TitanSDR - Basic LAN Control

Control protocol specifications

Control functionalities and TCP connections

The TitanSDR application can be controlled by an external application, employing a specific set of TCP commands, which allow to:

- Start/stop USB data stream (flowing from the receiver to the PC)
- Set preselection filtering
- Set RF attenuation
- Set IF/RF input
- Allocate/delete WB channels
- Tune WB channels
- Start/stop recording of WB channels
- Allocate/delete NB channels (within WB channels)
- Tune NB channels
- Set mode (CW, AM, NFM, USB, LSB, eUSB, eLSB, FSK and DRM), bandwidth, BFO frequency and gain (AGC or manual) of NB channels
- Stream NB channels' demodulated audio to the controlling application by LAN Ethernet

The TCP connections to be employed by the external controlling application are named as follows:

- *General TCP connection* (port number 2360) for commands/acknowledges exchange between external controlling application and TitanSDR;
- *NB channels TCP connections* (one for each NB channel, with port numbers ranging from 5000 to 5039), for LAN streaming of NB channels' demodulated audio.

The TitanSDR application is the server side of each connection (therefore, the external controlling application plays the role of a TCP client for every connection).

General TCP connection

The *General TCP connection* has to be set up by the controlling application (by connecting to port number 2360).

TCP commands for the *General TCP connection* are composed of 30 bytes and are formatted as follows:

1) Bytes 1-4: Command ID (4-bytes integer)
2) Bytes 5-8: Field1 (4-bytes integer)
3) Bytes 9-12: Field2 (4-bytes integer)
4) Bytes 13-16: Field3 (4-bytes integer)
5) Bytes 17-30: not used (for future extensions of protocol)

TCP acknowledges to commands are composed of 488 bytes and are formatted as follows:

1) Bytes 1-4: Ack ID (4-bytes integer)
2) Bytes 5-8: Field1 (4-bytes integer)
3) Bytes 9-12: Field2 (4-bytes integer)
4) Bytes 13-16: Field3 (4-bytes integer)
5) Bytes 17-20: Field4 (4-bytes integer)
6) Bytes 21-488: just used for ack to command 'Get allocated NB channels' (ID=23) to provide Field2, Field3 and Field4 for all allocated NB channels, when there are more than one (Field1>1).

TCP commands of the *General TCP connection* and related acknowledges are described in the table below.

		COMMAND FORMAT						ACK FORMAT			
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
Start USB	1	0	0	0	Start data streaming from receiver to PC	1	1	0	0	0	Cmd successfully implemented (Field1=1)
						1	2	1	0	0	Cmd failed (Field1=2); receiver not connected (Field2=1)
						1	2	2	0	0	Cmd failed (Field1=2); license file not found (Field2=2)
						1	2	3	0	0	Cmd failed (Field1=2); license mismatch (Field2=3)
						1	3	0	0	0	Cmd not executed: streaming yet started (Field1=3)
						1	4	0	0	0	Cmd not executed: receiver in Player mode (Field1=4)
Stop USB	2	0	0	0	Stop data streaming from receiver to PC	2	1	0	0	0	Cmd successfully implemented (Field1=1)
						2	2	0	0	0	Cmd not executed: streaming yet stopped (Field1=2)
						2	3	0	0	0	Cmd not executed: receiver in Player mode (Field1=3)

	COMMAND FORMAT					ACK FORMAT					
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field 4	Description
Set preselector	3	[MHz] 1:All pass 2:0-1.54 3:1.44-2.07 4:1.88-2.7 5:2.4-3.46 6:2.96-4.26 7:3.56-5.12 8:4.22-6.08 9:4.88-7.03 10:5.53-7.96 11:6.46-9.31 12:7.81-11.24 13:9.74-14.03 14:12.53-18.05 15:16.55-23.17 16:21.67-28.17 17:26.67-32	0	0	Set preselector in Field1	3	1	1...17	0	0	Cmd successfully implemented (Field1=1); preselector in Field2 set
						3	2	0	0	0	Cmd failed (Field1=2); preselector code (in cmd) is out of range 1...17
						3	3	0	0	0	Cmd failed (Field1=3): USB data streaming not yet started
						3	4	0	0	0	Cmd not executed: receiver in Player mode (Field1=4)

