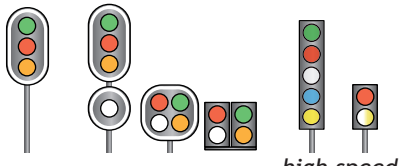
16. SPANISH RAILWAY SIGNALS

*To control Spanish signals directly you need a **Qdecoder** with **Signal** extension for Spanish signals.*

The Spanish railway RENFE (Adif) uses a main signalling system with typically tree lights (red, green and yellow). Signals are either mounted high or as dwarf signal on the right hand side of a track.

Besides that exist a special signalling system on the high speed line between Madrid and Figueras. Typical signal backgrounds look like follows:



16.1. MAIN SIGNALLING SYSTEM

Main Signals

The main signalling system distinguishes between 6 signal aspects:

description	signal			
stop	217			
passing allowed	209			
passing allowed with reduced speed (160 km/h)	210			
expect stop	212			
expect stop at an reduced distance	214			
reduce speed to 30 km/h	211			

Add on Signals

There are some signals that give additional information. They are mounted either below or above the main signal.

description	signal		
this signal indicates the direction of the further route			
passing allowed stop at the signal before passing			
passing allowed without stop			
A disturbed (dark) signal is of course no add-on signal, but an error. **Qdecoders** can switch to a dark background by an accessory command.			
speed reduction to the indicated speed	40	40	40
expect speed reduction	40	40	40
departure signal			

CONTROLLING SIGNALS BY QDECODERS

Main Signals

Qdecoders *offer several modes of different complexity - from simple red/green signals up to a mode that provides full support for all signal aspects.*

The accessory address of the signal A_{signal} *is written to the address configuration variable relating to the first function*

output the signal is connected to. Up to three addresses (A_{signal} ... A_{signal}+2) are used for switching of signal aspects.

Mode		2	140	3	19	141
address		A_{signal}				
function outputs	1					
	2					
	3	-	-			
control commands						
A_{signal}		*red*				
A_{signal}		*green*				
A_{signal}+1		-	*fl. green*	*yellow*	*green + yellow*	
A_{signal}+1		-	-	-	-	*yellow*
A_{signal}+2		-	-	-	-	*fl. green*
A_{signal}+2		-	-	-	-	*fl. yellow*

Add-On Signals

Add-on signals are connected to the function outputs of the decoder that follow the outputs used for the main signal directly. A main signal can be combined with any number of add-on signals.

mode		200	201	202	207	206	218
address	A_1	A_{addOn}					
function outputs	1						*dark signal*
control commands							
A_{addOn}		*off*	*off*	*off*	*off*	*off*	*signal on*
A_{addOn}		*on*	*flashing*	*on*	*flashing*	*on*	*signal off*
A_{addOn}+1		-	-	*flashing*	-		-

Modes 200 ... 202: These modes are associated with the stop aspect. Main signal changes to stop automatically if the add-on signal is switched on and the add-on switches off if the main signal changes to any proceed aspect.

Mode 206: The add-on signal is associated with a proceed slow aspect. If the add-on signal is switched on while the main signal shows stop aspect the main signals switches to "green" automatically. Changing the main signal aspect to stop will switch off the add-on signal too.

Mode 218: The disturbed signal is switched on and off using commands of an accessory address that is written to the adress CV of any function output the signal is connected to.

mode		219	220
address	A_1	A_{addOn}	
function outputs	1		
	2		
	3		
	4		
control commands			
A_{addOn}		*off*	
A_{addOn}		*left*	
A_{addOn}+1		*right*	
A_{addOn}+1		-	*straight*

Modes 207, 219 and 220: The add-on signal is associated with a proceed aspect. If the add-on signal is switched on the main signals switches to "green" automatically. Changing the main signal aspect to stop will switch off the add-on signal too.

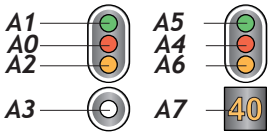
Examples

Let us have a look on the following track. The example is not a real life one but illustrates the way signals are controlled using **Qdecoders.** *A main signal with the white add-on lamp is at the end of the track. A second signal is equipped with an speed add on signal.*

The signals have a total of 8 bulbs. We choose a Z1-16 with ***Signal*** *extension.*

The decoder has additional 8 outputs that can be used to control some more signals, turnout or lights. The first signal shall switch its aspects by commands of accessory address 1. The white add-on gets addresses 4 and 5 for steady and flashing activation. Accessory address 6 is used for signal at the end of the track. The speed add on signal has address 9.

