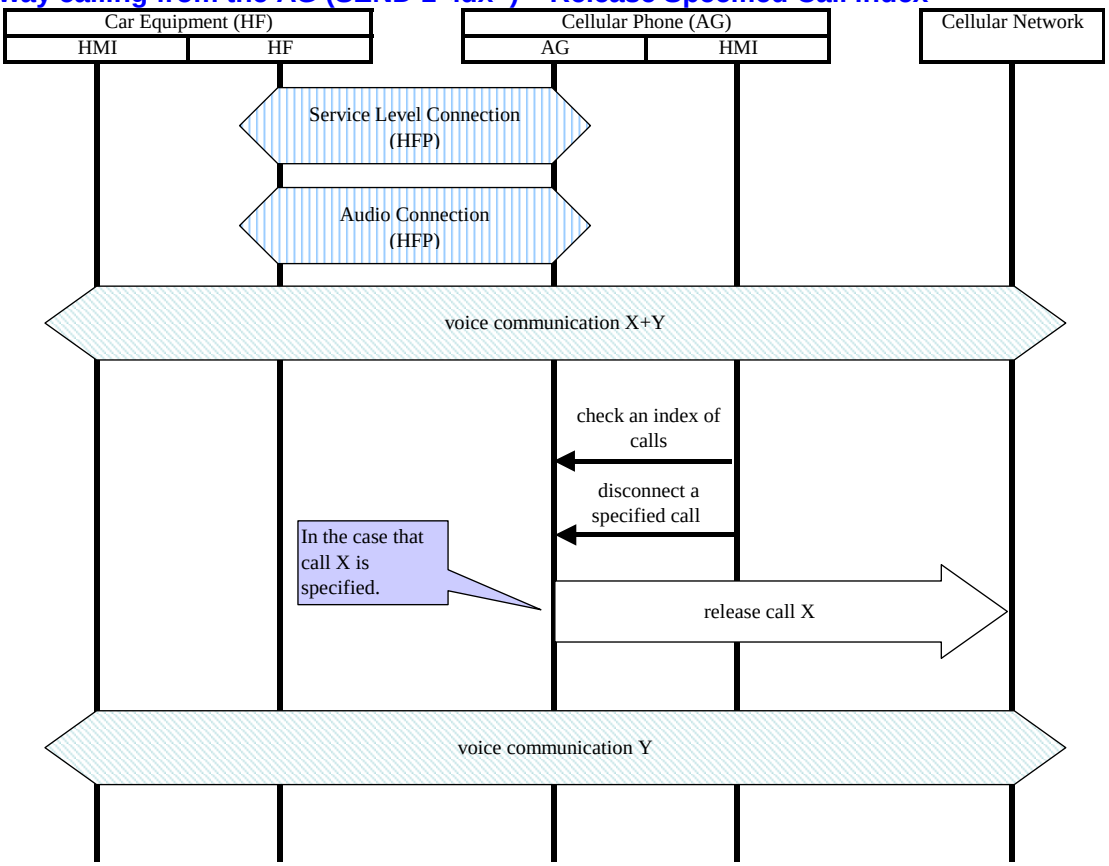
6.2.9.7 Three way calling from the AG (SEND 1)



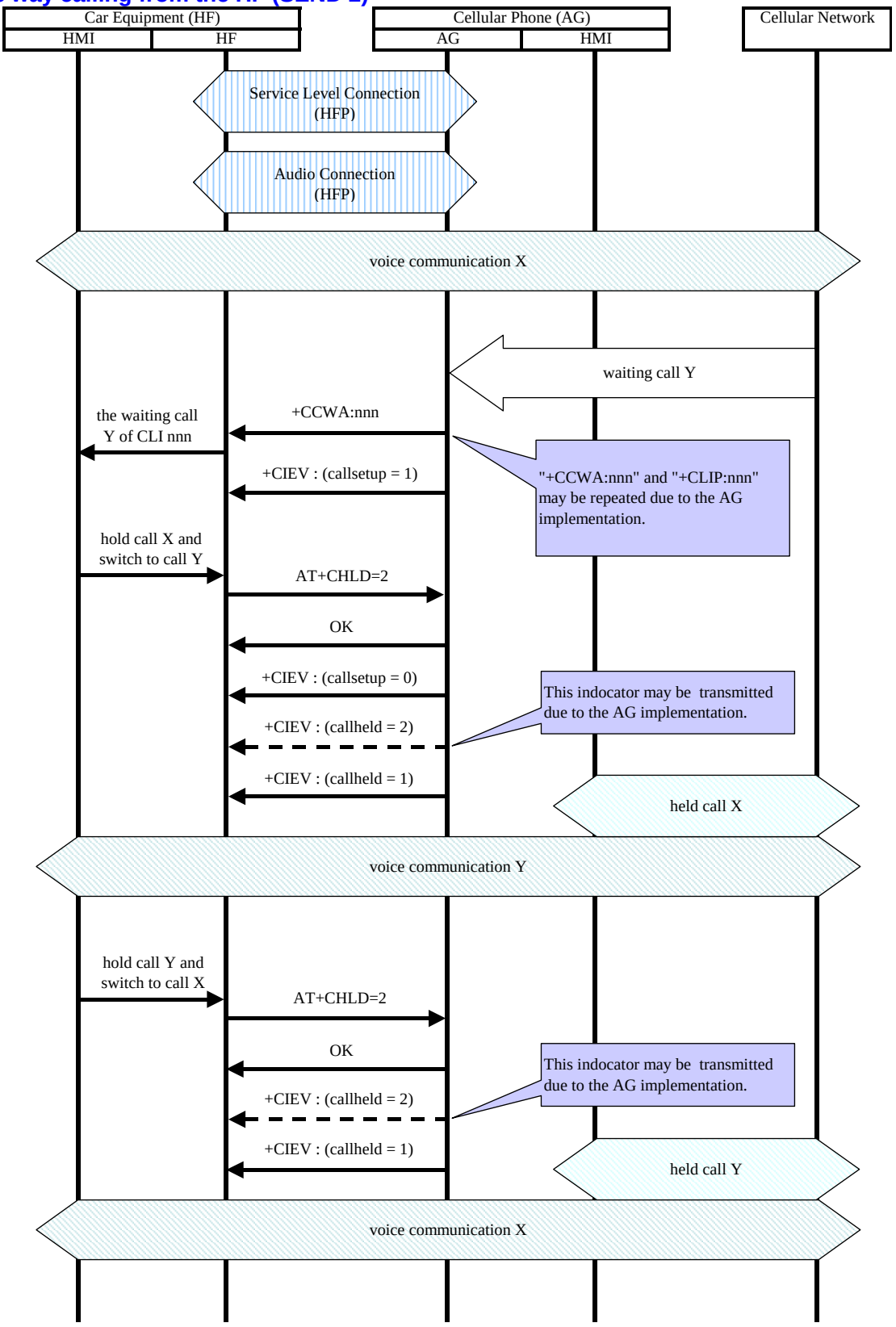
6.2.9.8 Three way calling from the HF (SEND 1<idx>) – Release Specified Call index



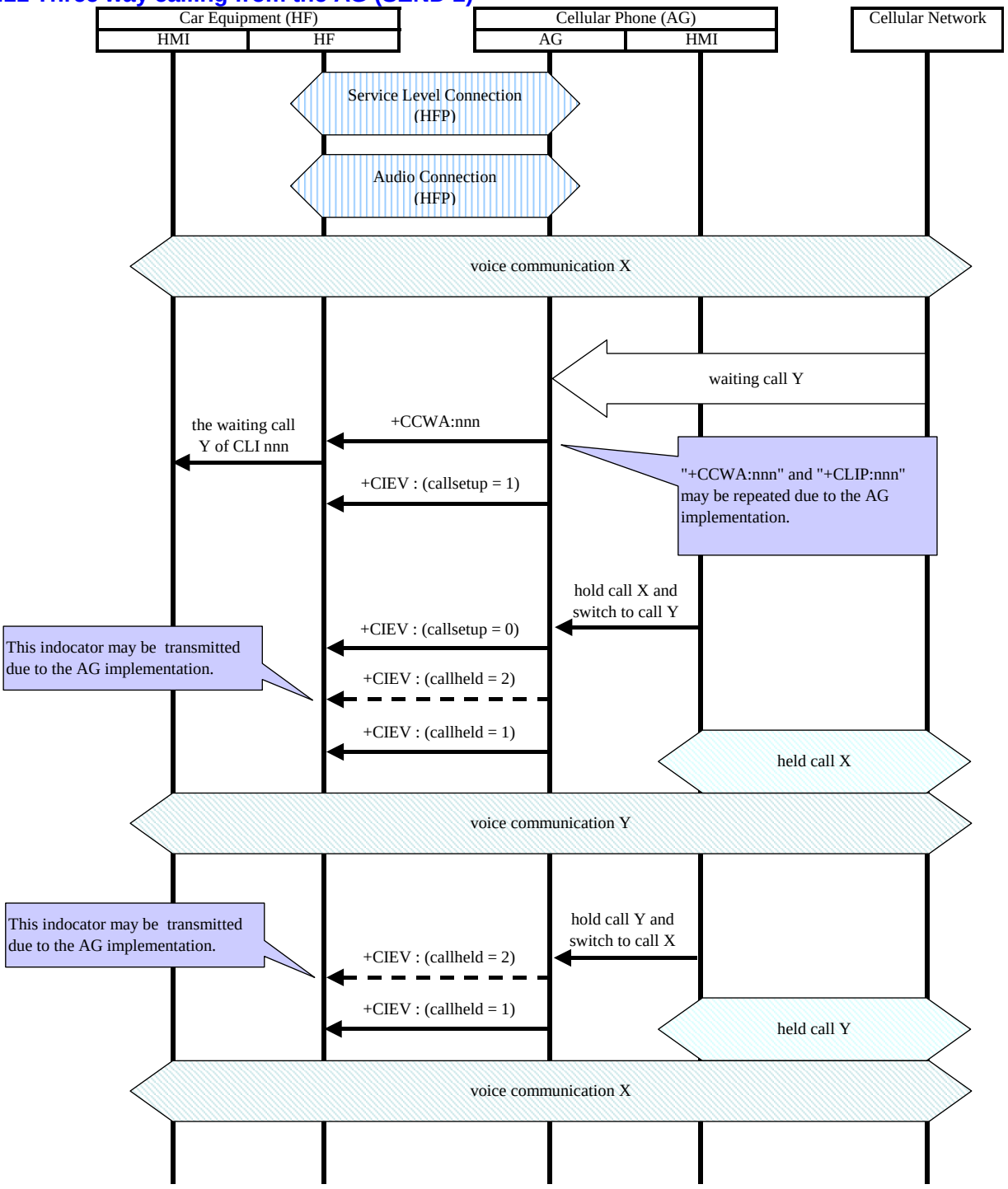
6.2.9.9 Three way calling from the AG (SEND 1<idx>) – Release Specified Call index



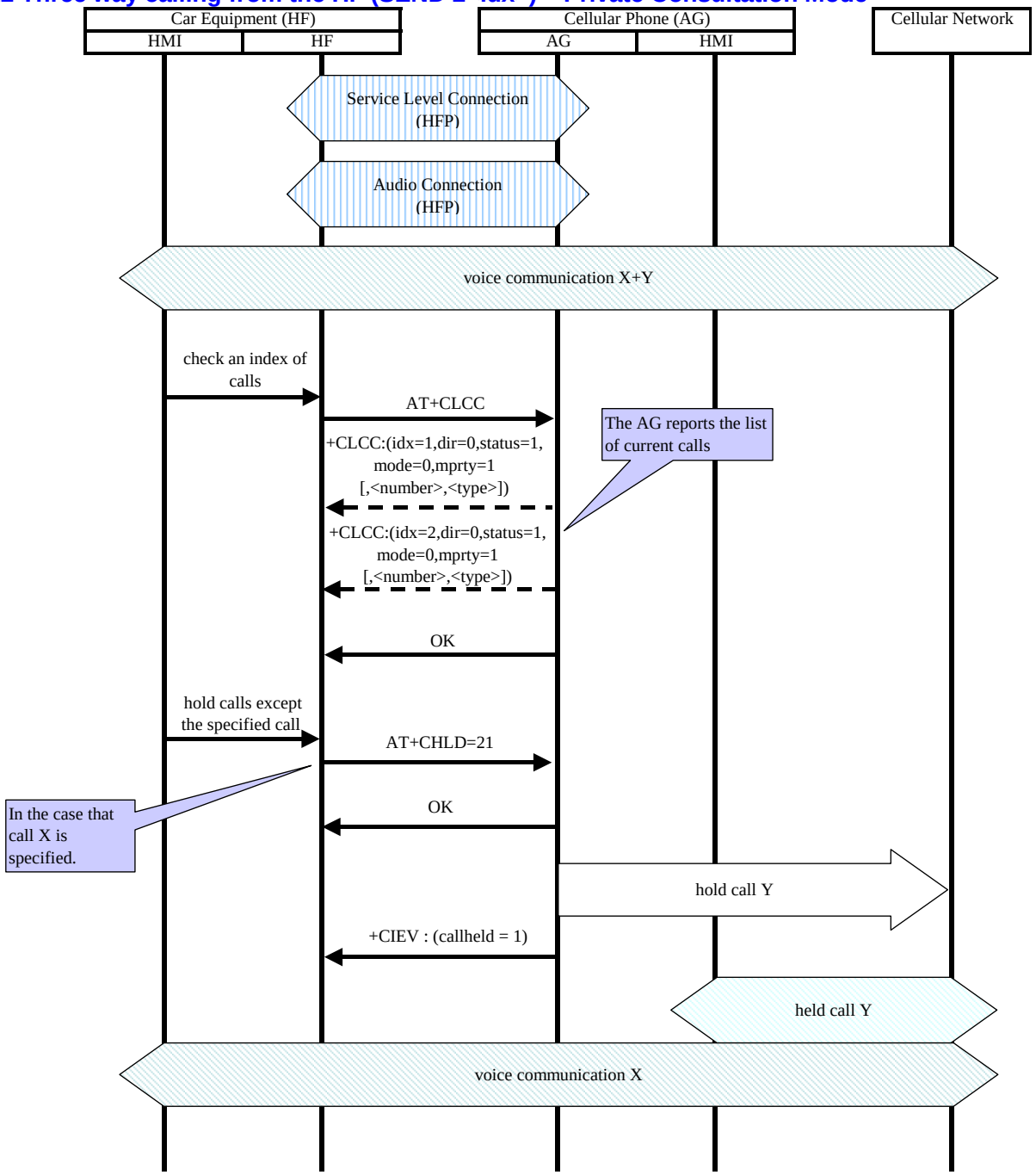
6.2.9.10 Three way calling from the HF (SEND 2)



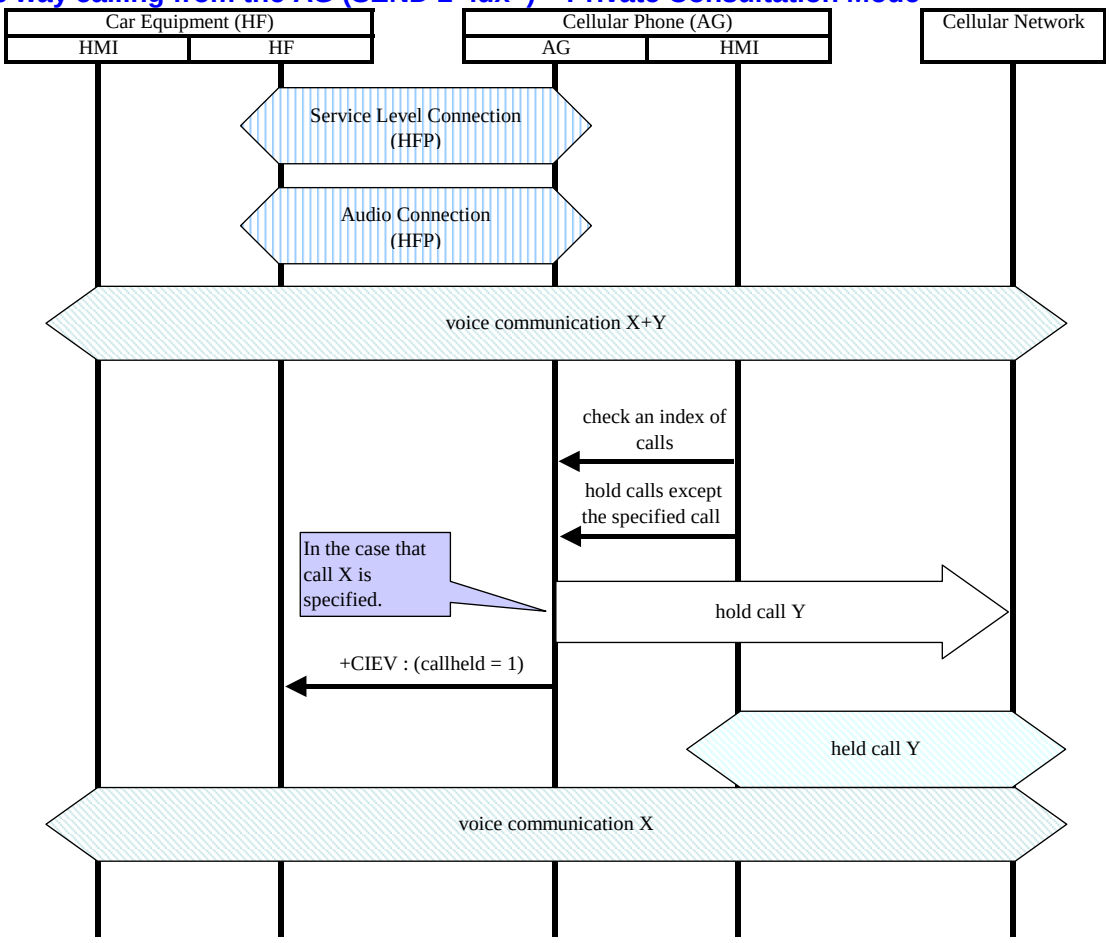
6.2.9.11 Three way calling from the AG (SEND 2)



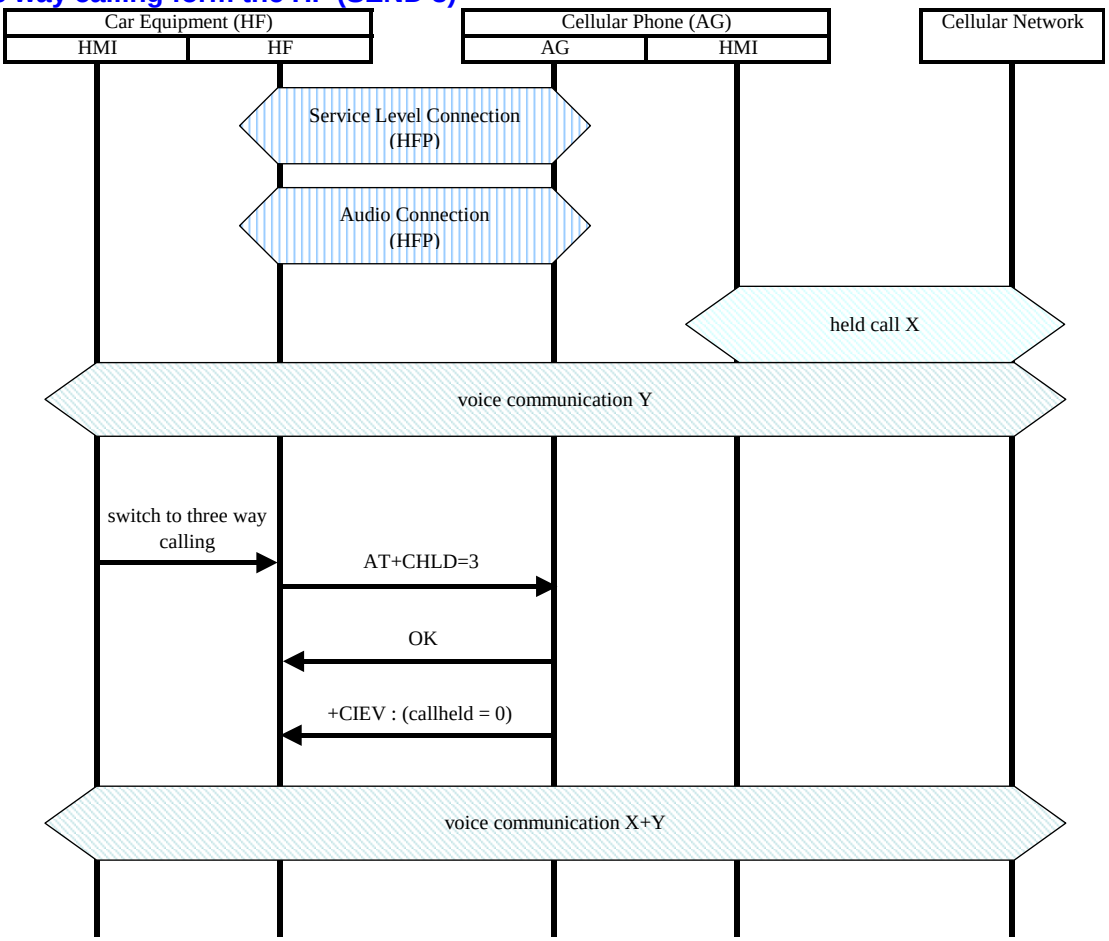
6.2.9.12 Three way calling from the HF (SEND 2<idx>) – Private Consultation Mode



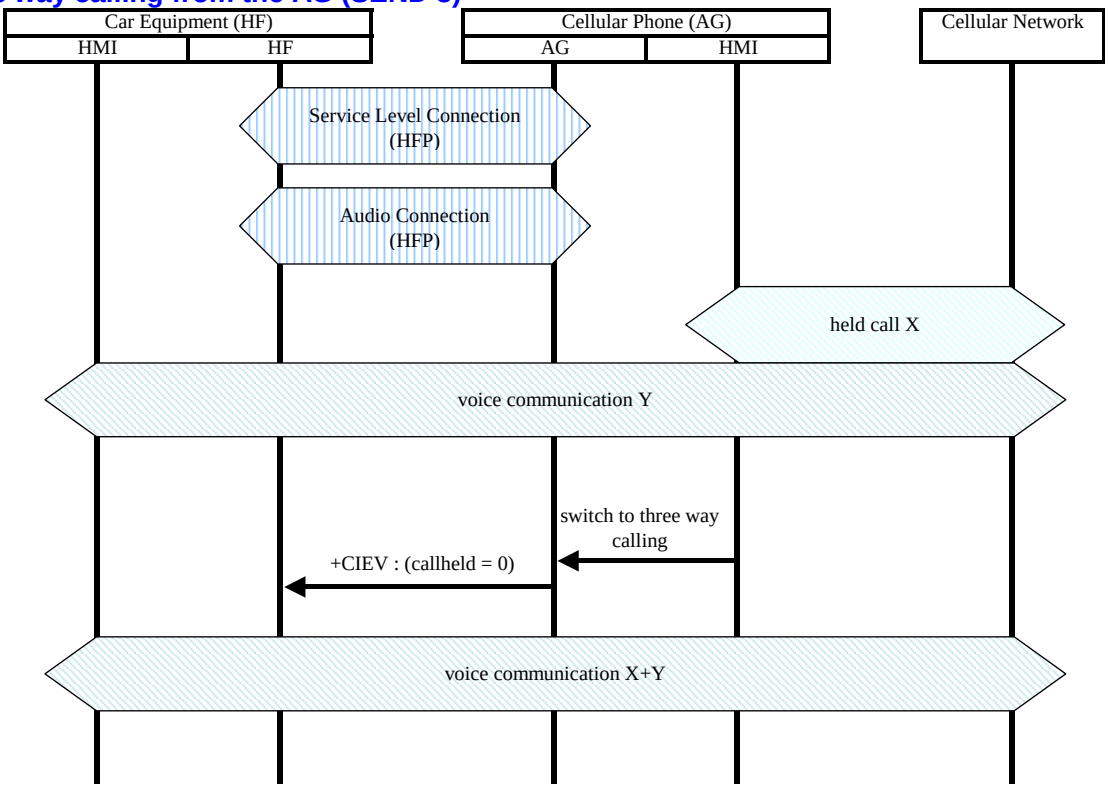
6.2.9.13 Three way calling from the AG (SEND 2<idx>) – Private Consultation Mode



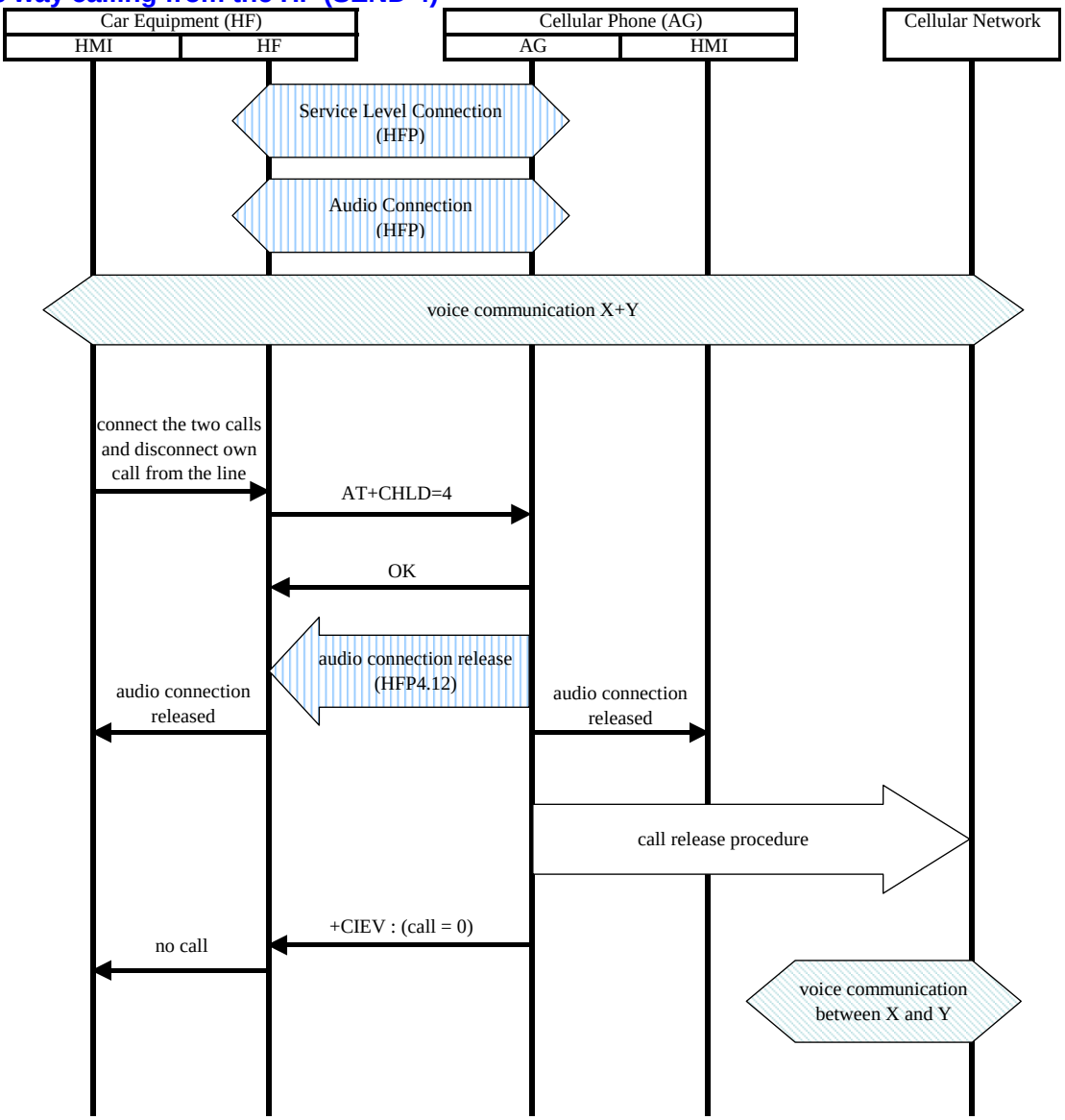
6.2.9.14 Three way calling form the HF (SEND 3)



