

GSM Control Channel Groups

These are: Broadcast Control Channel (BCCH); Common Control Channel (CCCH); Dedicated Control Channel (DCCH).

BCCH Group

The Broadcast Control Channels are downlink only (BSS to MS) and comprise the following:

- BCCH carries information about the network, a MSs present cell and the surrounding cells. It is transmitted continuously as its signal strength is measured by all MSs on surrounding cells.
- The Synchronizing Channel (SCH) carries information for frame synchronization.
- The Frequency Control Channel (FCCH) provides information for carrier synchronization.

CCCH Group

The Common Control Channel Group works in both uplink and downlink directions.

- Random Access Channel (RACH) is used by MSs to gain access to the system.
- Paging Channel (PCH) and Access Granted Channel (AGCH) operate in the “downlink” direction. The AGCH is used to assign resources to the MS, such as a Stand-alone Dedicated Control Channel (SDCCH). The PCH is used by the system to call a MS. The PCH and AGCH are never used at the same time.
- Cell Broadcast Channel (CBCH) is used to transmit messages to be broadcast to all MSs within a cell, for example, road traffic information, sporting results.

DCCH Group

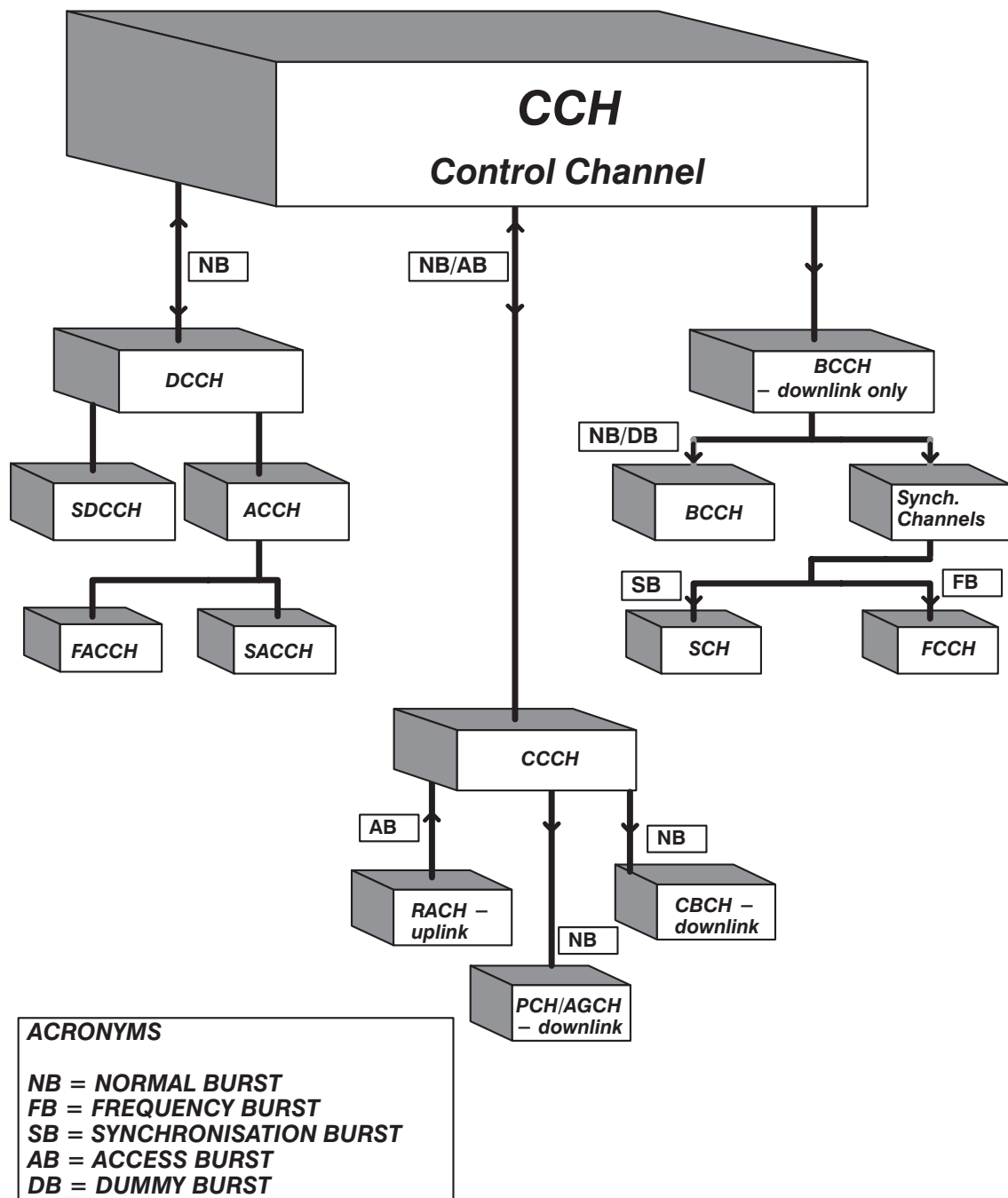
Dedicated Control Channels are assigned to a single MS for call setup and subscriber validation. DCCH comprises:

