

PiStar.UK - Pi-Star Digital Voice Software

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Pi-Star is a software image built initially for the Raspberry Pi (produced by the Raspberry Pi Foundation). The design concept is simple, provide the complex services and configuration for Digial Voice on Amateur radio in a way that makes it easily accessable to anyone just starting out, but make it configurable enough to be interesting for those of us who cant help but tinker.

Pi-Star would not be here today, were it not for the software made by Jonathan Naylor (G4KLX), we started with his DStarRepeater and ircDDBGateway and now support the full G4KLX MMDVM suite, including the extra cross-mode gateways added on by Andy (CA6JAU), I cannot thank these guys for the vast amount of time and effort that they continue to put into their projects.

Pi-Star can be what ever you want it to be, from a simple single mode hotsport running simplex providing you with access to the increasing number of Digital Voice networks, up to a public duplex multimode repeater!

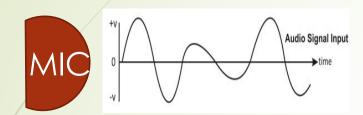
The world is at your fingertips, and the choices are yours!

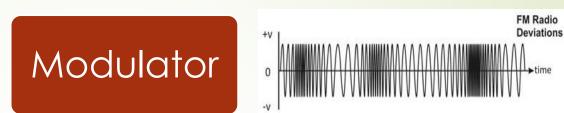
If you like to get your hands dirty, delve beneath the simple to use web based dashboard, Pi-Star provides some unique tools to make administration easy, but we also encourage those who want to understand what the system is and how it works to be as involved as they want to be!

Most importantly, have fun using Pi-Star!

Di-St	ar Digital	Voice D	achbaa	rd for MWO	MINZ	
PI-51		voice D	asiibua			dmin Config
abled	125		Active Star			
	Callsign	LogOff	- Anna	Info	UTOT GTOT	
	PISTAR B	PISTAR U	Pi-Star Us	ser Group on D-Star	30	30
	CN6GN B	GWEGW U	Blackwood	Club Members Group	30	30
Status		Last	20 calls hear	d via this Gateway		
and the second se	Time (BST)	Hode	Callsign	Target	Sec Dur(s)	Loss BER
	2017-05-30 16:30:	19 D-Star	KINDH/DAVE	CQCQCQ via REF001 C	Net 0.8	8% 8.2%
	nabled DMR 7925	DMR Collsign PISS DMR DISTAR B CM6GM B Status DMR Net PISS Net DMR Net PISS Net	Collsign LogOff DMR PISTAR 8 PISTAR U CNEGM B CMEGM U U Status DMR Net Last PZ5 Time (BST) Mode 2017-05-30 16:30:19 D-Star	Active Star OWR PIST PISTAR 8 PISTAR 8 PISTAR 8 PISTAR 0 PISTAR 0 PI	Active Starnet Groups OMR Collsign LogOff Info PIST PISTAR B PISTAR U Pi-Star User Group on D-Star CM6GM B CM6GM U Blackwood Club Members Group Status DMR Net Time (BST) Mode Z017-05-30 16-30-19 D-Star DME FEMAL COCOCO via REF001 C	ONR Callsign LogOff Info UTOT PX5 PISTAR B PISTAR U Pi-Star User Group on D-Star 30 CM6GM B GM6GM U Blackwood Club Members Group 30 Status Last 20 calls heard via this Gateway DMR Net Time (BST) Mode Callsign Tanget SncDur(s) 2017_05_30_16_30:19 D-Star Mode Callsign Tanget Net 8