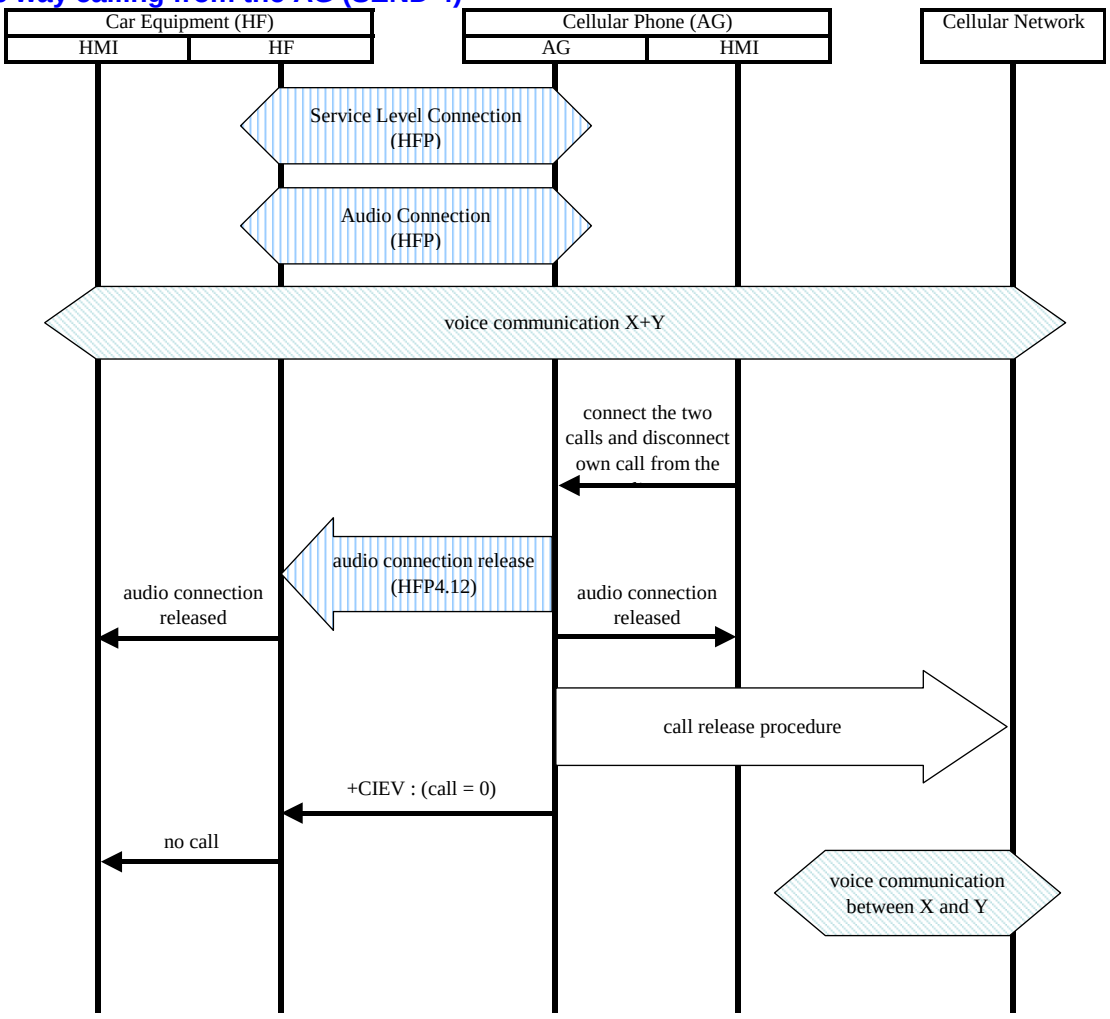
6.2.9.15 Three way calling from the AG (SEND 3)



6.2.9.16 Three way calling from the HF (SEND 4)

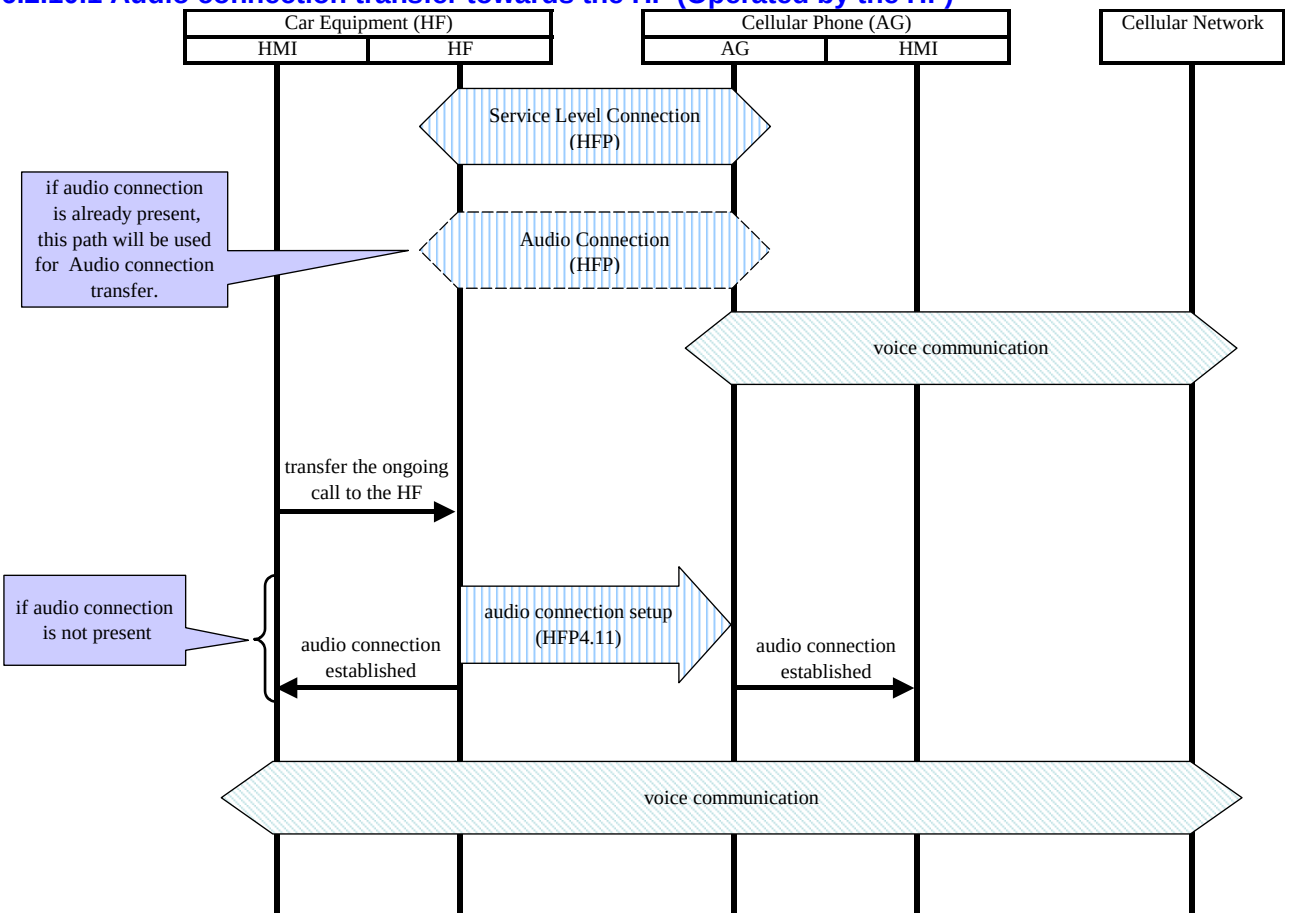


6.2.9.17 Three way calling from the AG (SEND 4)

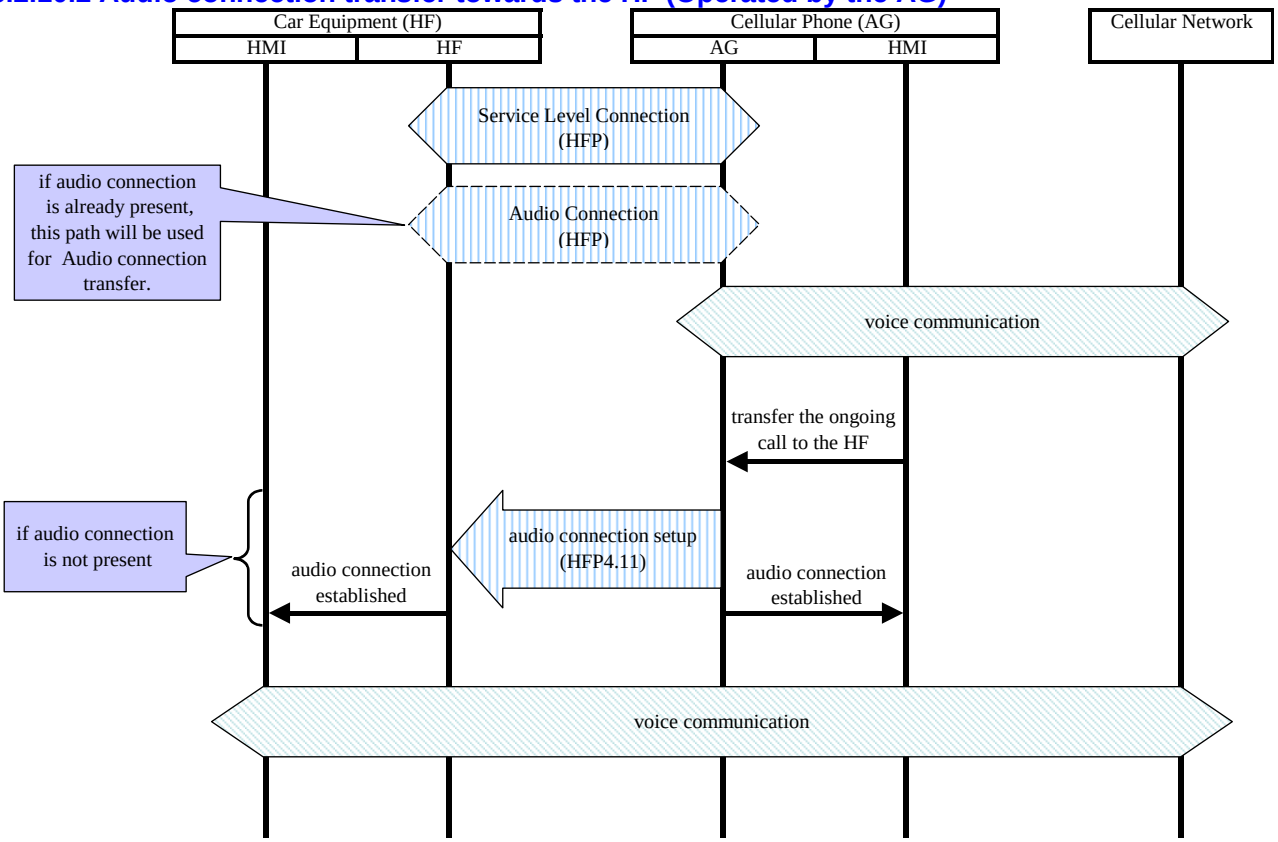


6.2.10 Audio connection transfer

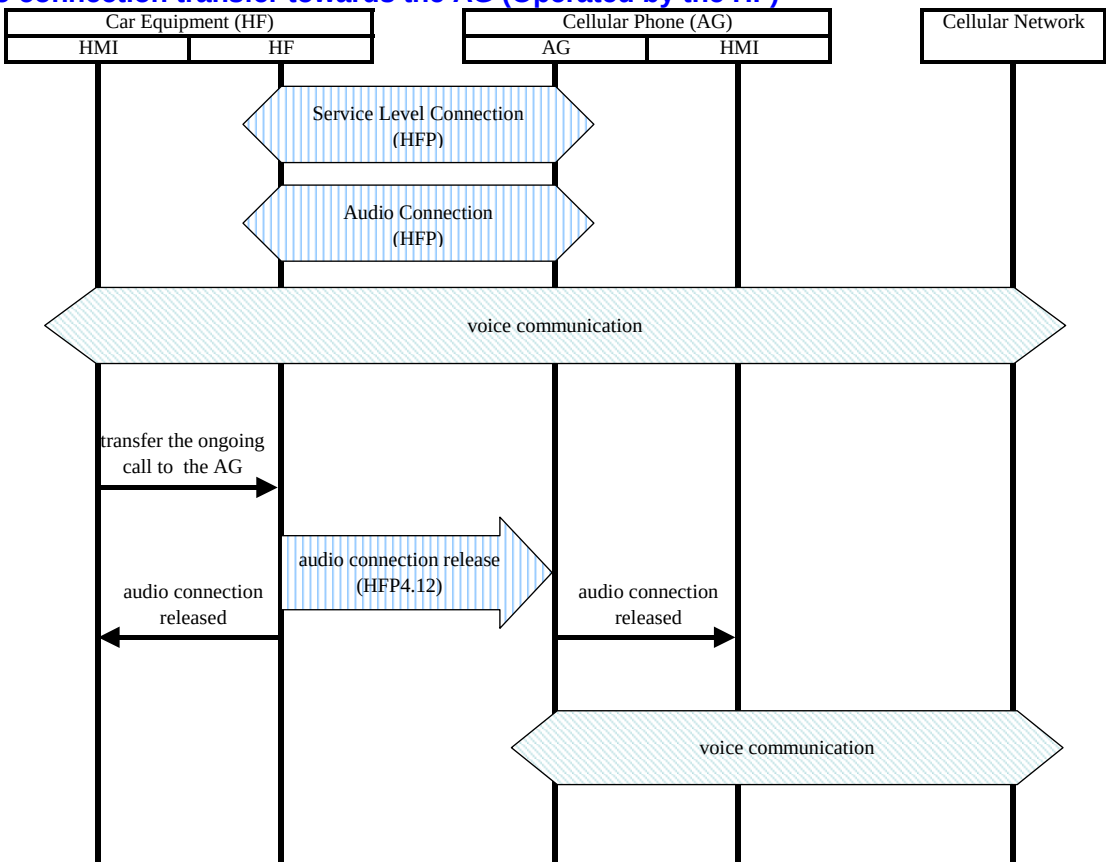
6.2.10.1 Audio connection transfer towards the HF (Operated by the HF)



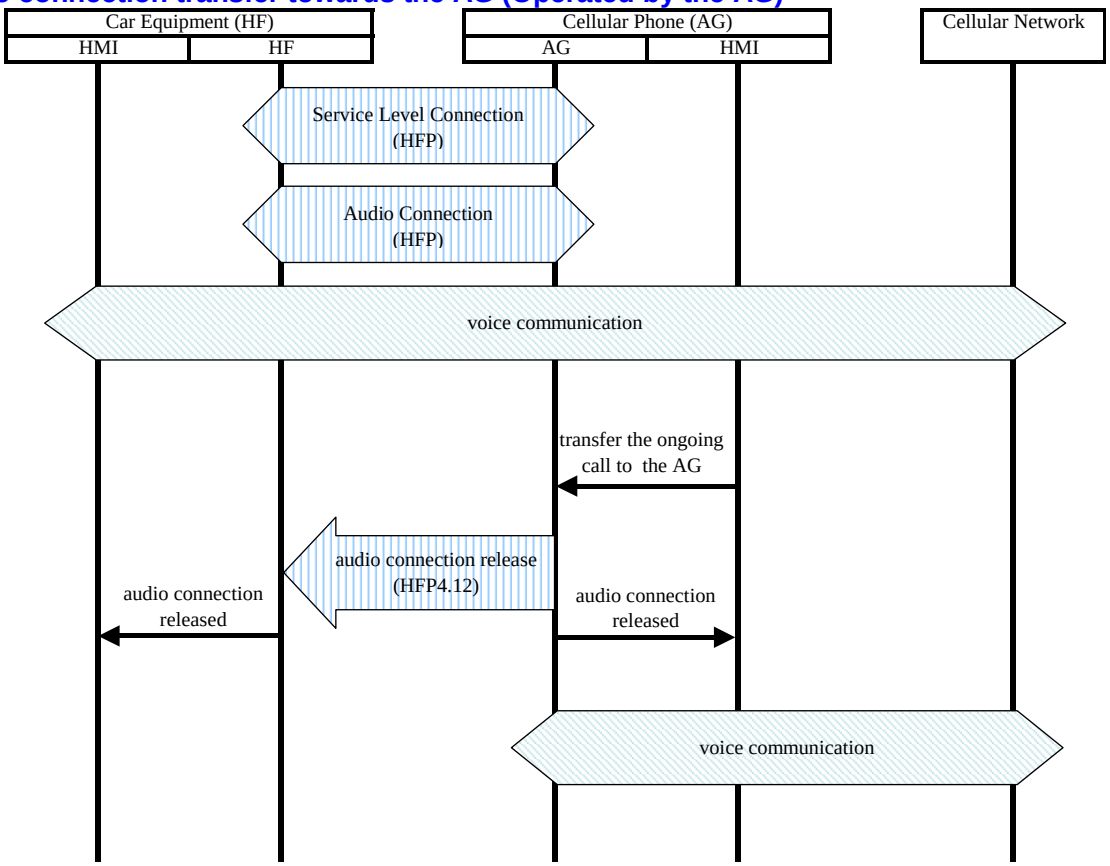
6.2.10.2 Audio connection transfer towards the HF (Operated by the AG)