- Stand-alone Dedicated Control Channel (SDCCH) which supports the transfer of Data to and from the MS during call setup and validation.
- Associated Control Channel. This consists of Slow ACCH which is used for radio link measurement and power control messages. Fast ACCH is used to pass “event” type messages, for example, handover messages. Both FACCH and SACCH operate in uplink and downlink directions.

Acronyms

BCCH	Broadcast Control Channel	CCCH	Common Control Channel
DCCH	Dedicated Control Channel	ACCH	Associated Control Channel
SDCCH	Stand-alone Dedicated Control Channel	RACH	Random Access Channel
		PCH	Paging Channel
AGCH	Access Grant Channel	CBCH	Cell Broadcast Channel

Control Channels



GSM Logical Channels

Control Channels

Broadcast Control Channel (BCCH)

The Broadcast Control Channel is transmitted by the BTS at all times. The RF carrier used to transmit the BCCH is referred to as the BCCH carrier. The information carried on the BCCH is monitored by the MS periodically (at least every 30 secs), when it is switched on and not in a call.

Broadcast Control Channel (BCCH) – Carries the following information (this is only a partial list):

- Location Area Identity (LAI).
- List of neighbouring cells which should be monitored by the MS.
- List of frequencies used in the cell.
- Cell identity.
- Power control indicator.
- DTX permitted.
- Access control (for example, emergency calls, call barring).
- CBCH description.

The BCCH is transmitted at constant power at all times, and its signal strength is measured by all MS which may seek to use it. "Dummy" bursts are transmitted to ensure continuity when there is no BCCH carrier traffic.

- **Frequency Correction Channel (FCCH)**

This is transmitted frequently on the BCCH timeslot and allows the mobile to synchronize its own frequency to that of the transmitting base site. The FCCH may only be sent during timeslot 0 on the BCCH carrier frequency and therefore it acts as a flag to the mobile to identify Timeslot 0.