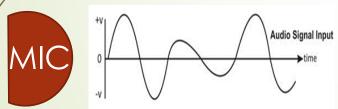
Analog FM





111010111000

Digital Voice



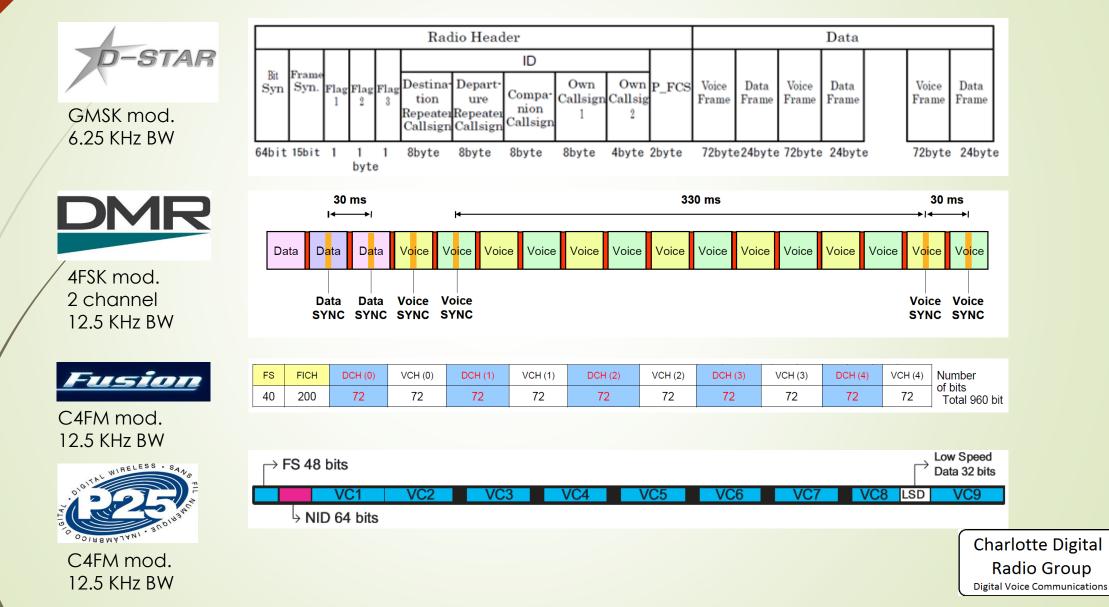
Vocoder

AMBE by Digital Voice Systems, Inc. D-STAR – GMSK DMR – 4FSK Fusion – C4FM P25 – C4FM

Modulator



Digital Voice Packet Structure



Major DV Mode Spec Differences

	Vocoder	Channels	Bandwidth	Multiplex	Modulation
P25 – Phase 1*	IMBE	1	12.5 kHz	FDM	C4FM
D-STAR	AMBE+	1	6.25 kHz	FDM	GMSK
DMR	AMBE+2	2	12.5 kHz	TDM	4FSK
NXDN	AMBE+2	1	6.25/12.5 kHz	FDM	C4FM
System Fusion	AMBE+2	1	12.5 kHz	FDM	C4FM
Free DV (HF)	Codec 2	1	1.25 kHz	FDM	QPSK

