

FarSync Flex And FarSync Flex V2 & V3 Hardware Reference Manual

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Introduction

The FarSync Flex USB adapter is a high quality synchronous and asynchronous solution for business, government and military applications, it has been developed to provide high performance, robust and versatile connectivity for Linux and Windows systems.

Typical applications include:

- Internet access and remote office access over leased lines
- HDLC framing support for non standard or specialist protocols
- Interfacing video and voice bit streams such as T-DMB, DAB ETI (N1, V.11) and STI (P1, V.11)
- Interfacing transparent bit stream for handling unusual protocols
- Line monitoring
- Data generators for test systems
- Engineering monitoring and for control of systems
- Acting as master or slave in a RS485 half duplex multi-drop environment
- BERT Line Testing (software option)
- Connection to secure BRENT units



Figure 1 - FarSync Flex

Specifications

Physical	Height 30mm, Length 126 mm, Width 62mm, Weight: 190g
Environmental	Operating 0 - 55°C; Storage -20°C - +70°C; Humidity 0-95% non-condensing *Operating -30 - 70°C; Storage -40°C - +85°C; Humidity 0-95% non-condensing
Power	Bus Powered; < 100mA at start up; < 500mA operational (typical 2W)
EMC	EN55022 Class B, CE, FCC Class B
Interfaces supported	RS232, X.21, V.35, RS530, RS422, RS449 & RS485
Encoding	NRZ, NRZI, FM0, FM1, Manchester* & Conditioned Diphase* Encoding
Clocking	Externally sourced (synchronous) - 0 - 2.048MHz (3.072MHz ⁺) Internally sourced (synchronous) - 100Hz - 2.048MHz (3.072MHz ⁺) Asynchronous - 75 - 192KHz
Data	Synchronous HDLC, Synchronous Transparent & Asynchronous
LED	Steady OFF - Power OFF; STEADY ON - Power ON, No Transmit Clock Present; Slow FLASH - Identify Mode, Fast FLASH - Transmit Clock Present

* Feature available on FarSync Flex V2/3 only.

+ Flex V3 only

The newer model FarSync Flex V3 replaces FarSync Flex V2 which in turn replaces the original FarSync Flex. Newer models support all the features of the earlier models and are fully software compatible with them. The way to physically differentiate models is by the V3 or V2 appearing on the serial number label on the side of the enclosure.

FarSync Flex V2 adds the following to FarSync Flex:

- Synthesizer for more flexibility in synchronous clock generation
- Terminal Timing support
- Enhanced ESD protection
- Communications controller functions implemented in a CPLD for ease of customization
- Manchester Coding
- Differential Manchester Coding
- Faster operation (2.048Mbps) in FM0, FM1 and NRZI modes

FarSync Flex V3 adds the following to Flex V2:

- Fully industrial temperature (-40°C - + 85°C) rated components used throughout
- Faster operation (3.072Mbps) for NRZ and Coded synchronous data

Interfaces

FarSync Flex is attached to the host device by a short USB 2.0 cable and connected to serial devices using network interface specific cables.

USB

FarSync Flex is designed for connection to a USB 2.0 High Speed (480Mbps) port, it is USB 3.0 and 1.1 compatible.

All FarSync Flex devices are supplied with a high-quality locking USB 2.0 A-B cable.



Figure 2 - USBF Cable

FarSync Flex can be used with a range of DTE and DCE cables for different interface types as detailed in the following sections:

RS232 - V.28 Electrical

The RS232 interface supports single-ended data, clock and control signals. Single-ended signals switch symmetrically about 0V.

Signal		DB25M	Direction	HD26F
Shield		1	-	1
Transmit Data	TxD	2	Output	2
Receive Data	RxD	3	Input	4
Request To Send	RTS	4	Output	5
Clear To Send	CTS	5	Input	6
Signal Ground	GND	7	-	9
Data Carrier Detect	DCD	8	Input	26
Transmit Clock	TxC	15	Input ¹	3
Receive Clock	RxC	17	Input ¹	8
Data Terminal Ready	DTR	20	Output	25
External Transmit Clock ²	XTC	24	Output ¹	7

¹ Clocks signals shown with default DTE configuration. When clocking directions reversed, DCE can be emulated with appropriate cabling; in fact the direction of each clock may be individually controlled.