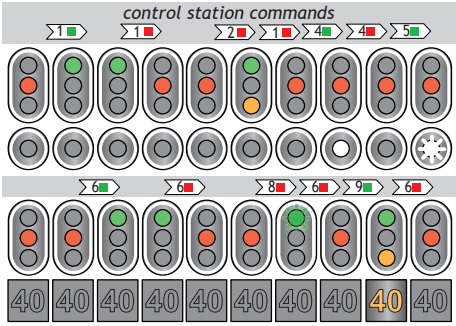
First connect the signals to the decoder one after another:



Next program the configuration variables according to the following table. The values given in grey do not need programming but they are written automatically when programming the values written on while background.

		signal	address		mode
function outputs	A0		A_{S1}	CV1=1	CV550= 141
	A1		-	CV552	CV553
	A2		-	CV555	CV556
	A3		A_{W}	CV558=4	CV559=202
	A4		A_{S2}	CV561=6	CV562=141
	A5		-	CV564	CV565
	A6		-	CV567	CV568
	A7	40	$A_{„40"}$	CV570=9	CV571=206
	...	other stuff			

Now you can switch signal aspects by sending control commands ("1 ■" means pressing the green switching key on the control station after choosing accessory address 1):



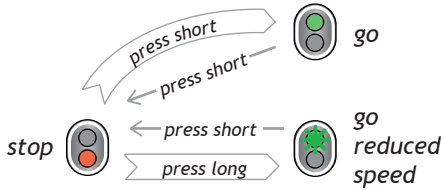
Controlling Signals by Input Keys

Any signal - including add-on signals - can be controlled by an input key connected to a function output of the **Qdecoder** using a 100 Ω resistor. Use one of the modes 226 or 227 for the function output for reading key input. Mode 227 is used when connecting a LED in parallel to the key. The LED might be used as signalling LED on the control desk for example. (See chapter „An Example" in the handbook for details.)

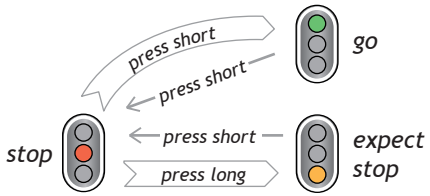
function	mode	
	without	with
The key controls ...	**LED**	
... the signal connected to the anterior function keys of the decoder using the signal switching flow	226	227

Once configured the key controls signal aspects depending on the signal aspect count.

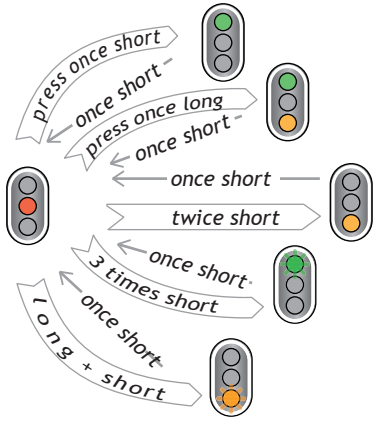
All signals with two aspects switch to the other aspect with a single key pressing.



On signals with three aspects there is a distinction between pressing the key for a short and a long time (about ½ second):

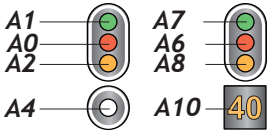


Main Spanish signals have up to six different signal aspects. The are controlled by a key as follows:



Our Example

Our example from page 171 needs a change when inserting keys for aspect control. We need one key each of the main signals and another ones for each of the add-on signals. Function outputs of the second decoder are written in purple:

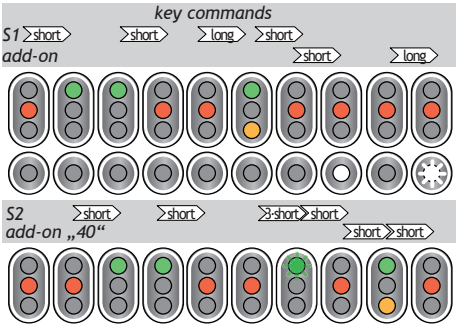


A3: key for main signal S1
A5: key for the white add-on signal
A9: key for main signal S2
A11: key for add-on signal „40“

