

# Juno Waves Minipacket Quick Reference

## Packets Generated by Flight Software

Packet Description	ID	SRC	Process	Source Description	Samp. Rate	Format	Notes
Packet of Packets	0x1	0x0	Varies	Varies	Varies		Used to compress a large number of small packets
LFR Q-Factor	0x2	0x1	QFCT	Unknown	Varies	8/16 bit pair	A down linked copy of info in burst info sent to FDS
AGC Settings	0x2	0x6	AGCA	HFWBR Log Amp	Varies	8bit Int.	Used by FSW to auto-attenuate strong signals
	0x2	0x7	AGCA	HFR Log Amp	Varies	8bit Int.	Used by FSW to auto-attenuate strong signals
HFR PLL Lock Quality	0x4	0x5	HFRH	HFR Lock Integrator	N/A	8bit Int.	Higher values represent failure to lock
HFWBR PLL Lock Qual.	0x4	0x4	HFRH	HFWBR Lock Integrator	N/A	8bit Int.	Higher values represent failure to lock
HFR spectrum	0x4	0x7	HFRH	HFR Log Amp	N/A	8bit Int.	HFR frequency bins defined in: SW-004 Item 002A
	0x4	0x6	HFRH	HFWBR Log Amp	N/A	8bit Int.	Fall-back operation
HFR baseband spec.	0x5	0xF	HFRL	HFR I -> FFT eng	7MHz	9bit floats	HFR frequency bins defined in: SW-004 Item 002A
	0x5	0xB	HFRL	HFWBR I -> FFT eng	7MHz	9bit floats	Fall-Back, HFR freq. bins defined in: SW-004 Item 002A
HFWBR baseband wfrm	0x7	0xB	WBRL	HFWBR I A/D	7MHz	12bit Int.	
	0x3	0xB	HFRL	HFWBR I A/D	7MHz	12bit Int.	Dual Route Data
	0x7	0xF	WBRL	HFR I A/D	7MHz	12bit Int.	Fall-back operation
	0x3	0xF	HFRL	HFR I A/D	7MHz	12bit Int.	Fall-back Dual Route Data
HFWBR I or Q wfrm.	0x8	0x8	WBRH	HFWBR I A/D	1.3125MHz	12bit Int.	Mixer Freq and filter determined by BND field.
	0x8	0x9	WBRH	HFWBR Q A/D	1.3125MHz	12bit Int.	Mixer Freq and filter determined by BND field.
	0x8	0xC	WBRH	HFR I A/D	1.3125MHz	12bit Int.	Fall-back operation
	0x8	0xD	WBRH	HFR Q A/D	1.3125MHz	12bit Int.	Fall-back operation
LFR B spectrum	0x9	0x1	LFRB	LFR B A/D* -> FFT eng	50kHz	9bit floats	LFR frequency bins defined in: SW-004 Item 002A
LFR E lo spectrum	0x9	0x2	LFRL	LFR E lo A/D* -> FFT eng	50kHz	9bit floats	LFR frequency bins defined in: SW-004 Item 002A
LFR E hi spectrum	0x9	0x3	LFRH	LFR E hi A/D* -> FFT eng	375kHz	9bit floats	MFR frequency bins defined in: SW-004 Item 002A
LFR B waveform	0xA	0x1	LFRB	LFR B A/Ds*	50kHz	16bit Ints	Contains only the Signal dataset
LFR E lo waveform	0xA	0x2	LFRL	LFR E lo A/Ds*	50kHz	16bit Int.	Contains only the Signal dataset
LFR E hi waveform	0xA	0x3	LFRH	LFR E hi A/Ds*	375kHz	16bit Int.	Contains only the Signal dataset
LFR B Noise Wfrm	0xA	0x0	LFRB	LFR B A/Ds*	50kHz	16bit Int.	Contains four datasets, S+N, N, S and C
LFR E lo Noise Wfrm	0xA	0x4	LFRL	LFR E lo A/Ds*	50kHz	16bit Int.	Contains three datasets, S+N, N, S and C
LFR E hi Noise Wfrm	0xA	0x5	LFRH	LFR E hi A/Ds*	375kHz	16bit Int.	Contains three datasets, S+N, N, S and C
MRO (memory read out)	0xE		CMRO				Housekeeping data sent through the LRS interface