² External Transmit Clock (Terminal Timing) is supported on Flex V2/3 only.

Cables

Use a KCR1 cable to present a RS232 DTE interface on a DB25M

Use a KCR1-DCE or KCR1 + NULL-MR4 cables to present a RS232 DCE interface on a DB25F

For Flex V2/3, the KCR1 cable can be used, however, Terminal Timing is only supported with the KCR1-V2 cable.



Figure 3 - KCR1 Cable (Product Code FS6011[-V2])

RS530 - RS422/V.11 Electrical

The RS530 interface supports differential data, clock and control signals.

Signal		DB25M	Direction	HD26F
Shield		1	-	1
Transmit Data	TxDa	2	Output	2
	TxDb	14	Output	11
Receive Data	RxDa	3	Input	4
	RxDb	16	Input	13
Request To Send	RTSa	4	Output	5
	RTSb	19	Output	14
Clear To Send	CTSa	5	Input	6
	CTSb	13	Input	15
Signal Ground	GND	7	-	9
Data Carrier Detect	DCDa	8	Input	26
	DCDb	10	Input	18
Transmit Clock	TxCa	15	Input ¹	3
	TxCb	12	Input ¹	12
Receive Clock	RxCa	17	Input ¹	8
	RxCb	9	Input ¹	17
Data Terminal Ready	DTRa	20	Output	25
	DTRb	23	Output	10
External Transmit Clock ²	XTCa	24	Output ¹	7
	XTCb	11	Output ¹	16

¹ Clocks signals shown with default DTE configuration. When clocking directions reversed, DCE can be emulated with appropriate cabling; in fact the direction of each clock may be individually controlled.

² External Transmit Clock (Terminal Timing) is supported on Flex V2/3 only.

Clock and Data Termination

Termination is used to minimize crosstalk and signal reflections.

The RS422/V.11 Receive Data and Transmit/Receive Clocks (when inputs) may be terminated by 100Ω according to user configuration.

Cables

Use a KCR1 cable to present a RS530 DTE interface on a DB25M

Use a KCR1-DCE or KCR1 + NULL-MR4 cables to present a RS530 DCE interface on a DB25F

For Flex V2/3, the KCR1 part of the cable must be KCR1-V2 for Terminal Timing support.

RS449 - RS422/V.11 Electrical

The RS449 interface supports differential data, clock and control signals.

Signal		DB37M	Direction	HD26F
Shield		1	-	1
Transmit Data	TxDa	4	Output	2
	TxDb	22	Output	11
Receive Data	RxDa	6	Input	4
	RxDb	24	Input	13
Request To Send	RTSa	7	Output	5
	RTSb	25	Output	14
Clear To Send	CTSa	9	Input	6
	CTSb	27	Input	15
Signal Ground	GND	19	-	9
Data Carrier Detect	DCDa	13	Input	26
	DCDb	31	Input	18
Transmit Clock	TxCa	5	Input ¹	3
	TxCb	23	Input ¹	12
Receive Clock	RxCa	8	Input ¹	8
	RxCb	26	Input ¹	17
Data Terminal Ready	DTRa	12	Output	25
	DTRb	30	Output	10
External Transmit Clock ²	XTCa	24	Output ¹	7
	XTCb	11	Output ¹	16

¹ Clocks signals shown with default DTE configuration. When clocking directions reversed, DCE can be emulated with appropriate cabling; in fact the direction of each clock may be individually controlled.

² External Transmit Clock (Terminal Timing) is supported on Flex V2/3 + KCR1-V2 only.

Clock and Data Termination

Termination is used to minimize crosstalk and signal reflections.

The RS422/V.11 Receive Data and Transmit/Receive Clocks (when inputs) may be terminated by 100Ω according to user configuration.