6.2.10.3 Audio connection transfer towards the AG (Operated by the HF)

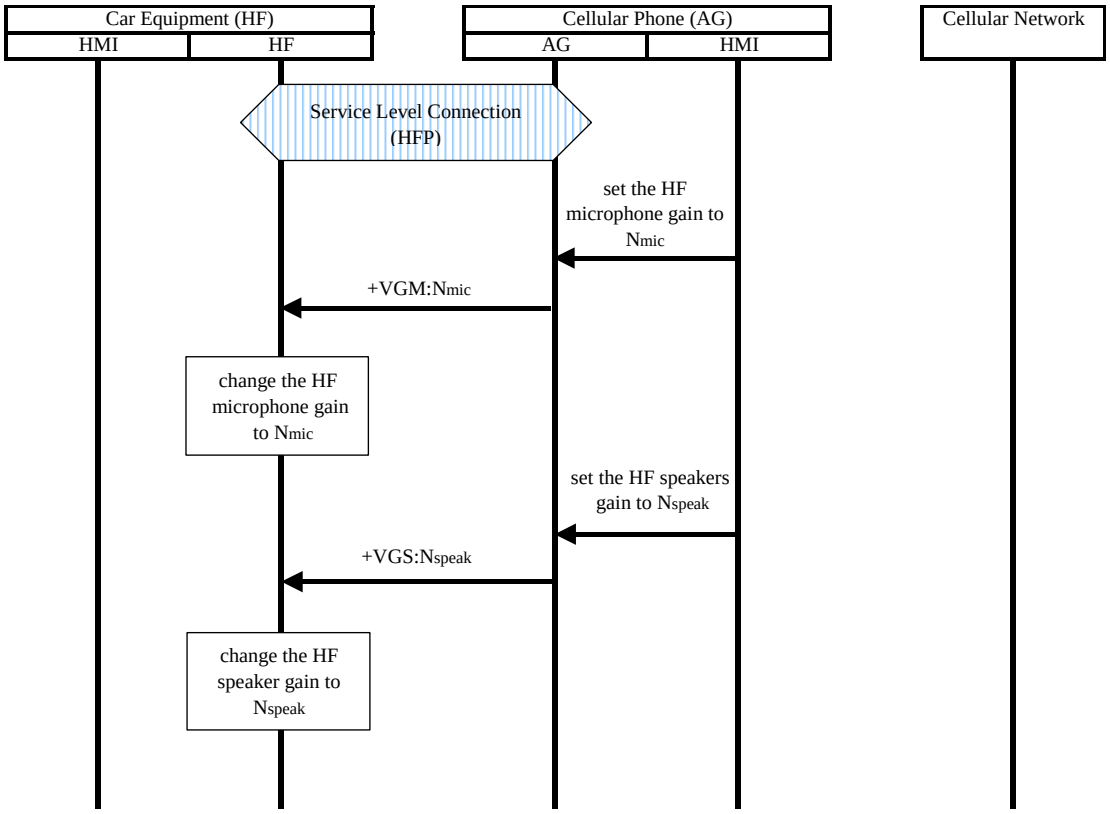


6.2.10.4 Audio connection transfer towards the AG (Operated by the AG)

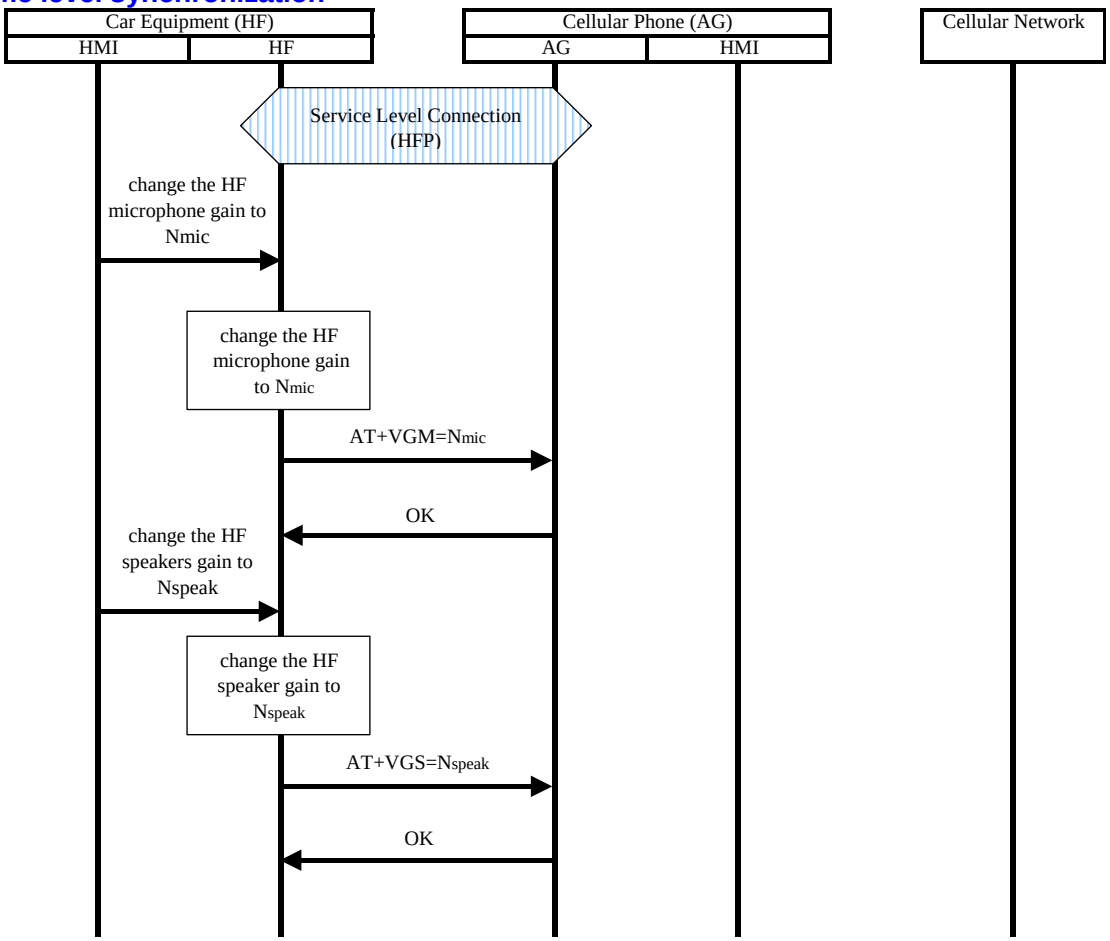


6.2.11 Remote audio volume control

6.2.11.1 Remote audio volume control

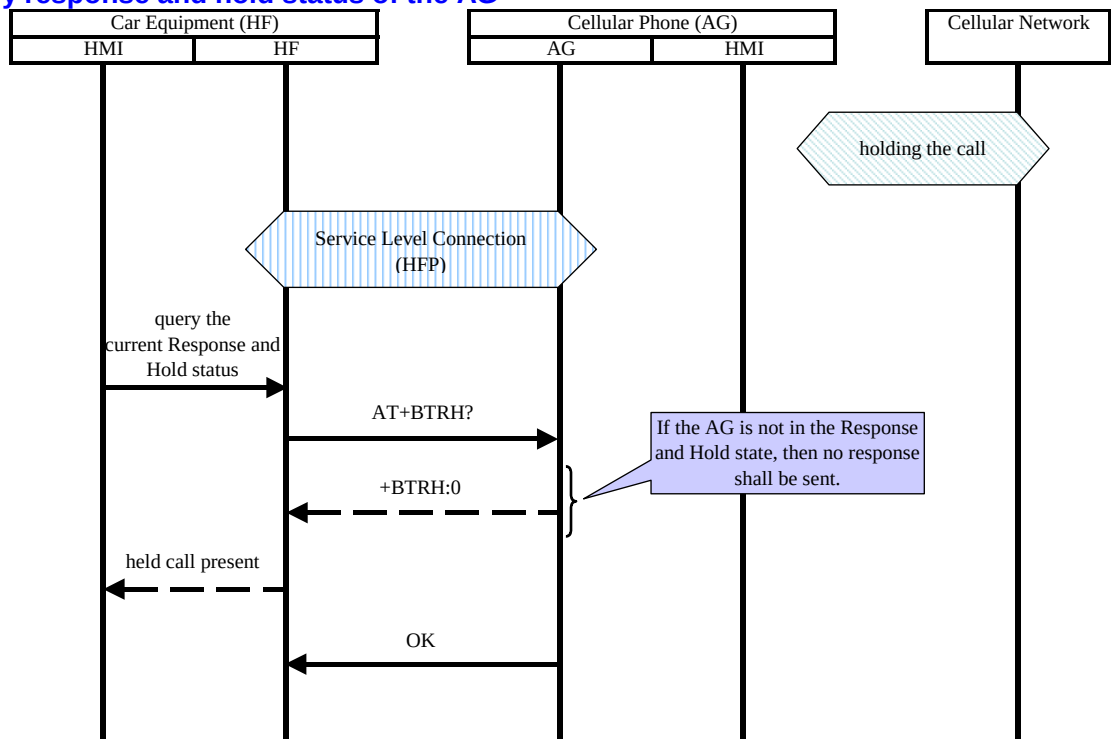


6.2.11.2 Volume level synchronization

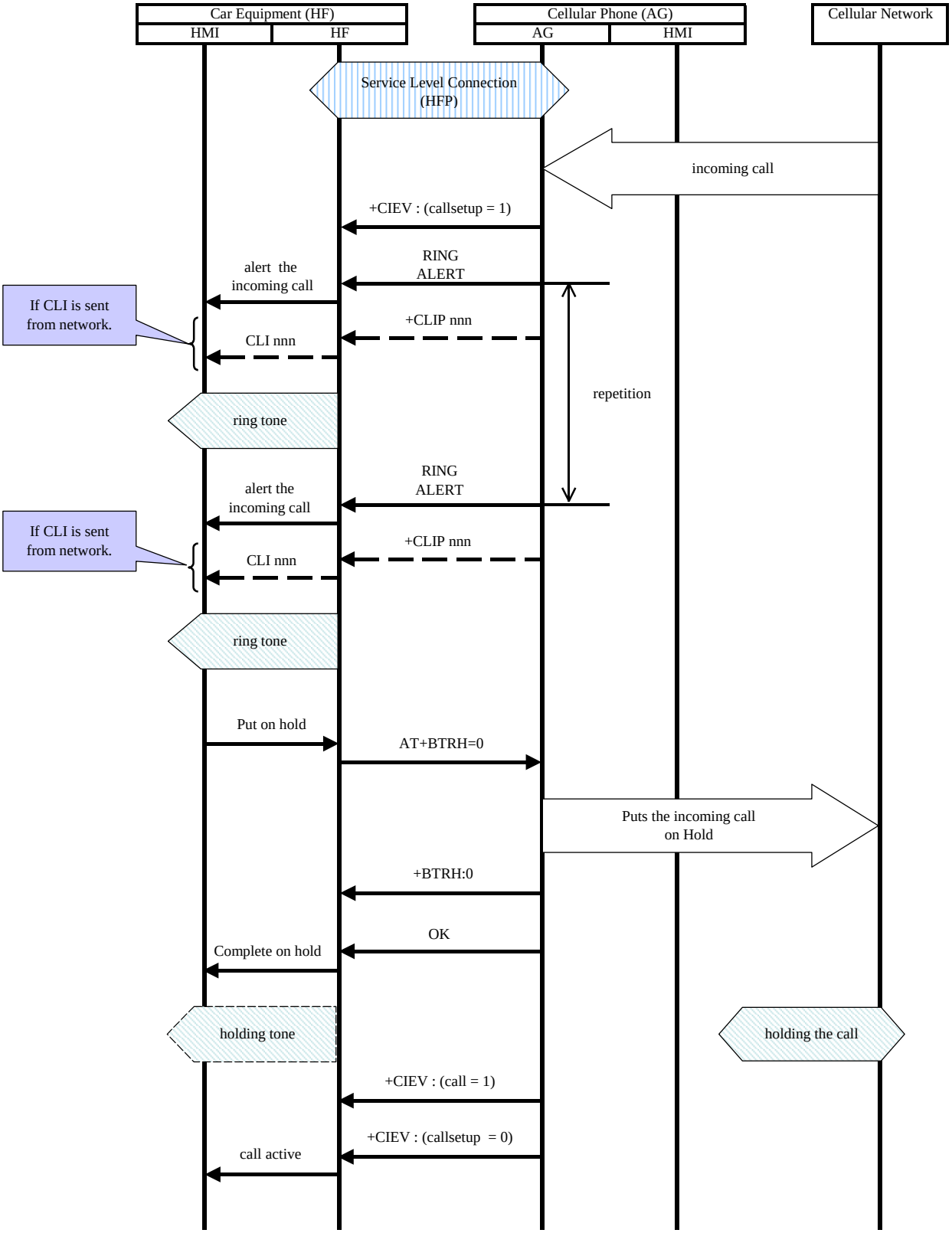


6.2.12 Response and Hold

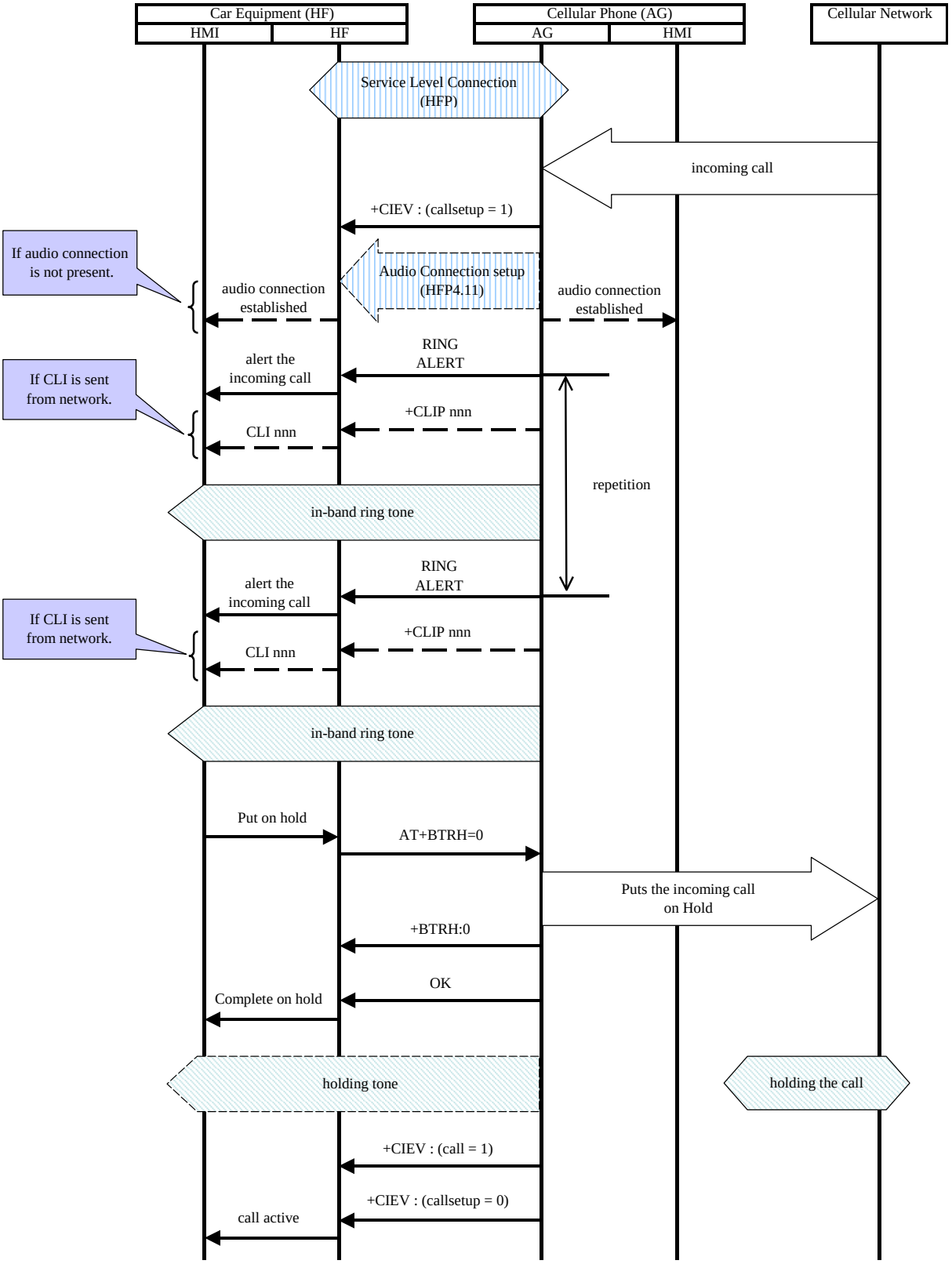
6.2.12.1 Query response and hold status of the AG



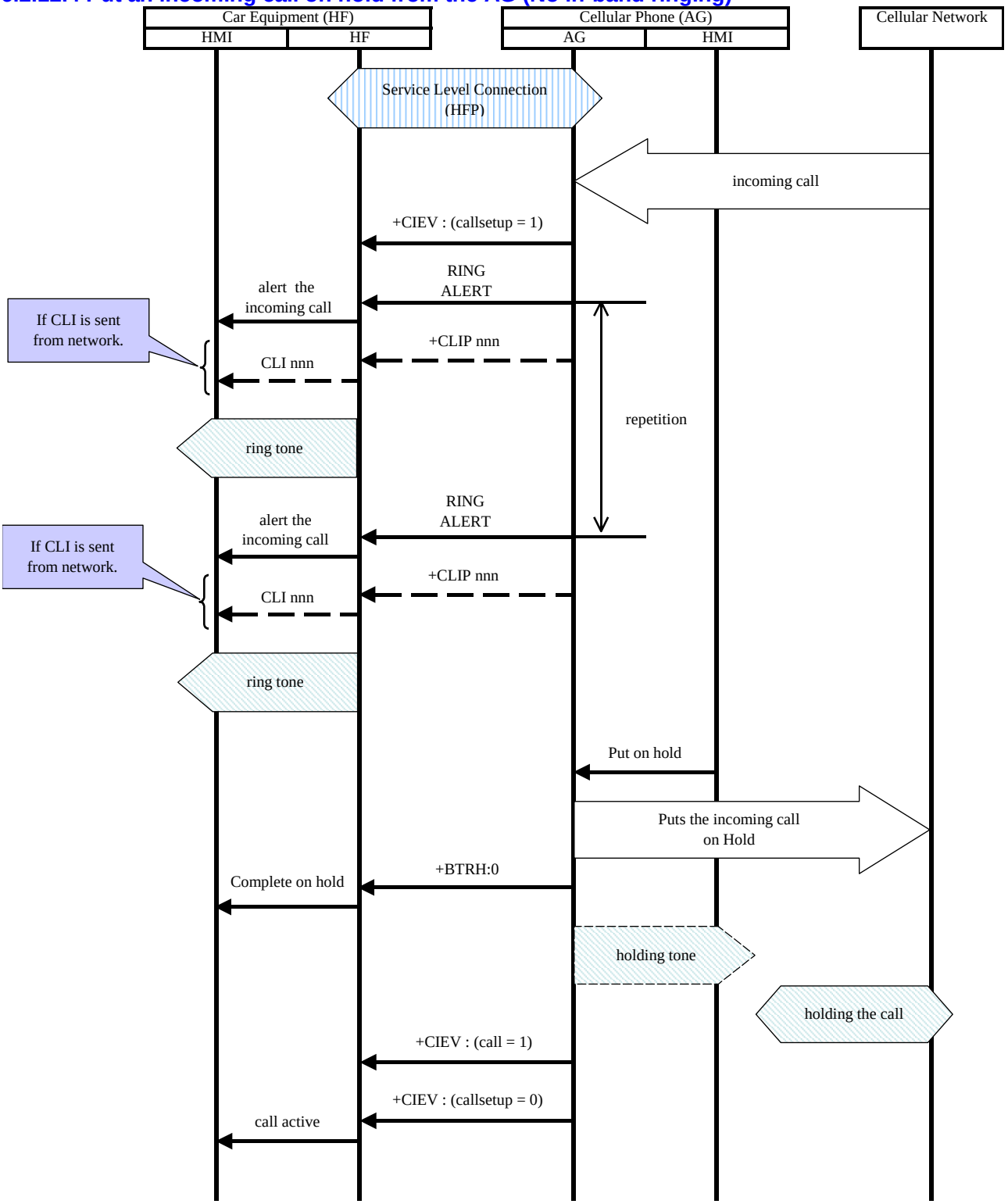
6.2.12.2 Put an incoming call on hold from the HF (No in-band ringing)



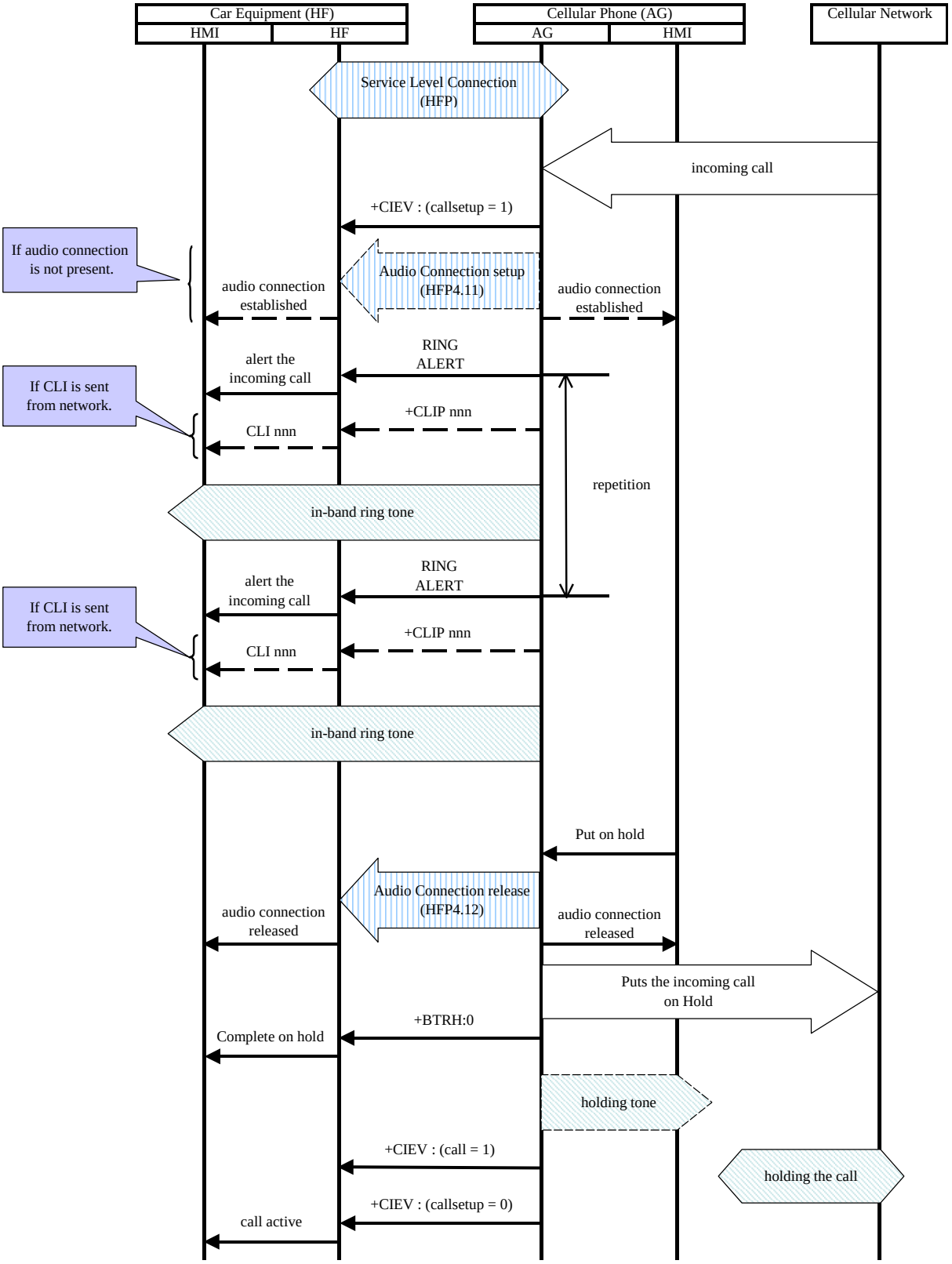
6.2.12.3 Put an incoming call on hold from the HF (In-band ringing)



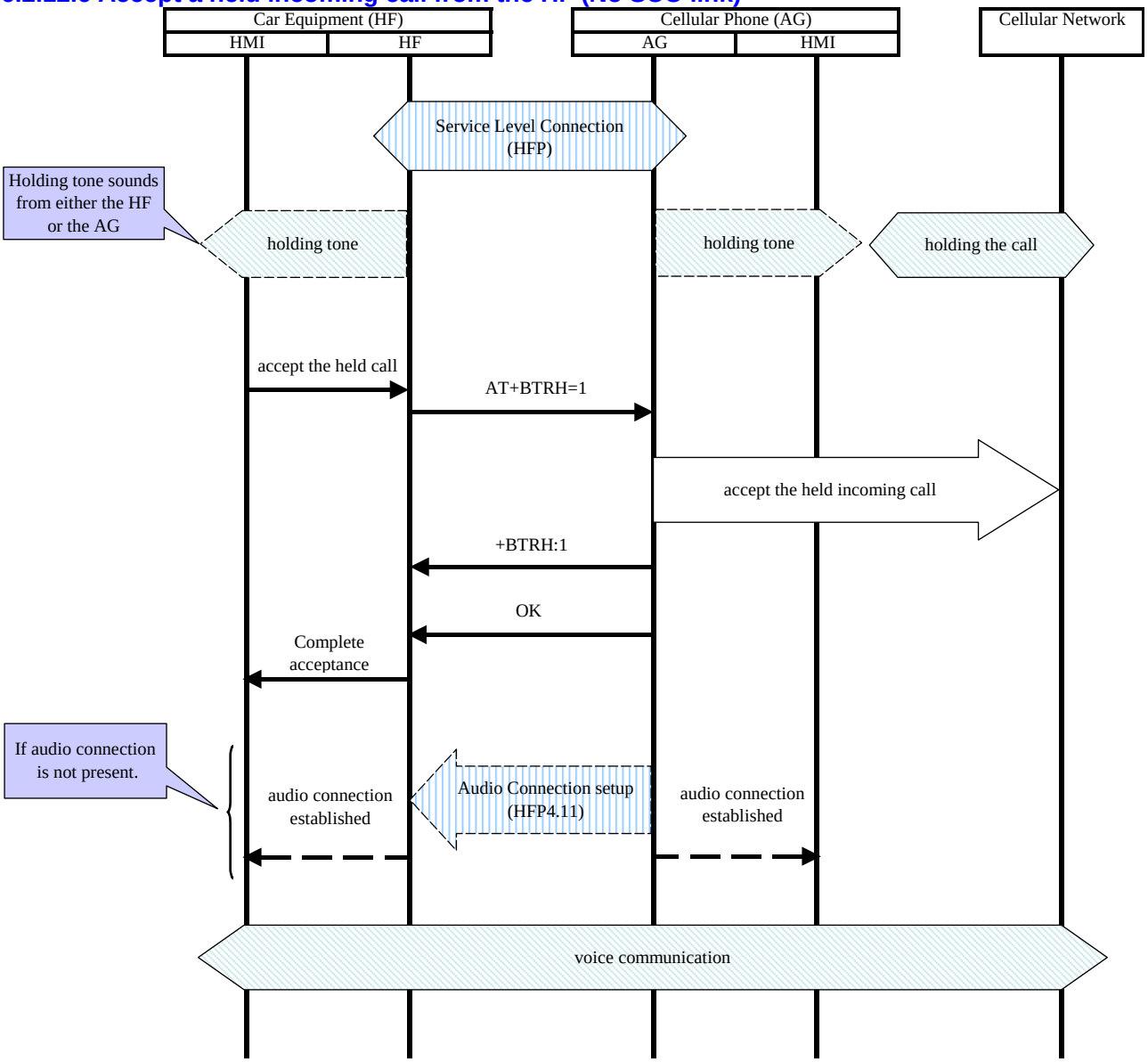
6.2.12.4 Put an incoming call on hold from the AG (No in-band ringing)



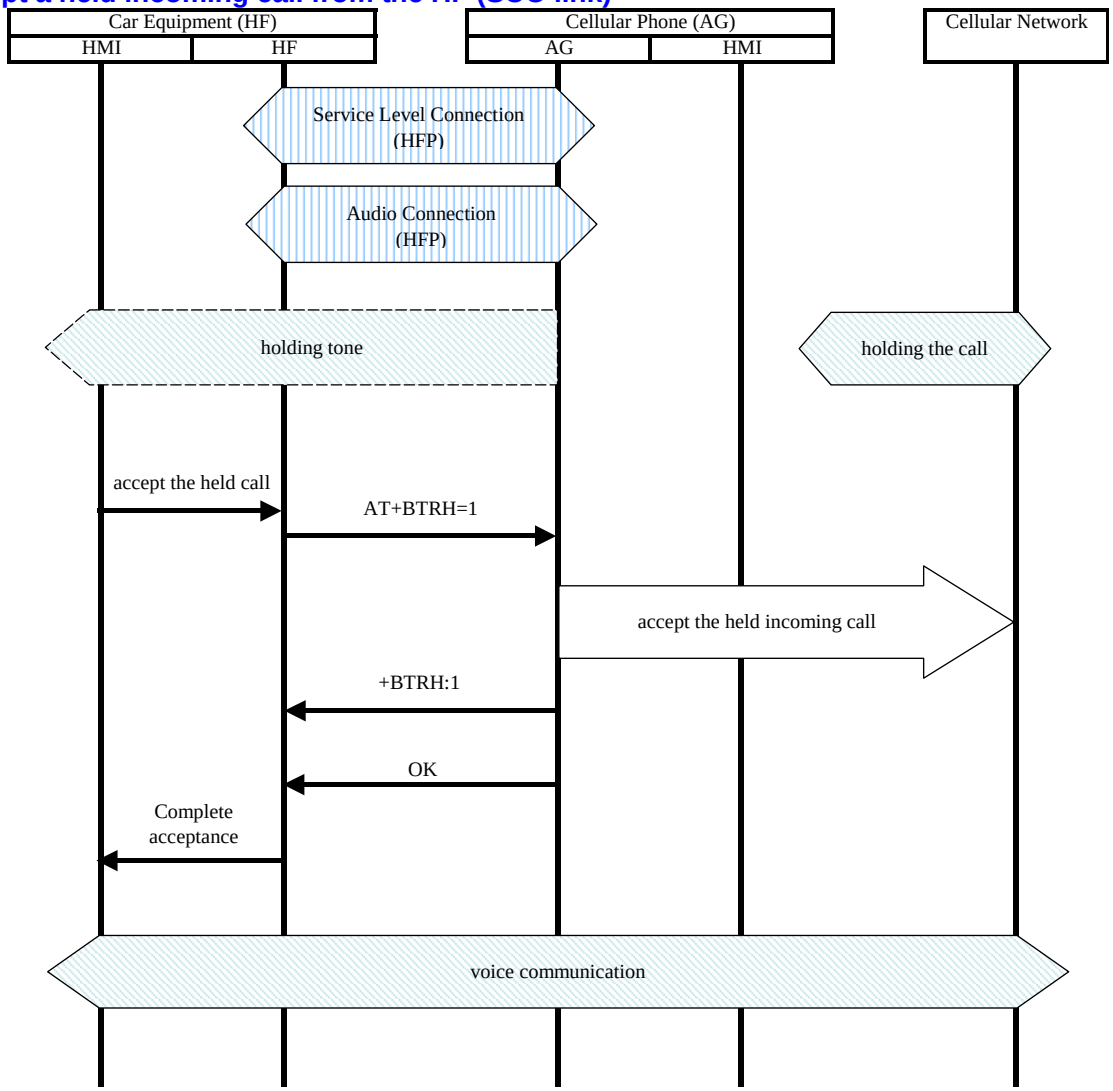
6.2.12.5 Put an incoming call on hold from the AG (In-band ringing)