*P25 phase 2 is excluded because it is still under development



Hostname: pi-star

Pi-Star: 3.4.17 / Dashboard: 20190402

Pi-Star Digital Voice Dashboard for KJ600V

Dashboard | Admin | Configuration

Modes Enabled		Gateway Activity						
D-Star DMR	Time (PDT)	Mode	Callsign	Target	Src	Dur(s)	Loss	BER
YSF P25	18:55:38 Apr 19th	D-Star	N1DZS/DMR	CQCQCQ via XRF303 D	Net	29.6	0%	0.0%
YSF XMode NXDN	18:54:08 Apr 19th	D-Star	KE0FHS/DMR	CQCQCQ via XRF303 D	Net	12.6	0%	0.0%
DMR XMode POCSAG	18:54:00 Apr 19th	D-Star	KJ600V P/FRED	ςδςδςδ	RF	8.0	0%	0.0%
	18:48:42 Apr 19th	D-Star	KI6UJH/D74	ςδςδςδ	Net	16.8	1%	0.0%
Network Status	18:35:50 Apr 19th	D-Star	VK4DA/BOB	ςδςδςδ	Net	0.8	0%	0.0%
D-Star Net DMR Net	18:18:04 Apr 19th	D-Star	K9MIT/DNGL	ςδςδςδ	Net	7.5	0%	0.0%
YSF Net P25 Net	17:50:01 Apr 19th	D-Star	KI7SBU/880H	ςδςδςδ	Net	5.7	0%	0.0%
YSF2DMR NXDN Net	16:56:58 Apr 19th	D-Star	КЈ7ЕРМ	ςδςδςδ	Net	5.7	0%	4.7%
YSF2NXDN YSF2P25	15:53:36 Apr 19th	D-Star	KE6YGM/ID51	ςδςδςδ	Net	7.1	0%	0.0%
DMR2NXDN DMR2YSF	15:45:52 Apr 19th	D-Star	KJ600V/INF0	ςδςδςδ	Net	6.9	0%	0.0%
	15:45:17 Apr 19th	D-Star	KJ600V/ECH0	ςδςδςδ	Net	9.1	0%	0.0%
Radio Info	14:19:20 Apr 19th	D-Star	AA6KA/ID51	CQCQCQ via REF014 C	Net	0.9	0%	0.0%
Trx Listening D-Star	14:15:52 Apr 19th	D-Star	N6XN/NAPA	CQCQCQ via REF014 C	Net	5.6	0%	0.0%
Tx 438,800000 MHz	14:15:23 Apr 19th	D-Star	KI6SZE/4100	CQCQCQ via REF014 C	Net	25.4	0%	0.0%
Rx 438,800000 MHz	13:52:40 Apr 19th	D-Star	N6PTS/D74	CQCQCQ via REF014 C	Net	0.1	0%	0.0%
FW MMDVM: 20190130	13:38:44 Apr 19th	D-Star	WA6EKS	CQCQCQ via REF014 C	Net	1.5	0%	0.0%
TCX0 12.0000 MHz	12:20:22 Apr 19th	D-Star	N07E/9100	CQCQCQ via REF014 C	Net	2.5	0%	0.0%

D	-Star Repeater						
RPT1	KJ600V B	10.5					
RPT2	KJ600V G	10:04					
I							
APRS	sjc.aprs2.net						
IRC	rr.openquad.net						
Lir	Linked to XRF303 D						
I)	OPlus Outgoing)						

1	Local RF Activity								
ł	Time (PDT)	Mode	Callsign	Target	Src	Dur(s)	BER	RSSI	
ł	18:54:00 Apr 19th	D-Star	KJ600V P/FRED	cococo	RF	8.0	0.0%		

Pi-Star / Pi-Star Dashboard, © Andy Taylor (MW0MWZ) 2014-2019. ircDDBGateway Dashboard by Hans-J. Barthen (DL5DI), MMDVMDash developed by Kim Huebel (DG9VH), Need help? Click here for the Facebook Group or Click here to join the Support Forum Get your copy of Pi-Star from here.

Pi-Star Digital Voice - Configuration

Dashboard | Admin | Expert | Power | Update | Backup/Restore | Factory Reset

	Gateway Hardware Information									
Hostname	Hostname Kernel Platform CPU Load CPU Temp									
pi-star	4.9.35-v7+	Pi 3 Model B (1GB) - Embest, CH	0.16 / 0.27 / 0.14	47.8°C / 118°F						

Control Software							
Setting Value							
Controller Software:	DStarRepeater MMDVMHost (DV-Mega Minimum Firmware 3.07 Required)						
Controller Mode:	Simplex Node ODuplex Repeater (or Half-Duplex on Hotspots)						