Cables

Use a KC449 or KCR1 + TC449 cables to present a RS449 DTE interface on a DB37M

Use a KC449-DCE or KC449 + NULL-449 cables to present a RS449 DCE interface on a DB37F

For Flex V2/3, the KCR1 part of the cable must be KCR1-V2 for Terminal Timing support.

For Flex V2/3, the KC449 cable can be used, however, Terminal Timing is only supported with the KC449-V2 cable.



Figure 4 - KC449 Cable (Product Code FS6019)

X.21 - RS422/V.11 Electrical

The X.21 interface supports differential data, clock and control signals.

Signal		DB15M	Direction	HD26F
Shield		1	-	1
Transmit	Ta	2	Output	2
	Tb	9	Output	11
Receive	Ra	4	Input	4
	Rb	11	Input	13
Control	Ca	3	Output	5
	Cb	10	Output	14
Indicate	Ia	5	Input	6
	Ib	12	Input	15
Signal Ground	GND	8	-	9
Signal Element Timing	Sa	6	Input ¹	3
	Sb	13	Input ¹	12

¹ Clock signal shown with default DTE configuration. When clocking direction reversed, DCE can be emulated with appropriate cabling.

Clock and Data Termination

Termination is used to minimize crosstalk and signal reflections.

The RS422/V.11 Receive Data and Transmit/Receive Clocks (when inputs) may be terminated by 100Ω according to user configuration.

Cables

Use a UCX1 cable to present a X.21 DTE interface on a DB15M

Use a UCX1-DCE or UCX1 + NULL-MX cables to present a X.21 DCE interface on a DB15F



Figure 5 - UCX1 Cable (Product Code FS6062)

V.35 - V.35/V.28 Electrical

The V.35 interface supports differential data and clock and single-ended control signals. Single-ended signals switch symmetrically about 0V.

Signal		M34M	Direction	HD26F
Shield		A	-	1
Transmit Data	TxDa	P	Output	2
	TxDB	S	Output	11
Receive Data	RxDa	R	Input	4
	RxDB	T	Input	13
Request To Send	RTSa	C	Output	23
Clear To Send	CTSa	D	Input	24
Signal Ground	GND	B	-	9
Data Carrier Detect	DCDa	F	Input	26
Transmit Clock	TxCa	Y	Input ¹	7
	TXCb	AA	Input ¹	16
Receive Clock	RxCa	V	Input ¹	8
	RxCb	X	Input ¹	17
Data Terminal Ready	DTRa	H	Output	25
External Transmit Clock ²	XTCa		Output ¹	
	XTCb		Output ¹	

¹ Clocks signals shown with default DTE configuration. When clocking directions reversed, DCE can be emulated with appropriate cabling; in fact the direction of each clock may be individually controlled.

² External Transmit Clock (Terminal Timing) is supported on Flex V2/3 only.

Clock and Data Termination

Termination is used to minimize crosstalk and signal reflections.

The V.35 Receive Data and Transmit/Receive Clocks (when inputs) may be terminated by 100Ω according to user configuration. The V.35 Transmitted Data and Transmit/Receive Clocks (when outputs) may be terminated by 100Ω according to user configuration.

Cables

Use a UCV1 cable to present a V.35 DTE interface on a M34M connector

Use a UCV1-DCE or UCV1 + NULL-V35 cables to present a V.35 DCE interface on a M34F connector

For Flex V2/3, the KCV1 cable can be used, however, Terminal Timing is only supported with the KCV1-V2 cable.



Figure 6 - UCV1 Cable (Product Code FS6063[-V2])

RS485 - RS422/V.11 Electrical

The RS485 interface supports differential data signals and operates in 2-wire half-duplex and 4-wire full-duplex modes.

Signal			Direction	HD26F
Shield			-	1
Transmit	TxDa		Output	2
	TxDb		Output	11
Receive	RxDa		Input	4
	RxDb		Input	13
Signal Ground	GND		-	9

Clock and Data Termination

Termination is used to minimize crosstalk and signal reflections.

In RS485 applications, the two extreme ends of the circuit should be terminated. This may be done by using or external resistors, or by using the onboard termination option.

