Artemis MKV

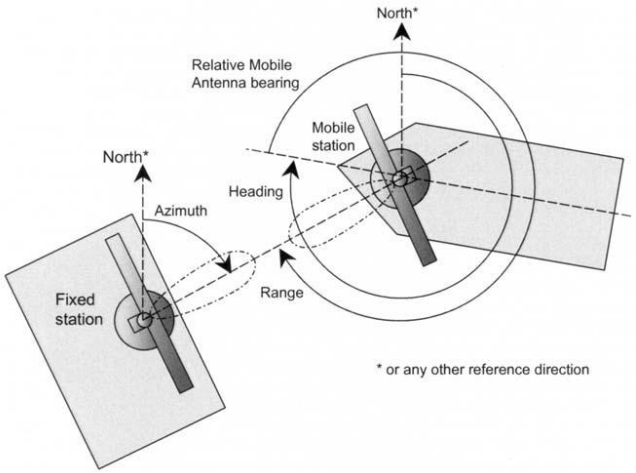
Ver 2012_a

General system description

Artemis control software (HMI)

Technical equipment description

Brief system description



- Range bearing position system consists of two units
- fix/ beacon at fixed point. Mobile at vessel
- Continuous wave (CW) is used for locking, tracking, distance and azimuth measurement.
- Mobile measure distance
- Fix measure azimuth
- Measurements used for absolute position or relative position

Setup a unit

- Configuration: Mobile or Fix
- Frequency pair 0,1,2 or 3
- Address code 0-63 (do not use 62)
- Bearing allignment (mobile) Bow of vessel=0˚
- Azimuth allignment (Fix) True north=0˚ or bow vessel=0˚
- Scan sector

Operate the system

- Free line of sight?
- Correct mode selected : Mk4 (artemis mk4)?
- Correct frequency pair selected? (fix=mob)
- Correct address code selected? (fix=mob)

Specification

- Frequency band : 9.2 - 9.3GHz
  - Selectable frequency pairs as used by MK4
- Distance measurement 10-5000m
  - 1 m standard deviation
  - 0.1m resolution
- Azimuth measurement 0-360 degrees
  - 0.02 degree standard deviation
  - 0.01 degree resolution
- Supply voltage 230 VAC, 50/60Hz (optional 24VDC)
- Station compatible with MKIV *(NOT MKIII !)*

RESON

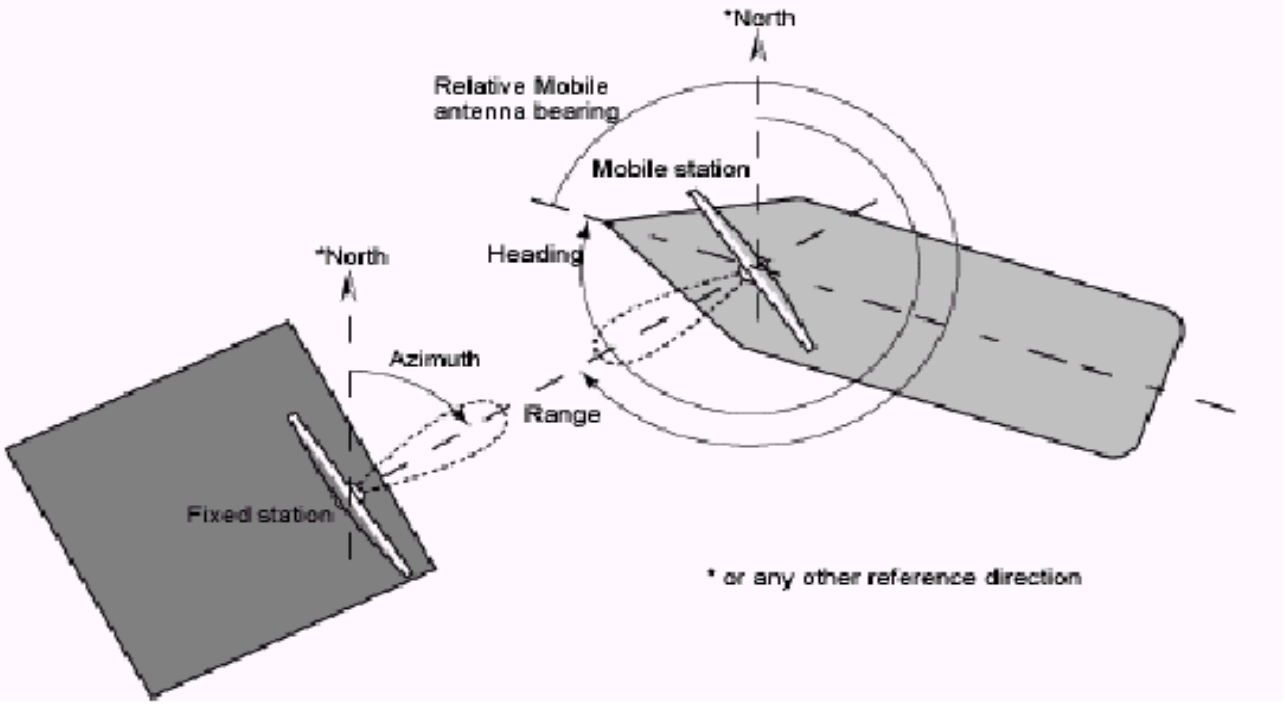
- Unit controlled by software.
  (easy to add new features)
- Data I/O
  - Ethernet or RS422
  - MKIV data formats
- Options
  - -Heating antenna
  - -Explosion proof

