

KAIROS Manager Function Manual

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Revision History

Revision	Edition	

Document Revision

This document shall from time to time be changed without notice. This document is created and published for the products having the following design specifications.

Firmware Version

Item	Version	How to Verify	
KAIROS Firmware	1.6.5.0	Software > Versions of KAIROS Manager	

Programming Software Version

Item	Version	How to Verify
KAIROS Manager	1.7.1	? > About of KAIROS Manager

Application Software Version

Item	Version	How to Verify

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4.

1. KAIROS Manager Installation



"KAIROS_Manager" is a PC Application to configure a KAIROS.

1.1. Installation

Installation of "KAIROS_Manager" requires a PC with Windows O.S.; insert the thumb drive with the installation package into the PC.

Im	portant!	Run	"Setup	.bat"	applicatio	n with	"Admir	nistrator	riahts"	΄.
	Joi cante.		Occup		appincacio		/			

Docs	5/23/2018 11:53 AM	ファイル フォルダー	
퉬 Files	4/23/2018 11:51 AM	ファイル フォルダー	
퉬 Fonts	12/13/2017 9:42 AM	ファイル フォルダー	
퉬 Libs	4/23/2018 12:03 PM	ファイル フォルダー	
🛍 autorun.inf	10/27/2010 2:39 PM	セットアップ情報	1 KB
📔 Kairos_Manager.zip	12/26/2017 1:22 PM	ZIP ファイル	63,825 KB
🕫 RA.ico	9/7/2004 2:38 PM	アイコン	4 KB
Readme.txt	8/29/2017 4:36 PM	テキスト ドキュメント	3 KB
🚳 SetupKA.bat	1/27/2015 5:34 PM	Windows バッチ ファイル	3 KB
🚳 Unistall.bat	12/18/2014 2:00 PM	Windows バッチ ファイル	1 KB

After installing, the application is available from the folder "C:\Radio_Activity\KAIROS\KAIROS_Manager.exe".

2. Connection setup

2.1. Connection setup

After double clicking on "KAIROS Manager.exe" the following window will appear. The IP address of the target equipment must be set to get access to the device. The main control window will appear which will give access to each equipment setting.

Connection setup	X
Profile <mark>(11)</mark>	Set as Default
IP settings IP Addre	ess / Hostname 2.33.91.14 (2)
IP Port 4000 (3)	Protocol O TCP (UDP (4)
Access Parameters Access Mode (5) Wired DMR RF Link TS A DMR RF Link TS B	Station ID (1 ÷ 254) (6) Use Secure Access Feature (7) Messages Timeout [s] (8) 1 ÷
New profile Save profile	Exit (3,2)

- (1) New Profile: Press this button to create New Profile.
- IP Address / Hostname: Enter target KAIROS IP address.
 If you don't know the target KAIROS IP address, there is a simple way to discover the IP by switching on KAIROS. Please refer to Appendix 4.1
- (3) IP Port number: Default is "4000".
- (4) Protocol : Select "UDP"
- Access Mode: Select "Wire" normally for cable LAN connection.
 DMR RF Link TS A: Connection via RF-LINK on Time Slot A
 DMR RF Link TS B: Connection via RF-LINK on Time Slot B
 * To connect Remote KAIROS via RF-LINK, please refer to Appendix 4.2.
- (6) Station ID: Uncheck for cable LAN connection.
 Check here for RF-LINK connection.
 * To connect Remote KAIROS via RF-LINK, please refer to Appendix 4.2.
- (7) Use Secure Access Feature: Uncheck if first time use the KAIROS. If you want to set password to open KAIROS setting, you need to set User / Password in TLC secure Access, then you can check here and use secure access. (Refer to 3.1.5 Handle Users)
- (8) Massages Timeout [s]: Timeout timer in case no connection.
- (9) Save profile : To save profile, press this button.

(10) Profile Name : Enter Profile Name to save, press OK.

ave Profile as	X
Profile Name	OK
	Cancel

(11) Profile: Select Profile to connect KAIROS.

Profile (11)	Set as Default
--------------	----------------

(12) Click "OK" to connect KAIROS, then open Main window.

Profile —			Set as De	fault
KAIROS (D	efault)			Ŧ
IP setting	5			
	IP Ad	dress / Hostname		
	1	172.33.91.14		
P Port	4000	Protocol	C TCP	UDP
Access Pa - Access Mo	rameters de	Station ID ((1 ÷ 254) Access Feat	ure
Wired O DMR R O DMR R	F Link TS A F Link TS B	Messages Time	out [s]	2

3. Main window 2.1. Connection setup

3. Main window

KAIROS_Manager 1.7.0 - KAIROS equipments remote control - KAIROS <Spare> KAIROS_Manager Software KAIROS ? Communications Status Buffer Sent 041B 03D9 000B 0000 8001 0000 000F 39C1 8073 0000 0000 0000 0100 1415 FFFF 0393 BFFF EE00 C005 0000 0100 0000 3822 3A3D 1714 6065 92C3 DDDE 000B 0898 05C8 0850 For Factory usage only 0101 0000 E185 OSFF 0000 7744 8046 0000 0000 0000 0000 0000 0000 0000 0000 0004 Received Worldwide Statistics an and a second and another the second and and another was second and and the second second second second second Exchanged Messages 44 10-01 C3 10-01 C3 10-01 C3 10-02 C3 10-02 C3 10-02 C3 10-02 C3 10-02 C3 Incorrect Messages 0 Error Rate [%] 0.00 satisfy an extent methods and as an extent methods and extended and Log on file Clear Exit MULTIPROTOCOL DMR TIER II NODE UHF 400÷470 MHz ITU Region 1 Band MASTER BASE STATION 5/N: 450KA5520 Base Station Role: MASTER Equipment ID: 0x084050C0 1:16 PM

Following is a description of the function menus of the maim window.

If you click [Worldwide] area, following "Current Country Specifications" will appear.



3.1. KAIROS_Manager



3.1.1. Select Language

This item is under developing.

3.1.2. Regional Settings

You can set Separator and etc. by here.



Select Measurement Units

3.1.3. Select Measurement Units

You can define Measurement Units from EU or US. The selection affects the measurement units of distance and temperature; they switch from km/°C to miles/°F and vice versa.

These units are used for modifying the network delay ("distance advance timing [km]") and for detecting the board and VCTCXO temperature.

3.1.4. File Transfer Setting

You don't need to change setting from default. If uncheck "Use FTP" the data will be transferred by KAIROS manager port 4000. If FTP default port is blocked by a router setting,



*

3. Main window 3.1. KAIROS_Manager

you can change it.

3.1.5. Add/Modify Users

This is the setting for secure access for the KAIROS Manager.

After this setting, you will be no longer able to access the KAIROS in a standard way, but in the following mode:

- launch KAIROS Manager

- In the connection setup window, select the box "use Secure Access Feature"

- Select your user and your password to access the station

To use secure access, select "TLC secure access" box. KAIROS-Configuration-Main Setup

Add a New User	Modify an Existent User
User Name	Tetsuya 💌
User Level:	
Set New Password:	*****
Repeat New Password:	*****

TLC Secure Access
Users' Database
Internal
C From>

After you added a new User Name and Password, you have to open KAIROS manager by entering User Name and Password when you open KAIROS Manager the next time.

User	Tetsuya	Ok
Password	*****	Exit

3.2. Software

(AIROS_Manager [Software KAIROS ?	
Communications	Versions	
	Upload	
	Automatic Update	

3.2.1. Versions

"Versions" allows the user to view versions of downloaded files in KAIROS.

Desa	ription		Version	Build	Date
KAIROS Equipment b	y Radio Activity s	rl, HW release 2.00	01	07	2017-03-30
Version	Date		Customizatio	n	
1.6.5.0_stable	2018-07-11	1 Standard (0)			
3.5.0.0 1.11.3.0	2018-02-15 2017-06-29	ka_bst ka_main ka_snmp	17 15 9	784 503 83	2018-07-11 2018-07-11 2018-07-11
25		ka_rctl web_int	12	226 303	2018-07-11 2018-07-11
Version	Date	bst net mar	29	554	2018-07-11
4.49	2018-02-27	ka_agw	18	330	2018-07-11
4.13	2017-04-07	ka_sip	17	23	2018-07-11
	Desc KAIROS Equipment to Version 1.6.5.0_stable Version 3.5.0.0 1.11.3.0 25 Version 4.49 4.13	Description KAIRO5 Equipment by Radio Activity s Version Date 1.6.5.0_stable 2018-07-11 Version Date 3.5.0.0 2018-02-15 1.11.3.0 2017-06-29 Version Date 4.49 2018-02-27 4.13 2017-04-07	Description KAIROS Equipment by Radio Activity srl, HW release 2.00 Version Date Output 1.6.5.0_stable 2018-07-11 SW Modules Version Date Name 3.5.0.0 2018-02-15 Name 1.11.3.0 2017-06-29 ka_snmp ka_rctl web_int ka_ptp version Date Date 4.49 2018-02-27 ka_agw 4.13 2017-04-07 ka_sip	Description Version KAIROS Equipment by Radio Activity srl, HW release 2.00 01 Version Date Customization 1.6.5.0_stable 2018-07-11 Standard (Version Date SW Modules Version Date Name Bit 3.5.0.0 2018-02-15 1.11.3.0 2017-06-29 Version Date ka_snmp 9 ka_rctl 1.2 web_int 38 Version Date 1.2 1.2 Versi	Description Version Build KAIROS Equipment by Radio Activity srl, HW release 2.00 01 07 Version Date Customization 1.6.5.0_stable 2018-07-11 Standard (0) Version Date Name Build 3.5.0.0 2018-02-15 Name Build 3.5.0.0 2017-06-29 ka_snmp 983 ka_snmp 983 ka_rctl 1226 Wersion Date 3803 ka_aptp 1031 Date 2018-02-27 ka_agw 1830 ka_sip 1723

3.2.2. Upload

To upload new SW,

- 1. Select the type of firmware you need to download (microprocessor/DSP/FPGA/SIP/OS).
- 2. Select the file to be downloaded through "..." button (browse).
- 3. Push "Upload" button.
- 4. Wait for the end of the process.

tem	Source File	Use FTP (recommended) 🔽	IP Port 21
Base Station DSP PLD	C:\Radio_Activity\ka_bst_std_1640_sta	ble_2018-05-24.tar.gz	
SIP Server Operating System	Abort	Upload	Close

After completed uploading, following window appears.



[Note]

Uploading time: No downtime required while uploading software.

Base Station: Approx. 1m 20s

DSP: Approx. 0m 12s

PLD: Approx. 0m 20s

SIP Server: Approx. 0m 40s

OS: Approx. 1m Os

No KAIROS downtime required while uploading software.

Down time: To upgrade KAIROS, takes approx. 0m 40s to 4m 10s to reboot. (OS takes the longest downtime)

3.2.3. Automatic Update

To upload new SW automatically,

- 1. Select the module/s you need to download (microprocessor/DSP/FPGA/OS).
- 2. Select the file to be downloaded by clicking over the bar (browse).
- 3. Push "Update selected modules" button.
- 4. Wait for the end of the process.

🗴 Software Upgrade	- KAIROS < RPT UHF	1 JVCKENWOOD>		23
Modules		Use FT	P (recommended)	
✓ Base Station	C:\Radio_Activity\ka_bs	t_std_1640_stable_2018-05-24.tar.gz		
DSP	C:\Radio_Activity\KA_D	SP-0004-49_2018-02-27_18-26.idm		
PLD	C:\Radio_Activity\KA_PL	D-4_13_2017-04-07_16-13.jed		
Operating System	C:\Radio_Activity\kk_v0	1-b07_2017-03-30.bin.gz		_
	Abort	Update Selected Modules	Close	
	Please note that	the automatic procedure may require up to several minutes,		
meanwhi	le you MUST NOT shi	itdown the KAIROS equipment or close the KAIROS_Manager ap	oplication	
	Warning: Once t	e procedure is complete the KAIROS_Manager will be closed and the KAIROS equipment will restart		
Sending to	KAIROS	Remaining: 1491.4 kbytes, 18 s (85.3 kbyte/s)	Base Station	1

After update is completed, the following window appears.



[Note]

Uploading time: if update all is selected, it takes total 3m 0s.

During the uploading, the KAIROS maintains normal operation. At the end of the upload process, the KAIROS is restarted and the Firmware is stored in flash memory. During this period, the KAIROS is upgrading and it takes about 4 minutes to resume normal operation.

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3.3. KAIROS

"KAIROS" menu is the most frequently used and contains windows for systems setup, configuration, control, and restart of equipment. It is continuously changing according to the product developing and updating, but its main functions remain the same and they are explained here.

3.3.1. Configuration

IROS_Manager Software	≥ KAIROS ?		
Company in Name	Configuration +	Network Settings	
Communications	Alarms Configuration	Logging Options	
Sent	Controls +	Main Setup	8 820A 0000
The second law approxim	Statistics >	TRX Operating Modes	0 0022 0000
	Bostart	Channels Table	L 0000 0000
	Residit	Cridinels Table	2 C005 0000
	Configurations Utility	Calibration Parameters	0 1B19 B765
		Primary Synchronization	0 93C5 E0E0
		TV Control	8 05C8 0850
		TX CONCION	1 C784 00BF
		RX Control	2 0042 0000
		Audio Lines Configuration	D 0000 ACB0
		Subtone/Supertone	
Received		Station Basic Data	rldwide
		Base Station Layer Configuration	
	rentes canas an estar conserves c	Base Station Operating Modes	
		RTP Configuration	ages 61

3.3.1.1. Network Settings

> IP Settings

It allows the user to set-up the IP Address of the radio for remote control over Ethernet. It is important to define the Subnet Mask and the gateway address (if present).

settings		Nameservers	Search Domains
nterface 1		1 208.67.220.220	1
P Address	172.33.91.12		2
ubnet Mask	255.255.0.0	2 208.67.222.222	

3.3.1.2. Logging Options

This setting is for developer only. Users don't need to touch it. Logs are stored in internal KAIROS.

A remote Syslog server can be used by entering the IP Address and the IP port.

User Messages		Secure Access Messages
Log Facility USER	-	Log Facility SECURITY (SYS3) 💌
Allowed Messages Level		Allowed Messages Level
DEBUG INFORMATIONAL NOTICE WARNING ERRORS CRITICAL ALERT EMERGENCY	<u>र</u> । र। र। र। र। र।	DEBUG INFORMATIONAL IV NOTICE IV WARNING IV ERRORS IV CRITICAL IV ALERT IV EMERGENCY IV
Remote Syslog Server		Remote Syslog Server — — —
IP Address IP Port 514		IP Port 514

3.3.1.3. Main Setup

Allows the user to set-up identifying parameters for the equipment and other parameters referring to hardware configuration (internal serial ports settings, remote control port settings and GPS module interface settings).

 Main Setup - KAI 	ROS < RPT UHF 1 JVCKEN	IWOOD>					23
Equipment Name	(1)	Identity Data (3)	GNSS Optional Module (5)	I/O Contacts (7)	AUTO	ON	OFF
RPT UHF 1	JVCKENWOOD	Station ID (1 ÷ 254) 64	Enable GNSS Module if present	ALARM OUT (ALR_OUT)	œ	0	С
		Network ID (1 ÷ 4095) 160	Supply Voltage to GNSS Antenna	EXT-1 IN (ALR_IN_1)	•	0	0
Geographic Data	(2)	1+1 Address (1 ÷ 254) 144	PPS Time Reference UTC USNO	EXT-2 IN (ALR_IN_2)	•	0	0
	(-)	DMR ID (1 ÷ 16776415) 2064		AUX-1 OUT (IO_OUT_1)	•	C	C
Network Name	RA-NETWORK	Group ID (1 ÷ 16776415) 100	UTC USNO:	AUX-2 OUT (PTT_OUT)	e	0	C
Zone Name	RA-ZONE		UTC time as per the United States Naval Observatory (USNO)	Fans Activation (FAN)	•	С	С
Carrier Name	RA-CARRIER	- Remete Central		ALARM Status Flag	œ	0	С
Site Name	RA-SITE						
Manual coordinates so	ource 🔽	IP Port 4000	Features (6) Run TRX Layer				
degs mins se	ecs secs/1000 N C 0 000 S C	Remote Control Via RF Link	Run Station Layer 🔽 Run RTP Layer 🔽 Run SIP Layer				
Longitude degs mins se	ecs_secs/1000 E 🙃			Dead from File			
0 0 (C Internal C From>		Write on File Read			
	JJJOOAA			Write	(Close	

(1) Equipment Name:

You can name the equipment here. The name you assigned is shown on top of the window.

(2) Geographic Data:

This field is reference only. It doesn't affect KAIROS performance. Manual coordinates source is, it will simply allow to write the position of the site for information purpose only, in case GPS is not mounted. This setting has no effect on any behavior of the system.

(3) Identify Data

- Station ID: It is the ID of the station, to be used in RF link; or generally for accessing a station while being physically connected to another one; or for identifying a station in status messages and alarms messages.
- Network ID: It is used for identifying a network when sending DMR status messages from mobiles to network; or in Tier 3 configuration.
- 1+1 Address: ID for "1+1 Hot Standby" Redundancy. Refer to "3.3.1.4.1 TRX Configuration, (3) Type" for more detail.
- > DMR ID: Unit ID as Mobile/Fixed Station also uses it for RF-Link.
- Group ID: It is the default destination ID for calls and messages generated by the station, if no other destination is specified.

(4) Remote Control

- > LAN Connection: Enter IP port number to connect from KAIROS Manager and etc.
- Remote Control via RF Link: Check if you want to access a KAIROS through RF Link must be enabled here for all KAIROS which is on RF-Link.
- > TLC Secure Access: This is the setting for secure access for the KAIROS Manager.