	COMMAND FORMAT				ACK FORMAT					
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
Set attenuator	4	[dB] 1: 0 2: 10 3: 20 4: 30	0	0	Set attenuator coded in Field1	4	1	1…4	0	0	Cmd successfully implemented (Field1=1); attenuator in Field2 set
						4	2	0	0	0	Cmd failed: attenuator code in cmd is out of range 1…4 (Field1=2)
						4	3	0	0	0	Cmd failed: USB data streaming not yet started (Field1=3)
						4	4	0	0	0	Cmd not executed: receiver in Player mode (Field1=4)
Set RF/IF Input	5	1: HF 2: IF	0	0	Set receiver input coded in Field1	5	1	1,2	0	0	Cmd successfully implemented (Field1=1); receiver input in Field2 set
						5	2	0	0	0	Cmd failed: receiver input in cmd is out of range 1,2 (Field1=2)
						5	3	0	0	0	Cmd failed: USB data streaming not yet started (Field1=3)
						5	4	0	0	0	Cmd not executed: receiver in Player mode (Field1=4)
Get available WB channel sizes	6	0	0	0		6	1	1…8	0	0	Cmd successfully implemented (Field1=1); max available WB channel size [kHz] coded in Field2: 1: 312.5 2: 625 3: 937.5 4: 1250 5: 1562.5 6: 1875 7: 2187.5 8: no resources available
						6	2	0	0	0	Cmd not executed: receiver in Player mode (Field1=2)

	COMMAND FORMAT				ACK FORMAT					
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
Allocate WB channel	7	Bandwidth[kHz]: 1: 312.5 2: 625 3: 937.5 4: 1250 5: 1562.5 6: 1875 7: 2187.5	Center freq [Hz]	0	Allocate new WB channel: size coded in Field1; center frequency in Field2	7	1	1…4	0	0	Cmd successfully implemented (Field1=1); number of allocated WB channel in Field2
						7	2	0	0	0	Cmd failed : frequency out of range (Field1=2)
						7	3	0	0	0	Cmd failed : resource insufficient (Field1=3)
						7	4	0	0	0	Cmd failed : resource not available (Field1=4)
						7	5	0	0	0	Cmd failed : USB stream not started (Field1=5)
						7	6	0	0	0	Cmd failed: at least one cmd field is out of range (Field1=6)
						7	7	0	0	0	Cmd not executed: receiver in Player mode (Field1=7)
WB channel tune change	8	1…4	Center freq [Hz]	0	Tune WB channel in Field1 at center frequency in Field2	8	1	1…4	0	0	Cmd successfully implemented (Field1=1); number of tuned WB channel in Field2
						8	2	1…4	0	0	Cmd failed: WB channel in Field 2 not allocated (Field1=2)
						8	3	1…4	0	0	Cmd failed : frequency out of range (Field1=3); WB channel in Field 2 not allocated
						8	4	1…4	0	0	Cmd failed : WB channel in Field 2 being recorded (Field1=4)
						8	5	0	0	0	Cmd failed: at least one cmd field is out of range (Field1=5)
						8	6	0	0	0	Cmd failed: NB channels allocated within WB channel (Field1=6)
						8	7	0	0	0	Cmd not executed: receiver in Player mode (Field1=7)

	COMMAND FORMAT					ACK FORMAT					
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
Start rec WB ch	9	1...4	0	0	Start recording of WB channel in Field1	9	1	1...4	0	0	Cmd successfully implemented (Field1=1); number of WB channel being recorded in Field2
						9	2	1...4	0	0	Cmd failed – another WB channel is being recorded (Field1=2); number of current WB channel being recorded in Field2
						9	3	1...4	0	0	Cmd failed - WB channel not allocated (Field1=3); number of WB channel in Field2
						9	4	0	0	0	Cmd failed: WB channel number in cmd is out of range 1...4 (Field1=4)
						9	5	0	0	0	Cmd not executed: receiver in Player mode (Field1=5)
Stop rec WB ch	10	1...4	0	0	Stop recording of WB channel in Field1	10	1	1...4	0	0	Cmd successfully implemented (Field1=1); number of WB channel in Field2
						10	2	1...4	0	0	Cmd failed – WB channel is not being recorded (Field1=2); number of WB channel in Field2
						10	3	1...4	0	0	Cmd failed –WB channel not allocated (Field1=3); number of WB channel in Field2
						10	4	0	0	0	Cmd failed: WB channel number in cmd is out of range 1...4 (Field1=4)
						10	5	0	0	0	Cmd not executed: receiver in Player mode (Field1=5)
Get min perc free HD space	11	0	0	0	Get minimum percentage of HD size to be left free	11	1	0...100	min free HD space [MB]	total HD size [MB]	Cmd successfully implemented (Field1=1); Field2: minimum percentage of free hard disk size; Field3: min free HD space in MB; Field4: total HD size in MB