\*Multiple A/D converters in use for noise mitigation

## Packets Generated by Ground Software

Packet Description	ID	SRC	Process	Source Description	Samp. Rate	Format	Notes
HFWBR Band Spectrum	0xF	0x1	ucal	0x88 an 0x89	1.3125MHz	32bit floats	The ucal program combines two 0x8 packets
HFR Band Spectrum	0xF	0x2	ucal	0x8C and 0x8D	1.3125MHz	32bit floats	Fall-back operation
LFR B Noise Spectrum*	0xF	0x0	upack	0x91	50kHz	as 0x91	Long packets relabeled as noise diagnostic data.
LFR Lo E Noise Spec*	0xF	0x4	upack	0x92	50kHz	as 0x92	
LFR Hi E Noise Spec*	0xF	0x5	upack	0x93	375kHz	as 0x93	

\* Altered packet flag set in the unpacker warning byte.

### Waves Header

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
byte 0	CRC 7	CRC 6	CRC 5	CRC 4	CRC 3	CRC 2	CRC 1	CRC 0
byte 1	CRC 15	CRC 14	CRC 13	CRC 12	CRC 11	CRC 10	CRC 9	CRC 8
byte 2	TimSr 1	TimSr 0	Seq 13	Seq 12	Seq 11	Seq 10	Seq 9	Seq 8
byte 3	Seq 7	Seq 6	Seq 5	Seq 4	Seq 3	Seq 2	Seq 1	Seq 0
byte 4	Sclk 31	Sclk 30	Sclk 29	Sclk 28	Sclk 27	Sclk 26	Sclk 25	Sclk 24
byte 5	Sclk 23	Sclk 22	Sclk 21	Sclk 20	Sclk 19	Sclk 18	Sclk 17	Sclk 16
byte 6	Sclk 15	Sclk 14	Sclk 13	Sclk 12	Sclk 11	Sclk 10	Sclk 9	Sclk 8
byte 7	Sclk 7	Sclk 6	Sclk 5	Sclk 4	Sclk 3	Sclk 2	Sclk 1	TQF

### Science Minipacket Header (w/o glopping)

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
byte 0	ID 3	ID 2	ID 1	ID 0	Len 11	Len 10	Len 9	Len 8
byte 1	Len 7	Len 6	Len 5	Len 4	Len 3	Len 2	Len 1	Len 0
byte 2	RTI 15	RTI 14	RTI 13	RTI 12	RTI 11	RTI 10	RTI 9	RTI 8
byte 3	RTI 7	RTI 6	RTI 5	RTI 4	RTI 3	RTI 2	RTI 1	RTI 0
byte 4	0	PreAttn	LfrAttn	SegEOF	SegNo3	SegNo2	SegNo1	SegNo0
byte 5	Attn 3	Attn 2	Attn 1	Attn 0	Src 3	Src 2	Src 1	Src 0
byte 6	Band 7	Band 6	Band 5	Band 4	Band 3	Band 2	Band 1	Band 0
byte 7	MSF 1	MSF 2	FMT 5	FMT 4	FMT 3	FMT 2	FMT 1	FMT 0

### Memory Readout Minipacket Header

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
byte 0	1	1	1	0	Len 11	Len 10	Len 9	Len 8
byte 1	Len 7	Len 6	Len 5	Len 4	Len 3	Len 2	Len 1	Len 0
byte 2	RTI 15	RTI 14	RTI 13	RTI 12	RTI 11	RTI 10	RTI 9	RTI 8
byte 3	RTI 7	RTI 6	RTI 5	RTI 4	RTI 3	RTI 2	RTI 1	RTI 0
byte 4					Frame3	Frame2	Frame1	Frame0
byte 5	A 19	A 18	A 17	A 16	A 15	A 14	A 13	A 12
byte 6	A 11	A 10	A 9	A 8	A 7	A 6	A 5	A 4
byte 7	MSF 1	MSF 2	Reg 1	Reg 0	A 3	A 2	A 1	A 0