After this setting, you will be no more able to access the KAIROS in a standard way, but in the following mode:

- launch KAIROS Manager
- In the connection setup window, select the box "use Secure Access Feature"
- Select your user and your password to access the station

Internal: Use internal User's Database. From \rightarrow : Use another KAIROS User's Database

TLC Secure Access	
Users' Database	
Internal Erom>	

After you check this, you have to open KAIROS manager by entering User Name and Password.

(5) GNSS Optional Module

- Enable GNSS Module if present: Check if the KAIROS has built-in GPS receiver
- Supply Voltage to GNSS Antenna: Check to supply +5V 100mA for external GPS antenna through GPS antenna cable.
- PPS Time Reference: Set all KAIROS as same selection.
 - UTC USNO: UTC time as per the United States Naval Observatory (USNO), choose this normally.
 - GPS: GPS time
 - GLONASS: GLONASS time
 - UTC-SU: UTC time as per Russia. It is derived from GLONASS time and the application of the UTC delta-time parameter from GLONASS satellites
 - GP-GL: GPS time derived from GLONASS time. It is derived from the application of the GPS delta-time parameter from GLONASS satellites

(6) Features

- Run TRX Layer: Microprocessor manages TX and RX peripheral modules. It is needed to make the DSP to start. It must always be active.
- Run Station Layer: Microprocessor manages the role of the base station inside the network. It manages the correct routing of signals, depending on the base station role. It is needed to make the processor to layer the main application. It must always be as

to launch the main application. It must always be active.

- Run RTP Layer: Microprocessor manages (generates and receives) the RTP fluxes. RTP layer should be activated only if RTP interface is used.
- Run SIP Layer: Microprocessor manages the onboard SIP server and SIP fluxes. SIP and RTP layer should be activated only if SIP interface is used.

(7) I/O Contacts

KAIROS provides some I/O ports fitted into the 25 pin D-SUB connector and the 6 pins connector placed in the back. Some of these I/O are specialized (e.g.: PTT_out or ALRM_out) but can be re-defined for special applications.

I/O contacts are not isolated from ground, they are referred to ground and pre-polarized by +3.3V. Due to this configuration, for safety reason, they can be connected to very low voltage external circuits only. Here following it is descripted the standard applications of these auxiliary pins.

GNSS Optional Module
Enable GNSS Module if present
PPS Time Reference UTC USNO
UTC USNO: UTC time as per the United States Naval Observatory (USNO)

Features	
Run TRX Layer	\checkmark
Run Station Layer	
Run RTP Layer	
Run SIP Layer	

I/O Contacts	AUTO	ON (
ALARM OUT (ALR_OUT)	•	0	ି (1)
EXT-1 IN (ALR_IN_1)	•	0	ି(2)
EXT-2 IN (ALR_IN_2)	•	0	0
AUX-1 OUT (IO_OUT_1)	•	\odot	୍ର (3)
AUX-2 OUT (PTT_OUT)	•	\odot	୍ (4)
Fans Activation (FAN)	•	\odot	୍ର (5)
ALARM Status Flag	•	0	ି (6)

3. Main window 3.3. KAIROS



The I/O output pins (PWR_GOOD, M_1, M_2, PTT_OUT_conn, I/O_OUT_1, ALR_OUT, FAN, OUT_1+1_MNG_CONN) are open collector type able to switch up to 20mA/40Vdc. A 470 Ohm resistor limits the maximum current and a 47k resistor refers the output to the internal 3.3V.

The I/O input pins (REMOTE_OFF, E_1, E_2, I/O_IN_2, I/O_IN_3, ALR_IN1, ALR_IN2, PPS_IN_CONN) are internally pull-upped to the 3.3V. A pair of diodes protect the input from voltage below zero. This input switch on closing it to GND.

- (1) ALR_OUT : [OUT] it is open from GND when the equipment detects an alarm condition. Power off is an alarm condition.
- (2) ALR_IN1, ALR_IN2 : [IN] alarm input; closing them to GND produces an alarm advise to the Supervisor Centre. Each alarm can be configured via the setup tool; it is possible to define a DMR TXT message or a SNMP trap for the 0 to 1 transition and for the 1 to 0. Typical application is the open site/cabinet event.
- (3) [OUT] general purpose output; it can be used in special applications that need to set an external device/relays.
- (4) [OUT] it is closed to GND when the transmitter goes on air. It is possible to insert a pre-time to allow the right switching on time to an external RF power amplifier.
- (5) [OUT] it is closed to GND when the temperature of the internal RF power amplifier rises above the threshold (typ 65°C). It can be used to switch on cooling fans in a cabinet.
- (6) [OUT] it is open from GND when the equipment detects an alarm condition. Power off is an alarm condition.

For more detail for I/O port, please refer to Appendix 4.3

3.3.1.4. TRX Operating Modes

"TRX Operating modes" concerns how to process the signals, depending on the base station role, and which parameters are managed by the DSP.

This window allows setting the operative configuration of the base station:

TRX Configuration		Analog Selective Calls Confi	guration
Operative mode (1)	Enabling TRX (7)	Codec to be used	NULL
MASTER BASE STATION	Enabling TX Enabling Main RX	Tone length (10 ÷ 255 ms)	100
Service (2)	✓ Enabling Repeater Mode ✓ Fnabling Repeater Mode ✓ PCM 1 (Analog Line 1) Enabled ✓ PCM 0 (Analog Line 0) Enabled ✓ Line 3 (Local TRX) Enabled ✓ Line 2 (IP Line) Enabled	Enable Analog Selective Calls ser Enable Analog Selective Calls red	nding ception
	✓ Line 1 (Physical Line 1) Enabled ✓ Line 0 (Physical Line 0) Enabled	Enable repeatition code detectio	' n
Active/Hot-Spare Parameters (4)			
Active/Hot-Spare Parameters (4) Automatic Role Self-Switching Time [min] 5 30s AUTO ID (needs a codec) (5)			
Active/Hot-Spare Parameters (4) Automatic Role Self-Switching Time [min] 5 30s AUTO ID (needs a codec) (5) Automatic Forced OFF			
Active/Hot-Spare Parameters (4) Automatic Role Self-Switching Time [min] 5 30s AUTO ID (needs a codec) (5) (Automatic Forced OFF Forced ON			
Active/Hot-Spare Parameters (4) Automatic Role Self-Switching Time [min] 5 30s AUTO ID (needs a codec) (5) (Automatic Forced OFF Forced ON Use external PA (6)	Service Class (8)		(

3.3.1.4.1. TRX Configuration

(1) Operative mode

You have to assign "Operative mode" for each KAIROS.



- > BASE STATION NOT CONFIGURED: Not use normally.
- SINGLE REPEATER OR MOBILE/FIXED: Select this for Single repeater or Use KAIROS as Mobile/Fixed Station.
- MASTER BASE STATION: Select this for Master base station. Master is the only one in the network.
- > SLAVE BASE STATION: Select this to all Slave stations.
- RF LINK-DOWN NODE: Select this for RF Link-Down node. For more detail for RF-Link, please refer to Appendix 4.4
- RF LINK-UP NODE: Select this for FR Link-Up node. For more detail for RF-Link, please refer to Appendix 4.4

(2) Service

- > FULL DUPLEX: For Full Duplex operation. Select this normally.
- > HALF DUPLEX: For Half Duplex operation.
- > SIMPLEX: For Simplex mode operation.

(3) Type

- > SINGLE UNIT: Select this normally.
- 1+1 ACTIVE NODE: If the station is very important and must not be broken, you can set Spare KAIROS as redundancy. This selection is for Active node.

"1+1 Address" which configured in "Main setup" is required. Both Main/Spare's "1+1" address must be set same address which is used as 2^{nd} IP address for KAIROS.



Eg) Main KAIROS IP address is "172.33.91.12"
Spare KAIROS IP address is "172.33.91.13"
Both KAIROS's "1+1 Address" is "144"
2nd IP address for both Main and Spare become same address as "172.33.91.144".
Thus the IP address for "1+1 Station" is always seen the same IP address from others.

Identity Data	
Station ID (1 ÷ 254)	11
Network ID (1 ÷ 4095)	160
1+1 Address (1 ÷ 254)	144
DMR ID (1 ÷ 16776415)	2011
Group ID (1 ÷ 16776415)	101

1+1 HOT SPARE NODE: For redundancy, this selection for Hot-Spare node.

Note: 1+1 stations cannot be master for PTP for Synchronization.

- (4) **Automatic Role Self-Switching Time [min]**: In case the Station is set as "1+1" redundancy, Active KAIROS can roll over by defined time in [min]. It effects for KAIROS lifetime.
- (5) 30s AUTO ID (needs a codec): In Analog mode only, This box sends the station ID with the selective call that you have set into main setup window. To send the ID of the base station in the format that is specified by the "Analog selective call configuration" box, into the upper right side of the same box. The ID is an automatic string, depending on the MAC address of the KAIROS.
- (6) **Use external PA**: Check here if use external power amplifier. In case an external power amplifier is present. By entering the gain of the external amplifier, the displayed power into channel table is the product of the measured one with the gain. The "max input power" selects the maximum power that can be selected in channel table, to avoid destroying the amplifier.
 - Ex) External PA: Gain 10 dB, Max Input Power 3.0W,

Use external PA		~
Gain [dB] (0÷25.5)	10.	0
Max Input Power [W]	3.0	•

TX power selection in Channel Table becomes like following picture,

TX Power [W]	10.0	-
Continuous TX [s]	0.0 10.0 20.0	
Squeich level[dB]	30.0	-

(7) **Enabling TRX**:

- > Enabling TX: Check here to use TX.
- > Enabling Main RX: Check here to use Main RX.
- Enabling Diversity RX: Check here to use Diversity RX. If no Diversity Antenna, uncheck.
- Enabling Repeater Mode: This is for Analog only.
 Although uncheck here, KAIROS works as repeater mode in digital mode.
- PCM 1(Analog Line 1) Enabled: To send Audio by RTP on IP network check here (Need Vocoder option). This is for TSB.

Enabling TRX

- Enabling TX
- Enabling Main RX
- ✓ Enabling Diversity RX
- 🔽 Enabling Repeater Mode
- PCM 1 (Analog Line 1) Enabled
- PCM 0 (Analog Line 0) Enabled
- Line 3 (Local TRX) Enabled
- Line 2 (IP Line) Enabled
- Line 1 (Physical Line 1) Enabled
- Line 0 (Physical Line 0) Enabled
- PCM 0(Analog Line 0) Enabled: To send Audio by RTP on IP network check here (Need Vocoder option). This is for TSA.
- Line 3 (Local TRX) Enabled: If the KAIROS is used by local input/output by local PTT, check here.
- > Line 2 (IP Line) Enabled: For DMR Simulcast / Multicast, check here.
- Line 1 (Physical Line 1) Enabled: If the KAIROS has local console (Old type), check here.
- Line 0 (Physical Line 0) Enabled: If the KAIROS has local console (Old type), check here.
- (8) Service Class: Select Tier 2 or 3.

3.3.1.4.2. Analog Selective Calls Configuration

This settings are for Selective Calls for Analog 5-tone. In Digital communication, you can omit here.

Analog Selective Calls Con	figuratio	n	
Codec to be used	NULL		•
Tone length (10 ÷ 255 ms)		100	
Enable Analog Selective Calls s	ending		
Enable Analog Selective Calls r	eception		
Enable repeatition code inserti	on		$\overline{ \mathbf{v} }$
Enable repeatition code detect	ion		$\overline{\checkmark}$

3. Main window 3.3. KAIROS

3.3.1.5. Channel Table

You can see the channel setting in this table. Total number of channels is 200. (Channel 0 to 199)

Channel 0 YES YES YES NO YES	Channel 1 YES YES YES YES YES	Channel 0 YES YES YES YES YES	Empty Channel NO NO NO NO	Empty Channel NO NO NO	Empty Channel NO NO NO	Empty Channel NO NO	Empty Channel NO NO	Empty (
YES YES YES NO YES	YES YES YES YES YES	YES YES YES YES YES	NO NO NO	NO NO NO	NO NO NO	NO NO	NO NO	N
YES YES NO YES	YES YES YES YES	YES YES YES YES	NO NO NO	NO NO	NO NO	NO	NO	
YES YES NO YES	YES YES YES	YES YES YES	NO NO	NO	NO	NO		IN
YES NO YES	YES YES	YES	NO	NO		NO	NO	N
NO YES	YES	YES		NO	NO	NO	NO	N
YES	NO		NO	NO	NO	NO	NO	N
NO	NU	NO	NO	NO	NO	NO	NO	N
NU	NO	NO	NO	NO	NO	NO	NO	N
12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12
52.59500	440.00000	440.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00
42.59500	435.00000	470.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00
NO	NO	NO	NO	NO	NO	NO	NO	N
1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.
0	0	0	0	0	0	0	0	(
0	500	500	500	500	500	500	500	50
								-
								-
146.2	123.5	123.5	123.5	123.5	123.5	123.5	123.5	123
146.2	123.5	123.5	123.5	123.5	123.5	123.5	123.5	12
NO	NO	NO	NO	NO	NO	NO	NO	N
YES	NO	NO	NO	NO	NO	NO	NO	N
YES	NO	NO	NO	NO	NO	NO	NO	N
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.
500	500	500	500	500	500	500	500	50
250	250	250	250	250	250	250	250	25
0	0	0	0	0	0	0	0	-
20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20
6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6
5	1	1	1	1	1	1	1	
5	1	1	1	1	1	1	1	
5	1	1	1	1	1	1	1	
5	1	1	1	1	1	1	1	
	-	DEEALIIT	DEEALIIT	DEEALILT	DEEALIIT	DEEALIT	DEEALILT	DEE
003	1023			DLIAULI	DELIMOLT	DELADET	DELADET	0017
093	093	DEFAULT	DEFAULT	DEEALILT	DEEALILT	DEEALILT	DEEALILT	DEE
	52.59500 42.59500 NO 1.0 0 146.2 146.2 NO YES VES VES 0.0 0.0 500 2500 20.0 6.0 5 5 5 5 5	S2.59500 440.0000 42.59500 435.0000 NO NO 1.0 1.0 0 0 0 500 146.2 123.5 NO NO YES NO 0.0 0.0 YES NO 0.0 0.0 2500 2500 0 0 0.0 0.0 20.0 20.0 5 1 5 1	S2.59500 440.0000 440.00000 42.99500 435.00000 470.00000 NO NO NO 1.0 1.0 1.0 0 0 0 0 0 500 500 146.2 123.5 123.5 146.2 123.5 123.5 NO NO NO YES NO NO 0.0 0.0 0.0 0.0 0.0 NO YES NO NO 250 250 250 0 0 0 0.0 20.0 20.0 5 1 1 5 1 1	22.59500 440.00000 440.00000 0.00000 42.99500 435.00000 470.00000 0.00000 NO NO NO NO 1.0 1.0 0.0 0 0 0 0 0 0 0 500 500 500 123.5 123.5 123.5 NO NO NO NO 0.0 <t< th=""><th>Line Line Line Line Line 22.59500 440.00000 440.00000 0.00000 0.00000 42.59500 435.00000 470.00000 0.00000 0.00000 NO NO NO NO NO NO 1.0 1.0 NO NO NO 0 0 0 0 0 0 0 0 0 0 0 0 500 500 500 500 500 1 - - - - - - 146.2 123.5 123.5 123.5 123.5 123.5 123.5 NO NO NO NO NO NO NO VES NO NO NO NO NO NO 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0</th><th>Lit Lit Lit Lit 259500 440.0000 440.0000 0.00000 0.00000 0.00000 42.99500 435.0000 470.00000 0.00000 0.00000 0.00000 NO NO NO NO NO NO NO 10 1.0 1.0 0.0 0.0 0.0 0.0000 0 0 0 0 0 0 0.0 0.0 0 0 0 0 0 0 0 0 146.2 123.5 123.5 123.5 123.5 123.5 123.5 NO NO NO NO NO NO NO 146.2 123.5 123.5 123.5 123.5 123.5 123.5 NO NO NO NO NO NO NO YES NO NO NO NO NO NO 0.0 0 0 0</th><th>Line Line Line Line Line Line 22.59500 440.00000 440.00000 0.00000 0.00000 0.00000 0.00000 NO NO NO NO NO NO NO NO 10 1.0 NO NO NO NO NO NO 10 1.0 0.0 0 0.0 0.0 0.0 0.0 0 0 0 0 0 0 0 0 0 0 0 500 NO NO NO NO NO NO NO</th></t<> <th>Line Line <thlin< th=""> Line Line L</thlin<></th>	Line Line Line Line Line 22.59500 440.00000 440.00000 0.00000 0.00000 42.59500 435.00000 470.00000 0.00000 0.00000 NO NO NO NO NO NO 1.0 1.0 NO NO NO 0 0 0 0 0 0 0 0 0 0 0 0 500 500 500 500 500 1 - - - - - - 146.2 123.5 123.5 123.5 123.5 123.5 123.5 NO NO NO NO NO NO NO VES NO NO NO NO NO NO 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Lit Lit Lit Lit 259500 440.0000 440.0000 0.00000 0.00000 0.00000 42.99500 435.0000 470.00000 0.00000 0.00000 0.00000 NO NO NO NO NO NO NO 10 1.0 1.0 0.0 0.0 0.0 0.0000 0 0 0 0 0 0 0.0 0.0 0 0 0 0 0 0 0 0 146.2 123.5 123.5 123.5 123.5 123.5 123.5 NO NO NO NO NO NO NO 146.2 123.5 123.5 123.5 123.5 123.5 123.5 NO NO NO NO NO NO NO YES NO NO NO NO NO NO 0.0 0 0 0	Line Line Line Line Line Line 22.59500 440.00000 440.00000 0.00000 0.00000 0.00000 0.00000 NO NO NO NO NO NO NO NO 10 1.0 NO NO NO NO NO NO 10 1.0 0.0 0 0.0 0.0 0.0 0.0 0 0 0 0 0 0 0 0 0 0 0 500 NO NO NO NO NO NO NO	Line Line <thlin< th=""> Line Line L</thlin<>

RX DMR Colour	Code (main)	5	(1) 1	1	1	1	
TX DMR Colour (Code (main)	5	1	1	1	1	
RX DMR Colour	Code (aux)	5	1	1	1	1	
TX DMR Colour	Code (aux)	5	1	1	1	1	
Downlink P25 NAC	code [hex]	093	093	DEFAULT	DEFAULT	DEFA	
Uplink P25 NAC	code [hex]	093	093 📈	DEFAULT	DEFAULT	DEFA	
Image: Construct of the second sec							

- > To change Channel, click on the target channel (1), then press button (2).
- > To set the channel as Default channel (Start-up channel), press button (3).
- > To modify the channel, press button (4) or double click on the target channel.