		COMMAND FORMAT				ACK FORMAT					
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
Set min perc free HD space	12	0,…,100	0	0	Set minimum percentage of of HD size to be left free in Field1	12	1	0…100	min free HD space [MB]	total HD size [MB]	Cmd successfully implemented (Field1=1); Field2: set minimum percentage of free hard disk size; Field3: set min free HD space in MB; Field4: total HD size in MB
						12	2	0	0	0	Cmd failed: percentage of free hard disk size out of range 0..100 (Field1=2)
Delete WB ch	13	1…4	0	0	Delete WB channel in Field1	13	1	1…4	0	0	Cmd successfully implemented (Field1=1); WB channel number in Field2
						13	2	1…4	0	0	Cmd failed – WB channel not allocated (Field1=2); WB channel number in Field2
						13	3	1…4	0	0	Cmd failed – WB channel is being recorded and there are NB channels within WB channel (Field1=3); WB channel number in Field2
						13	4	1…4	0	0	Cmd failed – WB channel is being recorded (Field1=4); WB channel number in Field2
						13	5	1…4	0	0	Cmd failed – NB channels are within WB channel (Field1=5); WB channel number in Field2
						13	6	0	0	0	Cmd failed: WB channel number in cmd is out of range 1…4 (Field1=6)
						13	7	0	0	0	Cmd not executed: receiver in Player mode (Field1=7)

	COMMAND FORMAT				ACK FORMAT					
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
Allocate NB ch	14	1...4	Carrier freq [Hz]	1 : CW 2 : USB 3 : LSB 4 : NFM 5 : FSK 7 : AM 8 :eUSB 9 : DRM 11:eLSB	Field1: WB channel number; Field2: carrier frequency of NB channel; Field3: modulation code	14	1	1...40	5000.. ..5039	Carrier freq [Hz]	Cmd successfully implemented (Field1=1); Field2: NB channel number; Field3: assigned port;Field4: carrier frequency [Hz]
						14	2	0	0	0	Cmd failed – no resources for further NB allocation (Field1=2)
						14	3	0	0	0	Cmd failed – WB channel not allocated (Field1=3)
						14	4	1...40	5000.. ..5039	Carrier freq [Hz]	Cmd implemented with clipped carrier frequency (Field1=4); Field2: NB channel number; Field3: assigned port; Field4: assigned carrier frequency [Hz]
						14	5	0	0	0	Cmd failed: at least one cmd field out of range (Field1=5)
						14	6	0	0	0	Cmd failed: USB data streaming not yet started (Field1=6)
						14	7	0	0	0	Cmd not executed: receiver in Player mode (Field1=7)
Delete NB ch	15	1...4	1...40	0	Field1: WB channel number; Field2: NB channel number	15	1	1...4	1...40	0	Cmd successfully implemented (Field1=1); Field2: WB channel number; Field3: NB channel number;
						15	2	0	0	0	Cmd failed – WB channel not allocated (Field1=2)
						15	3	0	0	0	Cmd failed – NB channel not allocated (Field1=3)
						15	4	0	0	0	Cmd failed: at least one cmd field out of range (Field1=4)

	COMMAND FORMAT				ACK FORMAT					
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
NB channel tune change	16	1…4	1…40	Carrier freq [Hz]	Field1: WB channel number; Field2: NB channel number; Field3: NB channel carrier frequency	16	1	1…4	1…40	0	Cmd successfully implemented (Field1=1); Field2: WB channel number; Field3: NB channel number
						16	2	0	0	0	Cmd failed – WB channel not allocated (Field1=2)
						16	3	0	0	0	Cmd failed – NB channel not allocated (Field1=3)
						16	4	1…4	1…40	Carrier freq [Hz]	Cmd implemented with clipped carrier frequency (Field1=4); Field2: WB channel number; Field3: NB channel number; Field4: assigned carrier frequency [Hz]
						16	5	0	0	0	Cmd failed: at least one cmd field out of range (Field1=5)
NB channel mode change	17	1…4	1…40	1 : CW 2 : USB 3 : LSB 4 : NFM 5 : FSK 7 : AM 8 : eUSB 9 : DRM 11: eLSB	Field1: WB channel number; Field2: NB channel number; Field3: NB modulation code	17	1	1…4	1…40	1-5,7-9, 11	Cmd successfully implemented (Field1=1); Field2: WB channel number; Field3: NB channel number; Field4: modulation code set;
						17	2	0	0	0	Cmd failed – WB channel not allocated (Field1=2)
						17	3	0	0	0	Cmd failed – NB channel not allocated (Field1=3)
						17	4	0	0	0	Cmd failed: at least one cmd field out of range (Field1=4)