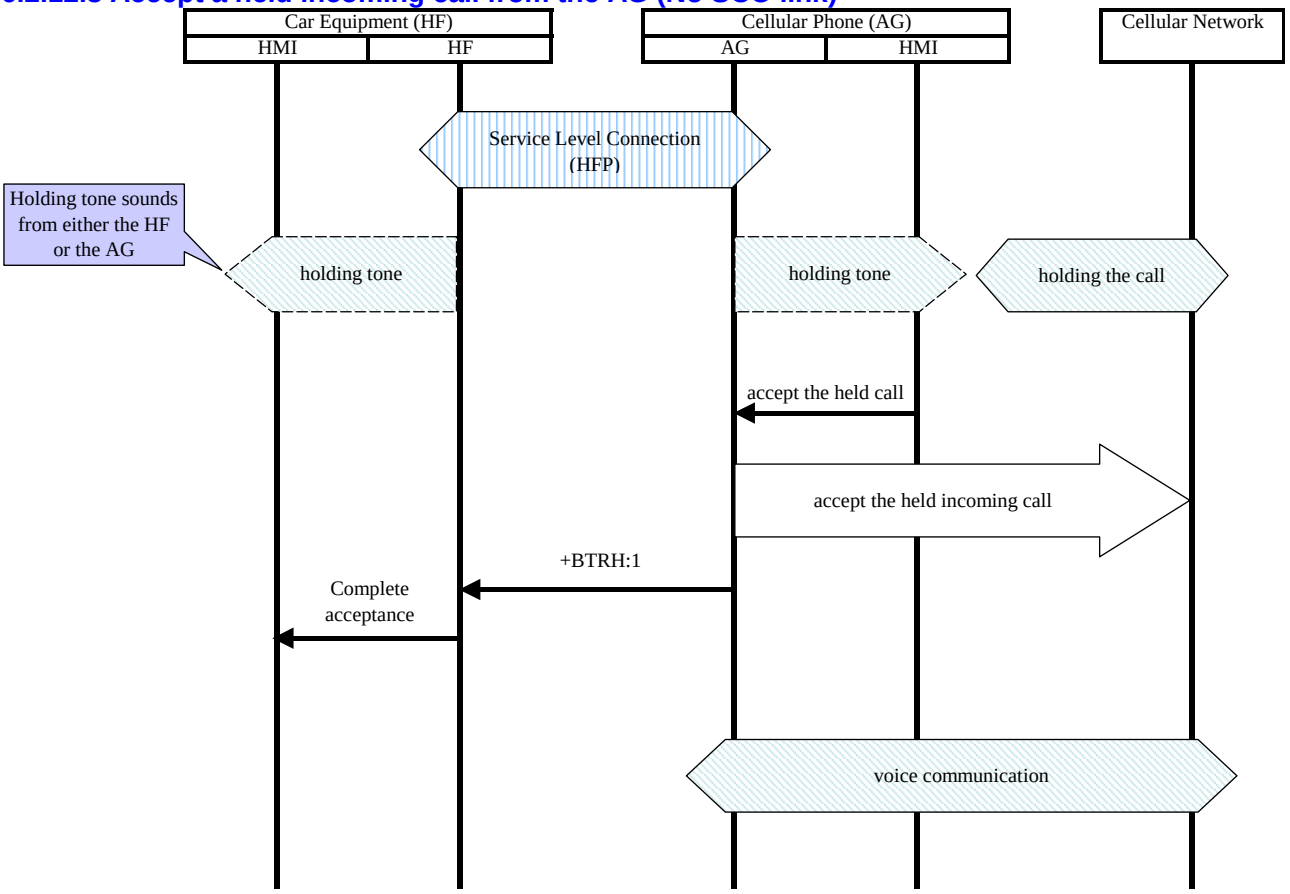
6.2.12.6 Accept a held incoming call from the HF (No SCO link)



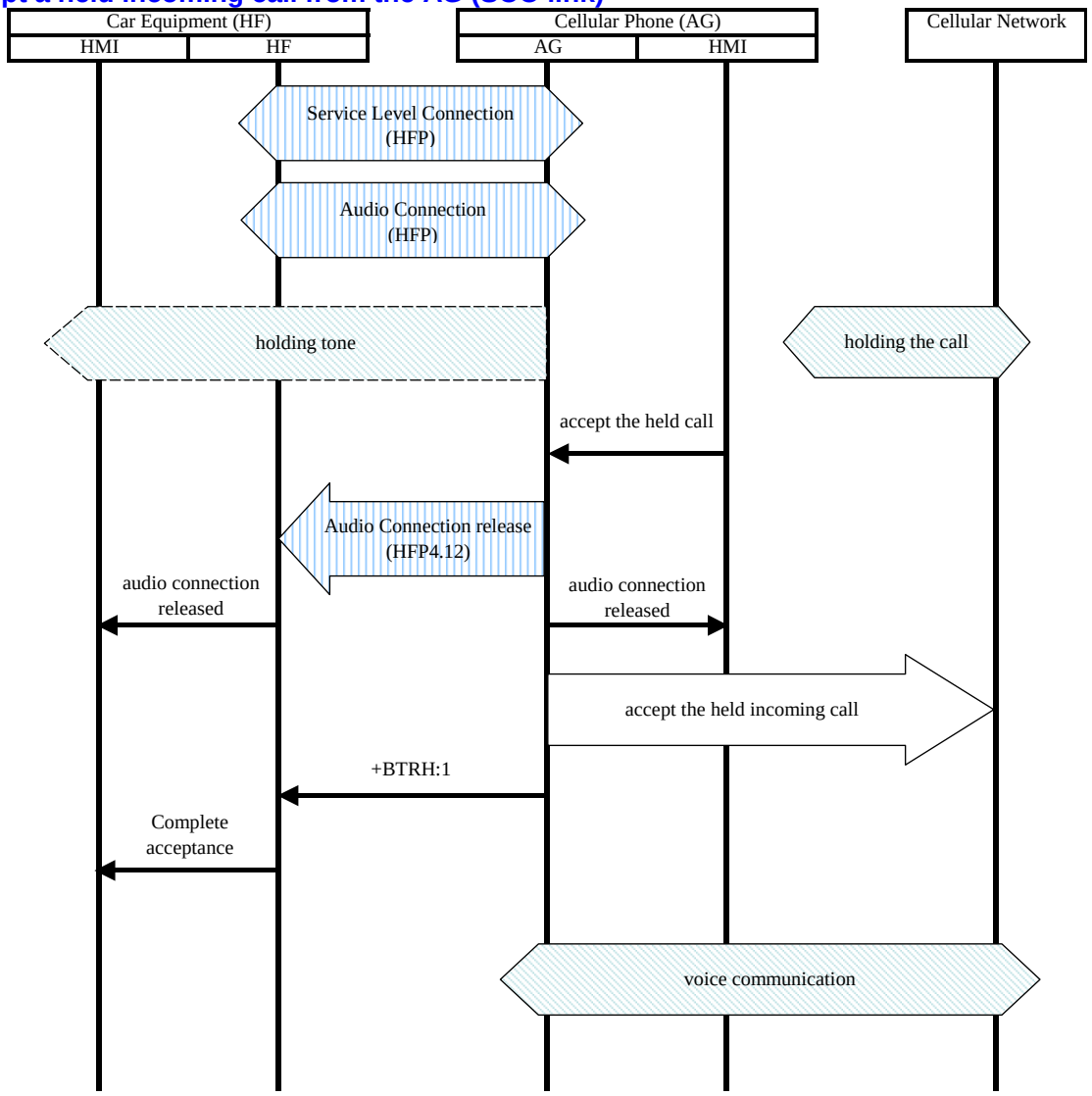
6.2.12.7 Accept a held incoming call from the HF (SCO link)



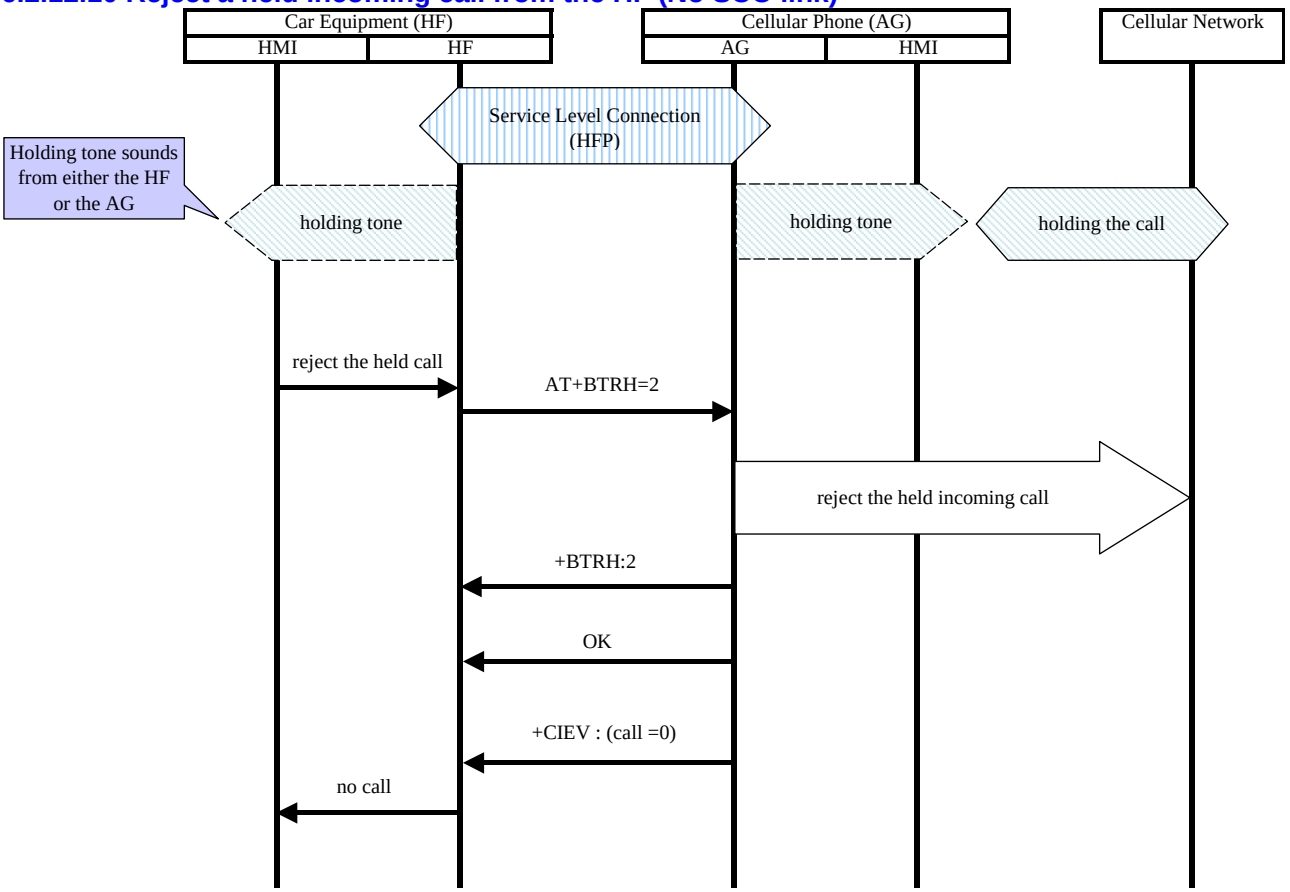
6.2.12.8 Accept a held incoming call from the AG (No SCO link)



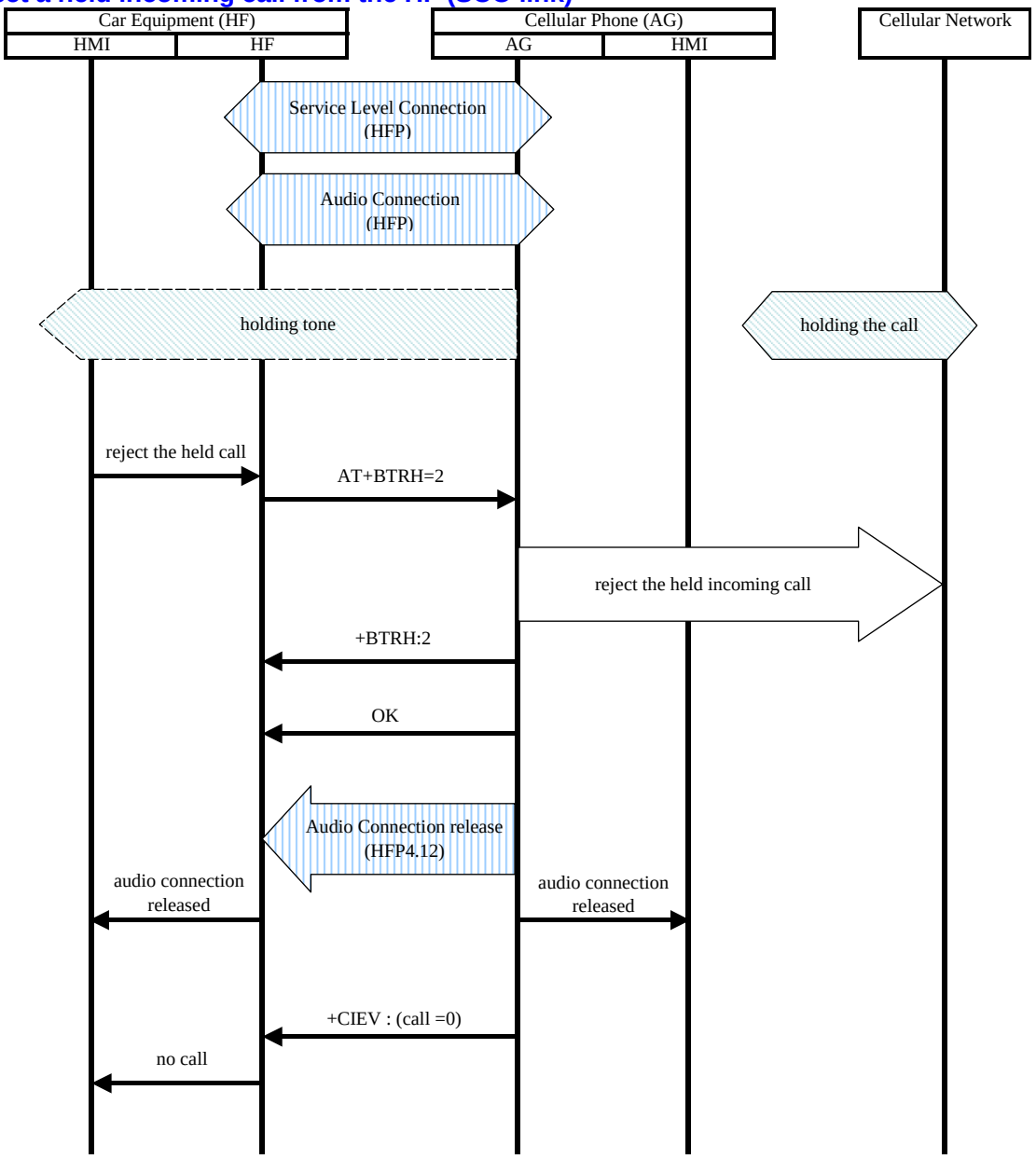
6.2.12.9 Accept a held incoming call from the AG (SCO link)



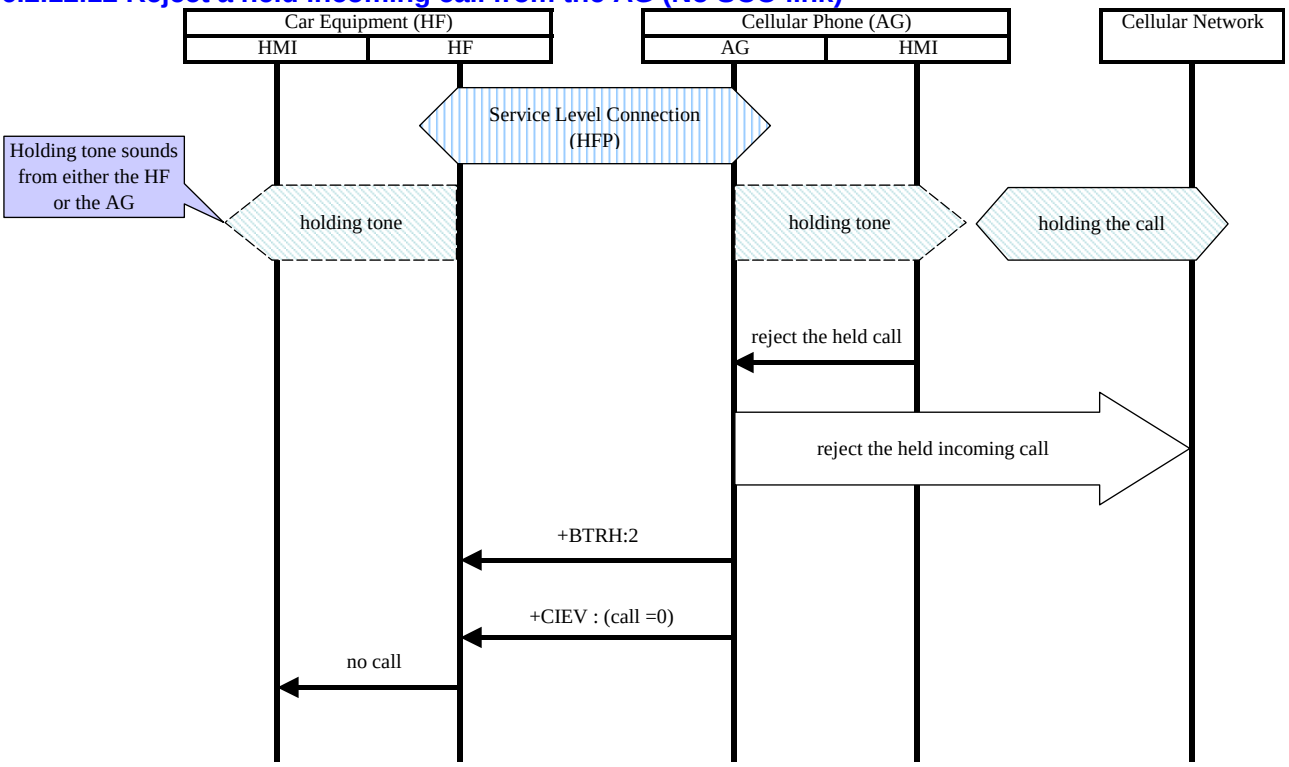
6.2.12.10 Reject a held incoming call from the HF (No SCO link)



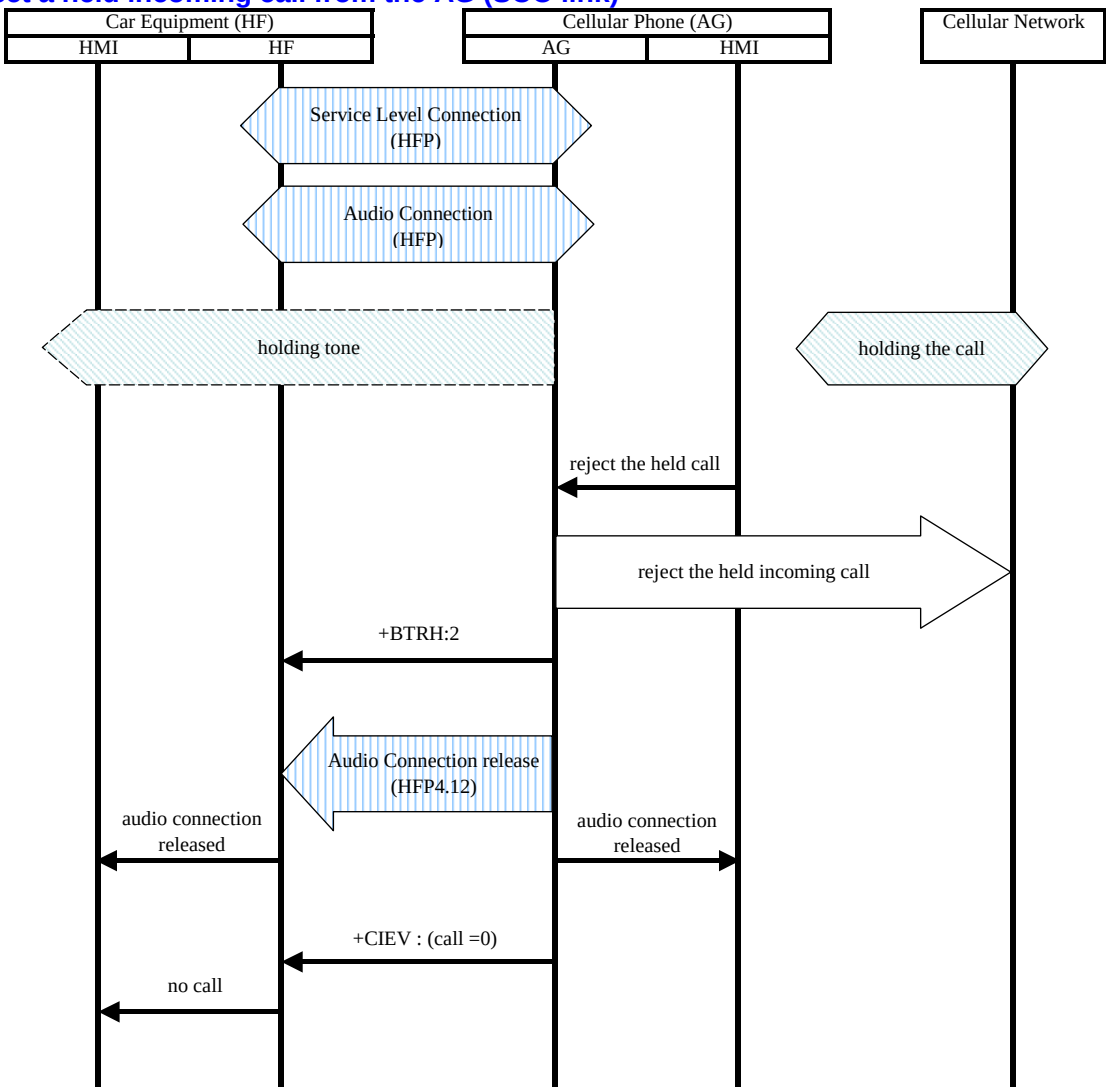
6.2.12.11 Reject a held incoming call from the HF (SCO link)



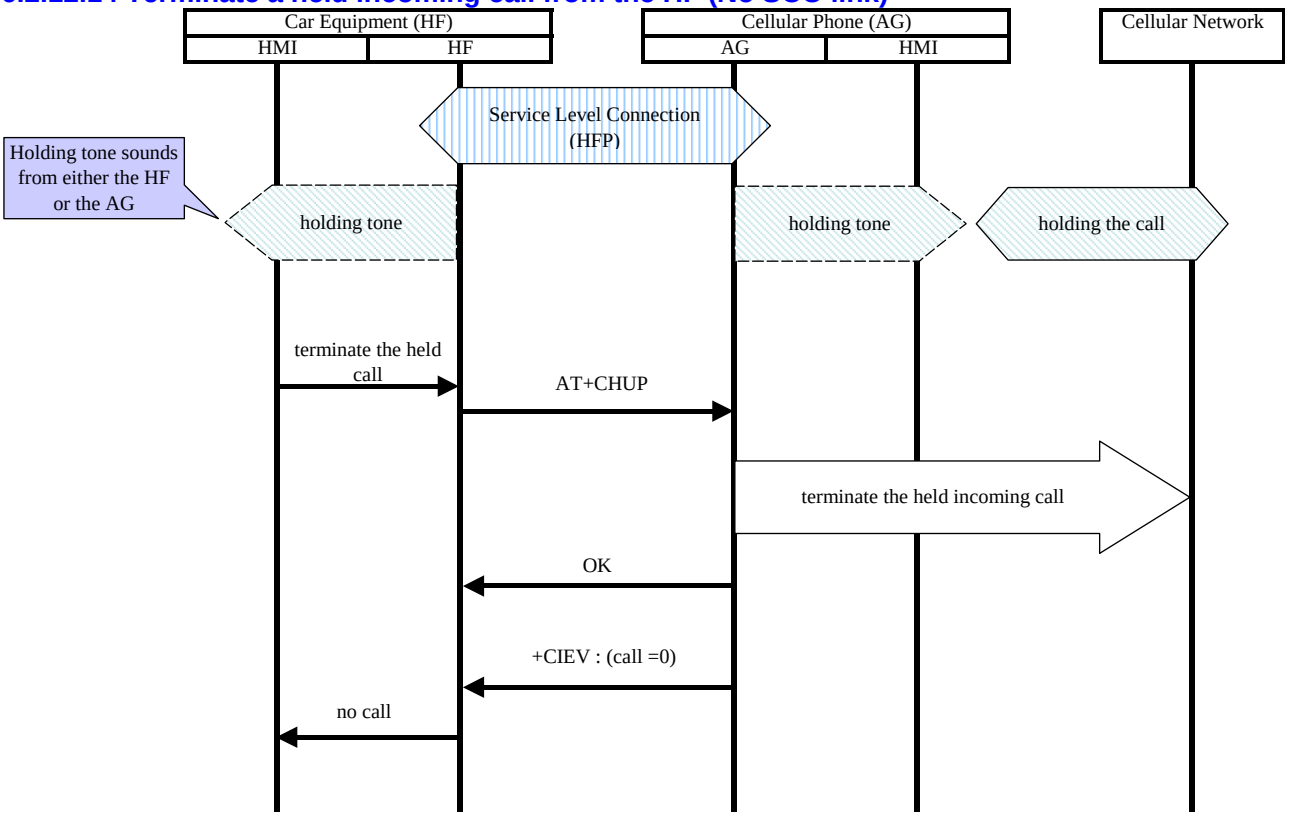
6.2.12.12 Reject a held incoming call from the AG (No SCO link)



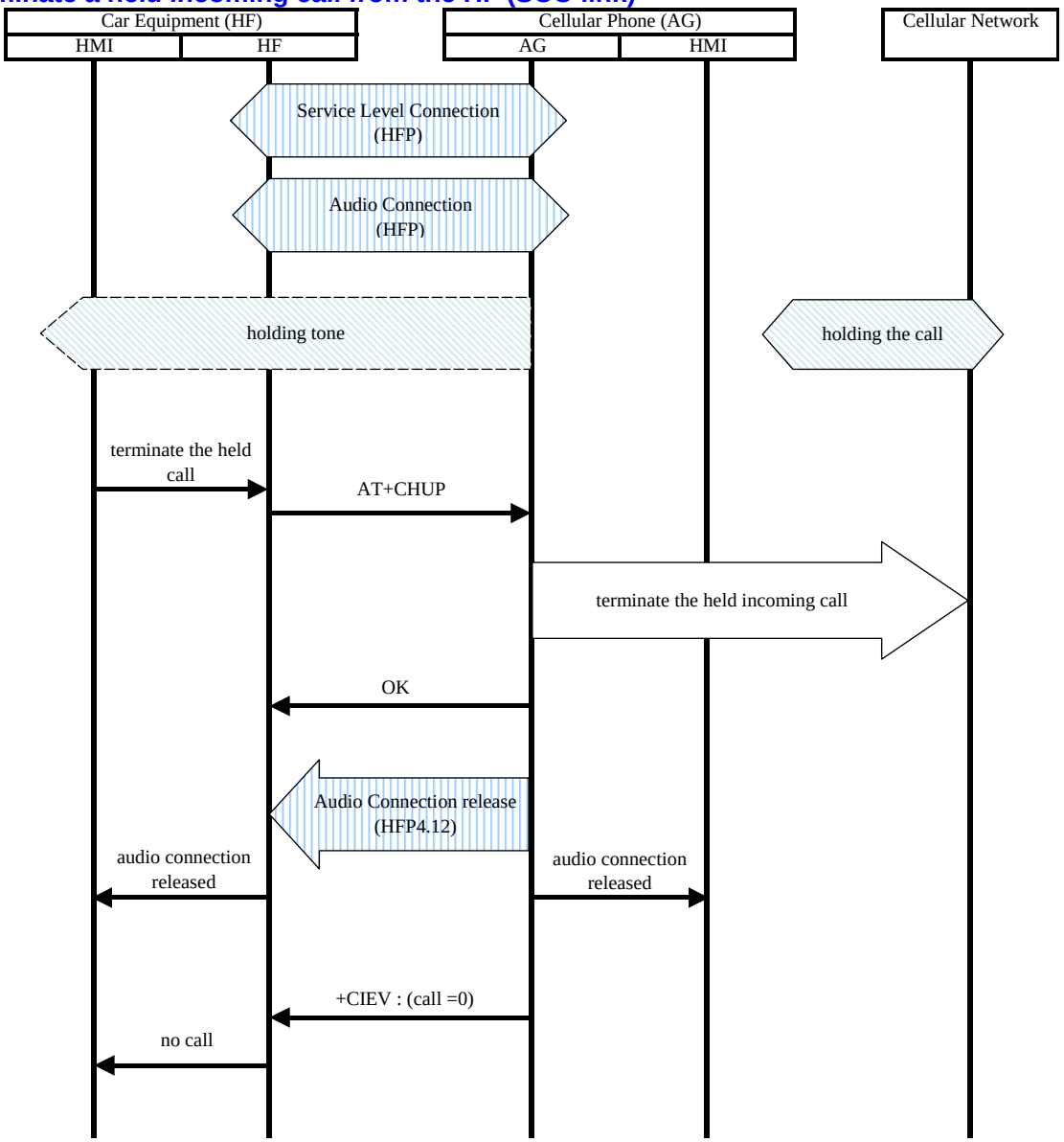
6.2.12.13 Reject a held incoming call from the AG (SCO link)