	Channel Name Channel Spacing[KHz] TX Frequency [MHz]	Channel 0 12.5	Main TX Subtone TCS Freq. [Hz] DCS Code [oct] 146.2	Main RX Subtone TCS Freq. [Hz] DCS Code [oct] 146.2
	RX Frequency [MHz] TX Power [W]	442.595000 1.0	Uplink Emerg. Subtone TCS Hold on RX	e [Hz] 0.0
(1) (2) (3)	Max Continuous TX [s] TX Cutoff Delay [ms] RX Squelch level[dB]	0 0 20.0	Subtone Deviation	(Hz] 250 (Hz] 0
 (4) R (5) (6) (7) (8) (9) (10) (11) (12) (13) 	X Squelch Hysteresis [dB] Channel Present Channel Enabled Simplex Shift ANALOG Mode ETSI DMR Mode MotoTRBO (TM) DMR Mode P25 Digital Mode POCSAG Mode Squelch Tail Cutoff on TX Squelch Tail Cutoff on RX Multitone TCS		P25 TX NAC -(14) O Default Any O Open •> 093 (15) Main DMR Color (16) Aux DMR Color	P25 RX NAC Default Any Open •> 093 RX TX Code 5 5 5 5 Code 5 5 5 5

- (1) Max Continuous TX [s]: Time out timer for Analog only. (0(off) to 600)
- (2) TX Cutoff Delay [ms]: TX Hang time for Analog only. (0 to 5000)
- (3) RX Squelch level [dB]: Threshold level for both Analog in SINAD and it affects Digital as well. (0 to 25.5)
- (4) RX Squelch Hysteresis [dB]: Squelch Hysteresis in dB for Analog only. (0 to 25.5)
- (5) Simplex Shift: To avoid desensitization of the RX by TX VCO frequency, it consists in moving the frequency of the TX VCO, out of the current channel during reception.
- (6) ANALOG Mode: Analog FM mode.
- (7) ETSI DMR Mode: Check here for KENWOOD DMR
- (8) MotoTRBO[™] DMR Mode: N/A
- (9) P25 Digital Mode: For P25 Phase 1
- (10) POCSAG Mode: POCSAG for paging feature.
- (11) Squelch Tail Cutoff on TX: "Squelch tail cutoff on TX" is normally never used, unless you are dealing with RF-linked networks. It consists in deleting the last 30ms of audio signal before deactivating the TX.
- (12) Squelch Tail Cutoff on RX: It cuts the last approx. 30 ms of voice before the squelch close, in order to cut the noise at the end of a call in RX.
- (13) Multitone TCS: Check for multiple TCS for RX, Enter other Subtones in "Subtone Control Additional Subtones".
- (14) This is NAC setting for P25 Phase 2.
- (15) DMR Color Code for TX and RX
- (16) DMR Color Code as 2nd color code. A KAIROS can receive two different color codes.

3.3.1.6. Calibration Parameters

To obtain better results from self-test process, it is recommended to set the calibration frequency as near as possible to the transmitter frequency; if there is a range of allowed frequencies for transmission, it is recommended to set the center of this range as the calibration frequency.

Frequency [MHz]	435.8	Read
Channel Bandwidth [kHz]	12,5 💌	Write
Subtone Frequency [Hz]	123.5	Close

3.3.1.7. Primary Synchronization

KAIROS has various kind of Synchronization, such as GPS, PTP, PPS and so on. This window is settings for Synchronization.



3.3.1.7.1. Synchronization mode

This is used for setting the source of synchronization of the current KAIROS.

(1) Choices: There are 4 level priorities for synchronization choice.

KAIROS use 1st Choice for its synchronization. If 1st choice is not available, it will shift to 2nd choice. If 2nd is not available, will shift to 3rd. It will try until 4th choice.

Followings are synchronization choices; (Choices which are often use written in **Bold** letters)

- Internal Reference (timing only): This is used for accessing a base station like a mobile, without the need to align the status machines to network delays. Not use this normally.
- Internal Reference (full): This is used for accessing a base station like a mobile, with the need to align the status machines to network delays. In case, Network Synchronization is not using GPS for all slaves, the Master of Synchronization can use this choice.
- Internal PPS (GPS/GLONASS): PPS stands for Pulse Per Second. This is used for the synch source of PPS is generated by internal GPS receiver in the KAIROS.
- External PPS (uncolored): This is used for if the synch source of PPS is not generated by a Kairos, that is without a PWM modulation for aligning the status matches.
- External PPS (full): This is used for if the synch source of PPS is generated by a KAIROS, which is modulated aligning the status match by PWM modulation.
- Internal PTP: Precision Time Protocol over IP. If this protocol is supported by the IP network, KAIROS can synchronize through TCP/IP network without GPS. 1+1 stations cannot be master for PTP.
- Superaudio tone: This is an old style synch source, via 4Wire, through a pattern made by tones on super-audio band (3-3.4KHz). Not use this nowadays.
- RF Link (ANALOG): In case of GPS failure, the link transceiver is able to recover a time and frequency reference from the Analog signaling coming from the Master station.
- **RF Link (DIGITAL)**: In case of GPS failure, the link transceiver is able to recover a time and frequency reference from the DMR signaling coming from the Master station. This reference isn't as precise as the GPS one but it is enough accurate to assure simulcast operation with small degradations in the overlap area. Note: If you use RF link as Synchronization, KAIROS network synchronize only while DMR transmitting by any call. If nothing calls, RF-Linked stations transmit DMR

synchronization packets every 90 sec.

- External Radio Network: It was used in the past to extend existing networks by competitors, with Radio Activity's systems, but it is unused nowadays.
- (2) Superaudio Synchronization, Lock Frequency [Hz]: Old Synchronization method in Analog FM. Nowadays it is not used.
- (3) RF Synchronization, Frequency Offset [Hz]: Old Synchronization method in Analog FM. Nowadays it is not used.

(4) Do frequency self-correction: As long as KAIROS is connected GPS or PTP as synchronization, its TX/RX frequency is always corrected by them. But if a single KAIROS repeater on mountain which is isolated from IP network, also no GPS used. In this case, KAIROS frequency only can rely on VCTCXO for its reference.

If technicians need to align TX frequency, there are two choices by "Do frequency self-correction".

[Method 1]

Select RF link (analog) as first choice of synchronization mode; push "write" button.

- Apply to the main RX input an RF signal by the RF signal generator, with a field strength of -70dBm, at the RX nominal frequency.

- In case the squelch is not opening, move

the generated frequency until the squelch opens.

- Push the button "Do frequency self-correction"

- Move the generated frequency towards the nominal frequency, at steps of 1kHz typically.

- Push the button "Do frequency self-correction" at every step, until you will be able to maintain the squelch open with generating the nominal frequency.

- Push the button "Do frequency self-correction" to complete the self-tuning!

[Method 2]

In case the Kairos is equipped with GPS board, the method is simpler:

- Launch KAIROS Manager and open the menu: Kairos – Configuration - Primary Synchronization

- Select Internal PPS (GPS/GLONASS) as first

choice of synchronization mode; push "write" button.

- Wait for the Kairos to be synchronized by GPS.

- Push the button "Do frequency self-correction" to complete the self-tuning!

Synchroniz	ation mode	
1st Choice	Internal PPS (GPS/GLONASS)	·
2nd Choice	Internal Ref (full)	·
3rd Choice	Internal Ref (full)	·
4th Choice	Internal Ref (full)	·

1st Choice	RF Link (ANALOG)
2nd Choice	Internal Ref (full)
3rd Choice	Internal Ref (full)
4th Choice	Internal Ref (full)

Synchronization mode

3.3.1.7.2. Internal PTP Handling

For synchronizing KAIROS through PTP, equipment must be connected via TCP/IP backbone. The PTP standard we are using is IEEE-1588-2008, end-to-end/one-step type. It requires an IP connection that is transparent to multicast (because PTP works with multicast packets) and with a quite stable latency in order to evaluate the delay with the minimum error as possible. Typically this requirement is satisfied if the available bandwidth is very greater than the used one (>10 times) and if it is dedicated to radio connection, that is, if there are no other services which may suddenly change the latency.





(1) **Role**: it is the role of KAIROS from the point of view of the PTP

Master: It is the only one PTP Master in the KAIROS IP Network.

Note: 1+1 Hot Standby Station cannot be assigned PTP Master.

Slave: Others are all slave.

Backup master: It is working as Slave normally. In case of Mater is broken, it will promote to be a Master.

(2) **PTP IP Parameters**:

Master IP Address: IP Address for PTP

Master. All PTP Slaves including Backup Master must be set PTP Master IP Address here. Backup Mst IP Address: IP Address for Backup Mater. All PTP Slaves must be set this in case PTP Master broken.

- (3) **Domain** (0 to 255): like for TCP/IP systems, it represents a sub-set of PTP devices; al the devices of the same system must have the same domain.
- (4) **Max Slaves Groups**: The number of messages generated by the master, each time it starts a delay detection process. Each message is targeted to a group of slaves, which will immediately answer to the master, as soon as they receive such a message. The less the number of slaves per group (ideally just one), the better the estimation of the delay
- (5) **Slave Group Membership**: the number of the group, which the slave belong to. Enter different membership number for Slaves here. If PTP Synchronization network has 10 PTP Slaves, each Slave have different member ship number from 1 to 10 in this box. For the

Internal PTP Handling	J
Role (1)	(3) Domain (0 ÷ 255) 0
C OFF	(4) Max Slaves Groups
 Master 	(5) Slave Group Membership
C Slave	(6) Master Offset
O Slave	(7) Peer-to-Peer Operations
O Backup Master	(8) UNICAST mode for PTP Messages
PTP IP Parameters —	2)
Master IP Address	Backup Mst IP Address
172.33.91.10	172.33.91.11

PTP Master, enter 0 in it.

- (6) **Master Offset**: practically unused, it is aimed to add a fixed time offset to the instant when messages are sent.
- (7) **Peer-to-Peer Operations**: it may be checked if the Ethernet switches are set in transparent clock, 1 step mode.
- (8) **UNICAST mode for PTP Messages**: It is still unused; it is intended for a future proprietary method for using PTP over networks which do not allow multicast packets.

3.3.1.7.3. PPS Signal Handling



- (1) Internal from GPS/GLONASS: Normally, choose "Automatic" and "Straight".
- (2) Internal from PTP device: Normally, choose "Automatic" and "Straight".
- (3) **External from rear plug**: Normally, choose "Automatic" and "Straight".
- (4) **PPS to PTP Event**: This is setting which PPS source will be used to make PTP event. Normally, Internal Ref is fine.



PPS to rear plug

Internal Ref

Internal PPS

(5) PPS to rear plug: This is setting to choose PPS source to rear plug Pin: (Pin2) for PPS.
 External PPS output from a KAIROS can support up to 10 units of other KAIROS to supply their External PPS Synchronization.

Pin2 -PPS Assembly Exp.



Option cable: KA-1+1

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3.3.1.7.4. RF Sync Source

RF Link station should use GPS for Synchronization. But in case of its GPS has some problem, DMR RF Sync support Synchronization for as temporary. This selection is to choose slot for it. RF Sync Source -

- OFF
- O Sync Packets on TS A
- O Sync Packets on TS B

3.3.1.8. **TX Control**

This window allows configuring transmitter parameters for Analog FM only, especially RF-Link on Analog FM. For other DMR typical parameters please refer to "Configuration - Base Station layer configuration" menu.

HP filter	Delay Dis ms.µs Null Ena km	Modulation FM	PM > 🖉
Parameters of transmission	TX Measures Current Deviation [Hz] 0 Limiter (dB) 0.0	Access READ WRITE	
✓ Hold Time [ms]		Reading Read	Save to EEP
Enable Tx end tone	TX Module Status	Repeat	Set

TX Control configuration in RF-Link

Operating Mode	HP filter	Notch	Squelch Tail cut off on TX in Channel Table	
			Channel Enabled Simplex Shift ANALOG Mode TSI DMR Mode PSI Digital Mode POCSAG Mode Squelch Tail Cutoff on TX Multitone TCS	
Master/Slave	Uncheck	Uncheck	Check	
Link-up	Uncheck	Uncheck	Uncheck	
Link-down	Uncheck	Uncheck	Uncheck	

3.3.1.9. **RX Control**

This window allows configuring receiver parameters for Analog FM only. For others DMR typical parameters please refer to "Configuration - Base Station layer configuration" menu.

	tion		Status and Measures		
	Signal Processing	Cauelch	RX Enabling Status	MAIN	DIV
\sim	Signal Processing	Squeiu	TS A RSSI [dBm]	-114.9	-140.5
⊴->	Reception Treshold [dBm] -140.0	- Speed Medium -	TS B RSSI [dBm]	-115.0	-140.5
	Reception Timeout [ms]		Peak deviation [Hz]	44	13
VHF		Treshold [dB SINADp] 20.0	Estimated SINADp [dB]	4.	6
LIHE	Demodulation	Hysteresis [dB SINADp] 6.0	Offset of received carrier [Hz]	-5	7
0.1	Channel Spacing [kHz]	Enree Linlock	Squelch released		~
			Hi-Perfactive		_
	LP filter	Delay line			

RX Control configuration in RF-Link

Operating Mode	300Hz HP filter TCS Notch	Expander	Squelch Tail cut off on RX in Channel Table	
			Channel Enabled Simplex Shift ANALOG Mode ETSI DMR Mode MotoTRBO (TM) DMR Mode P25 Digital Mode POCSAG Mode Squelch Tail Cutoff on TX Squelch Tail Cutoff on RX Multitone TCS	
Master/Slave	Check	Check	Check	
Link-up	Uncheck	Uncheck	Check	
Link-down	Check	Uncheck	Check	

3.3.1.10. Audio Lines Settings

This window allows configuring the physical analog line interface of the base station. Line 1 and 2 correspond to the physical 4W lines on the I/O connector; line RX/IP is a virtual line over TCP/IP connection; Vocoders are virtual internal line to DSP.

For each input and output line it is possible:

- to set nominal signal level
- > to enable HP and/or LP filters with programmable cut-off frequency
- > to insert a time delay
- > to enable and define nominal level and frequency of eventual control tones

Audio Lines Settings - KAIROS	<rpt 1="" jvckenwoodïز<sup="" uhf="">4/2ïز^{4/}2></rpt>	•	
Line 1		Line 2	Line RX/IP
	Priority 7	Priority 7	Priority 5
Simplex Echo canceller		Simplex	₩ µ-Law
Line In	- Input Lines	Echo canceller	_l ine In
		Line In	
Nominal Level [dBm] -10.0	Nom. vais P[] Sync	Nominal Level [dBm]	Hi-Pass filter [Hz]
300 Hz Hi-Pass filter	Freq. [Hz]		Enable AGC
Force E In	Level [dBm] -20,0 -20,0	300 Hz Hi-Pass filter	De-emphasis
IV Enable AGC		Force E In	
	Output Lines	De-emphasis	Line Out
Line Delay			
	Nom. vais SQSync	_Line Out	Eorce M Out
	Freq. [Hz]		
	Level [dBm] -20,0 -20,0	Nominal Level [dBm] -10.0	Pre-emphasis
Line Out		Hi-Pass filter 300Hz	
		Force M Out	
Nominal Level [dBm] -10.0		Enable AGC	Magadasa
Hi-Pass filter 300Hz		Jo Pre-emphasis	Vocoders
Force M Out	Phone Interface		Priority 7
I Enable AGC	Line to User		Vocader 1
, re-emphasis	Line to PSTN		
Line Delay	Busy tone decoder	Reading	l μ-Law
Disabled O Null	Ring gen Freq. [Hz] 25	Read	Vocoder 2
C Delay (ms.µs)	Rings before answer		
		Reading Close	J ⊻ μ-Law
		Close	

3.3.1.11. Subtone/Supertone

Subtone means Sub-Audio on Analog FM such as TCS (QT) and DCS (DQT).

Main Settings	Subtone Parameters	
Unlock TCS (1)	Main TX Subtone (5)	Main RX Subtone (6)
Enable FFSK as RX key (2)	 TCS Mode (freq. [Hz]) DCS Mode (code [oct]) 123.0 	TCS Mode (freq. [Hz]) DCS Mode (code [oct])
TCS Reversed Phase (3)		
Enable RX Detection	Thresholds (7)	Additional RX Subtones (9)
✓ Enable TX sending	Fast Acceptance [Hz] 0.0	Frequency [Hz] 88.5
SuperAudia (A)	Var. liv. Hi-Energy (+) [dB] 25.5	Frequency [Hz]
	Var. liv. Lo-Energy (-) [dB] 16.6	Frequency [Hz]
Enable SuperAudio as RX key		Erequency [Hz]
Send SuperAudio bursts Bursts to send		Frequency [Hz]
		Frequency [Hz]
	TCS hold time [ms] 500	Frequency [Hz]
Clear Apply now	Slow Acceptance waiting [ms] 50	Frequency [Hz]
Status (10) TCS Unlocked Multiple Show the measures in any case	Subtones Mode	
Received Subtone Frequency [Hz]	N/A	
Received Subtone Peak Deviation [Hz] Received Subtone Nominal Deviation [H		
Received Subtone Norminal Deviation [11	A N/N	

Unlock TCS: To by-pass the TCS/DPL controls check here.
 If check here, KAIROS repeats by all RX signal without Decoding TCS.