Next program the configuration variables according to the following table:

		signal	address		mode
function outputs	**A0**		A_{S1}	CV1=1	CV550= 141
	A1		-	CV552	CV553
	A2		-	CV555	CV556
	A3	key S1	-	CV558	CV559=226
	A4		A_{w}	CV561=4	CV562=202
function outputs	**A5**	key add-on	-	CV564	CV565=226
	A6		A_{S2}	CV567=6	CV568=141
	A7		-	CV570	CV571
	A8		-	CV573	CV574
	A9	key S2	-	CV576	CV577=226
	A10	40	$A_{„40“}$	CV579=9	CV580=206
	A11	key „40“	-	CV582	CV583=226
	...	other stuff			

The same signal aspect sequence can now be attained by pressing the keys:



16.2. HIGH SPEED LINE SIGNALS

Besides the normal main signalling system there is a special signalization on high speed lines of the ADIF. There are 2 signal background versions. The normal background has between 2 and 5 single coloured lamps.

In Madrid Puerta de Atocha a very small sized version with just two lamps is used. One of them can show either white or yellow light.

description	signal		
stop the blue light may be either blinking or steady	201		
restricted passing	206		
passing allowed The signal allows only local passing to the next relevant signal with reduced speed (30 km/h).	202		
expect stop Two succeeding signals showing “expect stop” instruct the train to reduce speed to 100 km/h	203		
announcement expect stop or reduced speed	204	80	
passing allowed at a reduced distance	205 207	80	80
passing allowed	208		

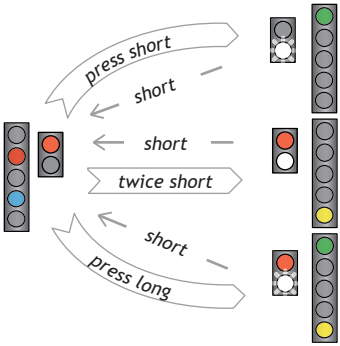
Controlling Signals by Qdecoders

Main Signals

Mode		2	19	19	142
address					
function outputs	1	2 1	2 1 3	2 1 1 3	1 2
	2			2 1 1 3	
	3	-			-
	4	-	-		-
control commands					
A_{signal}		stop (201)			
A_{signal}		passing allowed (208)			
$A_{signal}+1$		-	204 / 205		206 /
$A_{signal}+1$		-	-	203	202
$A_{signal}+2$		-	-	-	-

Add-On Signals

Speed indicators and the white bu
main signals are regarded as add-on s
with separate control. The add-ono



16.3. ROUTE INDICATOR SIGNAL

Route indication signal inform the driver about the direction of the activated route.

description	signal
straight direction	
branching direction	

A standard **Qdecoder** *switching mode can be used to control route indication signals:*

mode		2
address	A_1	A_{signal}
function outputs	1	
	2	
Schaltbefehle		
A_{signal}		branching direction
A_{signal}		straight direction

16.4. LEVEL CROSSING SIGNAL

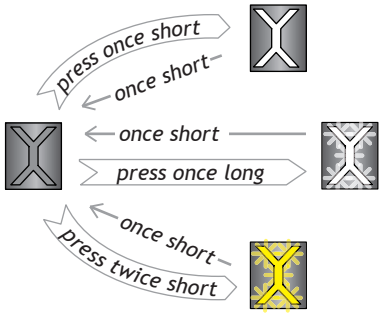
Level crossing signals indicate the state of the level crossing safety system. Up to four states (signal aspects) are distinguished:

description	signal
level crossing is not secured and not disturbed	
level crossing is secured	
level crossing is secured but the rail control is not informed yet	
level crossing is disturbed and not secured	

Qdecoder *offer special modes for level crossing signals with one (white) or two (white and yellow) lights:*

mode		144	145
address	A_1	A_{signal}	
function outputs	1		
	2	-	
Schaltbefehle			
A_{signal}		(off)	
A_{signal}		white	
$A_{signal}+1$		white flashing	
$A_{signal}+1$		-	yellow flashing

Controlling Signals by Input Keys



16.5. BRAKE TEST SIGNALS

Brake test signals are used for communication from the shunter to the driver of a train during test of the trains brakes.

description	signal
apply brakes	

description	*signal*
loose brakes	
brake test successful	

Qdecoder *offer a special mode for brake test signals:*

mode		148
address	A_1	A_{Signal}
function outputs	1	①
	2	② ③
Schaltbefehle		
A_{signal}		*(off)*
A_{signal}		*apply brakes*
$A_{signal}+1$		*loose brakes*
$A_{signal}+1$		*brake test successful*

Controlling Brake Test Signals by Input Keys

*To switch signal aspects of brake test signals use mode **224** for the function output the key is connected to. Switch signal aspects as follows:*