Cables

Use a KC485 cable to present a 2-wire half-duplex RS485 interface terminated with crimp terminal spades.

Bit Error Rate Testing

FarSync Flex may be used in Bit Error Rate Test (BERT) applications.

Any of the previously mentioned cables may be used in BERT applications.

Monitoring

FarSync Flex may be used in Monitoring applications. The input data, signals and clock on the primary port are used with input data and signals on a secondary port (on the same HD26 connector) to form a complete bidirectional monitoring solution.

Monitoring applications use special 'Y' cables. FarSite can currently supply cables for RS232/530 and X.21 monitoring, other network interfaces could be monitored, please contact us at www.farsite.com if you have other requirements.

RS232/530 Monitoring

The KCR-MON cable is used for RS232/530 monitoring. All 25-pins of the monitored circuit are connected straight through. All HD26 connections are monitored inputs.

DB25 Socket Contact	Interface Signal	DB25 Plug Pin Contact	HD26 Plug Pin Contact	Interface Signal	Twisted Pairs
15	TXCa	15	3	ASTa	PAIR
12	TXCb	12	12	ASTb	
3	RXDa	3	4	ARXa	PAIR
16	RXDb	16	13	ARXb	
5	CTSa	5	6	ACTSa	PAIR
13	CTsb	13	15	ACTSb	
8	DCDa	8	26	ADCDa	PAIR
10	DCDb	10	18	ADCDb	
2	TXDa	2	19	BRXa	PAIR
14	TXDb	14	20	BRXb	
4	RTSa	4	21	BCTSa	PAIR
19	RTSb	19	no connection	(RTSb)	
20	DTRa	20	22	BDCDa	PAIR
23	DTRb	23	no connection	(DTRb)	
17	RXCa	17	no connection	(RTa)	PAIR
9	RXCb	9	no connection	(RTb)	
7	GND	7	9	GND	
6	DSRa	6	no connection	-	PAIR
22	DSRb	22	no connection	-	
24	XTCa	24	no connection	-	PAIR
11	XTCb	11	no connection	-	
18	LL	18	no connection	-	
21	RL	21	no connection	-	
25	TI	25	no connection	-	
1	1	1	1	SHIELD	

Cable

Use a KCR-MON cable for RS232 or RS530 monitoring applications.



Figure 7 - KCR-MON Cable (Product Code FS6016)

X.21 Monitoring

The KCX-MON cable is used for X.21 monitoring. All 15-pins of the monitored circuit are connected straight through. All HD26 connections are monitored inputs.

DB15 Socket Contact	Interface Signal	DB15 Plug Pin Contact	HD26 Plug Pin Contact	Interface Signal	Twisted Pairs
6	TXCa	6	3	ASTa	PAIR
13	TXCb	13	12	ASTb	
4	RXDa	4	4	ARXa	PAIR
11	RXDb	11	13	ARXb	
5	CTSa	5	6	Ala	PAIR
12	CTSb	12	15	Alb	
2	TXDa	2	19	BRXa	PAIR
9	TXDb	9	20	BRXb	
3	RTSa	3	21	Bla	PAIR
10	RTSb	10	no connection	(lb)	
8	GND	8	9	GND	
7	-	7	no connection	-	
14	-	14	no connection	-	
15	-	15	no connection	-	
1	SHIELD	1	1	SHIELD	

Cable

Use a KCX-MON cable for X.21 monitoring applications.