- (2) Enable FFSK as RX key: "Enable FFSK as RX key" is a FFSK modulated code sequence that is used to unlock the squelch. When a signal is received by the RX, the squelch immediately opens, waiting to decode the correct FFSK code sequence. If the expected string is not received, the squelch closes.
- (3) Enable RX Detection: This is selection whether TCS decodes revere burst tone to close Squelch without tail-noise or not. Normally check here.
- (4) SuperAudio: No use.
- (5) Main TX Subtone: Select TCS or DCS and enter its value for TX. You don't need to change this setting because this is set by channel setting.
- (6) Main RX Subtone: Select TCS or DCS and enter its value for RX. You don't need to change this setting because this is set by channel table setting.
- (7) Thresholds: This is setting for characteristic for TCS. Don't change here.
- (8) Other TCS setting: Don't change here.
- (9) Additional RX Subtones: If the KAIROS has Multi CTCSS license to decode Multi TCS,
you may enter other tones here.

(10) Status: This is Status monitor for TCS.

Status		
TCS Unlocked Multiple Subto	ones Mode	
Show the measures in any case		
Received Subtone Frequency [Hz] 123.3		
Received Subtone Peak Deviation [Hz] 345.1		
Received Subtone Nominal Deviation [Hz] 250.0		
Received Superaudio Frequency [Hz] 0.0		
Received Superaudio Peak Deviation [Hz]	250.0	
	,	



Base Station Layer Configuration - KAIROS Configuration	<pre>> <master-broadcast></master-broadcast></pre>
Enable Repeater Mode (1) Direct Mode Reception (2) Send RC on Same Timeslot (3) Display IDLE Packets (4) Manual AT bit handling (5) Enable ETSI Tier III features (6)	Hang Times [30 ms ticks] (0 ÷ 32767) (9)Private Calls150Group Calls150Data Response16Channel16
TX: act as (7) RX: act as Base Station • Base Station • Mobile Station • Mobile Station •	Timeslots Validity [30 ms ticks] (10) Automatic 32 : Network Delay [30 ms ticks] (11)
MAIN Color Codes AUX Color Codes RX 1 . TX 1 . TX 1 .	Automatic 6 RX Pkts Advance [30 ms ticks] 0 Distance for timing adv [Km] 0

- (1) Enable Repeater Mode: Check here if the KAIROS needs to be Local Repeater when isolated from network.
- (2) Direct Mode Reception: Usually uncheck here. If check it, the KAIROS receives in direct mode (Not repeater mode) which is different from Mobile station mode in repeater.
- (3) Send RC on Same Timeslot: Check if the KAIROS has to support "Enhanced Encryption" feature for mobile unit.
- (4) Display IDLE Packets: Uncheck normally. To remote control the stations via RF, enable it on Ts A or Ts B on all the repeaters used as links, including Master if necessary; enable the flag «display IDLE packets» on slave links.
- (5) Manual AT bit handling: Uncheck. This is for factory usage only.
- (6) Enable ETSI Tier III features: Uncheck while Tier 2 operation.
- (7) TX: act as... / RX: act as...: Select Base Station normally. For RF up link and down link, must transmit as Base Station and Receive as Mobile Station.
- (8) MAIN (AUX) Color Codes: Color code setting for Main and AUX. You don't need to

change this setting because this is set by channel table setting.

- (9) Hang Times: Setting for Hang Times for each call.
 - > Private Calls: Hang time after Individual Call.
 - > Group Calls: Hang time after Group Call.
 - > Data Response: Hang time after Data TX.
 - > Channel: Additional Hang time follows by Private/ Group/ Data.

This can be Beacon transmission length as well.

Ex) Hang time for Individual call: 150+16=166. ($166 \times 30ms = 4980ms$)

In RF-down-link, Channel Hang Time is used for synchronization. In up-link it is set to 16, its minimum value. In down-link, there is not a minimum value, but normally it is worth to keep that value greater than 30, Recommendation is 100 (about 3 second). For more detail for RF-Link, please refer to Appendix 4.4

- (10) Timeslots Validity: "Timeslot validity" makes sense in a radio network: it has no meaning in case of a single repeater. "Timeslot validity" is the duration of the interval of time from current instant backward, which the time-stamps of received packets must belong to, in order to be taken into account for elaboration (transmission or voting). It is normally never used, but in case of critical linking backbones, where it is preferable to reduce the duration of the acceptance time window of some stations. It is not referred to mobiles, but to repeaters. It can be seen as the maximum lifetime of a packet, reaching a repeater of a network. If the radio network is well-designed, that parameter can be left to its maximum value, which does not affect any of the network.
- (11) Network Delay: Delay compensation, to compensate for different path delays in simulcast network. For 2 Level network, enter 6 here. If the network is complex, ask JVCKENWOOD Tech support.
- (12) RX Pkts Advance: Set some value in only RF-Link station.
- (13) Distance for timing adv [km]: Normally No use here for IP linked station. For the RF-linked remote site, on up-link to master only. In order to compensate for the flying delay in case of GPS failure on the up-link. The same setting on broadcast base is used for reducing the network delay correspondingly.

3.3.1.13. Base Station Basic Data

This setting is for a KAIROS act as Motorola repeater. You don't need to change port setting from default basically.

Base Station Basic Data - KAIROS <rpt 1="" 2="" jvckenwood�i="" uhf=""></rpt>					23
Data Services					
CAI Address (1 ÷ 125)	12				
Group CAI Address (225 ÷ 239)	225				
DMR ID GPS (0 ÷ 16776415)	0				
GPS IP Port (1025 ÷ 65000)	4001				
DMR ID RAW (0 ÷ 16776415)	0				
RAW IP Port (1025 ÷ 65000)	4004				
DMR ID ARS (0 ÷ 16776415)	0				
ARS IP Port (1025 ÷ 65000)	4005				
DMR ID TMS (0 ÷ 16776415)	0				
TMS IP Port (1025 ÷ 65000)	4007				
DMR ID TLM (0 ÷ 16776415)	0				
TLM IP Port (1025 ÷ 65000)	4008				
USER 1 IP Port (1025 ÷ 65000)	0				
USER 2 IP Port (1025 ÷ 65000)	0	Read from File			
USER 2 IP Port (1025 ÷ 65000)	0	Write on File			
Preamble Packets	4 -	Read Write	Cl	ose	

3.3.1.14. Base Station Operating Modes

This window allows configuring the role of the base station both in a network and in a standalone condition. It concerns the logical function of the base station, considered as a block of the radio system, and its parameters are managed by the microprocessor.

lase Station Parameters	IP Parameters	- Tier III Parameters		-Master-to-Master Parameters
Base Station Role	IP Address	Static Configuration	Run-Time Data	Static Routes
BROADCASTER	Present 172.33.21.29			IP Address TSA TSB ANA
Stand-Alone	Backup Master			
Audo Getexay	Present IP Address			
Noto RCO(10) Te-interrupt hendling	This B5			
Network Parameters	F Become Master on broken connection	- Tier III Network		
/otno Delav [ts]	- Yoke/Data reception from Master			
AN Compression Rate	Militast	Net (0 + 511) 0	0	
	Broadcast	Site (0 + 7) 0	0	
DMR Beacon	Unicast (?	Par PAR A+B	PAR A+8	Buffering
Beacon interval [mm:ss] 1:0		TS A Role PAYLOAD CH	PAYLOAD CH	Reception latency [ms]
Polite	Physical Console Parameters	TS B Role PAYLOAD CH	PAYLOAD CH	
Impolite C	Full Duplex Console			
	- Line 1 Console	Idle lime [s]		
DMR Beacoo	All-Call (* Emergency C	Accept not registered terminals	N N	
Bearry Interval firm-ss1	Operating Mode Group C	C-syscode [hex] 0003	0003	
	MALNUY ANALOG Private C	Net-Site [hex] 0000	0000	
Beacon Policy Imposite C	16777215 Dest DMR ID	Alow Tier II traffic 🥅 TS A 🛛 TS B 🦷	TSA TSB	
	Line 2 Console All-Call (*	ETCI Versions Compliance	1	
TA GEO-CONS	Operating Mode Emergency C	Erst versions compliance		Read from File
Analog 🕅	MAINLY DMR Private C	ETSL Version <= 1.5.1 (* ETSL Version == 1.6.1		Write on File
Digital 🖂	Dest OND ID	ETSI Version >= 1.7.1	C	Read

3.3.1.14.1. Base Station Parameters

- (1) Base Station Role
- MASTER: For Master station which choose best signal from Voted signals from slave (Including Master itself).
- SUBMASTER: It's same as Slave normally, in case of Master broken, Sub-Master will promote to be a Master.
- BROADCASTER: Usually for Slave. A KAIROS needs to cover Mobile stations as a repeater selects this.
- ➢ HALF-TK AUX MASTER: N/A
- LINK DOWN TO NET: For a KAIROS for RF-Link which is near to Master Side select this. For more detail for RF-Link, please refer to Appendix 4.4
- LINK UP TO MASTER: For a KAIROS for RF-Link which is Slave Broadcaster select this. For more detail for RF-Link, please refer to Appendix 4.4
- > SUBM LINK DOWN TO NET: This is as same as LINK DOWN TO NET, but for Sub-Master.
- > SUBM LINK UP TO MASTER: This is as same as LINK UP TO MASTER, but for Sub-Master.
- > MOBILE/FIXED: KAIROS will be Mobile/ Fixed Station. It doesn't support repeat function.

Base Station Parameters	
Base Station Role (1)	
MASTER]
Stand-Alone (2)	7
Audia Cataway (2)	_
Audio Gateway (5)	
MotoTRBO(TM) TX-interrupt handling (4)	
MotoTRBO(TM) TX-interrupt handling (4)	
Network Parameters	
Network Parameters Voting Delay [ts] (5) 3	

- (2) Stand-Alone: Uncheck normally. If check it, the KAIROS will be isolated from other KAIROS.
- (3) Audio Gateway: We recommend using a KAIROS Gateway as an Audio Gateway, but in case you would like to assign a KAIROS as an Audio Gate way, check here. Need Vocoder option.
- (4) MotoTRBO[™] TX-interrupt handling: N/A
- (5) Voting Delay [ts]: Delay compensation, to compensate for voting delays in simulcast network. For 2 Level network, enter 3 here. If the network is complex, ask JVCKENWOOD Tech support.
- (6) LAN Compression Rate: Parameter is 0 or 1 at this moment. 0: No compress packets on IP 1: Compress packets on IP
- (7) Beacon interval [mm:ss]: You can set here for Master Base station only. Enter Beacon interval timing here in 30 second step. This setting for Master Station only. Slave stations follow the timing of Master station.

DMR Beacon			
Beacon interval [mr	m:ss] (7)	1:0	÷
Beacon Policy	(8)	Polite Impolite	•

Beacon transmission duration is defined by Channel Hang time in Base Station Layer Configuration

[Note] Beacon interval timer will be renewed by last transmission such as repeating TX.

(8) **Beacon Policy:**

> Polite: The beacon never disturbs conversation. Impolite: The beacon disturbs conversation.



(9) TX end-tone: KAIROS will add 0.5 sec TX end-tone before stop transmission. It can be applied for Master station and Single repeater.



3.3.1.14.2. IP Parameters

- (10) Master IP address: You must set Master IP address for all slaves. (including Sub-master)
- (11) In case you assign a Slave as a Backup Master, enter this setting. (It is recommended for network redundancy)
- (12) Voice/ Data reception from Master: Choose one to be same as IP network.

IP Parameters	
	IP Address
✓ Present	172.33.91.10
Backup Master (11)	
✓ Present	IP Address
This BS	172.33.91.11
✓ Become Master on brok	en connection
Voice/Data reception from	Master <mark>(12)</mark>
Multicast	ē
Broadcast	0
Unicast	C

3.3.1.14.3. Physical Console Parameters

- (13) Full-Duplex Console: It allows Full Duplex conversation by physical console from rear 25pin port.
- (14) Line 1 Console: The setting for Physical console from rear 25pin port line 1.
- (15) Line 2 Console: The setting for Physical console from rear 25pin port line 2

Physical Console Paramet	ers	
Full-Duplex Console	(13)	
Line 1 Console (14)	All-Call	ē
Operating Mode MAINLY ANALOG	Emergency Group Private	000
16777215	Dest DMR ID	
Line 2 Console (15)	All-Call	œ
Operating Mode MAINLY DMR	Emergency Group Private	000
16777215	Dest DMR ID	

3.3.1.14.4. Tier III Controller

If your network is for Tier II, you don't need to change anything here. We will update here Tier 3 in Feb 2019.

3.3.1.14.5. Tier III Network

If your network is for Tier II, you don't need to change anything here. We will update here in Feb 2019.

atic Configurat	ion		- Run-Time Data
ier III Controller	(16)		
P Address			
er III Network –	(17)		
lodel	TINY	÷	TINY
et (0 ÷ 511)	0		0
ite (0 ÷ 7)	0		0
ar	PAR A+B		PAR A+B
S A Role	PAYLOAD	н Н	PAYLOAD CH
S B Role	PAYLOAD	н	PAYLOAD CH
dle Time [s]	3		3
ccept not registe	red terminals	~	$\overline{}$
-syscode [hex]	0003		0003
et-Site [hex]	0000		0000
llow Tier II traffic	TS A	TS B 🕅	🗖 TSA TSB 🥅
TSI Versions Com	pliance <mark>(18</mark>))	
TSI Version <= 1	.5.1	œ	c
TSI Version == 1	.6.1	0	0
TSI Version >= 1	.7.1	0	C

3. Main window 3.3. KAIROS

3.3.1.14.6. Master-to-Master Parameters



The Tier II/III, even in Analog, Controller can now instruct a Master Base Station to set up one or more dynamic Master-to-Master (M2M) route to exchange data with another Master Base Station. This is required for a Multisite Network.

Note: Master-to-Master functions is totally ASYNCHRONOUS, thus it cannot be used for any simulcast purpose.

(19) Static Routs: Set target Master IP address and check DMR slot/ Analog which you want to transfer Voice/Data to other Master.

(20) Buffering: Choose Reception latency in 60 [ms]

Maste	er-to-Master Par	ameters
Stati	c Routes (19)	
	IP Address	TSA TSB ANA
	172.33.60.10	
	172.33.60.11	
	172.33.60.12	
Buffe	ering <mark>(20)</mark>	
Rece	ption latency [ms]	60 -

3.3.1.15. **RTP Configuration**

This window is for configuration of RTP which connect KAIROS Tier 2 and Tier 3 networks to dispatching applications using Real Time Protocol to exchange voice and data along with the current status of the radio channels using RTP extension header.

[Note] Optional Vocoder Unit is required for RTP.



- (1) Console IP Address: Enter Console IP Address.Use OLD Equipment-ID Format: Uncheck.Use incremental timestamp on Header: Uncheck.
- (2) TS A Channel Parameters: For Timeslot ATS B Channel Parameters: For Timeslot BANALOG Channel Parameters: For Analog FM.

3.3.1.15.1. TS A(B) / ANALOG Channel Parameters

- (3) Channel Enabled: Check here if you need RTP.
- (4) Send Data: To send RTP data to console, check here.
- (5) Send RTP Extension: Normally Uncheck. In order to send Extension header data, check here.
- (6) Send Local Echo: Normally Uncheck. In order to send Local Echo check here.
- (7) Raw Data Exchange: Uncheck. N/A
- (8) Symmetric RTP: If check here, TX port number will be same as RX port number.
- (9) Voice Codec: Choose one from ANA, a-Law, u-Law to be same as console codec. Select u-Law normally.
- (10) Voice IP Ports: Set IP ports for Voice to be same as Console IP ports.
- (11) Data IP Ports: Set IP ports for Data to be same as Console IP ports.

TS A Channel Para	meters
Channel Enabled	(3) 🔽
Send Data Send RTP Extension Send Local Echo Raw Data Exchange Symmetric RTP Voice Codec (9)	(4) ▼ (5) ▼ (6) ▼ (7) □ (8) □
Voice IP Ports	(10)
From Console (RX)	40000
To Console (TX)	40100
Data IP Ports	(11)
From Console (RX)	40200
To Console (TX)	40200
	1 40300

3.3.1.16. **SIP Configuration**

KAIROS supports SIP Server (Asterisk) which can make communication between Mobile unit and SIP Phone.



If the target KAIROS for SIP is not activated SIP License, you need to activate SIP license by Web Server (Browser), and upload SIP library file to KAIROS by KAIROS Manager. Confirm the KAIROS is installed SIP server Library from Software – Versions.



Also confirm "Run RTP/SIP Layer" from Configuration – Main Setup.