	COMMAND FORMAT					ACK FORMAT				
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
NB channel BW change	18	1...4	1...40	BW [Hz]	Field1: WB channel number; Field2: NB channel number; Field3: NB channel bandwidth	18	1	1...4	1...40	BW [Hz]	Cmd successfully implemented (Field1=1); Field2: WB channel number; Field3: NB channel number; Field4: bandwidth set
						18	2	0	0	0	Cmd failed – WB channel not allocated (Field1=2)
						18	3	0	0	0	Cmd failed – NB channel not allocated (Field1=3)
						18	4	1...4	1...40	BW [Hz]	Cmd implemented with bandwidth clipped (Field1=4); Field2: WB channel number; Field3: NB channel number;Field4: bandwidth set
						18	5	0	0	0	Cmd failed: at least one cmd field out of range (Field1=5)
NB channel BFO frequency change	19	1...4	1...40	BFO freq [Hz]	Field1: WB channel number; Field2: NB channel number; Field3: NB channel BFO frequency	19	1	1...4	1...40	BFO [Hz]	Cmd successfully implemented (Field1=1); Field2: WB channel number; Field3: NB channel number; Field4: BFO frequency set;
						19	2	0	0	0	Cmd failed – WB channel not allocated (Field1=2)
						19	3	0	0	0	Cmd failed – NB channel not allocated (Field1=3)
						19	4	0	0	0	Cmd failed – no BFO for modes AM, NFM, SSB and eSSB (Field1=4)
						19	5	0	0	0	Cmd failed: at least one cmd field out of range (Field1=5)

	COMMAND FORMAT				ACK FORMAT					
	ID	Field 1	Field 2	Field 3	Description	ID	Field 1	Field 2	Field 3	Field4	Description
NB channel gain setting	20	1…4	1…40	1: slow AGC; 2: fast AGC; 3: manual gain	Field1: WB channel number; Field2: NB channel number; Field3: gain type	20	1	1…4	1…40	1…3	Cmd successfully implemented (Field1=1); Field2: WB channel number; Field3: NB channel number; Field4: gain type set
						20	2	0	0	0	Cmd failed – WB channel not allocated (Field1=2)
						20	3	0	0	0	Cmd failed – NB channel not allocated (Field1=3)
						20	4	0	0	0	Cmd failed: at least one cmd field out of range (Field1=4)
Change selected WB channel	21	1…4	0	0	Field1: WB channel number	21	1	1…4	0	0	Cmd successfully implemented (Field1=1); Field2: WB channel number;
						21	2	0	0	0	WB channel not allocated (Field1=2)
						21	3	0	0	0	Cmd failed: WB channel number in cmd is out of range 1…4 (Field1=3)
						21	4	0	0	0	Cmd not executed: receiver in Player mode (Field1=4)
Change selected NB channel	22	1…4	1…40	0	Field1: WB channel number; Field2: NB channel number	22	1	1…4	1…40	0	Cmd successfully implemented (Field1=1); Field2: WB channel number; Field3: NB channel number;
						22	2	0	0	0	WB channel not allocated (Field1=2)
						22	3	0	0	0	NB channel not allocated (Field1=3)
						22	4	0	0	0	Cmd failed: cmd field out of range (Field1=4)
Get allocated NB channels	23	0	0	0		23	0…40	1…4	1…40	5000… ..5039	Field1: number of allocated NB channels; Field2: WB channel number; Field3: NB channel number; Field4: NB channel socket port; NOTE – Field2, Field3 and Field4 repeated Field1 times

NB channel TCP connection

The *NB channel TCP connection* has to be set up by the controlling application, by connecting to the NB channel port of interest, which can be obtained by command 'Get allocated NB channels' (ID=23) of the *General TCP connection* or as a result of a previous allocation of a NB channel, by command 'Allocate NB ch' (ID=14), as Field3 of the corresponding acknowledge.

TCP messages from the TitanSDR application to the controlling application are composed of 4170 bytes and are formatted as follows:

1) Bytes 1-74: Header
2) Bytes 75-4170: Payload

The Header (bytes 1-74) is composed as follows:

1) Bytes 1-4 : MOD 100 counter (4-bytes integer)
2) Bytes 5-8 : WB channel number (4-bytes integer)
3) Bytes 9-12 : NB channel number (4-bytes integer)
4) Bytes 13-16 : carrier frequency of NB channel in Hz (4-bytes integer)
5) Bytes 17-20 : minimum frequency of NB channel in Hz (4-bytes integer)
6) Bytes 21-24 : maximum frequency of NB channel in Hz (4-bytes integer)
7) Bytes 25-28 : bandwidth of NB channel in Hz (4-bytes integer)
8) Bytes 29-32 : mode of NB channel (1:CW, 2:USB, 3:LSB, 4:NFM, 5:FSK, 7:AM, 8:eUSB, 9:DRM, 11:eLSB) (4-bytes integer)
9) Bytes 33-36 : BFO frequency in Hz (4-bytes integer)
10) Bytes 37-40 : gain type (1:slow AGC, 2:fast AGC, 3:manual gain) (4-bytes integer)
11) Bytes 41-44 : sampling rate of demodulated audio output (4-bytes integer)
12) Bytes 45-74 : not used (for future extension of protocol)

The Payload (bytes 75-4170) contains 2048 real samples of demodulated audio, represented as 2-bytes integers (type short).