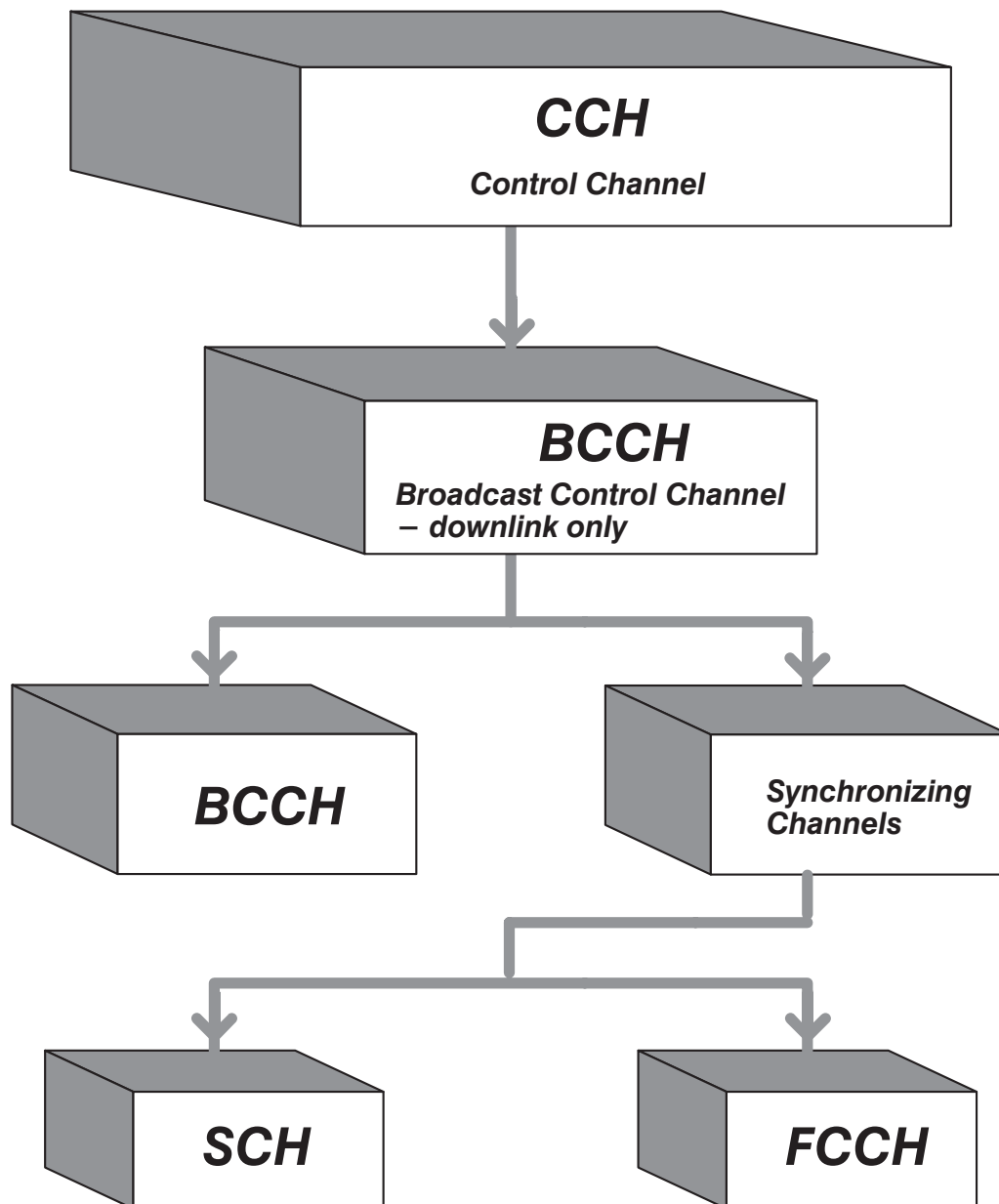
- **Synchronization Channel (SCH)**

The SCH carries the information to enable the MS to synchronize to the TDMA frame structure and know the timing of the individual timeslots. The following parameters are sent:

- Frame number.
- Base Site Identity Code (BSIC).

The MS will monitor BCCH information from surrounding cells and store the information from the best six cells. The SCH information on these cells is also stored so that the MS may quickly resynchronize when it enters a new cell.

Broadcast Control Channel (BCCH)



Control Channels

Common Control Channels (CCCH)

The Common Control Channel (CCCH) is responsible for transferring control information between all mobiles and the BTS. This is necessary for the implementation of "call origination" and "call paging" functions.