Features	
Run TRX Layer	
Run Station Layer	
Run RTP Layer	
Run SIP Layer	

It is possible to enable a KIROS as a SIP client account for each radio channel. (At the moment only DMR TSA, TSB and Analog are supported)

Account Davamator			-Demote Server
Account Parameter	,	Account Enabled	Relifice Server
Account Name	KAIROS TS1	Channel used for Vaice C. Data C.	IP Address
SIP User ID	101		IP Port 5060
SIP Authentication ID	101	Perform SIP REGISTER Procedure	
SIP Password		Perform SIP UNREGISTER before Restart 🥅	-Local Server
		Send RTP Header Extension	IP Address
Account Registration Tir	meout (60 - 7200) [s] 3600	Send Text and Positioning as SIP IM	
Maximum Conversation	Time (120 - 600) [s]	Don't delete Main Numeric Prefix on Dial	Trunk Mode No Trunk
Hang Sequence Time W	indow (2 - 10) [s] 5	Dep't delete Alt Numeric Brefy on Diel	, No Huik
Reply Timeout on Outg	oing DMR Call (20 - 120) [s]	Besister Terricel IDe as SID Numbers	
SIP Calls from AIR — Dial Method —		AIR Calls from SIP	
Call alert to STP Numb	er (*		
Call alert to Sup Numeric P	Prefix + SIP Number O		
Text Message with Al	phanumeric Prefix + SIP Number C		
DTMF Sending Method	1		
In-Band	•	- STD Server	
Into a SIP INFO Mess	age C	Str Server	
As RTP EVENT	C	Server IP Address 192.168.0.45	
Main Numeric Prefix on I	DMR Call Alerts 99	Server IP Port 5060	Read from File
		20001	Mathine and Eile

3.3.1.16.1. Account Parameters

Account Parameters						
Account Name	KAIROS TS1	(1)			Account Enabled	⊽(9)
SIP User ID	101	(2)			Channel used for Voice (• Data	C(10)
SIP Authentication ID	101	(3)			Perform SIP REGISTER Procedure	⊡(11)
SIP Password		(4)			Perform SIP UNREGISTER before Restart	୮(12)
					Send RTP Header Extension	Г(13)
Account Registration Time	eout (60 - 7200)	[s]	(5)	3600	Send Text and Positioning as SIP IM	⊏(14)
Maximum Conversation T	Time (120 - 600)	[s]	(6) ☑	180	Don't delete Main Numeric Prefix on Dial	(15)
Hang Sequence Time Win	dow (2 - 10) [s]		(7)	5	Don't delete Alt Numeric Prefix on Dial	Г(16)
Reply Timeout on Outgoi	ng DMR Call (20	- 120) [s] <mark>(8)</mark> ▼	20	Register Terminal IDs as SIP Numbers	□ (17)

- (1) Account Name: Enter any name.
- (2) SIP User ID: Extension number which is same as SIP server (Asterisk).
- (3) SIP Authentication ID: Enter same number as SIP User ID.
- (4) SIP Password: N/A (Do not enter)
- (5) Account Registration Timeout: Timeout time for registration to SIP server.
- (6) Maximum Conversation Time: If uncheck here, no limitation. (Managed by repeater TOT)
- (7) Hang Sequence Time Window: Time window for detecting the 3 PTTs On/Off sequence to hang-up a SIP call.
- (8) Reply Timeout Outgoing DMR Call: Time until hang-up a SIP to DMR call if nobody answers on the radio.
- (9) Account Enabled: Check here to use SIP feature on target time slot.
- (10) Channel used for: Choose "Voice" normally.
- (11) Perform SIP REGISTER Procedure: Check here normally.
- (12) Perform SIP UNREGISTER before Restart: Uncheck here normally.
- (13) Send RTP Header Extension: It allows sending RTP Header Extension.
- (14) Send Text Positioning as SIP IM: It allows text message from console
- (15) Don't delete Main Numeric Prefix on Dial: Uncheck here normally.
- (16) Don't delete Alt Numeric Prefix on Dial: Uncheck here normally.
- (17) Register Terminal IDs as SIP Numbers: Uncheck here normally.

3.3.1.16.2. SIP Calls from AIR

(1) Dial Method: Choose middle. Using this method each call alerts whose destination DMR ID's initial digits matches with one of the two numeric prefixes (Main Numeric Prefix and Alternate Numeric Prefix) will produce a SIP call addressed to a SIP resource having the same SIP contact URL of the target DMR ID. It is possible to set whether or not sending the selected prefix to the SIP Server.

SIP Calls from AIR	
Dial Method (1)	
Call alert to SIP Number	0
Call alert to Numeric Prefix + SIP Number	•
Text Message with Alphanumeric Prefix + SIP Number	0
DTMF Sending Method (2)	
In-Band	œ
Into a SIP INFO Message	0
As RTP EVENT	0
Main Numeric Prefix on DMR Call Alerts (3)	99
Alternate Numeric Prefix on DMR Call Alerts (4)	
Alphanumeric Prefix on DMR Messages (5)	

This is the only method currently available in the current release 1.6.0.0 and it will be provided in a future software release.

- (2) DTMF Sending Method: Choose "In-Band". It is the only way to exchange DTMF tones between radio portables and SIP Telephones in the current release.
- (3) Main Numeric Prefix on DMR Call Alerts: Additional prefix of extension number.
 - e.g.) SIP phone extension : 101 Numeric Prefix on DMR: 99 UID to call SIP phone from mobile : 99101
- (4) Alternate Numeric Prefix on DMR Call Alerts: 2nd Prefix if you need.
- (5) Alphanumeric Prefix on DMR Messages : N/A

3.3.1.16.3. AIR Call from from SIP

- (1) ID to call: ID for Air calls between KAIROS and mobile.
- (2) Call Mode: Choose Individual / Group



3.3.1.16.4. SIP Server

- (1) Server IP Address: IP address of SIP Server
- (2) Server IP Port: Enter same port number with SIP server.
- (3) Local IP Port: Enter same port number with SIP server.
- (4) Protocol: Enter same protocol with SIP server.

SIP Server	
Server IP Address (1)	192.168.0.65
Server IP Port (2)	5060
Local IP Port (3)	5061
Protocol (4) UDF	• • TCP C

3.3.1.16.5. SIP Trunk Configuration

It is a Server to connection between two different SIP servers (usually KA-SIP Server and customer's external PBX). It provides an alternative to a SIP Client – Server connection between the KA-SIP layer which acts as a SIP client and the customer's external VoIP PBX acts as SIP Register Server.

- (1) Remote Server: Set IP information for SIP Trunk Server.
- (2) Local Server: If assign SIP Trunk Server to another KAIROS, enter IP address in here.
- (3) Trunk Mode: No Trunk means using KAIROS itself.

SIP Trunk Configuration				
Remote Server	(1)			
IP Address				
IP Port	5060			
Local Server (2) IP Address				
Trunk Mode (3)	No Trunk 📩			

3.3.2. Alarm Configuration

The software on a KAIROS Base Station continuously monitors a lot of functional parameters, which can take the state of good or bad during a period. We can divide them into two major groups: analog parameters and logic parameters. The analog parameters can take any value

KAI	ROS ?		
Configuration		•	
	Alarms Configuration		Alarms Treatment
	Controls	•	Events Setup
	Statistics	•	
	Restart…	•	
_	Configurations Utility		

between a minimum and a maximum (i.e.: voltage, temperature...)

The logic parameters normally point out specific facts occurred over time (i.e.: the activation of an input contact)

3.3.2.1. Alarm Treatment

It sets the general parameters of the Alarm or Notice Events notification.

Communit	ty Data (1)		Destination (4)	
Name	public		Present Destination ID Timeslot	Destination Type Message Format
Password	admin		101 А € С В	Group 🕂 ETSI 🕂
			Г 16777215 А € С В	All Call 🕂 ETSI 🕂
SNMP Ser	vers (2)			
Present	IP Address	IP Port		
$\overline{\mathbf{v}}$	172.33.2.105	162		
\mathbf{V}	172.33.2.44	162	Message Parameters (5)	Base Station Identification
			Prepend date 🔽	Equipment Name
			Prepend time 🔽	Custom ID
				KAIROS
Г				
	,	,		
SNMP Para	ameters (3)		R	ead from File
	(-)	NOTICE		Write on File
Treshold lev				

(1) Community Data

- > Name: Name of the SNMP Community
- > Password: Password of the SNMP System

(2) SNMP Servers

Present: If you want to add a server, specifying its IP Address, you at first must check this checkbox; if you want to remove a server, simply uncheck this checkbox.

- > IP Address: Specifies the IP Address of an SNMP Server to which the Trap will be sent.
- > IP Port: Specifies the IP Port number (in the range $20 \div 65000$) of the server to which the Trap will be sent.

(3) SMNP Parameters

- Threshold level: Specifies the severity level under which an SNMP trap will not be sent.
- Common Severity for CLEAR: Specifies a unique severity degree for all the CLEAR Events, which takes priority over the per-Alarm CLEAR severity degree (in addition to the already shown severity degrees (see above, Severity Degree of an Alarm Event), this list-box provides an UNDEFINED value, which means that a CLEAR Event will assume the severity degree specified in the Events Setup window).

(4) Destination

- Present: If you want to add a DMR Destination, you first must check this checkbox; if you want to remove a DMR Destination, simply uncheck this checkbox.
- Destination ID: Specifies the Destination ID, which can be an Individual ID or a Group ID, according to the Destination type.
- > Timeslot: Specifies the Timeslot (A or B) which a text message will be sent on.
- Destination Type: Specifies the type of the Destination ID (currently the only choice is between "ALL CALL" and "GROUP ID")
- > Message Format: Specifies the format of the text messages that will be sent.
- (5) Message Parameters
 - Prepend date: If checked, the related text of an Event will be prepended by the UTC date of an Event occurrence, in (YYYY-MM-DD) format.
 - Prepend time: If checked, the related text of an Event will be prepended by the UTC time of an Event occurrence, in (HH:MM) format.
 - Base Station Identification: You can choose here how the Base Station will be identified in the DMR text message sent; the current choices are:
 - None: No identification string will be inserted.
 - Equipment Name: The name of the Station, as set in the Main Setup window.
 - Station ID: The Station ID value, as set in the Main Setup window.
 - Equipment S/N: The Serial Number of the Station, assigned from Factory, normally displayed in the main window of KAIROS_Manager.
 - Equipment ID (hex): The Equipment ID of the Station, assigned by Factory, normally displayed in hex format in the main window of KAIROS_Manager.
 - Custom String: The identification will be the string chosen by the user, set in the following item
 - Custom ID: Sets your own Identification String to be sent if Custom String has been chosen in the previous item.

3.3.2.2. Events Setup

Configures how to handle and dispatch every single event.

y Overvoltage Supply Undervoltage Ethernet Lini	k Status PLD Data Correctness DSP Loadin
SNMP Traps (1)	Properties and Methods (3)
Traps Destination	Alarm Enabled
172.33.2.105:162	Consecutive events to toggle
172.33.2.44:162	Insert into ACTIVE/HOT-SPARE analysis
	Alarm Raise (4)
	Message
	Broken Ethernet Link
Traps Sending Policy	System Defined Severity
Merge Auxiliary Data in Text Messages	
Send the CLEAR TRAP on a CLEAR Event	
Repeat RAISE TRAP every	Alarm Clear (5)
	Message
On-Air Messages (2)	Ethernet Link Restored
DMR	
Destination TS Call Type Format	
1 A Group ETSI	
16///215 A All Call ETSI	- I/0 Contacts Activation (6)
	Activate EXT- contact
	,
Repetitions 1	
Interval [s]	Write Read Close

(1) SNMP Traps / Traps Destination: In this section you will find all the previously configured SNMP Servers (IP Address + IP Port number): if you want the Station to send the trap related to the Event to one or more of the listed servers, simply check the checkboxes associated to the servers. If you don't want the Station to send the trap, then uncheck all.

SNMP Traps / Traps Sending Policy: For every Alarm Event, in this section you can decide Traps sending policy.

(2) On-Air Messages: In this section you will find all the previously configured DMR Destinations (ID + Timeslot + Type + Format): if you want the Station sends to one or more of the listed destinations the event-related text message, simply check the checkboxes associated to the destinations. If you don't want the Station sends the message, uncheck all.

- (3) Properties and Methods: In this section you will define the behavior of an Event, as follows:
 - Alarm Enabled: Enables or disables all the actions subsequent to the detection of the Event.
 - Consecutive events to toggle: Specifies how many consecutive detections of the Event are needed to toggle the status of the Alarm; note that in some Events this parameter is not enabled to the User.
 - Insert into ACTIVE/HOT-SPARE analysis: Here you can specify if the Event participates to the Equipment Status Analysis which can produce an ACTIVE-to-SPARE role exchange in a 1+1 environment; please, note that not all Events are qualified to participate to that analysis, and currently not all qualified Events, even selectable, will participate to the analysis: it is limited to the followings:
 - Ethernet Link Status
 - No TX Power
 - TX Power too low
 - TX Power too high
 - TX SWR Alarm
 - TX Power Reduction
 - BS Temperature
 - TX Temperature
- (4) Alarm Raise / Message: Here you can specify the text of the messages that will be sent to configure SNMP Server(s) and through the DMR RF channel; you can insert a free-format ANSI text up to 47 alphanumeric characters. Please note that some Alarms don't have a CLEAR event: in this case an appropriate reminder will be displayed instead of the Message textbox of the Alarm Clear section.

Alarm Raise / System Defined Severity: Here you can specify the severity degree for the displayed alarm. While the user can define the CLEAR Event severity degree for every alarm, the user can define the RAISE Event severity degree only for some alarms, because for some others it is still Factory-defined and cannot be changed. The range of values is as shown above, in Severity Degree of an Alarm Event. If you didn't specify any SNMP Server in the Alarms Treatment window, the User-Defined Severity value has no meaning.

Alarm Raise / User-Defined Level: Here You can specify a value, in the range 0 to 15, which will be inserted into the SNMP Trap; the SNMP Server can use this value as an additional filter, or a customized priority/significance for that alarm. If you didn't specify any SNMP Server in the Alarms Treatment window, the User-Defined Level value has no meaning.

(5) Alarm Clear: it is written in the (4) Alarm Raise.

(6) I/O Contacts Activation: If checked, the RAISE Event of the alarm will participate in the activation of the ALARM OUT contact on the rear DB25 connector.

3.3.3. Controls

To know KAIROS Statuses, Click Controls then choose the one which you want to know.

KAIROS_Manager Software	KAIROS ?		
- Communications	Configuration Alarms Configuration		Status Buff
Sent	Controls	•	KAIROS Overall Status
Sent Controls Statistics Restart… Configurations Utility			DSP and PLD Status Loop Test Result Vtune Test Result GPS Status Primary Synchronization Status Audio Lines Control AF Test DMR Test P25 BER Test - TX P25 BER Test - RX Base Stations Viewer

3.3.3.1. KAIROS Overall Status

You can know various basic statuses from this window.

KAIROS Overall Status - KAIR	COS <master-broadcast></master-broadcast>	
TRX Status	Synchronization Status	DSP Measures Clear Packets Counters
DSP Ready TRX Active	PPS Signal from GPS Present Valid Lock	Last DSP Startup:
Clbr Running Clbr OK	PPS Signal from PTP Present Valid Lock	2018-09-26 15:34:53
M. RX Fail D. RX Fail	External PPS Signal Present Valid Lock	DMR Packets Out of Window 0
Interrupts from PLD	Superaudio Tone Present Valid Lock	ANA Packets Out of Window 0
SQ Analog PTT	Synchronization from RF Signal or 4FSK Lock	Safety Margin for DMR Packets 0
	Synchronization from Internal Reference	Safety Margin for ANA Packets 0
	DED Cowerthy Sunchwanized	Timing Error [µs] 0.000
RX P25 TX P25	DSP Correctly Synchronized	PPS Position [µs] 42.468
10(125)		
Features Status	AF Lines Status	RX Measures
SIMULCAST Features	AF to DMR Codecs TS A TS B	Peak Deviation [Hz]
DMR Features	DMR Codecs to AF TS A TS B	Estimated SINADo [dB]
ANALOG Features	Output Signalling Line 1 Line 2 IP Line	Offset of received carrier [Hz]
ETSI Tier III Features	Input Signalling Line 1 Line 2 IP Line	
NETCONTROL Access	Emergency Self-Repeating Mode	
SNMP Features	Registered to Master	Analog Measures
POCSAG Features	Promoted to Master for Emergency	Input Supply Voltage [V] 13.2
MULTITONE TCS Features		TX Temperature [°C] 30
P25 Features	-Vocadore Status	TX Input Current [A] N/A
SID Features	vocouers status	Forward Power [W] N/A
Amateur Dadio Features	Vocoder 1 Vocoder 2	Reflected Power [W] N/A
External Raw Access		SWR N/A
Audio from Web		
	Clocks Status	DMR Status
Commands Set	TX PLL Lock RX PLL Lock	Internal Second/Timeslot 268
Unlock SO		TSA TSB
Unlock TCS/DPL		Last Received Timeslot 0 0
Start Transmission	1+1 Status Force to SPARE	Frequency offset rx [Hz] 0 0
Disable TX	1+1 Node Link between Nodes	Time offset rx [ms] 0.000 0.000
Line 2 Output Signal		Error Vector 0 0
Local TRX Test		Last Received Color Codes 0 0
		Last Transmitted Data Types 0 0
		RSSI Main [dBm] -109.9 -110.2
Disable Digital Squelch	Close	RSSI Diversity [dBm] -126.9 -126.9
(1) VHE 136 ± 174 MHz Ban		(2) MASTED BASE STATION

There are some useful information on the bottom bar.

- (1) Frequency Band Information
- (2) Service Class
- (3) TRX Operative Mode
- (4) Serial Number
- (5) Base Station Role
- (6) Equipment ID which is match with MAC address. You can't change it.
- (7) Own IP address

Detail explanation for each item is written from the next page.