Figure 8 - KCX-MON Cable (Product Code FS6017)

Clocking

FarSync Flex supports any clock frequency up to the maximum supported rate when clocked externally or can source any of the following clocks when clocked internally:

FarSync Flex Clock Rates (Synchronous, NRZ)							
15,	25,	30,	50,	60,	75,	100,	120,
125,	150,	200,	240,	300,	375,	400,	480,
500,	600,	750,	800,	960,	1000,	1200,	1500,
1600,	1920,	2000,	2400,	3000,	3200,	3840,	4000,
4800,	6000,	6400,	7200,	7680,	8000,	9600,	12000,
12800,	14400,	15360,	16000,	16800,	19200,	21600,	24000,
25600,	26400,	28800,	30720,	31200,	32000,	33000,	33333,
33600,	36000,	38400,	40000,	40800,	43200,	48000,	51200,
56000,	61440,	64000,	76800,	80000,	96000,	102400,	112000,
122880,	128000,	153600,	160000,	192000,	200000,	204800,	224000,
245760,	250000,	256000,	307200,	320000,	384000,	409600,	448000,
491520,	512000,	576000,	614400,	640000,	704000,	768000,	819200,
832000,	896000,	960000,	983040,	1000000,	1024000,	1088000,	1152000,
1216000,	1228800,	1280000,	1344000,	1408000,	1472000,	1536000,	1600000,
1638400,	1664000,	1728000,	1792000,	1856000,	1920000,	1984000,	2000000,
2048000,	2112000,	2176000,	2240000,	2304000,	2368000,	2432000,	2496000,
2560000,	2624000,	2688000,	2752000,	2816000,	2880000,	2944000,	3000000,
3008000,	3072000,	3136000,	3200000,	3264000,	3328000,	3392000,	3456000,
3520000,	3584000,	3648000,	3712000,	3776000,	3840000,	3904000,	3968000,
4000000,	4032000,	4096000,	4160000,	4224000,	4288000,	4352000,	4416000,
4480000,	4544000,	4608000,	4672000,	4736000,	4800000,	4864000,	4928000,
4992000,	5000000,	5056000,	5120000,	5184000,	5248000,	5312000,	5376000,
5440000,	5504000,	5568000,	5632000,	5696000,	5760000,	5824000,	5888000,
5952000,	6000000,	6016000,	6080000,	6144000,	6208000,	6272000,	6336000,
6400000,	6464000,	6528000,	6553600,	6592000,	6656000,	6720000,	6784000,
6848000,	6912000,	6976000,	7000000,	7040000,	7104000,	7168000,	7232000,
7296000,	7360000,	7424000,	7488000,	7552000,	7616000,	7680000,	7744000,
7808000,	7872000,	7936000,	8000000,	8064000,	8128000,	8192000,	9000000,
10000000,	10710000,	11000000,	12000000,	13000000,	14000000,	15000000,	16000000.

Rates shown in **RED** are available on Flex (V1) only.

Rates shown in **BLUE** are available on Flex V2/3 only.

Maximum NRZ rate for Flex (V1)/V2 is 2048kbps. Maximum NRZ rate for Flex V3 is 3072kbps.

FarSync Flex Clock Rates (Synchronous, Coded)

15,	25,	30,	50,	60,	75,	100,	120,
125,	150,	200,	240,	300,	375,	400,	480,
500,	600,	750,	800,	960,	1000,	1200,	1500,
1600,	1920,	2000,	2400,	3000,	3200,	3840,	4000,
4800,	6000,	6400,	7200,	7680,	8000,	9600,	12000,
12800,	14400,	15360,	16000,	16800,	19200,	21600,	24000,
25600,	26400,	28800,	30720,	31200,	32000,	33000,	33333,
33600,	36000,	38400,	40000,	40800,	43200,	48000,	51200,
56000,	61440,	64000,	76800,	80000,	96000,	102400,	112000,
122880,	128000,	153600,	160000,	192000,	200000,	204800,	224000,
245760,	250000,	256000,	307200,	320000,	384000,	409600,	448000,
491520,	512000,	576000,	614400,	640000,	704000,	768000,	819200,
832000,	896000,	960000,	983040,	1000000,	1024000,	1088000,	1152000,
1216000,	1228800,	1280000,	1344000,	1408000,	1472000,	1536000,	1600000,
1638400,	1664000,	1728000,	1792000,	1856000,	1920000,	1984000,	2000000,
2048000,	2112000,	2176000,	2240000,	2304000,	2368000,	2432000,	2496000,
2560000,	2624000,	2688000,	2752000,	2816000,	2880000,	2944000,	3000000,
3008000,	3072000,	3136000,	3200000,	3264000,	3328000,	3392000,	3456000,
3520000,	3584000,	3648000,	3712000,	3776000,	3840000,	3904000,	3968000,
4000000,	4032000,	4096000,	4160000,	4224000,	4288000,	4352000,	4416000,
4480000,	4544000,	4608000,	4672000,	4736000,	4800000,	4864000,	4928000,
4992000,	5000000,	5056000,	5120000,	5184000,	5248000,	5312000,	5376000,
5440000,	5504000,	5568000,	5632000,	5696000,	5760000,	5824000,	5888000,
5952000,	6000000,	6016000,	6080000,	6144000,	6208000,	6272000,	6336000,
6400000,	6464000,	6528000,	6553600,	6592000,	6656000,	6720000,	6784000,
6848000,	6912000,	6976000,	7000000,	7040000,	7104000,	7168000,	7232000,
7296000,	7360000,	7424000,	7488000,	7552000,	7616000,	7680000,	7744000,
7808000,	7872000,	7936000,	8000000,	8064000,	8128000,	8192000,	9000000,
10000000,	10710000,	11000000,	12000000,	13000000,	14000000,	15000000,	16000000.