It consists of the following:

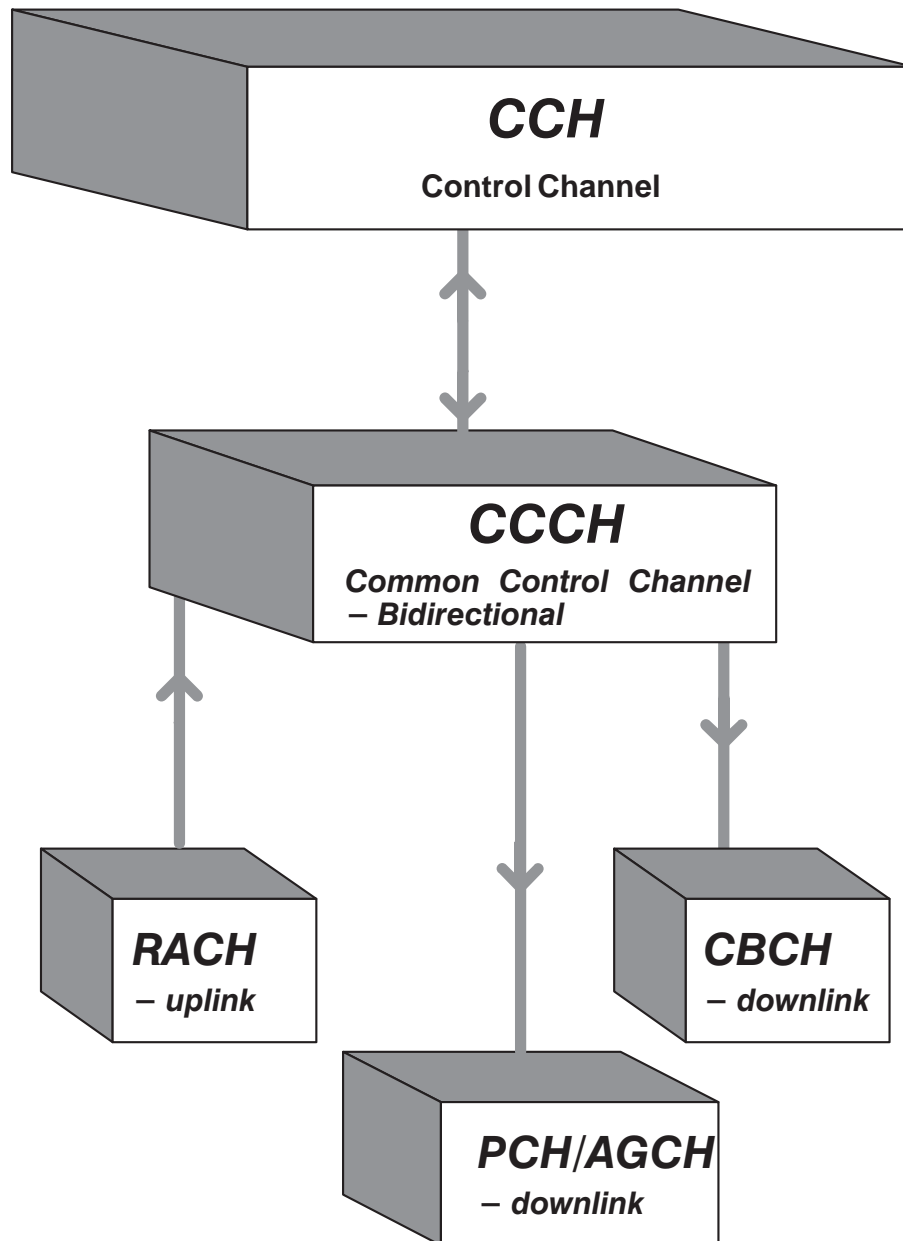
- **Random Access Channel (RACH)**
Used by the mobile when it requires to gain access to the system. This occurs when the mobile initiates a call or responds to a page.
- **Paging Channel (PCH)**
Used by the BTS to page MS, (paging can be performed by an IMSI, TMSI or IMEI).
- **Access Grant Control Channel (AGCH)**
Used by the BTS to assign a dedicated control channel to a MS in response to an access message received on the Random Access Channel. The MS will move to the dedicated channel in order to proceed with either a call setup, response to a paging message, Location Area Update or Short Message Service.
- **Cell Broadcast Channel (CBCH)**
This channel is used to transmit messages to be broadcast to all MSs within a cell. The CBCH uses a dedicated control channel to send its messages, however it is considered a common channel because the messages can be received by all mobiles in the cell.