3.3.3.1.1. TRX Status

TRX Status			
DSP Ready	TRX Active		
Clbr Running	Clbr OK		
M. RX Fail	D. RX Fail		
Interrupts	from PLD		
SQ	Analog PTT		
TCS/DPL	Digital PTT		
RX DMR TS A	TX DMR TS A		
RX DMR TS B	TX DMR TS B		
RX P25	TX P25		

Item	Description
DSP Ready	The ready for the DSP working. Basically Green.
TRX Active	The activeness for TX/RX. Basically Green. In case the KAIROS in stand-by
	mode in 1+1 Hot stand-by for redundancy here will be Gray.
Clbr Running	During calibration is running it turns to Green.
Clbr OK	It turns to Green if the calibration was done as OK.
M.RX Fail	Normally Gray unless Main Receiver has a problem.
D.RX Fail	Normally Gray unless Diversity Receiver has a problem.
Interrupts	The status for the DSP is interrupted from PLD. (Programmable Logic Device)
from PLD	Basically Green.
SQ	Busy Status. While the RX block is receiving signal, it turns on Green.
	If the KAIROS is disabled RX, here is always Gray.
Analog PTT	On-Air Status for Analog. While transmitting in analog, it turns on Green.
	If the KAIROS is disabled TX, here is always Gray.
TCS/DPL	It turns Green when the received correct QT / DQT signal.
DIGITAL PTT	On-Air Status for Digital. While transmitting in digital, it turns on Green.
	If the KAIROS is disabled TX, here is always Gray.
RX DMR TS A	It turns green when the DMR signal (Slot A) is being received.
TX DMR TS A	It turns green when the DMR signal (Slot A) is being transmitted.
RX DMR TS B	It turns green when the DMR signal (Slot B) is being received.
TX DMR TS B	It turns green when the DMR signal (Slot B) is being transmitted.
RX P25	It turns green when the P25 is being received.
TX P25	It turns green when the P25 is being transmitted.

3.3.3.1.2. Feature Status

You can see various licensed feature's enabling status. Enabling features are turned on Green.

For example, on the picture case, SIMULCAST is Gray but it doesn't mean the KAIROS is not activated SIMULCAST License. In case you don't use Simulcast mode, it turns off Green.

If you just want to check feature's license activated status, use Web server function by Firefox browser.

Procedure to activate license, we have the other document "KAIROS LICENSES GUIDE", please contact to JVCKENWOOD.



Item	Description
SIMULCAST Features	It turns green if the Simulcast Feature is enabled.
	If the Simulcast license is not present, the repeater will not work in
	simulcast mode.
DMR Features	It turns green if the DMR Feature is enabled.
ANALOG Features	It turns green if the Analog mode license is enabled.
	This license is always activated for all KAIROS as default setting.
ETSI Tier III Features	It turns green if the DMR Tier III (Trunking) Feature is enabled.
NETCONTROL Access	It turns green if the NETCONTROL license is activated.
	Net Control is the Radio equipment monitoring and remote control SW
	tool for Windows-based platforms. It allows sites supervision both by
	the final Customer and the Installer/Maintainer via an IP-link. License
	to connect and remotely manage the radio base stations is included.
	Each base station of the network is displayed as a colored icon showing
	its status. The NetControl license must be activated on the KAIROS
	itself (not on the DMR_NetControl software tool), so you need a
	NetControl license for every KAIROS you have.
SNMP Features	It turns green if the SNMP license is activated. If you want the Station
	to send the trap related to the Event to SNMP servers need this
	License.
POCSAG Features	It turns green if the POCSAG (Post Office Code Standardization
	Advisory Group) Feature is enabled.
MULTITONE TCS	It turns green if the MULTITONE TCS license is activated. It allows the
Features	use of up to 8 different CTCSS contemporary.
P25 Features	It turns green if the P25 Feature is enabled.
TX Features	It turns green if the TX Feature is enabled. This license is always
	activated for all KAIROS as default setting except KA-TI-02 (Gateway).
SIP Features	It turns green if the SIP Feature is enabled.

Amateur Radio	It turns green if the Amateur Radio license is activated.
Features	Amateur radio feature consists in enabling all the features of a
	KAIROS, apart from the SIP agent, and to limit the usable bandwidth to
	the Amateur Radio band only.
External Raw Access	It turns green if the External RAW Access license is activated.
	This is for software developer only.
Audio from Web	It turns green if the Audio from Web license is activated. This license is
	always activated for all KAIROS as default setting.

3.3.3.1.3. Commands

The "Commands" section contains the following radio related controls:

- Unlock SQ: To unlock the squelch threshold in order to activate the Rx in Analog mode.
- Unlock TCS/DPL: To by-pass the TCS/DPL controls;
- Start Transmission: To start transmitting silence;
- > Disable TX: To block the transmission;
- Line 2 Output Signal: To activate the signal of "channel on air" sent to the console connection.
- Local TRX Test: Check here to lock RX and DSP mode of Analog signal to perform RX performance test.
- Disable Digital Squelch: While receiving DMR signal, if you check and set here, the KAIROS will maintain its behavior as receiving.

3.3.3.1.4. Synchronization Status

You can check the synchronization status of KAIROS.

- Present: It turns green if the Signal for Synchronization exists. There may be more than one Green.
- Valid: It turns Green when the synchronization signal is Valid. There may be more than one Green.



Synchronization Status

Synchronization from RF Signal or 4FSK

Synchronization from Internal Reference

Present

Present

Present

Present

Valid

Valid

Valid

Valid

Lock

Lock

Lock

Lock

Lock

Lod

PPS Signal from GPS

PPS Signal from PTP

External PPS Signal

Superaudio Tone

> Lock: It turns Green the signal KAIROS uses for synchronization. It displays only one.

DSP Correctly Synchronized: You can see that the figure above is not synchronized with other devices. It uses the Internal Reference only. (Light Green means "Synchronization" is locked by Internal Reference as 2nd choice)

Commands	Set
Unlock SQ Unlock TCS/DPL Start Transmission	
Disable TX	
Line 2 Output Signal	
Local TRX Test	
Disable Digital Squelch	

The figure on the right shows the status of synchronization with PTP.

Synchronization Status			
PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK Lock Synchronization from Internal Reference Lock			
DSP Correctly Synchronized			

The figure on the right shows that it is not synchronized. DSP Correctly Synchronized turns on Red.

-Synchronization Status

PPS Signal from GPS	Present	Valid	Lock
PPS Signal from PTP	Present	Valid	Lock
External PPS Signal	Present	Valid	Lock
Superaudio Tone	Present	Valid	Lock
Synchronization from RF Signal or 4FSK Lock Synchronization from Internal Reference Lock			
DSP Correctly Synchronized			

3.3.3.1.5. AF Lines Status

- AF to DMR Codecs: If the KAIROS installed Vocoder option, it turns Green when Vocoder input AF from external input line. (Physical console)
- DMR Codecs to AF: If the KAIROS installed Vocoder option, it turns Green when Vocoder output AF by receiving DMR signal.
- Output Signaling: If the KAIROS installed
 Vocoder option, while Analog signal outputs to
 Line1, Line2, and/or IP Line by receiving signal
 or IP network, turns on Green.
- Input Signaling: If the KAIROS installed
 Vocoder option, while Analog signal inputs
 from Line1, Line2, and/or IP Line, turns on Green.
- Emergency Self-Repeating Mode: Normally Gray.
 If a Slave failed to register the Master, here will





Emergency Self-Repeating Mode Registered to Master Promoted to Master for Emergency

be Red, and Slave enters Self-Repeating Mode as fail-safe. Under this mode, the repeater works as isolated from other repeaters. Repeater adds "Pi-Pi/ tone on Down-link signal to indicate that the repeater working as this mode.

- Registered to Master: Normally Green. If a Slave failed to register the Master, here will be Red. You need to check the Master IP address setting on Slave.
- Promoted to Master for Emergency: In case Master stopped its role, a Slave which is assigned Back-up-Master will be automatically promoted

to Master with indicating Yellow. If damaged Master was recovered, Back-up-Master, which is temporarily promoted to Master, will automatically be demoted back to Slave.

3.3.3.1.6. **Vocoders Status**

If the KAIROS has Option Vocoder, it turns on Green here.

If no built-in Vocoder, always gray.

Note: Vocoder 1 for TS A, Vocoder 2 for TS B.

3.3.3.1.7. **Check Status**

- \triangleright TX PLL Lock: It turns green if clock for TX PLL working.
- > RX PLL Lock: It turns green if clock for RX PLL working.
- DSP <=> PLD Communication: It turns green if the communication between DSP and PLD work fine.

3.3.3.1.8. 1+1 Status

- Force to SPARE: By pressing this button, KAIROS which is working as Main in 1 + 1redundancy turns to SPARE.
- ➤ 1+1 Node: It turns green if the KAIROS is set as 1+1 Hot/Standby redundancy.
- Link between Nodes: It has not been developed yet. It's for future usage. \geq

1+1 Status	Force to SPARE
1+1 Node	Link between Nodes
Last role change	2018-07-30 18:23

Clocks Status TX PLL Lock RX PLL Lock

Emergency Self-Repeating Mode Registered to Master

Emergency Self-Repeating Mode Registered to Master

Promoted to Master for Emergency

Promoted to Master for Emergency



vocoucis status	
Vocoder 1	Vocoder 2
Vocoders Status	
Vocoder 1	Vocoder 2

-Vocoders Status

> Last role change: It shows last role date and time on 1+1 Hot/Standby mode.

Note: The KAIROS while TRX is not active, 4 LEDs (RX1, RX2, TX1, TX2) light orange for 1 sec every 10 sec.



3.3.3.1.9. DSP Measures

DSP Measures Clear P	ackets Counters
Last DSP Star 2018/07/13 9:	tup: 14:08
DMR Packets Out of Window	0
ANA Packets Out of Window	0
Safety Margin for DMR Packets	2
Safety Margin for ANA Packets	0
Timing Error [µs]	0.000
PPS Position [µs]	42.468

Item	Description
DMR Packets Out of Window	Normally 0. If the number is stable (not increasing), DMR
	network is working well.
ANA Packets Out of Window	Normally 0. If the number is stable (not increasing), Analog
	network is working well.
Safety Margin for DMR Packets	Normally greater than 1. If the number is often 1 or 0,
	increase the network delay.
Safety Margin for ANA Packets	Normally greater than 1. If the number is often 1 or 0,
	increase the network delay.
Timing Error [us]	Receiving Signal Timing error from expected timing.
	Less than 10 [us] is OK.
PPS Position [us]	PPS Position error from expected timing of PPS based on
	current synchronization.
	Less than 10 [us] is OK.

3.3.3.1.10. RX Measures

3987
15.6
-65

Item	Description
Peak Deviation[Hz]	It shows Peak Deviation while RX.
Estimated SINADp [dB]	It shows Peak SINAD while RX.
Offset of received carrier [Hz]	It shows carrier offset of RX signal.

3.3.3.1.11. Analog Measures

12.8
28
1.222
9.755
1.018
1.23

Item	Description
Input Supply Voltage [Hz]	It shows DC input Voltage.
TX Temperature [°C]	It shows Temperature around TX circuit.
TX Input Current [A]	It shoes the drained current by the TX Final power amplifier.
Forward Power [W]	It shows forward TX power which is detected by KAIROS internal circuit.
	Normally it shows similar power to the setting of TX power.
Reflected Power [W]	It shows reflected TX power which is detected by KAIROS internal circuit.
	If this number is close to Forward Power, check TX cabling and Antenna.

3.3.3.1.12. DMR Status

DMR Status		
Internal Second/Timeslot	3	126
	TS A	TS B
Last Received Timeslot	24	0
Frequency offset rx [Hz]	-60	0
Time offset rx [ms]	0.021	0.000
Error Vector	114	0
Last Received Color Codes	1	0
Last Transmitted Data Types	0	9
RSSI Main [dBm]	-69.2	-106.7
RSSI Diversity [dBm]	-93.9	-126.8

Item	Description
Internal Second/Timeslot	It's internal counter.
Last Received Timeslot	It shows Last received Timeslot.
Frequency offset rx [Hz]	It shows Frequency offset of RX Signal. Normally it's less than 100.
Time offset rx [ms]	It shows Time offset of RX. Normally it's less than 0.05
Error Vector	It shows Vector Error
Last Received Color Codes	It shows Last Received Color Code
Last Transmitted Data Types	It shows Last Transmitted Data type
RSSI Main [dBm]	It shows RSSI (Received Signal Strength Indication) of Main receiver.
RSSI Diversity [dBm]	It shows RSSI (Received Signal Strength Indication) of Diversity receiver.

3.3.3.2. DSP and PLD Status

This Window shows DSP and PLD Status that is for factory usage.

Some of them are repeated from Overall Status on here.

Basically, you can refer to Overall Status to know the KAIROS information.

As long as there is no Red indicator, you can omit this window.



Force Role to HOT-SPARE: By pressing this button, KAIROS which is working as Main in 1
 + 1 redundancy turns to SPARE.

3.3.3.3. Loop Test Result

This menu allows to check the overall performances of synthesizer and of RX. Check all the boxes about "Test to execute"; push "set" button and then "Run loop test". At the end of the test the table with the measurements is filled in and the corresponding flags are green if the test is positive, or red if the test is negative. In this case, depending on the red flags, it is possible to identify the possible cause of the problem.



3.3.3.3.1. Test Results

Item	Description (Overall)
IF Initialized	Normally Green when IF block ready.
IF Sampling	Sampling mode for IF. 16kHz on DMR. Green means OK.
S/N @ 1kHz	1kHz internal test tone. Green means OK.
Residual Modulation	Residual noise on Modulation. Green means OK.
Psophometric SINAD	SINAD test. Green means OK.

Item	Description (Main, Diversity)
Received Field Strength	Test result of field strength for Main and Diversity receiver.
LSB Attenuation-16 - 14 kHz	Attenuation test result of Lower Side of IF Filter at -16 to -14kHz
LSB Corner - 8 kHz	Attenuation test result of Lower corner of IF Filter at -8kHz
Ripple -5% + 5 kHz	Ripple Test result of IF filter at +/- 5kHz.
USB Corner + 8 kHz	Attenuation test result of Upper corner of IF Filter at +8kHz
USB Attenuation +14 + 16 kHz	Attenuation test result of Upper Side of IF Filter at -16 to -14kHz
LC Tank Capacitance [pF]	This is the Value of LC Tank Capacitance which is in the PLD.

RC Resonator Capacitance	This is the Value of RC Resonator Capacitance which is in the PLD.
IF Software Version	Software Version for IF.

Item	Description (1kHz, 3kHz, 300Hz)
Peak Deviation [Hz]	Green means OK.
Distortion	Green means OK.
SINAD	Green means OK.

3.3.3.3.2. Test Measures

The table with the measurements is filled in

Test Measures					
	Main	Diversity —	Overall		
	@ 1 kHz	@ 1 kHz	@ 1 kHz	@ 3 kHz	@ 300 Hz
Field Strength [dBm] Subtone Deviation vs Nominal [dB] Residual Modulation [Hz] S/N [dB] Psophometric SINAD [dBp] Error Vector	-68.8 11 57.2 79.6 173	-69.9 8 54.2 79.8 349	-0.2 7 57.2 77.5 244		
BER SINAD [dB] Distortion [%]	-557 0 32.5 2.3	-553 0 33.1 2.1	-555 0 33.4 2.0	41.9 0.8	38.9 1.0
Peak Deviation [Hz] Signal Level vs Nominal [dB] TX-RX Phase Difference [deg] TX->RX Delay Time [ms]	1458 0.0	1445 0.0	1451 0.0 76.4 3.848	1555 0.4 110.6 3.680	1489 -0.3 -174.8 5.284

3.3.3.3.3. Test to Execute

Check all the check-boxes in "Test to execute"; push "set" button and then "Run loop test". Please make sure that no signal is applied to the RX input while performing this test, else some wrong results are possible.

At the end, save the results by pushing the "Save in eep" button.



The tuning of Kairos is completed. The self-test is able to check every parameter of the modulator and of the demodulator, except for the TX output power and the RX sensitivity, which should be tested by external devices.

3.3.3.4. Vtune Test Result

The Kairos embeds a DSP based algorithm for self-tuning the input filters of the main and diversity RX, the coarse control voltage of the local VCOs of TX and RX and for self-testing the overall performances of the synthesizer and receiver. This test is performed by internally connecting the output of the synthesizer to the input of the RX and by comparing the transmitted pattern to the received one.

396.8 403.2 409.6 416.0 422.4 428.8	0.33 0.78 0.58	0.00 9.87	1863.5				the second second	
403.2 409.6 416.0 422.4 428.8	0.78 0.50	0.87		1,55	2185.7	-65.4	-69.8	8
409.6 416.0 422.4 428.8	0,50	0101	2626.7	1.98	2148.3	-65.6	-69.7	7
416.0 422.4 428.8		1.44	1999.4	2,48	2254.6	-64.5	-69.8	B
422.4 428.8	1.98	2,62	1979.1	2.05	2149.3	-66.0	-49.7	2
428.8	1.86	2.68	1993 0	9.59	2339.7	-65.0	-69.6	2
46070	2 31	2 24	2828 7	4 25	2127 8	-65 1	-69 5	7
ASE 2.	0 54	4.09	1999 /	4.97	2127.0		-49.4	7
441.6	9.90	4.00	2148 9	E 49	0000 4	-64.8	-49.5	7
449.0	2 24	E 49	1070 1	6.22	2862.2	-64.9	-49.4	E .
AEA A	0.67	4.52	1000 4	2.00	2222 4	-45.0	20.0	ő
454.4	0,01	0.04	1000.7	0.00	2200.4			
406.0	0.72	1,00	2020.7	(1000	2041.7	-00.2	-70.0	
407.2	4,27	8.29	2641.9	8.21	2127.0	-66.9	-07.7	2
4/3.0	4,40	9,24	2063.2	6.91	2185.7	-66.9	-19.5	

To make this test,

Step 1: If the KAIROS is in UHF band (KA-450 and KA-500 only) connect a 50 ohm dummy load to the input of diversity RX; else if the KAIROS is in VHF or other band, leave the RX input (both Main and Diversity) open.