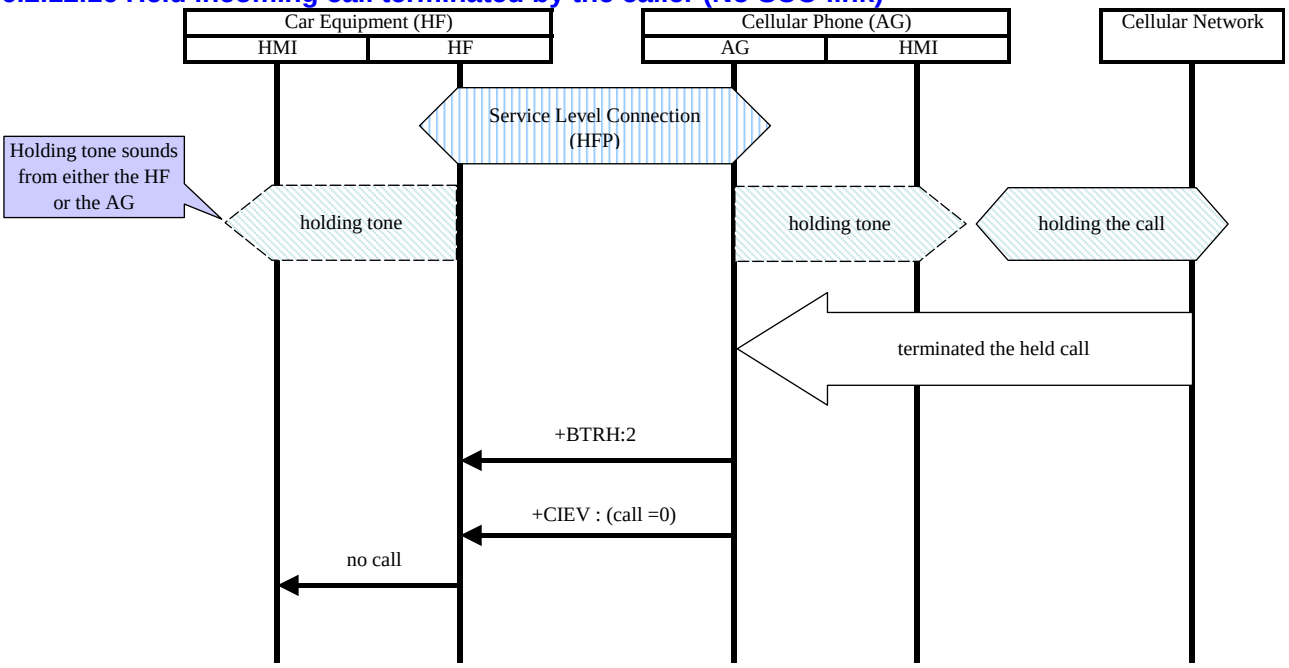
6.2.12.14 Terminate a held incoming call from the HF (No SCO link)



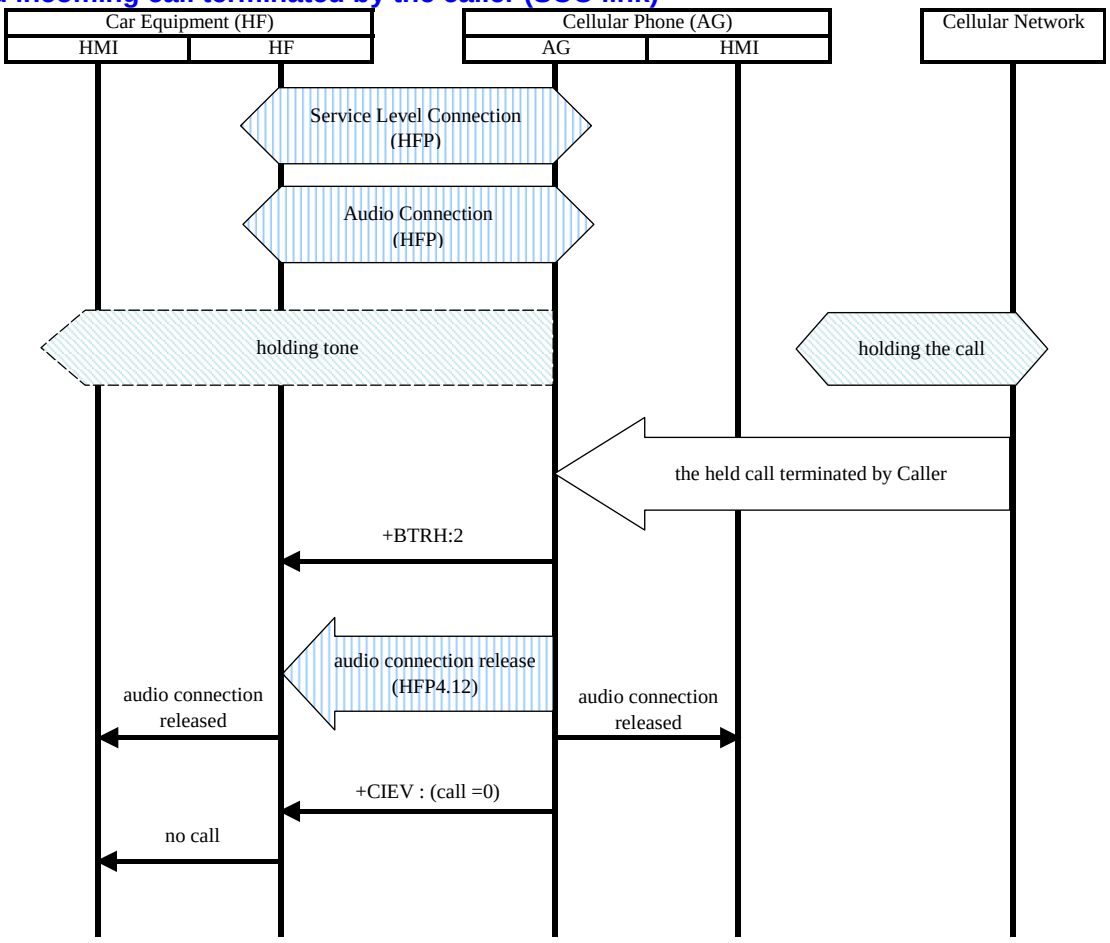
6.2.12.15 Terminate a held incoming call from the HF (SCO link)



6.2.12.16 Held incoming call terminated by the caller (No SCO link)

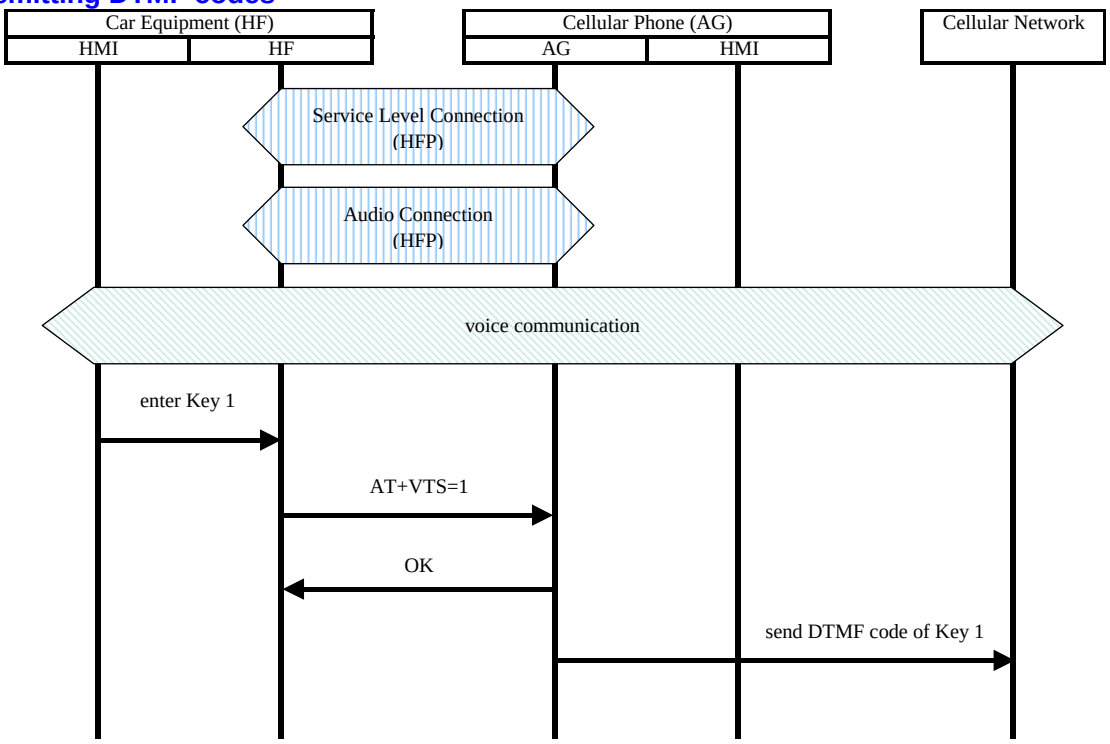


6.2.12.17 Held incoming call terminated by the caller (SCO link)

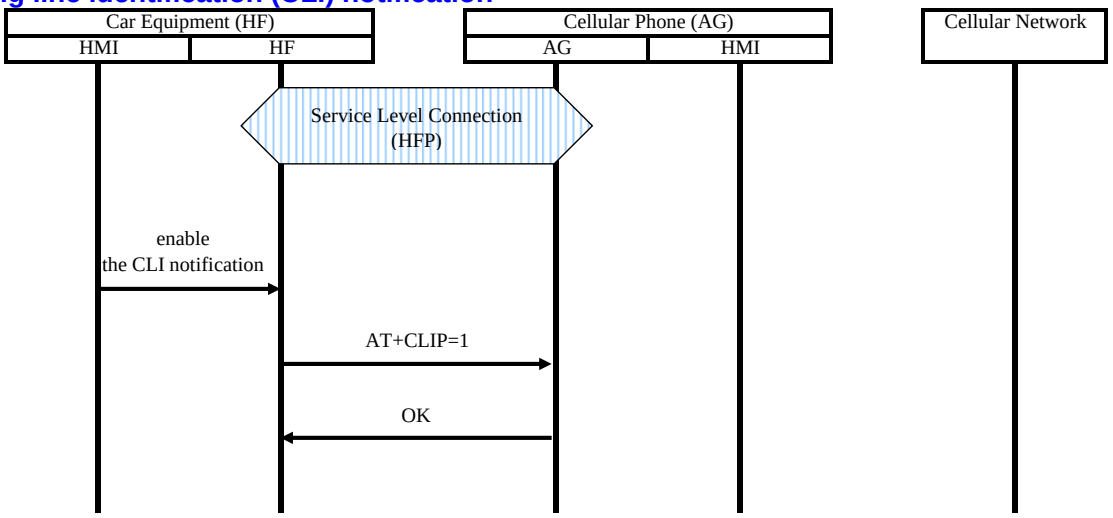


6.2.13 Others

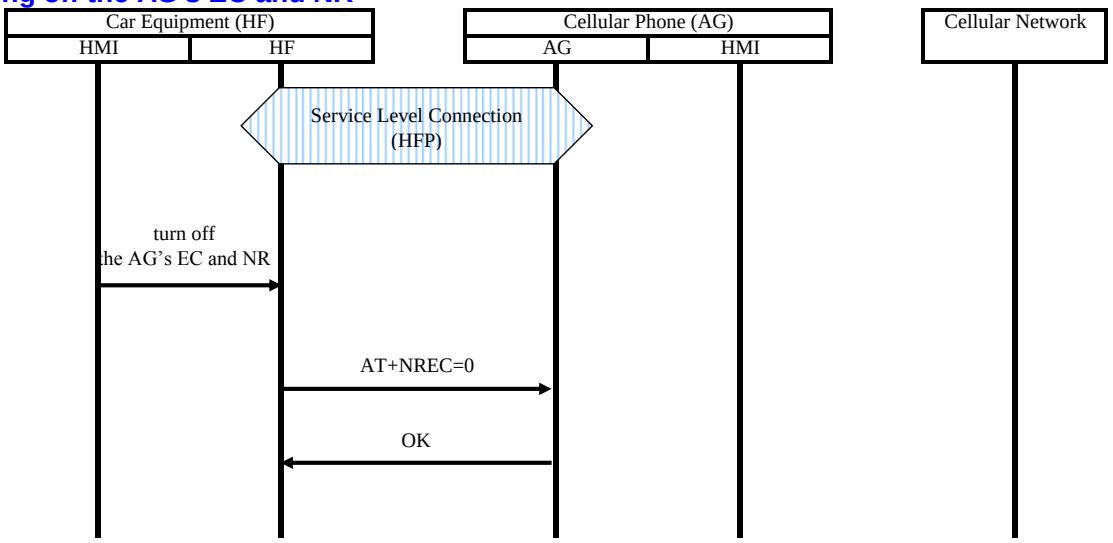
6.2.13.1 Transmitting DTMF codes



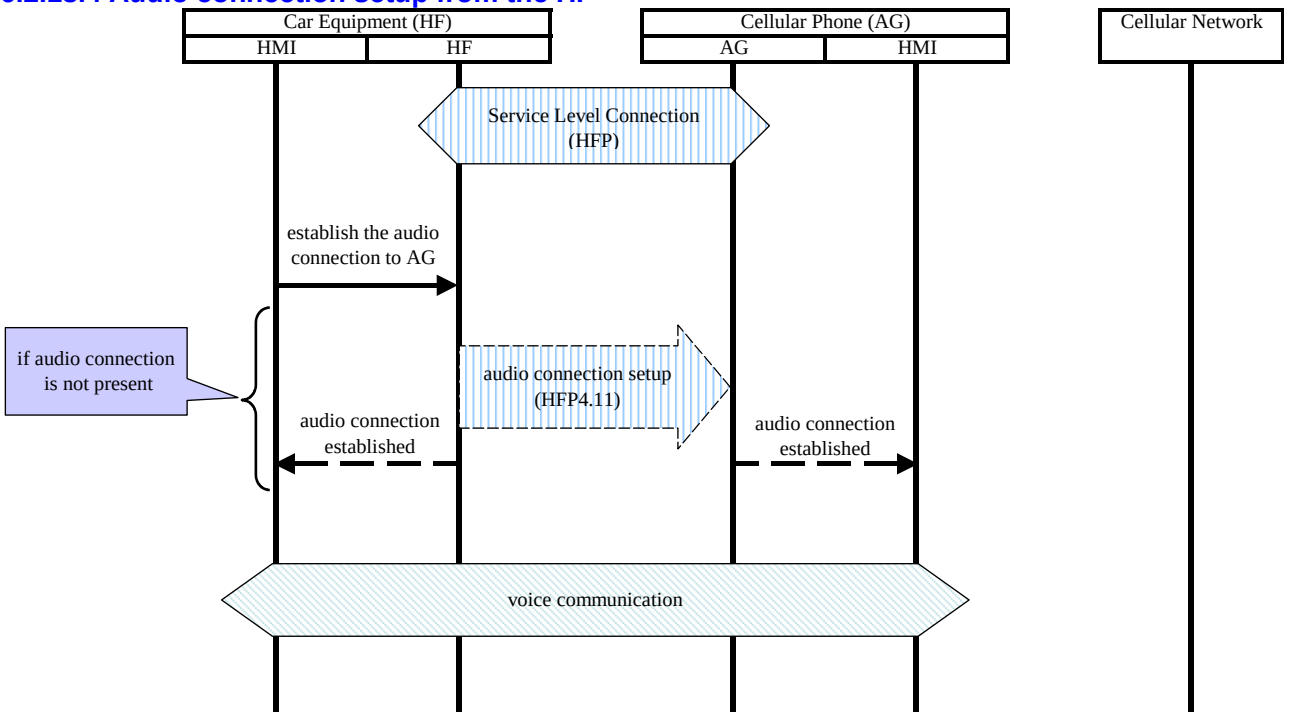
6.2.13.2 Calling line identification (CLI) notification



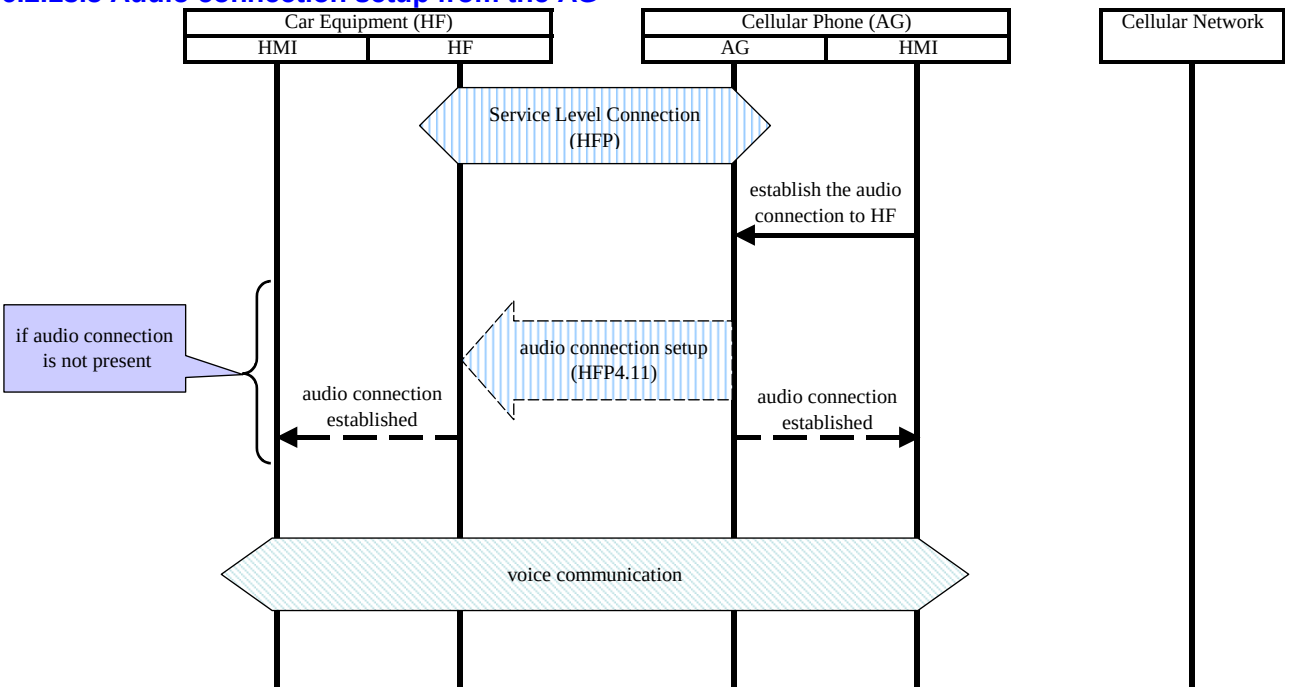
6.2.13.3 Turning off the AG's EC and NR



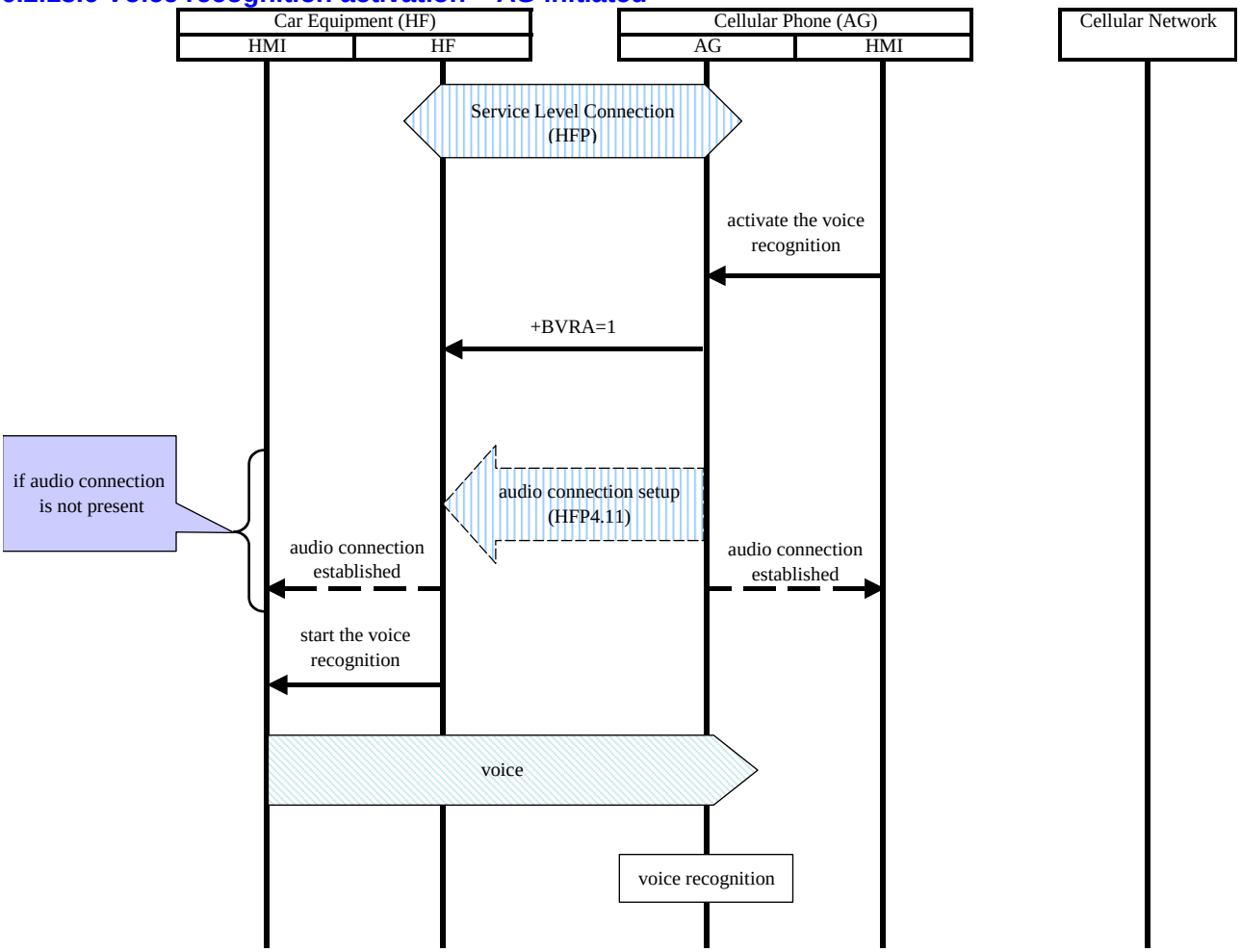
6.2.13.4 Audio connection setup from the HF



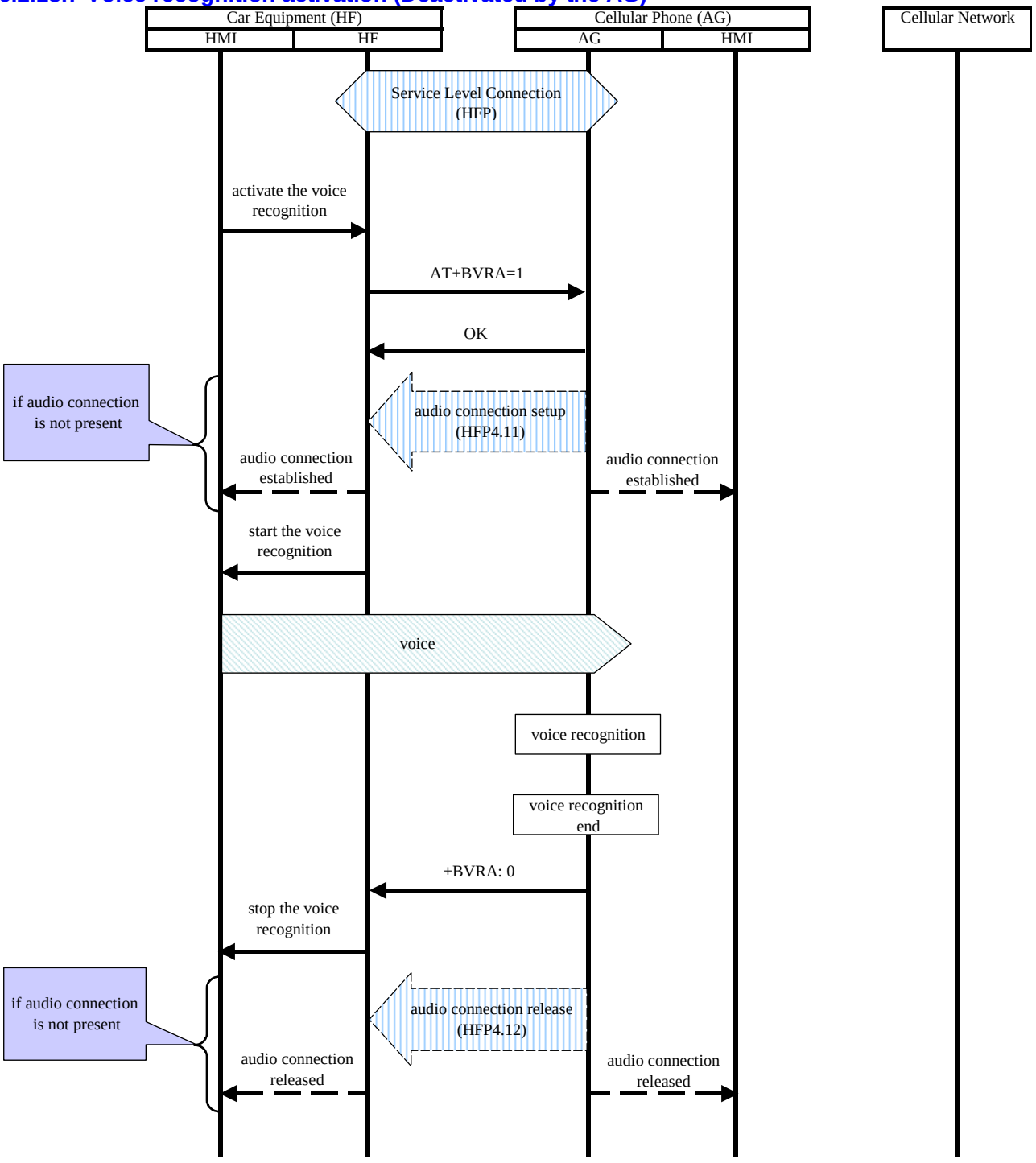
6.2.13.5 Audio connection setup from the AG