Active MSs must frequently monitor both BCCH and CCCH. The CCCH will be transmitted on the RF carrier with the BCCH.

Acronyms:

CCCH	Common Control Channel
RACH	Random Access Channel
PCH	Paging Channel
AGCH	Access Grant Channel
CBCH	Cell Broadcast Channel

Common Control Channel (CCCH)



Control Channels

Dedicated Control Channels (DCCH)

The DCCH is a single timeslot on an RF carrier which is used to convey eight Stand-alone Dedicated Control Channels (SDCCH). A SDCCH is used by a single MS for call setup, authentication, location updating and SMS point to point.

As we will see later, SDCCH can also be found on a BCCH/CCCH timeslot, this configuration only allows four SDCCHs.

Associated Control Channels (ACCH)

These channels can be associated with either an SDCCH or a TCH. They are used for carrying information associated with the process being carried out on either the SDCCH or the TCH.

- **Slow Associated Control Channel (SACCH)**

Conveys power control and timing information in the downlink direction (towards the MS) and Receive Signal Strength Indicator (RSSI), and link quality reports in the uplink direction.

- **Fast Associated Control Channel (FACCH)**

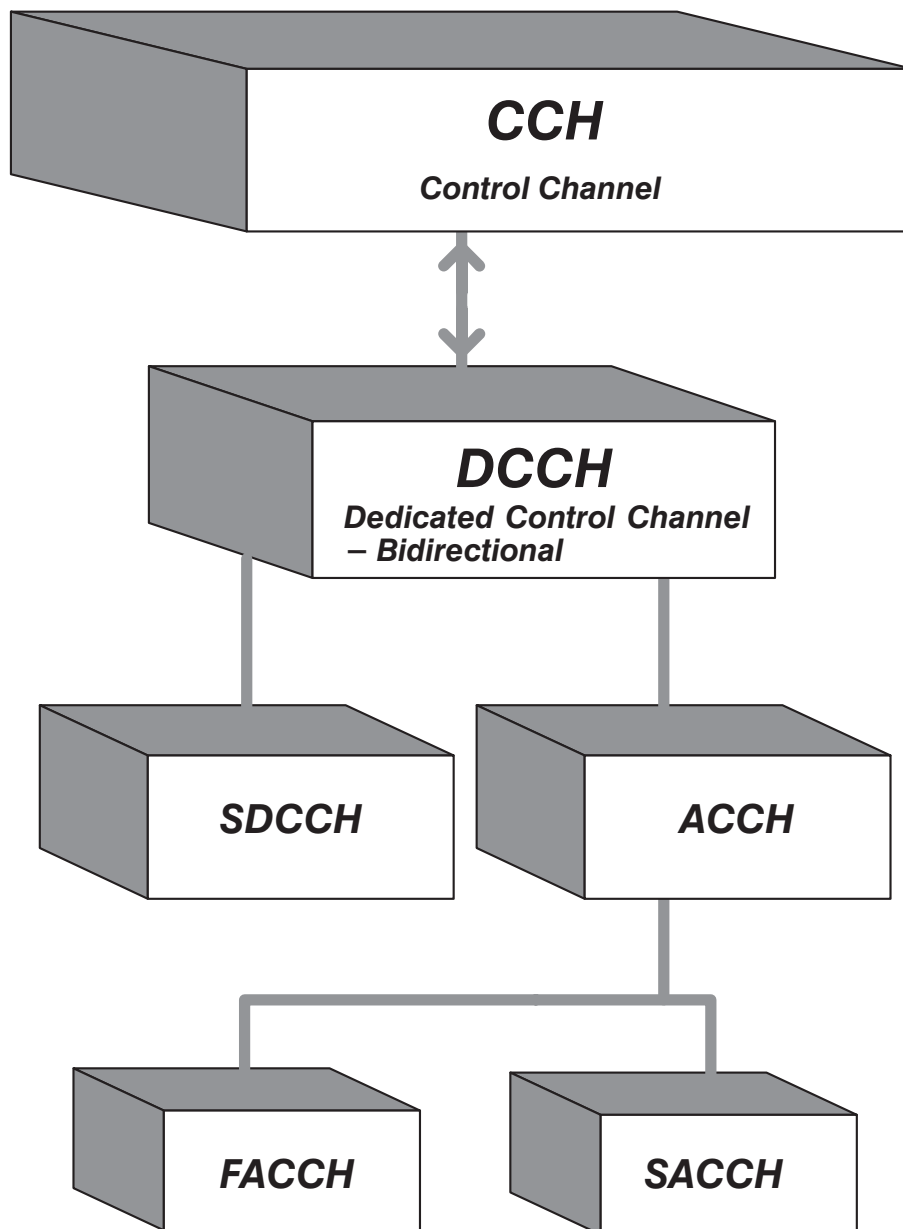
The FACCH is transmitted instead of a TCH. The FACCH “steals” the TCH burst and inserts its own information. The FACCH is used to carry out user authentication, handovers and immediate assignment.