- Step 2: Push the button "Run Vtune test"; wait the end of the test and "save to EEP". During this test the Kairos fills in a lookup table with the tuning voltage (as a function of the frequency) of the RX input filters and the coarse control voltage of the VCOs. This test is performed by Factory just once during the life of the equipment, because every slight change during aging will be compensated by internal fine tuning.
- Step 3: Remove the dummy load.
- Step 4: Open the menu Kairos Controls Loop test result.
- Step 5: Do Loop Test Result (3.3.3.3)

Item	Description
Frequency [MHz]	Test Frequency
RX Head [V]	BPF Voltage for RX front-end
RX PLL (Coarse) [V]	Coase adjustment Voltage for RX PLL
RX PLL (Fine) [mV]	Fine adjustment Voltage for RX PLL

TX PLL (Coarse) [V]	Coase adjustment Voltage for TX PLL
TX PLL (Fine) [mV]	Fine adjustment Voltage for TX PLL
RSSI Main [dBm]	RSSI level for Main RX
RSSI Diversity [dBm]	RSSI level for Diversity RX
Residual Dev [Hz]	Deviation by Residual noise
3.3.3.5. GPS Status

GPS S	tatus - KAIROS «	<mst -="" sip=""></mst>						
Valid F	IS RMC record	Valid	PPS signal	C GPS		•		
Coor	dinates							
	Latitude	Longit	tude	Maidenhead Locator				
35	° 30' 31.228" N	139° 33' 2	1.128" E	P M 9 5 S M				
GPS	5atellites in View	(12)						•
#	Satellite ID	Elevation [deg]	Azimut [deg]	C/No Ratio [dBc/Hz]			•	
1	3	1	274	-1 🛞	•	•		
2	14	42	189	47 🙂		• ••		
3	16	40	274	25 🙄				
4	21	22	116	44 😡		•	•	
5	23	17	317	-1 😣				
6	25	10	65	25 😊				
7	26	63	313	27 🙄		• •		
8	27	19	208	47 🙂				
9	29	32	45	27 🙂				
10	31	72	72	27 🙂				
11	32	20	174	44 🙂				
12	4	U	U	14 🙁				
								Close
]			i

8

Bad Condition

3.3.3.5.1. Status

Item	Description			
Valid RMC record	While the GPS receiver Re-code Valid RMC sentence, it becomes Green.			
Valid PPS Signal	While the GPS receiver outputs Valid PPS signal, it becomes Green.			

Good Condition

3.3.3.5.2. View

Item	Description
GPS/GLONASS	It Shows a GPS receiving mode.

3.3.3.5.3. Coordinates

Item	Description
Latitude	Latitude information
Longitude	Longitude information
Maidenhead Locater	Grid Square Locator of positioning location.

3.3.3.5.4. GSP Satellites in View

It can show Signal Status of each Satellite.

If GPS receiver receives more than 3 Satellites (More than 3 Greens), it can positioning location, also output valid PPS signal.

#	Satellite ID	Elevation [deg]	Azimut [deg]	C/No Ratio [dB	c/Hz
1	3	1	274	-1	
2	14	42	189	47	
3	16	40	274	25	
4	21	22	116	44	
5	23	17	317	-1	
6	25	10	65	25	
7	26	63	313	27	
8	27	19	208	47	
9	29	32	45	27	
10	31	72	72	27	
1	32	20	174	44	
12	4	0	0	14	



If the GPS receiver can't catch GPS signal due to GPS antenna or cable problem, it shows "POOR RECEPTION"

GPS S	atellites in View	(12)	POOR RECEPTION		
#	Satellite ID	Elevation [deg]	Azimut [deg]	C/No Ratio [dBc	/Hz]
1	8	0	219	-1	8
2	9	1	328	-1	8
3	14	25	185	-1	3
4	16	50	295	-1	8
5	21	30	100	-1	8
6	23	25	305	-1	8
7	25	0	76	-1	3
8	26	65	353	-1	8
9	27	36	214	-1	6
10	29	18	40	-1	8
11	31	62	111	-1	0
12	32	5	171	-1	3

If KAIROS is not installed GPS receiver unit or not active due to some reason, following message pops up.



3.3.3.6. Primary Synchronization Status

This is a specialized window for Synchronization.

Synchronization Stat	tus		1	Timing Measure	
Current Sy	nchronization S	ource		Internal GNSS Timing error [µs]	0.0
Inte	rnal Ref (full))		External PPS Timing error [µs]	0.0
				Internal PTP Timing error [µs]	819.1
PPS Signal from GPS	Present	Valid	Lock	DMR Access Timing error [µs]	0.0
PPS Signal from PTP	Present	Valid	Lock	PTP Last Sync time difference [us]	0.0
External PPS Signal	Present	Valid	Lock	PTP Network Delay [µs]	0.0
Superaudio Tone	Present		Lock	System Time Adjustment Count	1
Superaudio Tone on Line	1		Lock		
External Network	Present				
Ext Network / RF Signal Internal Reference	/ 4FSK		Lock Lock		
DSP Corre	ctly Synchro	nized			
Base Station (orrectly Syn	chroniz	ed	Superaudio Synchronization	
				Detected Frequency Real	

3.3.3.6.1. Synchronization Status

- Present: It turns green if the Signal for Synchronization exists. There may be more than one Green.
- Valid: It turns Green when the synchronization signal is Valid. There may be more than one Green.
- > Lock: It turns Green the signal KAIROS uses for synchronization. It displays only one.

Item	Description
Current Synchronization Source	Here it shows what method KAIROS is currently synchronizing by.
PPS Signal from GPS	Here it shows PPS signal from Internal GPS receiver. (Option)
PPS Signal from PTP	Here it shows PPS signal from PTP.
External PPS Signal	Here it shows PPS signal from External connector Pin2. Connector locates on its rear panel.
Superaudio Tone	Here it shows presence and lock status of Superaudio tone which is an old style synch source, via 4Wire, through a pattern made by tones on super-audio band (3-3.4KHz). Not use this nowadays.
Superaudio Tone on Line 1	Here it shows Superaudio Tone which on Line 1 status.
External Network	Here it shows whether External Network for Synchronization is present.
Ext Network / RF Signal / 4FSK	Here it shows Lock status by External Network for Synchronization.
Internal Reference	Here it shows Lock status by Internal Reference for Synchronization. Though "Internal Reference" is not the 1st choice for Synchronization but in case it lights here up, it means 1st choice Synchronization has
	some problem.

DSP Correctly Synchronized	Here it shows whether DSP is synchronized correctly or not. Usually here is Green as Correctly Synchronized. Light Green means "Synchronization" is locked by Internal Reference as 2nd choice
Base Station Correctly Synchronized	Here it shows whether Base Station is synchronized correctly or not. Usually here is Green as Correctly Synchronized.

3.3.3.6.2. Timing Measure

This window shows Timing measure information for various synchronization source.

Timing Measure	
Internal GNSS Timing error [µs]	0.0
External PPS Timing error [µs]	0.0
Internal PTP Timing error [µs]	819.1
DMR Access Timing error [µs]	0.0
PTP Last Sync time difference [µs]	0.0
PTP Network Delay [µs]	0.0
System Time Adjustment Count	1

3.3.3.6.3. Superadudio Synchronization

This is Old Synchronization method in Analog FM. It is not used nowadays.

Superaudio Synchronization		
Detected Frequency [Hz]	N/A	
Detected Level [dB]	N/A	

3.3.3.7. Audio Line Control

Audio line control is a tool for a technician to investigate KAIROS connections by ganerate signal by DSP. Line Out for the genarator, Line In for the detecter.





Function Manual rev.1.00

3.3.3.7.1. Line Status

This is indicator to show which LINE of IN/OUT is active now. IN means "Line In", OUT means "Line Out".

Item	Description
LINE 1	Input port Line 1 for AUX port.
LINE 2	Input port Line 2 for AUX port
LINE IP	Input from IP Network
LINE RX	Input from RX
AMBE 1	Input from AMBE 1
AMBE 2	Input from AMBE 2

3.3.3.7.2. Active Line

> Line In

It is a tool to force input audio from selected Input Line to decode the signal.

Check "Cont. Reading" then press "Read" to display the Measures in "Line In" window.

Select button such as "IP", then check "Force Input Signalling" to updade Measures.

Line In	_	Measures
1 2	Force Input Signalling Decoder off	S+N+D level [dB] -57.2 Estimated SINAD [dB] 25.1 Distortion [%] 5.5 Decoded audio freq. [Hz] 0
RX AMBE1 AMBE2	Decoded Sel Call / DTMF SEL CALL 0000 0000 0000	Instant audio freq. [Hz] 1000 In/Ref Sig. phase [deg] 90.0 Network Delay [ms] 0.00 Errs detected in BER test 0
NONE	DTMF 0000 0000 0000 0000	Error vector in BER test 0 B E R





Line Out

It is a tool to force output audio from selected Output Line.

If you would like to send audio on IP line, press "IP" then check "Force Output Signalling", you can choose signal pattern from pull-down selection.

You can modify the signal waveform by entering numbers on the right side.

Line Out		Not connected
1	Force Output Signalling	Test Frequency [Hz] 1000
2	Encoder off	Sq. wave ON [ms] 30
IP		Sq. wave OFF [ms] 970
тх		Hi-Pass flt. [Hz]
AMBE1	DTMF Sending Parameters	Lo-Pass flt. [Hz]
AMBE2	Number to send:	Sweeper
NONE	Send	Min frequency [Hz] 300
		Max frequency [Hz] 3400
L		Step frequency [Hz] 5
		Time [ms] 10
		Default Set

3. Main window 3.3. KAIROS

3.3.3.8.**AF Test**

This is a setting window to support Audio Line Control.

F Test Configuration	AF Generator Settings	Sw Module Status
Enable AF Generator	Test Frequency [Hz] 1000	Parameters carrying enabled
Enable Audio Analyzer	Min sweep frequency [Hz] 300	AF Generator enabled
Activate PTT on AF presence	Max sween frequency [Hz]	Audio Analyzer enabled
		- Measures
est Mode Settings	Sweep step neddency [12] 5	
Freeder off	Sweep Time [ms] 10	Estimated SINAD [dB] 25.1
	J Sq. wave ON Time [ms] 30	Distortion % 5.5
	Sq. wave OFF Time [ms] 970	Instant audio freq. [Hz] 1000
	Hi-Pass filter [Hz]	In/Ref Signals phase [deg] 90.0
ecoded Sel Call / DTMF	Lo-Pass filter [Hz]	Network Delay [ms] 0.00
SEL CALL		
0000 0000 0000 0000		Error vector in BER test 0
DTMF		
0000 0000 0000 0000	Default Set	BER
		4
one length ms	Number to send: 0123	456789ABCDE Send 13 14 15 16 Default
	70 70 70 70 70 70 70	/0 /0 /0 <u>Set</u>
70 70 70 70 70		
10 70 70 70 70 70 70 70	eters	
10 70 70 70 70 70 70 70	eters	5 6 7 8
70 70 70 70 70 1odem Sequence Test Parame /ords per bit-sequence hex	eters	5 6 7 8 0000 0000 0000 0000
70 70 70 70 70 1odem Sequence Test Parame /ords per bit-sequence hex Set	eters 1 2 3 4 0000 0000 0000 0000 0000 0000 0000	5 6 7 8 0000 0000 0000 0000 0000 0000 0000 0000
70 70 70 70 70 Iodem Sequence Test Parame /ords per bit-sequence hex Set	1 2 3 4 0000 0000 0000 0000 0000 0000 0000 0000 9 10 11 12	5 6 7 8 0000 0000 0000 0000 0000 0000 0000 0000 13 14 15 16
70 70 70 70 70 Iodem Sequence Test Parame /ords per bit-sequence hex Set	eters 1 2 3 4 0000 0000 0000 0000 0000 0000 0000	5 6 7 8 0000 0000 0000 0000 0000 0000 0000 0000 13 14 15 16

3.3.3.8.1. AF Test Configuration

AF Test Configuration

- Enable AF Generator
- Enable Audio Analyzer
- Activate PTT on AF presence
- Insert psofo filter

Item	Description
Enable AF Generator	Check here normally to generate AF signal.
Enable Audio Analyzer	Check here normally to activate Audio Analyzer.
Activate PTT on AF presence	If check here active PTT by Audio source.
Insert psofo filer	If check here decoder adds DSP filter (300-3kHz)

3.3.3.8.2. Test Mode Settings

You can set Encoder / Decoder on /off by pull-down setting.

Test Mode Settings	
Encoder off	-
Decoder off	•

3.3.3.8.3. Decoded Sel Call / DTMF

Decoded Sel call / DTMF code will be displayed here.

Decoded Sel Ca	Decoded Sel Call / DTMF							
SEL CALL								
0000 0000	0000 0000							
DT	MF							
0000 0000	0000 0000							

3.3.3.8.4. AF Generator Settings

AF Generator Settings	
Test Frequency [Hz]	1000
Min sweep frequency [Hz]	300
Max sweep frequency [Hz]	3400
Sweep step frequency [Hz]	5
Sweep Time [ms]	10
Sq. wave ON Time [ms]	30
Sq. wave OFF Time [ms]	970
Hi-Pass filter [Hz]	
Lo-Pass filter [Hz]	
Default S	et

Item	Description				
Test Frequency [Hz]	You can define Test tone frequency. Usually 1000Hz.				
Min sweep frequency [Hz]	Minimum frequency of sweep tone.				
Max sweep frequency [Hz]	Maximum frequency of sweep tone.				
Sweep step frequency [Hz]	Step frequency of sweep tone.				
Sq. wave ON Time [ms]	Square Wave On time.				
Sq. wave OFF Time [ms]	Square Wave Off time.				
Hi-Pass filter [Hz]	Hi-Pass filter Enable/Disable, cutoff Frequency				
Lo-Pass filter [Hz]	Low-Pass filter Enable/Disable, cutoff Frequency				

3.3.3.8.5. Sw Module Status

Sw Module Status Parameters carrying enabled AF Generator enabled Audio Analyzer enabled

Item	Description
Parameters carrying enabled	It turns on Green if AF Generator Settings are loaded correctly
AF Generator enabled	It turns Green if the AF Generator Module is ready.
Audio Analyzer enabled	It turns Green if the Audio Analyzer Module is ready.

3.3.3.8.6. Measures

Here you can read the Measures

Measures	
S+N+D level [dB]	-57.2
Estimated SINAD [dB]	25.1
Distortion %	5.5
Decoded audio freq. [Hz]	0
Instant audio freq. [Hz]	1000
In/Ref Signals phase [deg]	90.0
Network Delay [ms]	0.00
Errors detected in BER test	0
Error vector in BER test	0
BER	
J	

3.3.3.8.7. DTMF sending Parameters

Γ	DIME	Send	ing Pa	rame	ters												
									Numbe	r to se	nd:	01234	56789	ABCDE			Send
	Tone le	ength n	ns									,					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Default
	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	Set

3.3.3.8.8. Modem Sequence Test Parameters

Modem Sequence Test Parameters	5							
	1	2	3	4	5	6	7	8
Words per bit-sequence hex	0000	0000	0000	0000	0000	0000	0000	0000
Set	0000	0000	0000	0000	0000	0000	0000	0000
	9	10	11	12	13	14	15	16

3.3.3.9. DMR Test

Here you can set DMR Test signal.

Timeslot A		Timeslot B	
Priority	5 🕂	Priority	5 🕂
Error Vector	0	Error Vector	0
Burst Alignment	0	Burst Alignment	0
Frequency Offset	0	Frequency Offset	0
Start/Restart	Stop	Start/Restart	Stop

Item	Description
Priority	TX priority setting. Bigger number is higher priority.
Error Vector	0-200: Very Good
	200-600 Good
	600-800: Critical
	800-1200: Intermittent receiving.
	1200-1500: No communication, Squelch Closed
Burst Alignment	Time offset in DMR
Frequency Offset	Frequency offset in DMR

3.3.3.10. Base Stations Viewer

		100 C	100 - 111 -		2.5 1.52	100000	
	200 C 200					TS A	SB ANA
SLV 13	MASTER	-	172.33.91.14	172.33.91.14			

Item	Description
BS ID	Base Station ID
BS Name	Base Station Name
BS Role	Base Station Role
Node Type	Node type
Private IP	Private IP address
Public IP	Public IP address
Delay [ms]	Delay time of IP network
Activity	Here can display Active slot for each station of network.
	Yellow for the KAIROS which is receiving.
	Green for the KAIROS which is receiving and chosen as the best signal by voting.

3.3.3.11. **Data and Time**

KAIROS	2018/07/10 10:10:31	(Align)
Computer	2018/07/10 10:14:26	Close

You can adjust RTC time in KAIROS to your computer time.

This time in KAIROS is not for Synchronization, but to add time on alarm message.

3. Main window 3.3. KAIROS

3.3.4. Statistics

KAIROS can show following Statistics;

3.3.4.1. Station Statistics

It shows station statistics in Analog only.

You can know the RX frequency is affected by interference by comparing Network Commitment.