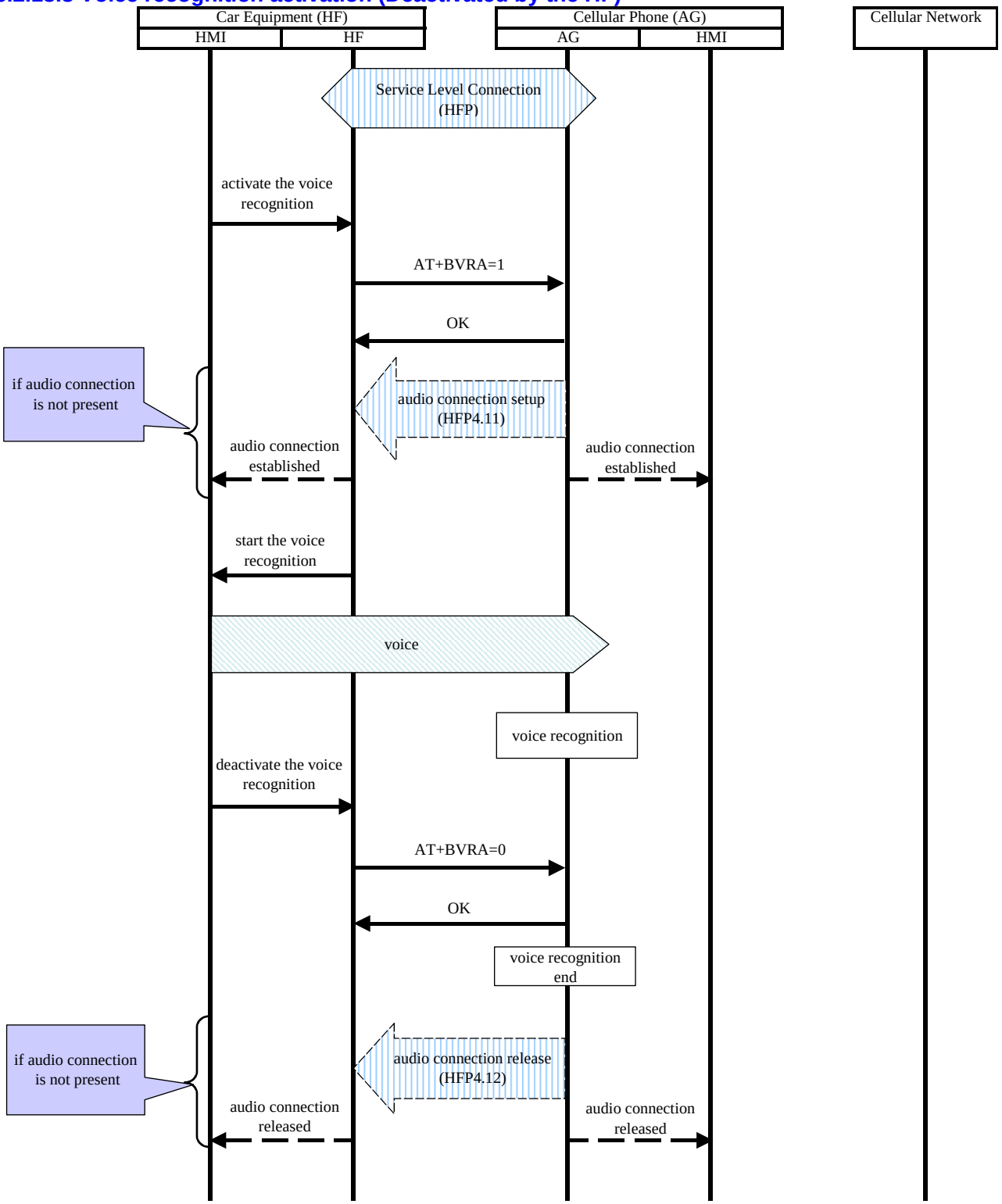
6.2.13.6 Voice recognition activation – AG initiated



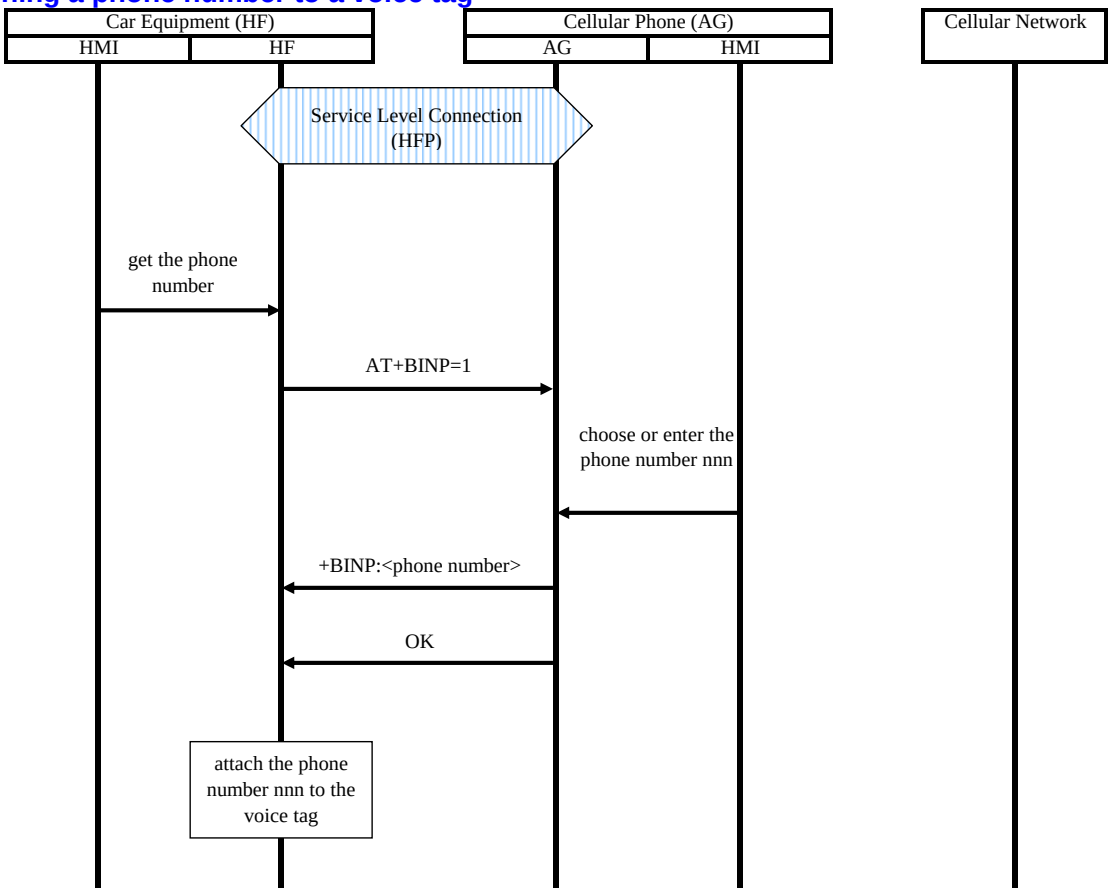
6.2.13.7 Voice recognition activation (Deactivated by the AG)



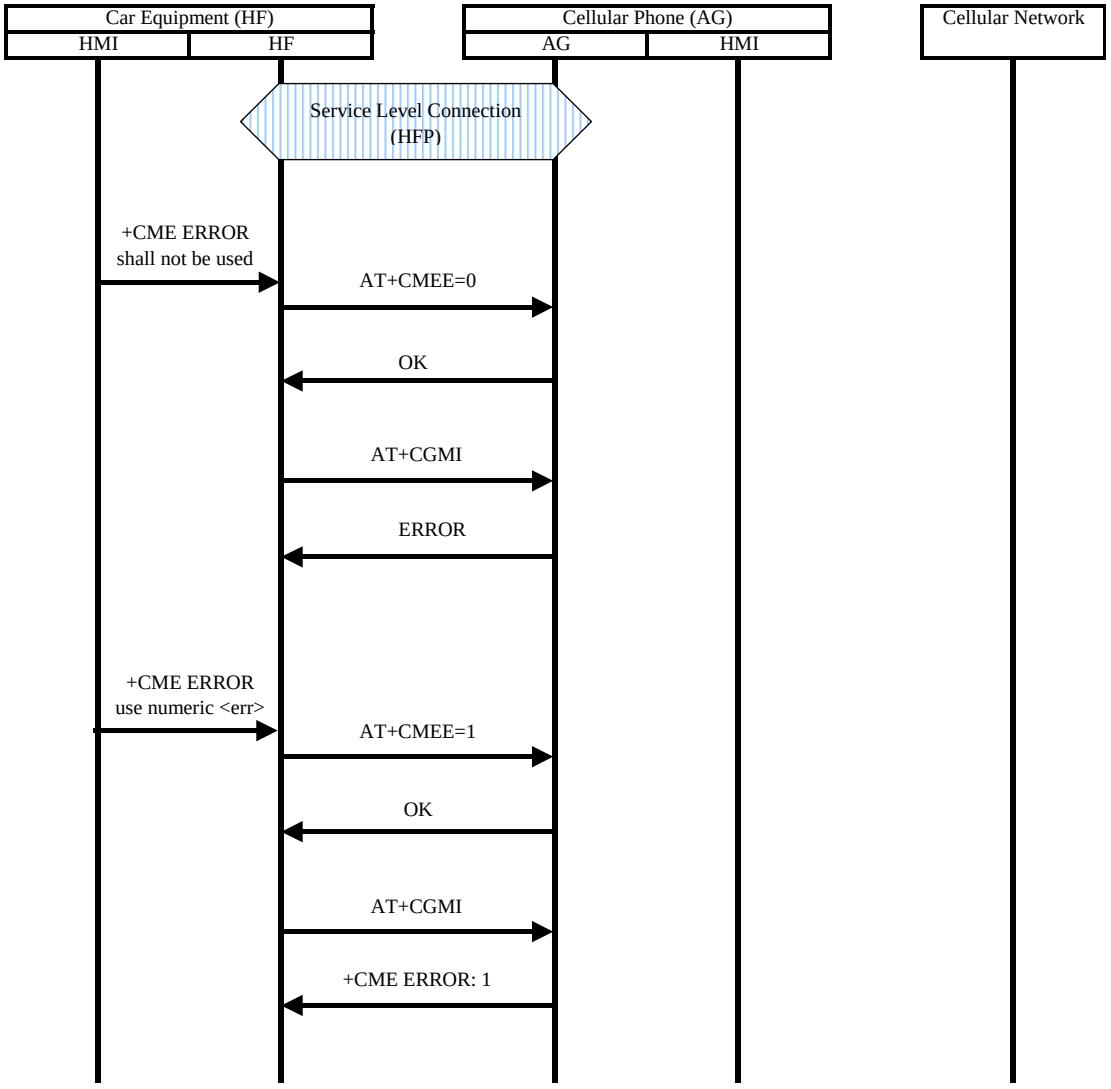
6.2.13.8 Voice recognition activation (Deactivated by the HF)



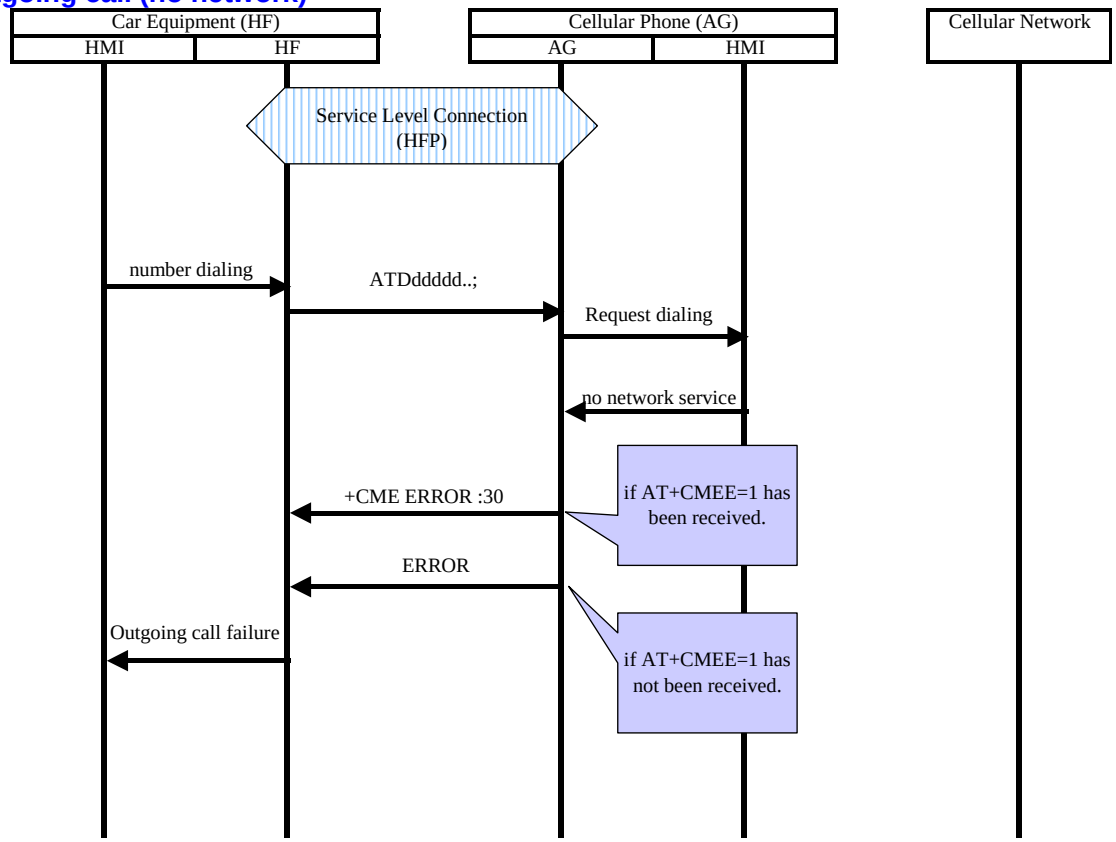
6.2.13.9 Attaching a phone number to a voice tag



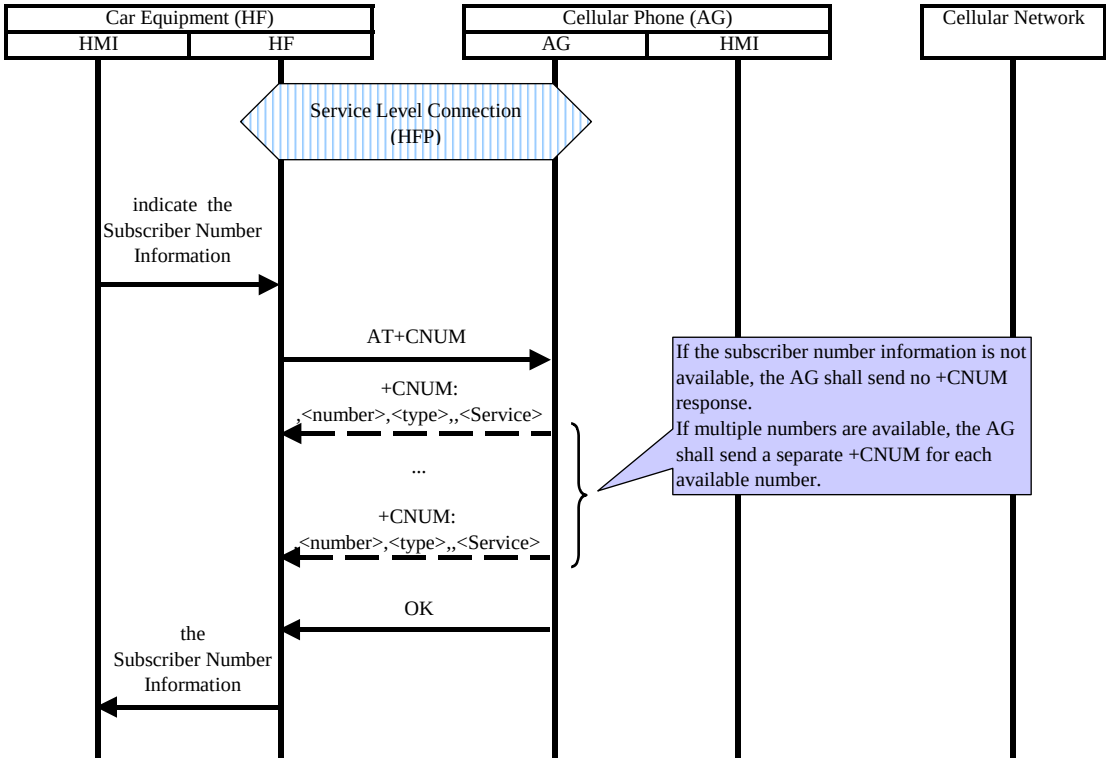
6.2.13.10 Extended AG Error Results Code