Apply Changes

MMDVMHost Configuration

Setting			٧	alue				
DMR Mode:		RF Hangtime:	20	Net Hangtime: 20				
D-Star Mode:		RF Hangtime:	20	Net Hangtime: 20				
YSF Mode:		RF Hangtime:	20	Net Hangtime: 20				
P25 Mode:		RF Hangtime:	20	Net Hangtime: 20				
NXDN Mode:		RF Hangtime:	20	Net Hangtime: 20				
YSF2DMR:								
YSF2NXDN:								
YSF2P25:	0							
DMR2YSF:			Uses 7 p	prefix on DMRGateway				
DMR2NXDN:	Uses 7 prefix on DMRGateway							
POCSAG:		POCSAG Paging Features						
MMDVM Display Type:	None	▼ Port: /dev/ttyAMAO ▼	Nextion	Layout: G4KLX 🔻				

Apply Changes

General Configuration

Setting		Value						
Hostname:	pi-star	Do not add suffixes such as .local						
Node Callsign:	KJ600V							
Radio Frequency:	438.800.000	MHz						
Latitude:	37.0621	degrees (positive value for North, negative for South)						
Longitude:	-122.0101	degrees (positive value for East, negative for West)						
Town:	Scotts Valley							

Hostname: pi-star

Pi-Star Digital Voice Dashboard for KJ600V

Dashboard | Admin | Live Logs | Power | Update | Configuration

_	Gateway Hardware Information									
	Hostname Kernel Platform CPU Load CPU Temp									
	pi-star	4.9.35-v7+	Pi 3 Model B (10	SB) - Embest, CH	0.38 / 0.35 / 0.15	47.8°C / 118°F				
			Service	Status						
	MMDVMHost	DMRGateway	YSFGateway	YSFParrot	P25Gateway	P25Parrot				
	DStarRepeater	ircDDBGateway	TimeServer	PiStar-Watchdog	PiStar-Remote	PiStar-Keeper				

Modes Ena	abled	D-Star Link Information							mation					
D-Star	DMR	Radio	Default	Auto	Timer	Link	Link	ed to	Mode	Direction		Last Cha	nge (P	DT)
YSF	P25	KJ600V B	REF014 C	Auto	Never	ever Up XRF303		03 D	DPlus	Outgoing		18:54:08 Apr 19th		9th
YSF XMode	NXDN													
DMR XMode	POCSAG			_				nk Ma		-			_	
Radio Modul					Ref	lector			Link	/ Un-Link		Ac	tion	_
Network Status		KJ600	OV B 🔻	I	REF014	•	C 🔹		Link	UnLink		Reques	t Chan	ge
D-Star Net DMR Net														
YSF Net	P25 Net					G	atewa	iy Acti	vity					
YSF2DMR I	NXDN Net	Time	(PDT)	Mode		Callsi	gn		Targ	et	Src	Dur(s)	Loss	BER
YSF2NXDN	YSF2P25	19:00:04 Ap	r 19th	D-Star	WDØHD	R/DMR			via XR		Net	ТХ		
DMR2NXDN	DMR2YSF	18:59:32 Ap	r 19th	D-Star		/DMR			via XR		Net	28.1	0%	0.0%
		18:59:14 Ap	r 19th	D-Star	AC2F/	DMR		COCOCO	via XR	F303 D	Net	1.5	0%	0.0%
Radio I	nfo	18:59:04 Ap	r 19th	D-Star	KD8I8	/7100) via XR		Net	0.8	0%	0.0%
Trx TX D)-Star	18:58:04 Ap	r 19th	D-Star	N7DEN	I/DMR		CQCQCQ	via XR	F303 D	Net	1.4	0%	0.0%
Tx 438.800	0000 MHz	18:54:08 Ap		D-Star	KEØFH	IS/DMR		COCOCO	via XR	F303 D	Net	12.6	0%	0.0%
Rx 438.800	0000 MHz	18:54:00 Ap	r 19th	D-Star	KJ600	V P/FR	ED	CQCQCQ			RF	8.0	0%	0.0%
FW MMDVM::	20190130	18:48:42 Ap		D-Star	KI6U3	H/D74		CQCQCQ			Net	16.8	1%	0.0%
TCX0 12.00	000 MHz	18:35:50 Ap	r 19th	D-Star	VK4DA	A/BOB		CQCQCQ			Net	0.8	0%	0.0%
		18:18:04 Ap	r 19th	D-Star	K9MI1	/DNGL		COCOCO			Net	7.5	0%	0.0%
D-Star Rep	peater	17:50:01 Ap	r 19th	D-Star		8U/880H		CQCQCQ			Net	5.7	0%	0.0%
RPT1 KJ60	DOV B	16:56:58 Ap	r 19th	D-Star	_	M		CQCQCQ			Net	5.7	0%	4.7%
RPT2 KJ60	DOV G	15:53:36 Ap	r 19th	D-Star	_	M/ID51		CQCQCQ			Net	7.1	0%	0.0%
D-Star Ne	twork	15:45:52 Ap	r 19th	D-Star		V/INFC		CQCQCQ			Net	6.9	0%	0.0%
APRS sjc.ap	rs2.net	15:45:17 Ap		D-Star	KJ600	V/ECHC)	CQCQCQ			Net	9.1	0%	0.0%
IRC rr.open	quad.net	14:19:20 Ap		D-Star		/ID51) via RE		Net	0.9	0%	0.0%
Linked to X		14:15:52 Ap		D-Star		NAPA			via RE		Net	5.6	0%	0.0%
(DPlus Out	going)	14:15:23 Ap	r 19th	D-Star	_	CE/4100)) via RE		Net	25.4	0%	0.0%
		13:52:40 Ap		D-Star	_				via RE		Net	0.1	0%	0.0%
		13:38:44 Ap	r 19th	D-Star	WAGE	(S		COCOCO	via RE	F014 C	Net	1.5	0%	0.0%