UTC Date/Time	Network Commitment	RX Commitment	RX Interferences
018-07-25 01:00 - 01:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 02:00 - 02:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 03:00 - 03:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 04:00 - 04:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 05:00 - 05:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 06:00 - 06:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 07:00 - 07:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 08:00 - 08:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 09:00 - 09:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 10:00 - 10:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 11:00 - 11:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 12:00 - 12:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 13:00 - 13:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 14:00 - 14:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 15:00 - 15:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 16:00 - 16:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 17:00 - 17:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 18:00 - 18:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 19:00 - 19:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 20:00 - 20:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 21:00 - 21:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 22:00 - 22:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-25 23:00 - 23:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
018-07-26 00:00 - 00:59	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)
24-Hours Summary	0.0 s (0.00 %)	0.0 s (0.00 %)	0.0 s (0.00 %)

3.3.4.2. Network Statistics

UTC Date/Time	RX DMR TS A	RX DMR TS B	RX ANALOG	VT DMR TS A	VT DMR TS B	VT ANALOG	Tab view
2018-07-25 04:00 - 04:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	Hours of the
2018-07-25 05:00 - 05:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	Stations
2018-07-25 06:00 - 06:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 07:00 - 07:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 08:00 - 08:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	- TD View -
2018-07-25 09:00 - 09:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	10 view
2018-07-25 10:00 - 10:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	Station Nam
2018-07-25 11:00 - 11:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	Station ID
2018-07-25 12:00 - 12:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	IP Address
2018-07-25 13:00 - 13:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	Equipment 9
2018-07-25 14:00 - 14:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	Equipment I
2018-07-25 15:00 - 15:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 16:00 - 16:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 17:00 - 17:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 18:00 - 18:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 19:00 - 19:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 20:00 - 20:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 21:00 - 21:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 22:00 - 22:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-25 23:00 - 23:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-26 00:00 - 00:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-26 01:00 - 01:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-26 02:00 - 02:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	
2018-07-26 03:00 - 03:59	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	0 (0.00 %)	

3.3.4.3. Packets Counter

DIGITAL Branch	ANALOG Branch	Physical Audio Lines
Voter Margin [30 ms ticks]: 4	Voter Margin [30 ms ticks]: 3	LINE 0
		Input Packets from Line: 0
DMR	ANALOG	Output Packets to Line: 0
Received Packets: 243	Received Packets: 0	
Transmitted Packets: 1076	Transmitted Packets: 562	
Packets Out of Rx Window: 0	Packets Out of Rx Window: 0	LINE 1
Packets Out of Tx Window: 0	Packets Out of Tx Window: 0	Terret Deskets From Lines 0
LAN Compression Rate [%]: 0	LAN Compression Rate [%]: 0	Output Packets to Line: 0
P25	DATA MESSAGES	
Received Packets: 0	Received Packets: 0	
Transmitted Packets: 0	Transmitted Packets: 0	
Packets Out of Rx Window: 0	Packets Out of Rx Window: 0	(
Packets Out of Tx Window: 0	Packets Out of Tx Window: 0	

3.3.5. Restart...

From this menu, you can choose to perform a layer-specific re-start, or a complete restart of a power off.

Warning: If you Shutdown a remote equipment, the only way to power it back on is by hitting the physical button on-site.



- > KAIROS: Restart all application in KAIROS.
- Reboot: Restart from Linux OS
- Restart a Remote KAIROS: If you need to restart a KAIROS which is beyond RF-Link. (A KAIROS which cannot be connected by IP network)

3.3.6. Configurations Utility



3.3.6.1. Save configurations

You can save KAIROS (TRX+DSP) configurations into file.

3.3.6.2. Load Configurations

After press Load configurations, following "Select Items to Load" window will appear.

In this window, you can select item which you want to load.

By using Load Configurations, you can do not only save/load, but also do cloning.

If you clone KAIROS by load data, please take note following Tips,

Note:

- Network Settings: You need to pay attention in case you check
 "Network Settings", it will affect KAIROS IP address after restart.
- Main Configuration: This part includes some Identify Data.
- Channels Table: You can load file to different frequency's model, like Load VHF file to UHF, in that case, you need to uncheck Channels Table, otherwise your KAIROS will be unlocked.

Select Items to load		
Base Station Network Settings Logging Settings Primay Synchronization Settings Main Configuration Alarm Traps Parameters Alarm Events definitions TRY Configuration	र र र र र र	Select All Deselect All Select for Cloning
TRX Configuration Channels Table Base Station Basic Data Base Station Operating Mode RPT Configuration SIP Configuration	<u>द</u> । द। द। द। द	
DSP PARAMETERS bank	V	ОК
		Cancel

3.4. ?

3.4.1. About...

🗴 About	23
∞ K	AIROS_Manager
	a JVCKENWOOD Company
	Version 1.7.1 KAIROS equipments remote control
	© 2014-2018 Radio Activity srl - © 2018 JVCKENWOOD
	www.radioactivity-tlc.it info@radioactivity-tlc.it
Use submitt	ed to license Close

3.4.2. KAIROS Equipment Info

It shows some Equipment Information.

You can know installed options status by this window without open physical KAIROS.

00	KAIROS Equipment Info		23				
	Equipment ID [hex]:	08404 F 60					
	Equipment Name:	MST DWN LINK					
	Equipment Serial Number:	450KA5490					
	Activation Date:	2018-07-03					
	Ethernet Address:	00:1E:18:40:04:F6					
	IP Address:	172.33.95.91					
	Station ID:	31					
	Network ID:	160					
	Working Band:	UHF 400÷470 MHz ITU Region 1 Band					
	Country:	Worldwide					
	Base Station Class:	Multiprotocol DMR Tier II Node					
	TRX Role:	RF LINK-DOWN NODE					
	DMR Role:	MASTER					
	DMR Individual ID:	2031					
	DMR Group ID:	101					
	- Installed Options						
	Installed Options						
	GNSS DMR Vocoder TS A DMR Vocoder TS B						
	Read		Close				

4. Appendix

4.1. IP Discover

When KAIROS is placed in field or coming back from a site, maybe a problem to connect to it if the IP address is unknown. A simple way to discover the IP is switching on KAIROS with the following procedure.

1. Switch off the equipment.

2. At equipment switched off, press the on/off button for at least 4 sec (all Radio LED will be orange), until the Radio LED start to flash orange slowly.

3. Release the on/off button => the Radio LED start to flash green fast.

4. Press again the on/off button within 4 seconds => the equipment goes in "IP discover status"

5. KAIROS performs all the setup procedure but its IP becomes: 172.33.16.140/16; during this status the Radio Led flash orange every 2 seconds to advise that the equipment is in a maintenance status.

6. Connect the setup tool to 172.33.16.140/16 address to see/change the IP currently in use in the equipment.

7. At the end of the procedure switch off the equipment pressing the on/off button for at least 2 sec as usual.

At the next power on, the equipment will assume the last IP saved.

4.2. Remote KAIROS

To connect Remote KAIROS via RF-LINK by KAIROS Manager, you need to pay attention for some settings.



Important items are written in **Bold**.

Item	MST	MST	SLV	SLV	Note
	Broadcaster	RF-Link Down	RF-Link Up	Broadcaster	
IP Address	172.33.91.12	172.33.95.91	172.33.95.92	172.33.91.13	Unique IP
					address
Subnet mask	255.255.0.0	255.255.0.0	255.255.0.0	255.255.0.0	
Station ID	10	15	16	11	Unique ID
Network ID	160	160	160	160	Same ID
DMR ID	2010	2015	2016	2011	Unique ID
TX Frequency	Freq VHF a1	Freq UHF a	Freq UHF b	Freq VHF a2	Recommended
RX Frequency	Freq VHF b1	Freq UHF b	Freq UHF a	Freq VHF b2	Recommended
Color code	1	1	1	1	Same CC
Synchronization	EXT PPS	Internal Ref	Internal Ref	EXT PPS	Recommended
		(Full)	(Full)		
Remote Control via	N/A	Slot A	Slot A	Slot A	Recommended
RF Link					
Display IDLE Packets	N/A	Yes	Yes	Yes	Recommended

- Ex) To connect Slave Broadcaster.
- (1) Enter RF-Link Down IP Address.
- (2) Choose DMR RF Link to Access.
- (3) Enter target remote KAIROS Station ID.
- (4) Increase Message Timeout more than 10 [s] is recommended.

172.33.95.91 (1)							
IP Port 4000	Protocol	C TCP	UDP				
Access Parameters							
Access Parameters Access Mode	Station ID ((1 - 254)	11				
Access Parameters Access Mode O Wired	✓ Station ID ((1 ÷ 254) • Access Feat	11 (

4.3. I/O Port



DB25 Connector

Pin No.	Signal Name	I/O	Signal Type	Description	Spec	Тур.	Remarks
1	GND	-	GND	GND	-	-	-
2		0	Digital		H: Not Good	3.3V	Open Collector
2	PWR_GOOD	0	Digital		L: OK	0	Output Pin.
2	INI 14	-	Analog	Audio Input for Analog (PM)	Around 1V p-p	1 Vp-p	For DMR need
3	IN_IA	1	Analog	Audio Input for DMR TS1			Vocoder option.
4		0	Analog	Audio Output for Analog (PM)		480mV	For DMR need
4	001_1A	0	J Analog	Audio Output for DMR TS1			Vocoder option.
5	M 1	0	Digital	Squelch Control for Analog	H: Not Busy	3.3V	
5	IVI_1	0	Digital	Squelch Control for DMR TS1	L: Busy	0	
6	IN 2A	-	Analog	Audio Input for Analog (FM)	Around 1V p-p	1 Vр-р	For DMR need
0	IN_2A	-	Analog	Audio Input for DMR TS2			Vocoder option.
7		0	Apolog	Audio Output for Analog (FM)		1V	For DMR need
1	001_2A	0	Analog	Audio Output for DMR TS2			Vocoder option.
	MO	0	Digital	Squelch Control for Analog	H: Not Busy	3.3V	Open Collector
0	IVI_2	0	Digital	Squelch Control for DMR TS2	L: Busy	0	Output Pin.
9	GND	-	GND	GND	-	-	-
10		0	Digital		H: Not Active	3.3V	Open Collector
10	1_100_01	0	Digital		L: Active	0	Output Pin.

			Divital		H: External Device OFF	3.3V	
11	IO_IN_3	I	Digital		L: External Device ON	0	
40			District	Alama lanata	H: Alarm OFF	3.3V	
12	ALR_IN1	I	Digital	Alarm Input1	L: Alarm ON	0	
				Power Supply for	-	Vcc V	Max 400mA.
13	+12Vcc_TO_	0	Analog	General Purpose External			
	EXT			Device			
	REMOTE_O				H (250msec): Power ON	3.3V	
14	NOFF	I	Digital	Power On/ Off Control	L (3sec): Power OFF	0	
					H: External PTT OFF	3.3V	
15	E_1	Ι	Digital	External PTT Switch1	L: External PTT ON	0	
				Audio Input for Analog (PM)	Around 1V p-p	1 Vp-p	For DMR need
16	IN_1B	I	Analog	Audio Input for DMR TS1			Vocoder option.
				Audio Output for Analog (PM)		480mV	For DMR need
17	OUT_1B	0	Analog	Audio Output for DMR TS1			Vocoder option.
					H: External PTT OFF	3.3V	
18	E_2	Ι	Digital	External PTT Switch2	L: External PTT ON	0	
				Audio Input for Analog (FM)	Around 1V p-p	1 Vp-p	For DMR need
19	IN_2B	Ι	Analog	Audio Input for DMR TS2			Vocoder option.
				Audio Output for Analog (FM)		1\/	For DMR need
20	OUT_2B					I V	
	_	0	Analog	Audio Output for DMR TS2		ĨV	Vocoder option.
		0	Analog	Audio Output for DMR TS2		0 to 20 V	Vocoder option.
		0	Analog	Audio Output for DMR TS2 Not isolated inputs for voltage		0 to 20 V	Vocoder option. 10k Ohm / 0 to 20V referred to ground.
21	V ext 1	0	Analog	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital.		0 to 20 V	Vocoder option. 10k Ohm / 0 to 20V referred to ground.
21	V_ext_1	0	Analog Analog	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control		0 to 20 V	Vocoder option. 10k Ohm / 0 to 20V referred to ground.
21	V_ext_1	0	Analog	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement.		0 to 20 V	Vocoder option. 10k Ohm / 0 to 20V referred to ground.
21	V_ext_1	0	Analog	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement.	H: Not Active	0 to 20 V	Vocoder option. 10k Ohm / 0 to 20V referred to ground.
21	V_ext_1 PTT_OUT	0 I 0	Analog Analog Digital	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement. PTT Output	H: Not Active	0 to 20 V 3.3V 0	Vocoder option. 10k Ohm / 0 to 20V referred to ground. Open Collector Output Pin.
21	V_ext_1 PTT_OUT	0 I 0	Analog Analog Digital	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement. PTT Output	H: Not Active L: Active	0 to 20 V 3.3V 0 3.3V	Vocoder option. 10k Ohm / 0 to 20V referred to ground. Open Collector Output Pin.
21 22 23	V_ext_1 PTT_OUT IO_IN_2	0 I 0 I	Analog Analog Digital Digital	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement. PTT Output AUX Input2	H: Not Active L: Active H: External Device OFF	0 to 20 V 3.3V 0 3.3V 0	Vocoder option. 10k Ohm / 0 to 20V referred to ground. Open Collector Output Pin.
21 22 23	V_ext_1 PTT_OUT IO_IN_2	0 I 0	Analog Analog Digital	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement. PTT Output AUX Input2	H: Not Active L: Active H: External Device OFF L: External Device ON H: Alarm OFF	0 to 20 V 3.3V 0 3.3V 0 3.3V	Vocoder option. 10k Ohm / 0 to 20V referred to ground. Open Collector Output Pin.
21 22 23 24	V_ext_1 PTT_OUT IO_IN_2 ALR_OUT	0 I 0 I	Analog Analog Digital Digital Digital	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement. PTT Output AUX Input2 Alarm Output	H: Not Active L: Active H: External Device OFF L: External Device ON H: Alarm OFF	0 to 20 V 3.3V 0 3.3V 0 3.3V 0 3.3V 0	Vocoder option. 10k Ohm / 0 to 20V referred to ground. Open Collector Output Pin. Open Collector Output Pin
21 22 23 24	V_ext_1 PTT_OUT IO_IN_2 ALR_OUT	0 I 0 I	Analog Analog Digital Digital	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement. PTT Output AUX Input2 Alarm Output	H: Not Active L: Active H: External Device OFF L: External Device ON H: Alarm OFF L: Alarm OFF	0 to 20 V 3.3V 0 3.3V 0 3.3V 0 3.3V 0 3.3V	Vocoder option. 10k Ohm / 0 to 20V referred to ground. Open Collector Output Pin. Open Collector Output Pin.
21 22 23 24 25	V_ext_1 PTT_OUT IO_IN_2 ALR_OUT ALR_IN2	0 	Analog Analog Digital Digital Digital	Audio Output for DMR TS2 Not isolated inputs for voltage sensing. ADC port form Analog to Digital. It can be used by Net Control software at this mement. PTT Output AUX Input2 Alarm Output Alarm Input2	H: Not Active L: Active H: External Device OFF L: External Device ON H: Alarm OFF L: Alarm OFF L: Alarm ON	0 to 20 V 3.3V 0 3.3V 0 3.3V 0 3.3V 0 3.3V 0	Vocoder option. 10k Ohm / 0 to 20V referred to ground. Open Collector Output Pin. Open Collector Output Pin.

6pin Connector for	flat	cable
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Pin No.	Signal Name	I/O	Signal Type	Description		Remarks
1	+12V	0	DC	This pin provides 13.2V, limited at 400mA, to supply a general purpose external device		
2	PPS_IN_ CONN	I/O	Digital	This pin supports an external PPS signal or can share the internal PPS (from GPS receiver or from the PTP or from other sourced synch). As described previously, a bus connection between different co-located KAIROS realizes a multiple GPS reception with automatic backup. This pin can also be configured to accept an external synchronous clock or an external pulse per second signal. Contact Factory for further details.	3.3V 0	
3	OUT_1+1_ MNG_CONN	0	Digital	These pins support a simple protocol to allow two KAIROS to functioning as 1+1 (main and spare) redundancy equipment.	3.3V 0	
4	IN_1+1_ MNG_CONN	I	Digital	These pins support a simple protocol to allow two KAIROS to functioning as 1+1 (main and spare) redundancy equipment.	3.3V 0	
5	FAN	0	Digital	It is closed to GND when the temperature of the internal RF power amplifier rises above the threshold (typ 65°C). It can be used to switch on cooling fans in a cabinet.	3.3V 0	
6	GND	Ι	Analog	GND terminal	0V	



4.4. RF-Link (2 sites) setting

Important items are written in **Bold**.

Item	Master	RF-Link	RF-Link	Slave	Note
		Downlink	Uplink	Broadcaster	
Own IP Address	172.33.91.12	172.33.95.91	172.33.95.92	172.33.91.13	Unique IP
					address
Subnet mask	255.255.0.0	255.255.0.0	255.255.0.0	255.255.0.0	Recommended
Master IP Address	N/A	172.33.91.12	N/A	172.33.95.92	Important
Remote Control via	N/A	Slot A	Slot A	Slot A	Recommended
RF Link					
Operative Mode	Master	RF Link-Down	RF Link-Up	Slave	Important
Base Station Role	MASTER	LINK DOWN	LINK UP TO	BROADCASTER	Important
		ΤΟ ΝΕΤ	MATER		
Voting Delay	3	N/A	N/A	N/A	Important
Network Delay	8	6	2	8	Important
Station ID	250	77	64	65	Unique ID
Network ID	160	160	160	160	Same ID
DMR ID	2048	2077	2048	2049	Unique ID
TX Frequency	Any F1tx	Any F2tx	Any F3rx	Any F1tx	Important
RX Frequency	Any F1rx	Any F3rx	Any F2tx	Any F1rx	Important
Color code	1	1	1	1	Same CC
Synchronization	GPS	EXT PPS(Full)	GPS	EXT PPS(Full)	Recommended
Display IDLE Packets	N/A	Yes	Yes	Yes	Recommended
TX: act as	Base Station	Base Station	Base Station	Base Station	Important
RX: act as	Base Station	Mobile Station	Mobile Station	Base Station	Important
Hang Times,	150	0	0	150	Recommended
Private/Group Calls					
Hang Times, Data	16	0	0	16	Recommended

Hang Times, Channel	16	100	100	16	Recommended
RX Pkts Advance	0	2	6	0	Important

Typical delays for RF linked networks