6.2.13.11 Outgoing call (no network)

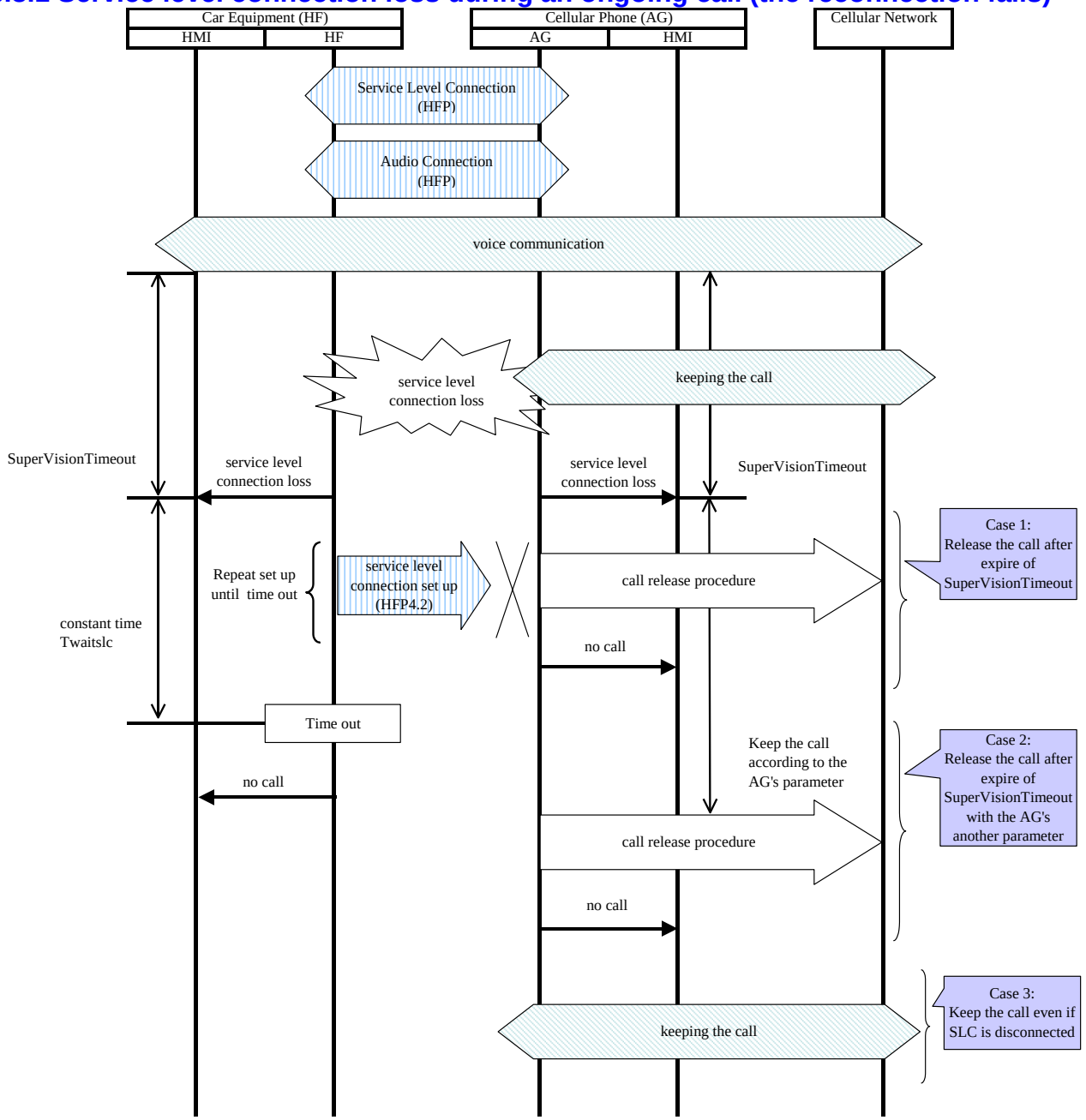


6.2.13.12 Subscriber Number Information

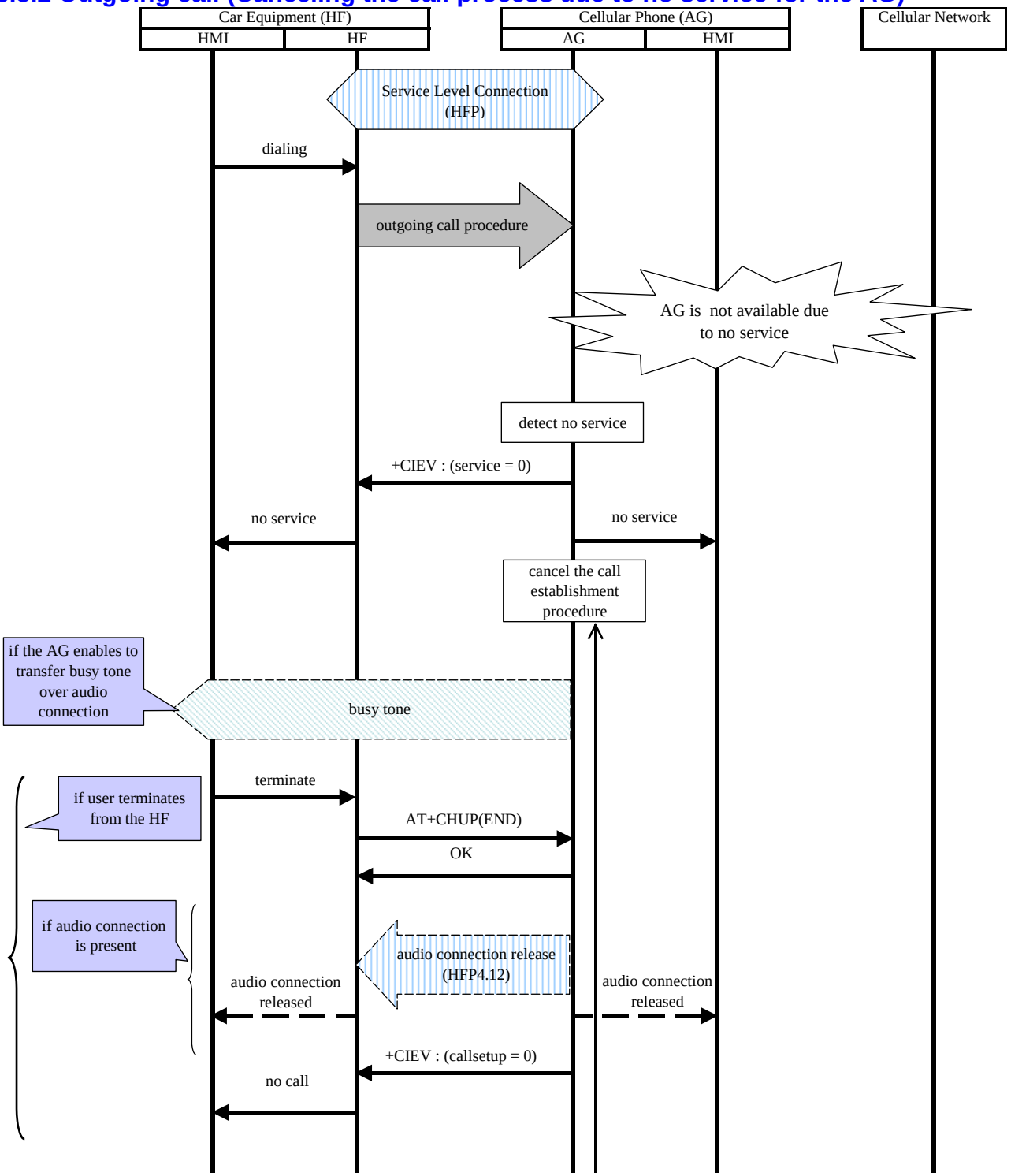


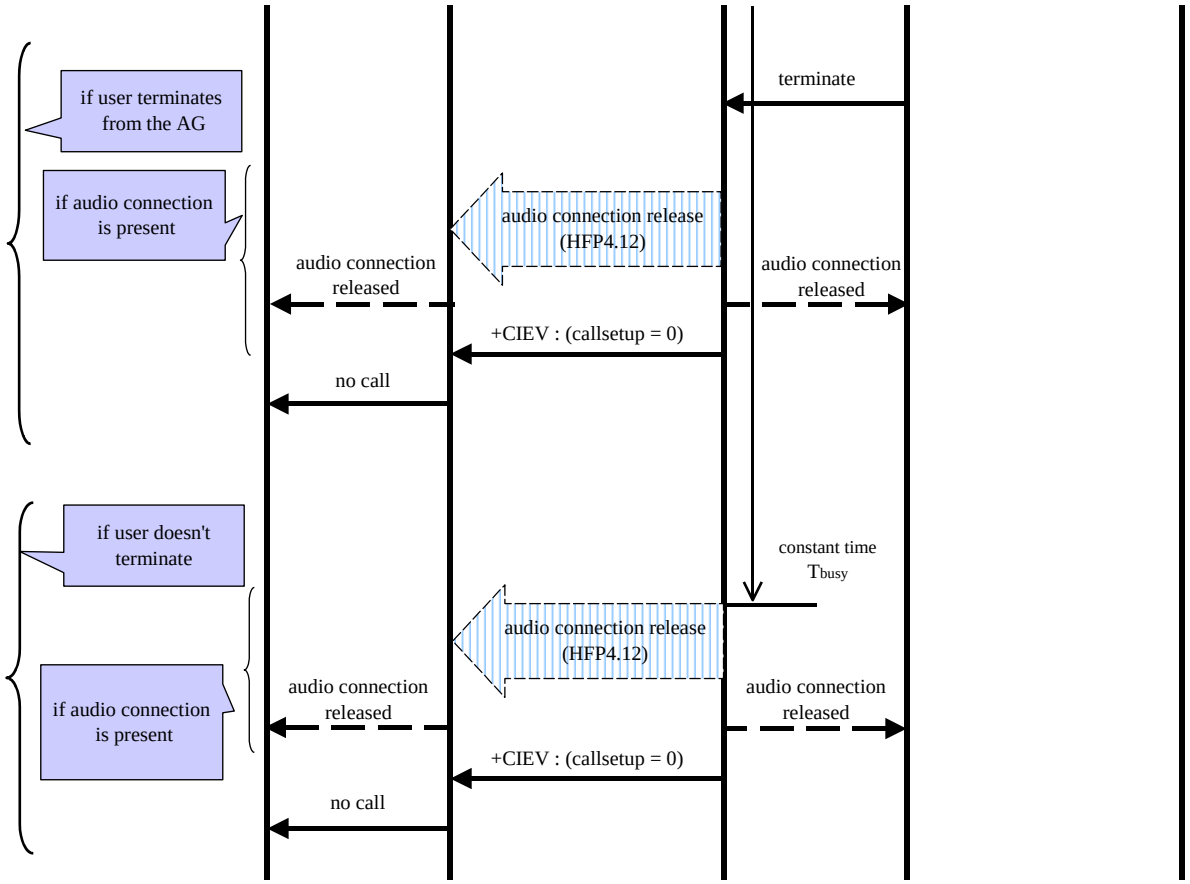
6.3 Abnormal Usage Scenarios

6.3.1 Service level connection loss during an ongoing call (the reconnection fails)

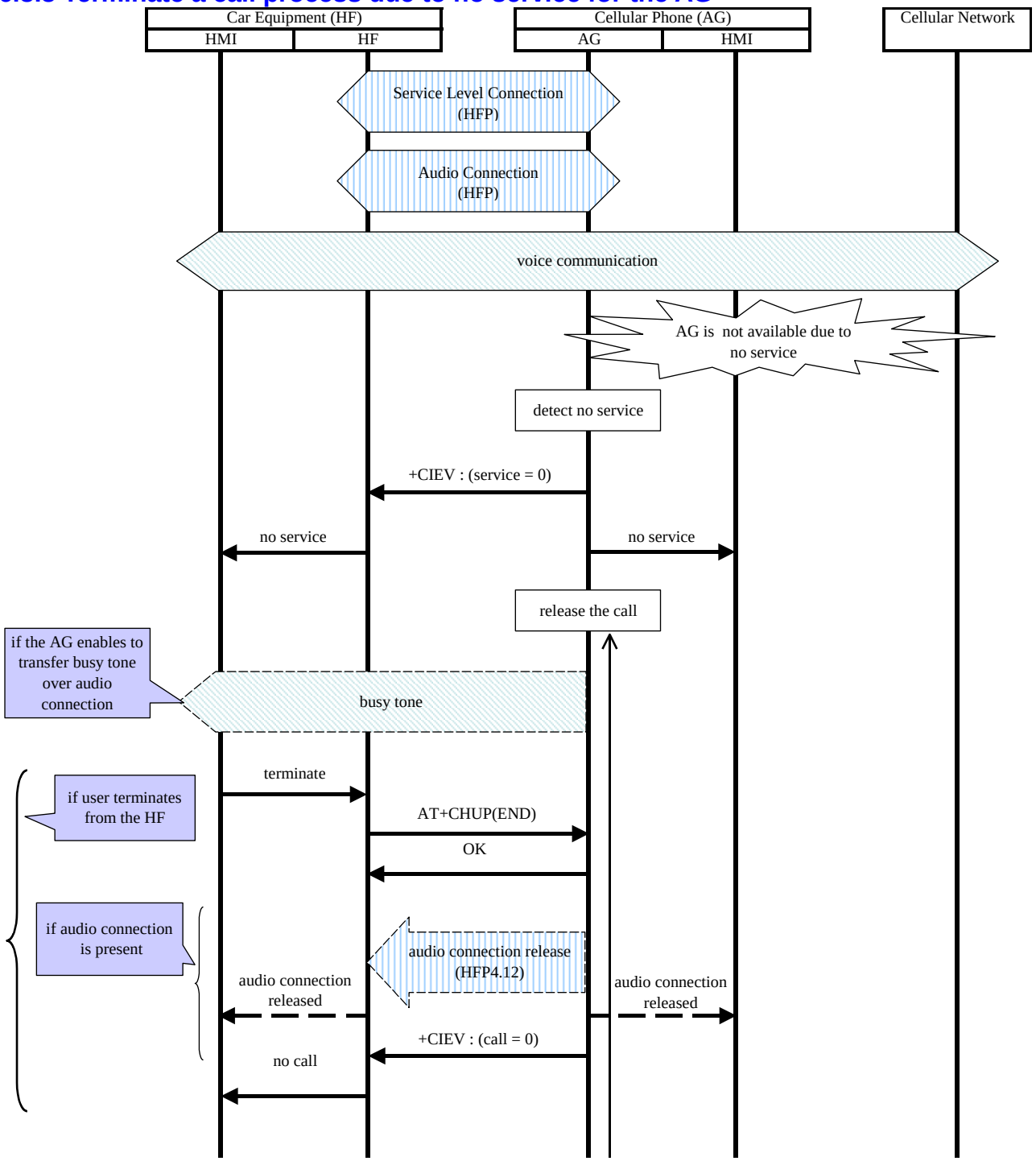


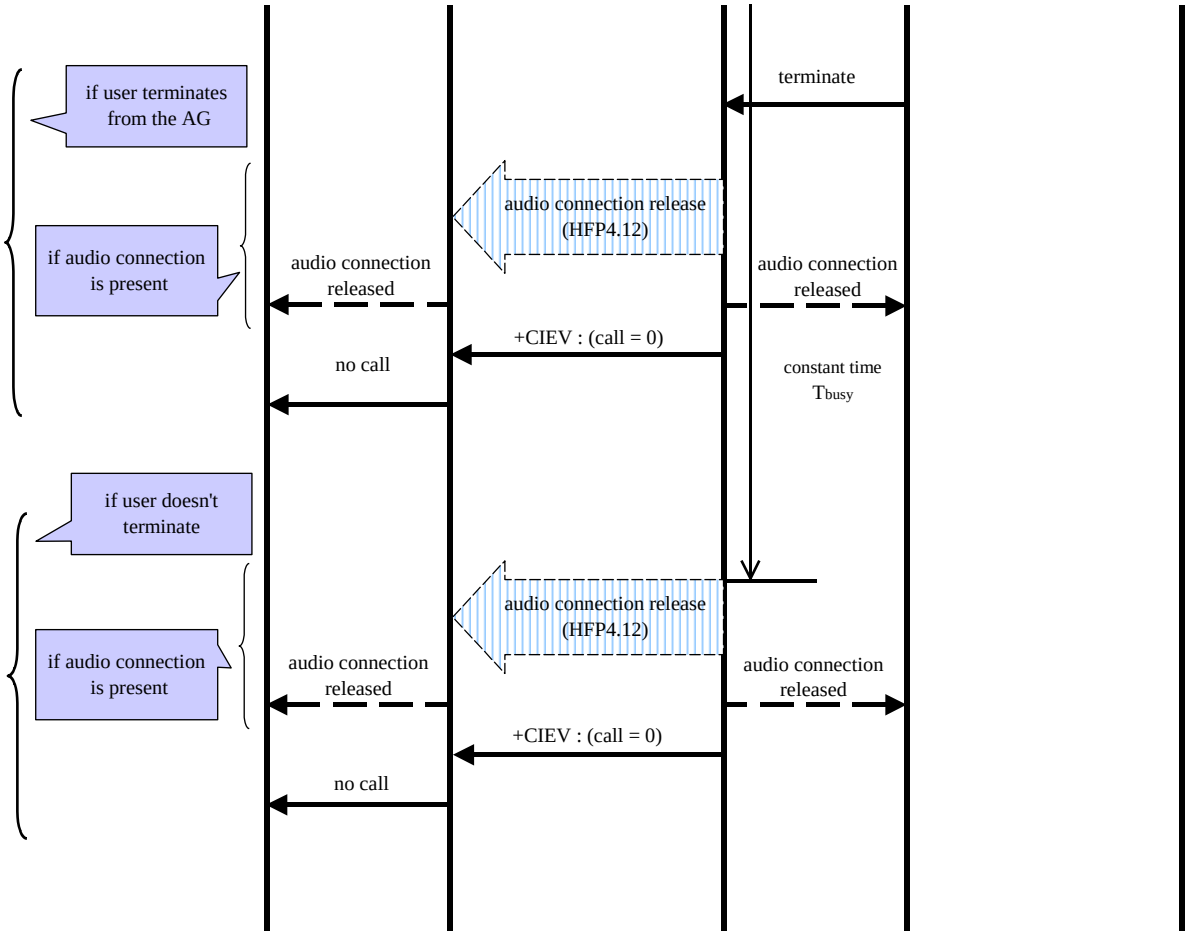
6.3.2 Outgoing call (Canceling the call process due to no service for the AG)



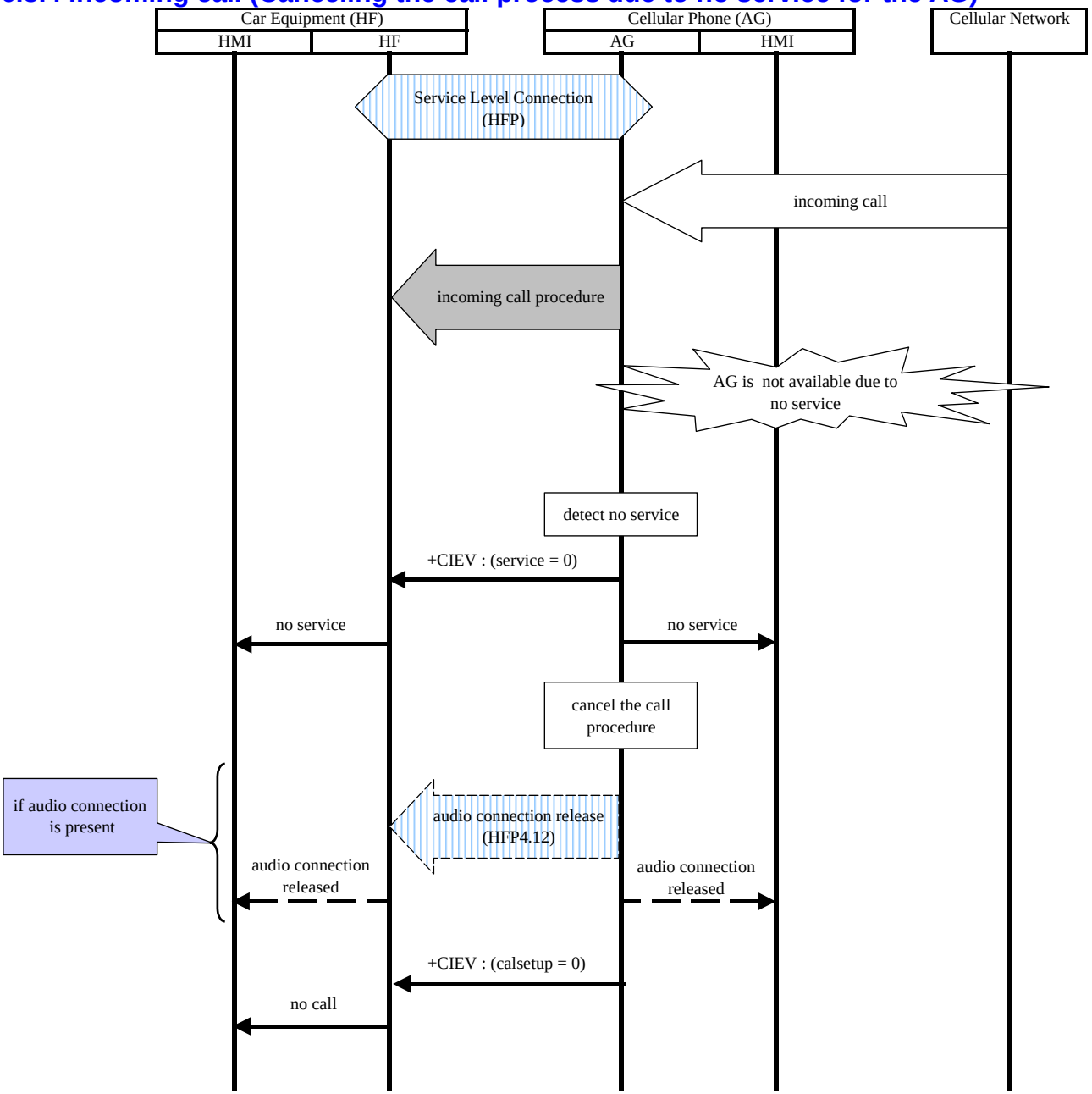

if user terminates from the AG
if audio connection is present
terminate
audio connection release (HFP4.12)
audio connection released
audio connection released
+CIEV : (callsetup = 0)
no call
if user doesn't terminate
constant time Tbusy
audio connection release (HFP4.12)
if audio connection is present
audio connection released
audio connection released
+CIEV : (callsetup = 0)
no call

6.3.3 Terminate a call process due to no service for the AG

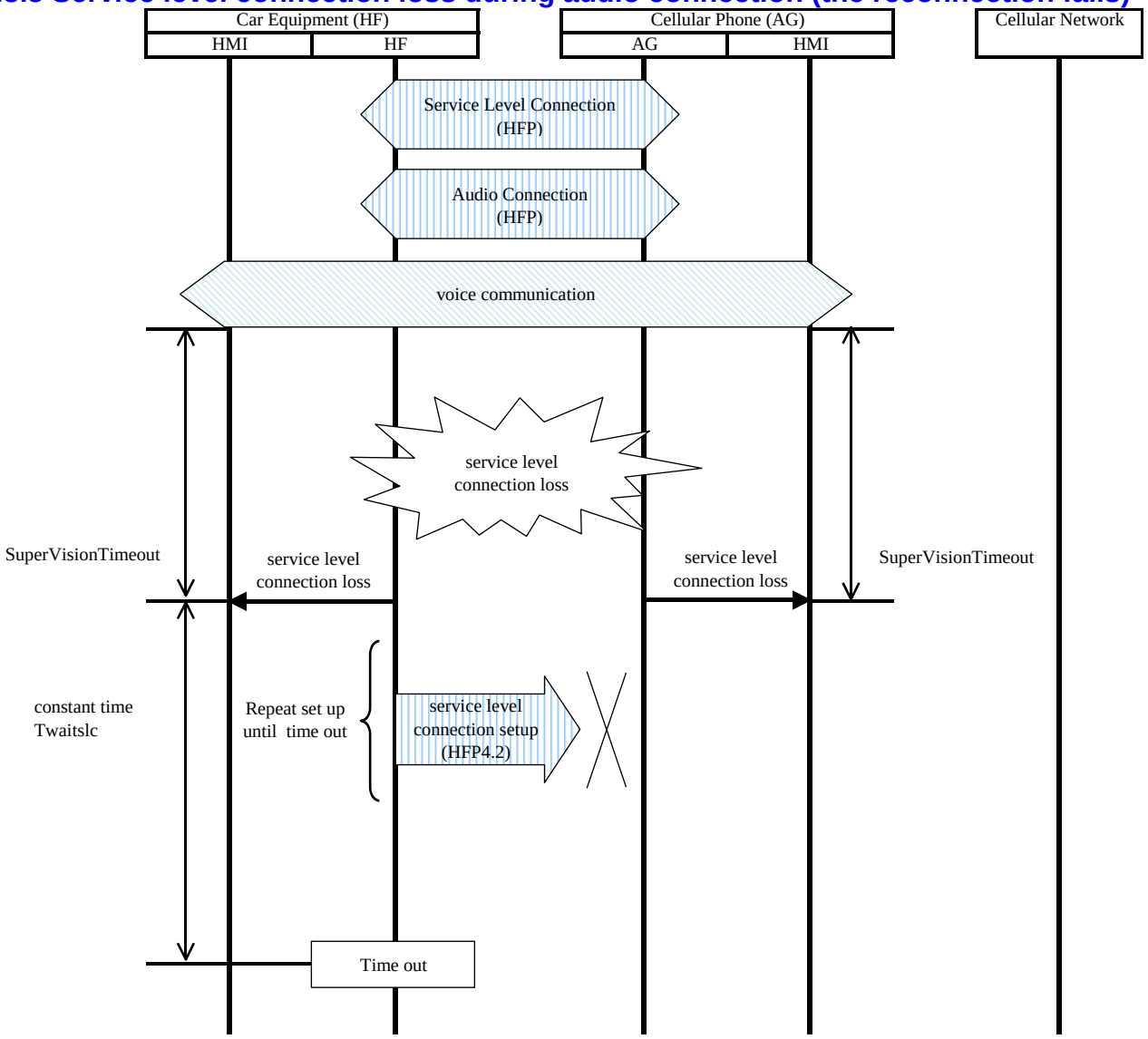



if user terminates from the AG
if audio connection is present
terminate
audio connection release (HFP4.12)
audio connection released
audio connection released
+CIEV : (call = 0)
no call
constant time
Tbusy
if user doesn't terminate
if audio connection is present
audio connection release (HFP4.12)
audio connection released
audio connection released
+CIEV : (call = 0)
no call

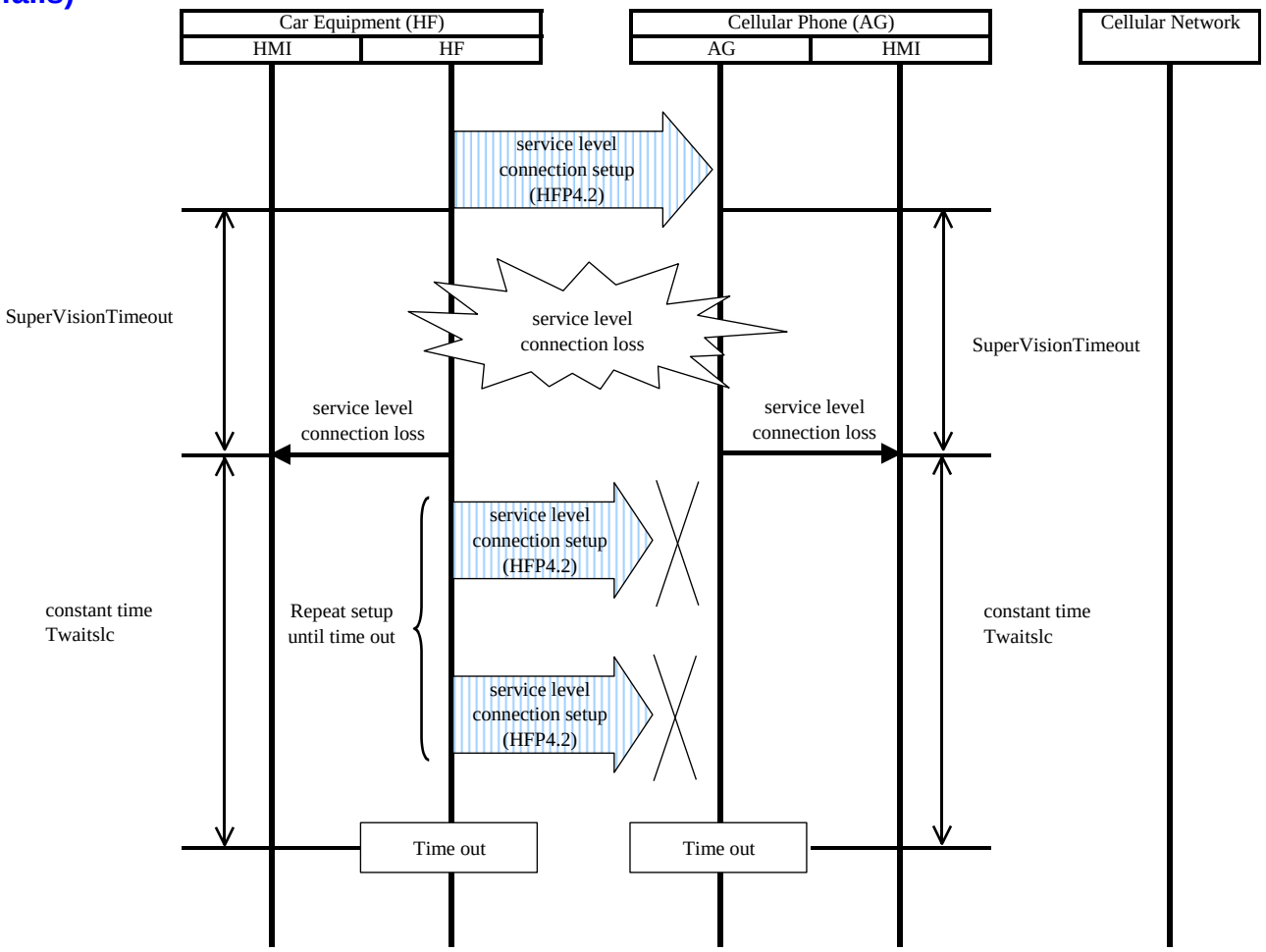
6.3.4 Incoming call (Canceling the call process due to no service for the AG)



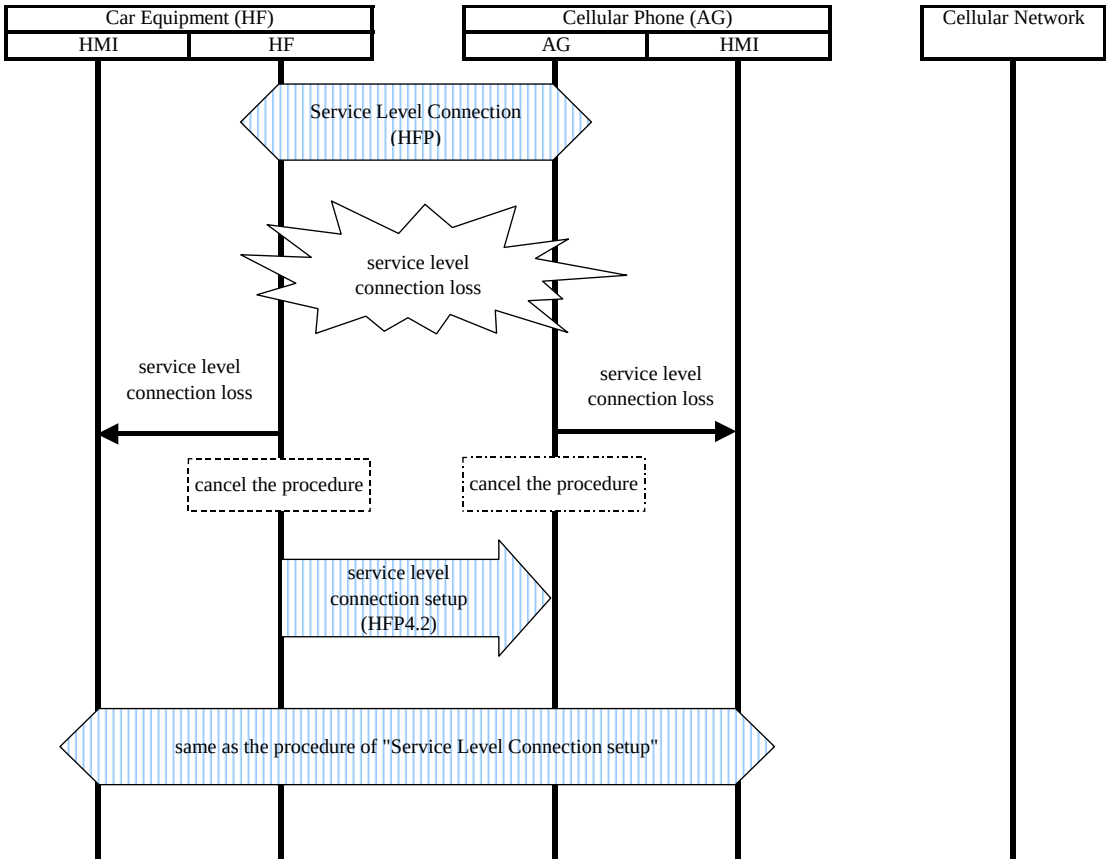
6.3.5 Service level connection loss during audio connection (the reconnection fails)