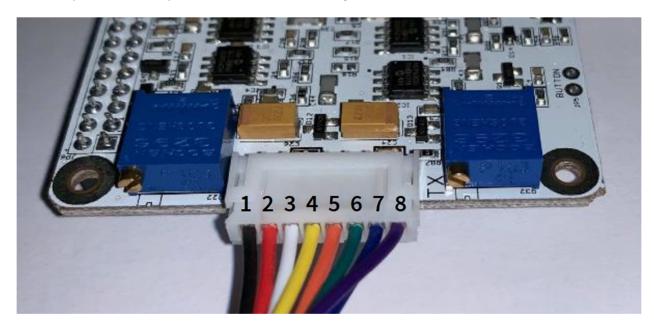
Local RF Activity								
Time (PDT) Mode Callsign Target Src Dur(s) BER RSSI								
18:54:00 Apr 19th	D-Star	KJ600V P/FRED	<u>cőcőcő</u>	RF	8.0	0.0%		

MMDVM-Pi rev. 0.9 board

- Designed for repeater and high power hotspot applications connects to user supplied Raspberry Pi board
- Utilizes a high performance 32bit ARM processor running at 180Mhz (Room for future upgrades)
- Fourth generation analogue filter design that provides an extremely low BER compared to previous generations
- 2 Multi-turn pots for fine RX and TX adjustments
- Onboard LEDs to show status and modes (PTT, COS, Power, D-Star, DMR, P25, Fusion)
- Connection for Nextion LCD screen
- 8 pin JST Connector with pigtail wires
- Open source MMDVM firmware preloaded and easily upgraded by software

Wiring connections

Here is a picture of the 8 pin header with cable showing wire colors:



Here is a table of the pin numbers, names and wire colors:

Pin number	Signal name	Description	Wire color
1	CTRL	Control (output)	Black
2	COS/STAT1	Carrier sense (input)	Red
3	RX audio	Receive audio from radio (input)	White
4	Ground	Signal ground	Yellow
5	Ground	Signal ground	Orange
6	TX audio	Transmit audio to radio (output)	Green
7	PTT	Push to talk (enable transmit) (input)	Blue
8	RSSI	Received signal strength indicator (input)	Purple