All of the control channels are required for system operation, however, in the same way that we allow different users to share the radio channel by using different timeslots to carry the conversation data, the control channels share timeslots on the radio channel at different times. This allows efficient passing of control information without wasting capacity which could be used for call traffic. To do this we must organise the timeslots between those which will be used for traffic and those which will carry control signalling.

Acronyms:

SDCCH	Stand-alone Dedicated Control Channel
SACCH	Slow Associated Control Channel
FACCH	Fast Associated Control Channel

Dedicated Control Channel (DCCH)



Channel Combinations

The different logical channel types mentioned are grouped into what are called channel combinations. The four most common channel combinations are listed below:

- Full Rate Traffic Channel Combination – TCH8/FACCH + SACCH
- Broadcast Channel Combination – BCCH + CCCH
- Dedicated Channel Combination – SDCCH8 + SACCH8
- Combined Channel Combination – BCCH+CCCH+SDCCH4+SACCH4

The Half Rate Channel Combination (when introduced) will be very similar to the Full Rate Traffic Combination.

- Half Rate Traffic Channel Combination – TCH16/FACCH + SACCH

Channel Combinations and Timeslots

The channel combinations we have identified are sent over the air interface in a selected timeslot.

Some channel combinations may be sent on any timeslot, but others must be sent on specific timeslots. Below is a table mapping the channels combinations to their respective timeslots:

Channel Combination	Timeslots
Traffic	Any timeslot
Broadcast	0,2,4,6 (0 must be used first) *
Dedicated	Any timeslot
Combined	0 only

The diagram opposite illustrates how these different channel combinations may be mapped onto the TDMA frame structure.

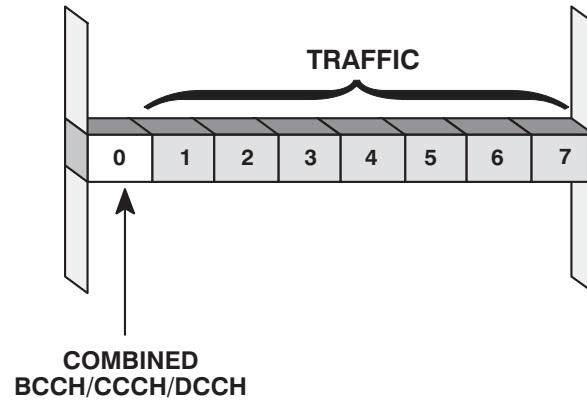
* If broadcast is assigned to timeslots 2, 4 or 6 then FCCH and SCH will be replaced with dummy bursts since these control channels may only occur on timeslot 0.

Note:

Only one BCCH/CCCH timeslot is required per cell (not RF carrier).

Timeslots and TDMA Frames

LOW CAPACITY CELL



HIGHER CAPACITY CELL