### Data Format Types

Format Value	Sample Type	Rice Comp.	Block Size	Data Align	Signed	Format Name
0x14	8 bit Int	ON	-	-	unsigned	8bit_rice
0x4	8 bit Int	off	8 bits	-	unsigned	8bit_in_8bit
0x11	8 bit Int	off	16 bits	Lower	unsigned	8bit_in_16bit_lo
0x13	12 bit Int	ON	-	-	unsigned	12bit_rice
0x10	12 bit Int	off	8 bits	-	unsigned	12bit_in_8bit_truc
0x6	12 bit Int	off	12 bits	-	unsigned	12bit_in_12bit
0x7	12 bit Int	off	16 bits	Lower	unsigned	12bit_in_16bit_lo
0x8	12 bit Int	off	32 bits	Lower	unsigned	12bit_in_32bit_lo
0x9	16bit Int	ON	-	-	unsigned	16bit_rice
0xA	16bit Int	off	8 bits	-	unsigned	16bit_in_8_bit_truc
0xB	16bit Int	off	12 bits	-	unsigned	16bit_in_12_bit_truc
0x1C, 0xC	16bit Int	off	16 bits	-	unsigned	16bit_in_16_bit
0xD	16bit Int	off	32 bits	Lower	unsigned	16bit_in_32_bit_lo
0xE*	9bit float	ON	12 bits	Lower	unsigned	9bit_in_12_bit_lo_rice
0xF*	9bit float	ON	16 bits	Lower	unsigned	9bit_in_16_bit_lo_rice
0x5	9bit float	off	9 bits	-	unsigned	9bit_in_9bit
0x3	9bit float	off	16 bits	Lower	unsigned	9bit_in_16bit_lo
0x12	9bit float	off	32 bits	Lower	unsigned	9bit_in_32bit_lo
0x2	32bit float	off	32 bits	-	SIGNED	32bit_in_32bit
0x1B	8/16bit Int	off	24 bits	-	unsigned	8_16bit_pair_in_24bit

\*represents putting 9-bit floats into a 12 or 16 bit block and compressing the blocks

### Packet ID to PPD Channel Name Conversion\*\*

ID	Channel	ID	Channel	ID	Channel
0x21	LFR Q-Factor	0x8D	HFR Q	0xA5	LFR Hi E NRD S+N
0x26	HFWBR AGC	0x91	LFR B spec	0xA5	LFR Hi E NRD N
0x27	HFR AGC	0x92	LFR Lo E spec	0xA5	LFR Hi E NRD S
0x3F	HFR base dual	0x93	LFR Hi E spec	0xA5	LFR Hi E NRD C
0x44	HFWBR Lock	0xA0	LFR B NRD S+N	0xF0	lfr b spec nrd s+n
0x45	HFR Lock	0xA0	LFR B NRD N	0xF0	lfr b spec nrd n
0x46	HFR fallback	0xA0	LFR B NRD S	0xF0	lfr b spec nrd s
0x47	HFR	0xA0	LFR B NRD C	0xF1	HFWBR band spec
0x5B	HFR base fallback	0xA1	LFR B	0xF2	HFR band spec
0x5F	HFR base	0xA2	LFR Lo E	0xF4	lfr lo e spec nrd s+n
0x7B	HFWBR base	0xA3	LFR Hi E	0xF4	lfr lo e spec nrd n
0x7F	HFWBR base fallback	0xA4	LFR Lo E NRD S+N	0xF4	lfr lo e spec nrd s
0x88	HFWBR I	0xA4	LFR Lo E NRD N	0xF5	lfr hi e spec nrd s+n
0x89	HFWBR Q	0xA4	LFR Lo E NRD S	0xF5	lfr hi e spec nrd n
0x8C	HFR I	0xA4	LFR Lo E NRD C	0xF5	lfr hi e spec nrd s

\*\* Channel names are not case sensitive.