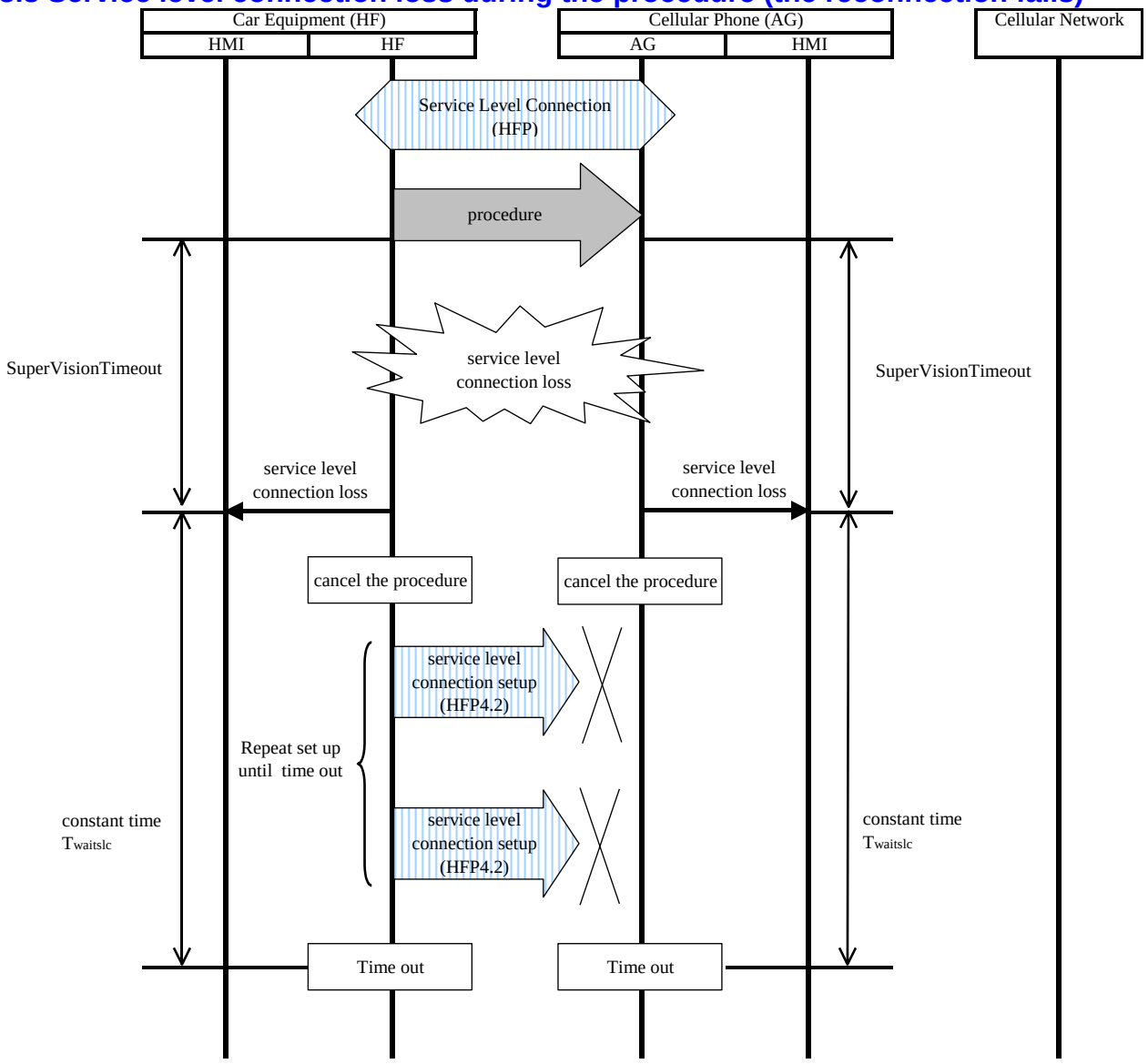
6.3.6 Service level connection loss during service level connection (the reconnection fails)



6.3.7 Service level connection loss and reconnection succeeded



6.3.8 Service level connection loss during the procedure (the reconnection fails)



モバイルコンピューティング推進コンソーシアム
Mobile Computing Promotion Consortium

MCPC-TR-002

Hands-Free Profile 1.5

Application Guideline

Appendix A

Version 1.51

Oct/19/2011

Mobile Computing Promotion Consortium
Technical Committee

Appendix A Contents
(Phonebook Transfer Guideline)

1. Abstract

This document describes the guideline how to transfer the phonebook from the cellular phone or the PDA to the Hands-Free Car Kit using Bluetooth wireless technology.
Generally, we already have some of the solutions to support phonebook transfer as follows.

(1) vCard with OBEX
(2) AT command
(3) Custom application for exchanging phonebook data

In this document, we select and show the guideline of (1). Because vCard and OBEX is already standardized as OPP (Object Push Profile) in the Bluetooth SIG, it can be utilized for the multipurpose. This technology can resolve the problem of sorting or selecting Japanese character data (ex. Furi-gana, which means sound).

2. Phonebook transfer features of the cellular phone

Regarding the phonebook transfer of the cellular phone, the following features shall be supported as the OBEX Client/Server operations. This table shows which feature shall be Mandatory(M), Option(O), Not-Recommended(N/R) or Not-Applied(N/A). If the cellular phone does not have phonebook storing ability, its supported feature is N/A.

"OBEX Authentication" in the table below is a kind of certifying operation in order to identify whether the remote device is the correct target requested to connect when OBEX is initiated. The details of OBEX Authentication are described in the next section.

IrMC Level	OBEX Authentication (Note-1)		OBEX Client Support	OBEX Server Support
	Support	Operation		
Level 1 (Note-1) OBEX PUT object in Inbox	O	N/R	M	M
Level 2 OBEX PUT Entire Object Store	M	O	M	M
Level 2 OBEX GET Entire Object Store	M	O	N/R (Note-3)	M
Level 3 OBEX GET/PUT Objects by Static Indices	M	O	N/R (Note-4)	O
Level 4 OBEX GET/PUT Objects by Unique Indices, Change Log Support, Change Counter Support	M	M	O (Note-2)	O

Note-1 Regarding OBEX Authentication,
- Level 1: Object transfer with an indefinite device. OBEX Authentication is not recommended to operate in this case.
- Level 2/3: Object transfer between devices of same user. OBEX Authentication is recommended to operate in this case. (Refer to IrMC Errata 990714 No.5)
- Level 4 is based on the Synchronization Profile Specification of Bluetooth SIG. OBEX Authentication shall be operated.

Note-2 When Synchronization is realized, the Server shall support OBEX Authentication. However, the Client features so that the cellular phone initiates OBEX Authentication might be Optional.

Note-3 Since supporting the PUT Client features enables entire object transfer and providing both the PUT/GET Client features makes user operations complicated, OBEX Authentication is not recommended to support for Level 2.

Note-4 Since providing the PUT/GET Client features with specified Static Index makes user operations complicated, OBEX Authentication is not recommended to support for Level 3.

Note-5 When Level 1 is initiated, input value in the Name header of transfer objects shall avoid one which can be confused with Level 2 object name, such as "pb.vcf" etc.

3. OBEX Authentication

The cellular phone shall support OBEX Authentication. During OBEX session establishment, the cellular phone shall execute Authentication Sequence specified in the section 3.1 and use Authentication Key specified in the section 3.2.

6.4 3.1 Authentication Sequence

"Normal Authentication" allows IrMC Level 1/2/3 OBEX operations. This enables accessing data in "telecom/####" except "/luid/#####". "Normal Authentication" shall be used for Level 2/3 OBEX Authentication when the cellular phone is the Client.

When the PUT Client/Server transfers only one object, it is not needed to execute OBEX Authentication. However, when the remote device requests OBEX Authentication, the local device shall respond with "Normal Authentication". An example of "Normal Authentication" (PUT operation) is shown below. The details shall be referred in IrOBEX version 1.2, IrDA Object Exchange Protocol version 1.2, Infrared Data Association.

Example. Normal Authentication (PUT operation)

1	Client	**1st Connect Request** w/ Authentication Challenge w/o Target header	
2	Server	**1st Connect Response** w/ Authentication Challenge	
3	Client	**2nd Connect Request** w/ Authentication Response	
4	Server	**2nd Connect Response** w/ Authentication Complete	
5	Client	**6.4.1.1.1.1 PUT Request** w/ one object	**6.4.1.1.1.2 PUT Request** w/ "t except "tele
6	Server	**6.4.1.1.1.3 PUT Response**	

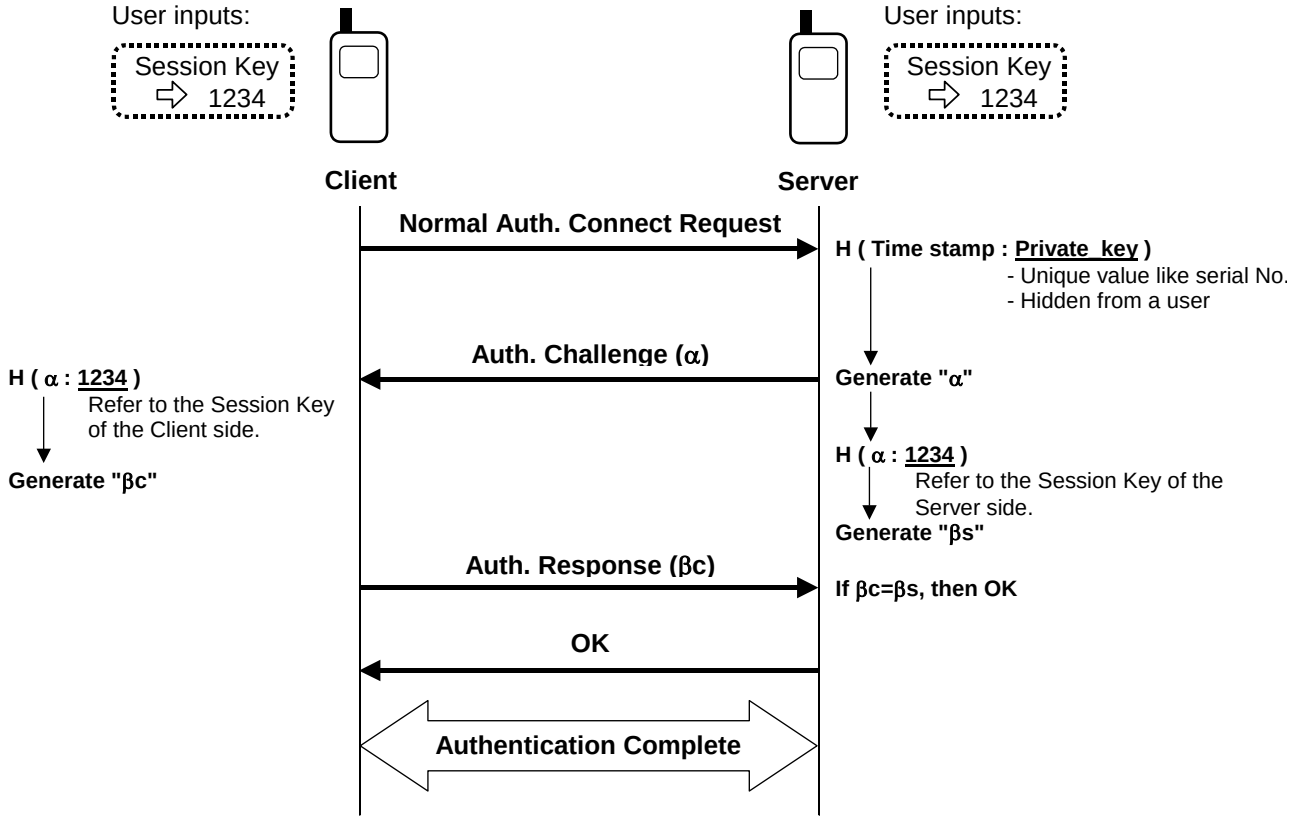
"#####" represents any object name.

6.5 3.2 Authentication Key

Users can setup the following Authentication Key.

Session Key: 4 digits numeric key. The device of Server side requests the Session Key during "Normal Authentication". The value of the Session Key shall be same between the Client and the Server. The Session Key is canceled during OBEX session release after end of object transfer.

Example. "Normal Authentication" sequence and the Session Key usage



7. 4. OPP : Object Push Profile

OPP is already defined by the Bluetooth SIG, which was released on 22 February 2001. Most of current Bluetooth embedded cellular phones have OPP available, CCAP would like to utilize this as the phonebook transfer.

The phonebook format is defined to adopt vCard ver2.1 when using the telephony application in this specification.

OPP defines the roles, the server and the client. CCAP strongly requests that the AG should be the client and the HF should be the server at the point of the phone functionality.

8. 5. vCard

As defined in OPP, the format of the phonebook should be followed ver.2.1 of vCard. However, especially considering in Japanese situation, the HF Car Kit has to handle some of the ver3.0 of vCard because the property of “Sort_String” is used for information of “Furi-gana” in vCard 3.0. The following requirements or attentions should be considered for implementation.

8.1 5.1 Property

Properties of vCard for a standard cellular phone, which shall be careful to be implemented, are listed below. Multiple phone numbers for a name entry of vCard can be stated. However, this guideline does not specify the number of phone numbers.

Property	Name	Support	Note	Ref.: IrMC1.1
VERSION	Version	M	VCard 2.1	M
N	Name	M		M
SOUND or Sort_String	Furi-gana	M	Use the extended parameter.	Note.1
TEL	Phone number	M	Allow multiple entries	M
EMAIL	Mail address	M	Allow multiple entries	O
X-CLASS	Secret property	M	Value: PUBLIC[default] / PRIVATE	-
X-GNO	Group No.	O Note.2	Default value is 0. Multi-Group entry is not allowed.	-
X-GN	Group name	O Note.2	Multiple Group names cannot be set to the same Group. Group name shall be unique for each Group. Default Group name: none	-
X-REDUCTION	Speed dialing	O		-
ADR	Address	O		O
ORG	Company name	O		O

Note.1 Refer to “IrMC Errata 2000 07 18 (July 28th 2000).

Note.2 It is recommended both “Group number” and “Group name” be supported when the Group setting is applied.

< Export >

(1) Character code settings: CHARSET, ENCODING

- CHARSET: Shift-JIS or UTF8

- ENCODING: none

(2) Version information: VERSION
- vCard 2.1

(3) Name: N
- When the delimiter between the first name and the last name is needed, ';' shall be used. The first Name shall be set in Field-2 and the last name in Field-1.
  When the delimiter is not needed, the first name and the last name shall be set in Field-1.

(4) Furi-gana: SOUND or Sort_String
- The extended parameter shall be used to indicate which property of "Furi-gana" is.
- Default parameter shall be X-IRMC-N.

Extended parameter	name of property adding X-IRMC-"Furi-gana"
Field etc.	Same field shall exist as described after X-IRMC-[Property].
CHARSET, ENCODING	CHARSET: Shift-JIS/UTF8, ENCODING: none

- Using the extended parameter X-IRMC-N, this shall be "Furi-gana" of N and have five fields as same as N.

(5) Telephone number: TEL
- Multiple TEL shall be able to be included in a vCard.
- Type of TEL shall be supported at least 5, general, cellular, home, work and FAX.
- Multiple TEL shall be able to be set for a type of TEL.
- Example of type of TEL and the parameter:

General	-> VOICE [default]
Cellular	-> CELL
Home	-> HOME;VOICE
Work	-> WORK;VOICE
FAX	-> FAX

(6) E-mail address: EMAIL
- Multiple EMAIL shall be able to be included in a vCard.
- Multiple EMAIL shall be able to be set for the same address type of e-mail.
- The parameter shall be supported at least INTERNET [default].

(7) Secret property: X-CLASS

- IrMC Level 1 send:	Send the default value [PUBLIC].
- IrMC Level 2,3,4 send:	Send Secret Property as it is.
- Secret Property: OFF	Send as PUBLIC.
- Secret Property: ON	Send as PRIVATE.

(8) Group No. and Group name: X-GNO, X-GN

- IrMC Level 1 send:	Not sent (Group No. to Group name correspondence between the sender and the receiver might not be kept.)
- IrMC Level 2,3,4 send:	Send as the setting

- When the Group No. is not set, default value 0 shall be sent.
- When the Group name is not set, only the property shall be sent.

(9) Speed dial: X-REDUCTION

- IrMC Level 1 send:	Not sent
- IrMC Level 2,3,4 send:	Send as the setting

(10) Address: ADR
- Each field of ADR is shown below:

Field-1	Postal address (Not popular in Japan.)
Field-2	Extension address (Room No. of apartment, dormitory etc.)
Field-3	Street (House No., Block No. etc.)
Field-4	Minor district (Town, City etc.)
Field-5	Major district (State, Prefecture etc.)
Field-6	Postal code
Field-7	Country

- If the address cannot be classified, it shall be described in Field-2.

(11) Company name: ORG
- Company name shall be set in Field-1.
- Section name shall be set in Field-2

(12) Send property for each IrMC Level:
- Data transfer in IrMC Level 1

  The main case is expected between cellular phones of different users. In this case, properties for Group settings and speed dial settings shall not be transferred in order to avoid inconsistency of date between the sender and the receiver. Secret property shall be transferred as the default value, PUBLIC.
- Data transfer in IrMC Level 2/3/4

- The main case is expected between cellular phones or PC of the same user. In this case, all properties implemented shall be transferred as their settings

(13) Entire objects:
- When creating entire objects, the owner information shall be added as the head data. If the owner information is missing, the head data shall be empty.
- As an example of creating entire objects for a cellular phone which does not support Static Index of IrMC Level 3, the method of sorting the second data and the following data in Gojyu-on, the Japanese syllabary, order is expected.

< Import >

(1) Character code settings: CHARSET, ENCODING
- Receiving objects, which CHARSET is SHIFT-JIS or UTF8, shall be enabled. If CHARSET is not defined, it shall be regarded as SHIFT-JIS.
- If ENCODING is QUOTED-PRINTABLE or BASE64, the object shall be able to be received. If ENCODING is not defined, the object shall be able to be received as no ENCODING.
- If CHARSET/ENCODING is defined other types, the object shall be able to be received according to the feature of the cellular phone.

(2) Version information: VERSION
- VERSION:2.1 indicated vCard shall be able to be received.
- If there is no VERSION property, it shall be received as VERSION:2.1.
- If VERSION:3.0 is indicated, vCard3.0, it shall be able to be received according to the feature of the cellular phone.

(3) Name: N
- Data in Field-1 of N shall be set as the last name, Field-2 as the first name.
- If N is not divided in Fields, whole data shall be set as the last name.
- If there is no N property, or if N is NULL and FN exists, data in FN shall be set as a name. In this case, whole data shall be set as the last name.

(4) Furi-gana: SOUND or Sort_String
- Data shall be set as Furi-gana which property is indicated in extended parameter after SOUND or Sort_String.
- It is recommended that data between ‘<’ and ’>’ can be received.

(5) Telephone number: TEL
- Example of the parameter and type of TEL:

VOICE	-> General phone [default]
CELL	-> Cellular phone
HOME;VOICE	-> Home
WORK;VOICE	-> Work
FAX	-> FAX

- If the parameter is not supported, it shall be set as default value, VOICE.
- The parameter added PREF shall be set in the first entry.
- If the total number of TEL over the max entries, exceeded data shall be discarded.

(6) E-mail address: EMAIL
- Unsupported parameters shall be set as default value, INTERNET.
- If the total number of EMAIL over the max entries, exceeded data shall be discarded.

(7) Secret property: X-CLASS
- IrMC Level 1 receive: Set as default value, PUBLIC
- IrMC Level 2/3/4 receive: If PUBLIC is indicated, set Secret property OFF.
  If PRIVATE is indicated, set Secret property ON.
  If illegal value is received, set as default value, PUBLIC.

(8) Group No. and Group name: X-GNO, X-GN
- IrMC Level 1 receive: Set Group No. as default value 0.
  Group name shall be set that of Group No.0. If Group name of Group No.0 is missing, Group name shall not be set.
- IrMC Level 2/3/4 receive: Group No. and Group name shall be set as they are.
  If there is inconsistency between received Group No. and received Group name, latter received information shall be applied.
  If the object has only Group No., Group name corresponding to the Group No. shall be set automatically.

(9) Speed dial: X-REDUCTION
- IrMC Level 1 receive: Set no Speed dial information.
- IrMC Level 2/3/4 receive: Set Speed dial information as it is.
  If another Speed dial settings are already applied for the receiver, latter received information shall be used and former settings shall be discarded.

(10) Address: ADR
- If received ADR is divided in to some fields and Field-7 (Country) is Japan, Field-5 (Major district) shall be set as the head data and assembled in order of Field-4, 3, 2 and 1.

(11) Company name: ORG
- Set the value in Field-1 as Company name and the value in Field-2 Section name.

(12) Owner/Local information:
- If entire objects are received in IrMC Level 2, the head data shall be applied for the owner information. In this case, the subscriber number shall not be replaced.
  If the head data is empty, it shall be discarded. The owner information shall not be replaced with the empty object.
- If the owner information is received in IrMC Level 4 Sync, the subscriber number shall not be replaced.

(13) Entire objects:
- When entire objects are received, feature of data indicating in received order or Gojyu-on, the Japanese syllabary, order shall be equipped.
- If the total number of objects over the max entries, exceeded data shall be discarded.

(14) Common notice for each property
- Properties not implemented in the cellular phone shall be discarded.
- Parameters not implemented in the cellular phone shall be set as default value.
- Data which length over the entry limit, exceeded data shall be discarded.

8.2 5.2 Size of the vCard

However the limitation of vCard size is not defined, it should be taken into account for receive buffer size of the Car Kit. Especially the recent cellular phone can handle the photograph, it is

recommended the transmit data can be selected by the user's operation.

8.3 5.3 other

For Japanese use, "MCPC GL-003 OBEX Implementation Guideline" should be referred.

9. 6. Transfer

CCAP recommends to support the following object transfer.

(1) One object transfer

The OPP client can select just one object to be transferred. The way to select the object is implementation dependant. The selection by the user's operation would be preferable. The client may close OBEX session after the transfer.

(2) Plural objects transfer

The OPP client can select plural objects to be transferred. The way to select the objects is implementation dependant. The selection by the user's operation would be preferable. In this function, the user's explicit operation to close OBEX session might be required on the OPP client.

(3) Entire objects transfer

The OPP client can select whole phonebook in the client.
In the specification of IrMC, OBEX authentication shall be executed when entire data push. However, it's defined in OPP that this is not executed. In this guideline, CCAP recommends that OBEX authentication be not executed because Bluetooth authentication is already done and we think much of the convenience for the user.

10. 7. Others

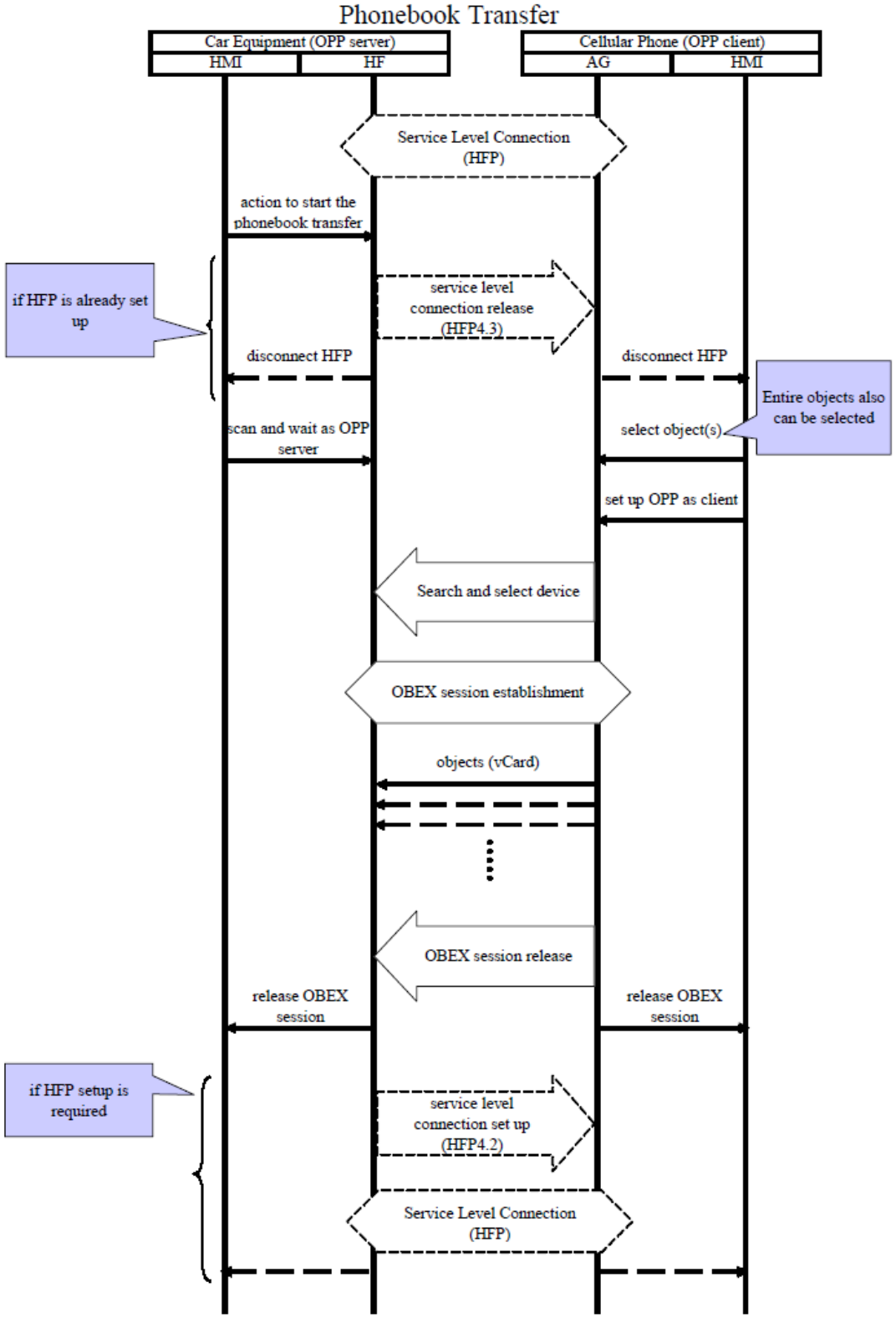
(1) Additional properties for Japanese market

The following properties would be considered because the conventional cellular phones already implement them.

- Memory number
- Group number
- Group name
- Secret code

They are defined in MCPC GL-003.

11. 8. Sequence chart (example)



MCPC-TR-002

Hands-Free Profile 1.5

Application Guideline

Version 1.51

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