Rates shown in **RED** are available on Flex (V1) only.

Rates shown in **BLUE** are available on Flex V2/3 only.

Maximum Coded rate for Flex (V1) is 1536kbps. Maximum Coded rate for Flex V2 is 2048kbps. Maximum Coded rate for Flex V3 is 3072kbps.

Flex (V1) supports FM0, FM1 & NRZI. Flex V2/3 additionally supports Manchester and Differential Manchester.

All Flex models support the same range of asynchronous data rates:

FarSync Flex Clock Rates (Asynchronous)

15,	25,	30,	50,	60,	75,	100,	120,
125,	150,	200,	240,	300,	375,	400,	480,
500,	600,	750,	800,	960,	1000,	1200,	1500,
1600,	1920,	2000,	2400,	3000,	3200,	3840,	4000,
4800,	6000,	6400,	7680,	8000,	9600,	12000,	12800,
15360,	16000,	19200,	24000,	25600,	30720,	32000,	38400,
48000,	51200,	57600,	61440,	64000,	76800,	96000,	102400,
115200.							

NOTE: 57600 asynchronous clock accuracy is -1.23% and 115200 is +2.56%.

Synthesizer

FarSync Flex supports a wide range of hard-coded standard frequencies for synchronous NRZ and encoded data which will meet most requirements. If, however, a non-standard clock rate is required this can usually be achieved by reconfiguration of the onboard synthesizer at run-time. For further information, see document *TN02_03_FarSync_User_Synthesizer_Programming_Guide.pdf*.

Mounting Kit

The optional FarSync Flex Mounting Kit consists of a pair of extruded aluminium or moulded plastic mounting brackets that allow the Flex to be fixed to walls, panels or vehicle bulkheads.

FarSync Flex can be ordered with the fixing brackets already attached.



Figure 9 - FarSync Flex Mounting Kit

For further information, see document *TN03_02_FarSync_Flex_Mounting_Kit_Assembly_Guide.pdf* (extruded aluminium brackets) or *S0627M-02 FarSync Flex Plastic Clip on Mounting Bracket Fitting Instructions* (moulded plastic brackets).

Uncased FarSync Flex Installation Guide

In some applications where the FarSync Flex is to be mounted inside another piece of equipment, it may not be necessary for the Flex to be installed without its own enclosure. In this case the FarSync Flex PCB assembly may be removed from its enclosure and installed directly. FarSite can supply Flex's without the enclosure, contact us at www.farsite.com. For further information about fitting, see document *TN04_03_Uncased_FarSync_Flex_Installation_Guide.pdf*.

Customisation

The FarSync Flex hardware and software design lends itself to customisation for specific customer requirements, such as:

- Special Data Encoding requirements
- Special Protocol implementations
- Special Clock rates
- Special Control Signal operation
- Special Cables

Please contact us at www.farsite.com with your requirements.