Advantages of the MK5

- Software controlled. (changes could easily added)
- Better lock-in principle. (no expensive and sensitive gearbox)
- MK4 components difficult to deliver (mixer, gunn)
- UTP communication
- RS422 communication

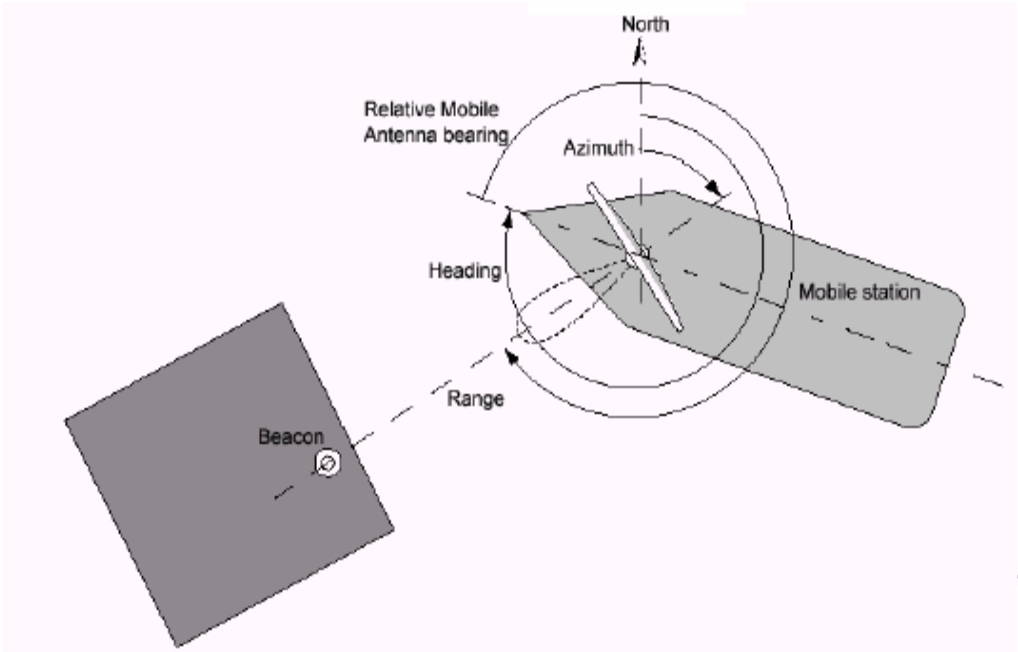
Fix - Mob configuration

- Azimuth, bearing and heading
- heading=180-rel bearing + azm



Beacon-Mob configuration

- Bearing and heading
- Azm = Rel bearing+heading-180



Installations

Main functions

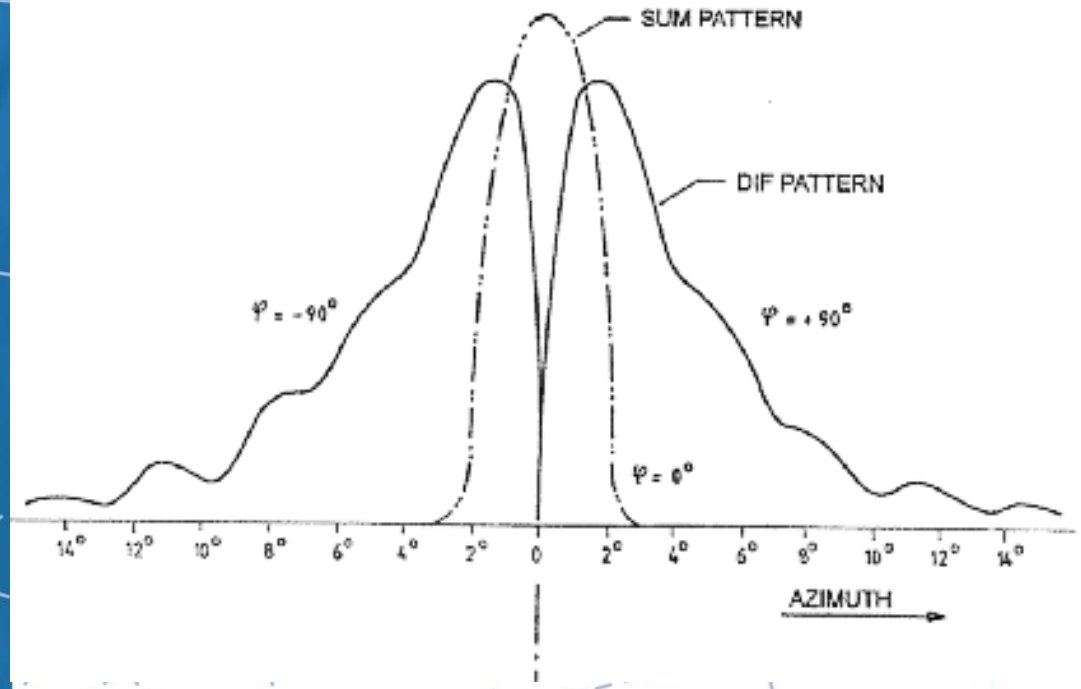
- Locking and tracking
- Distance measurement
- Azimuth measurement
- Communication

Locking &Tracking principle

- Locking : finding signals counter antenna
- Tracking : following signals counter antenna
- Based on design of antenna:
- SUM port
- energy divided equally and in phase between 2 slotted waveguide parts
- Dif port
  Difference pattern: zero signal in broadside differing 180 deg. in phase
- Phase detector creates error voltage (amplitude and polarity depends of incoming wave front)
- Error voltage control motor which drives antenna.

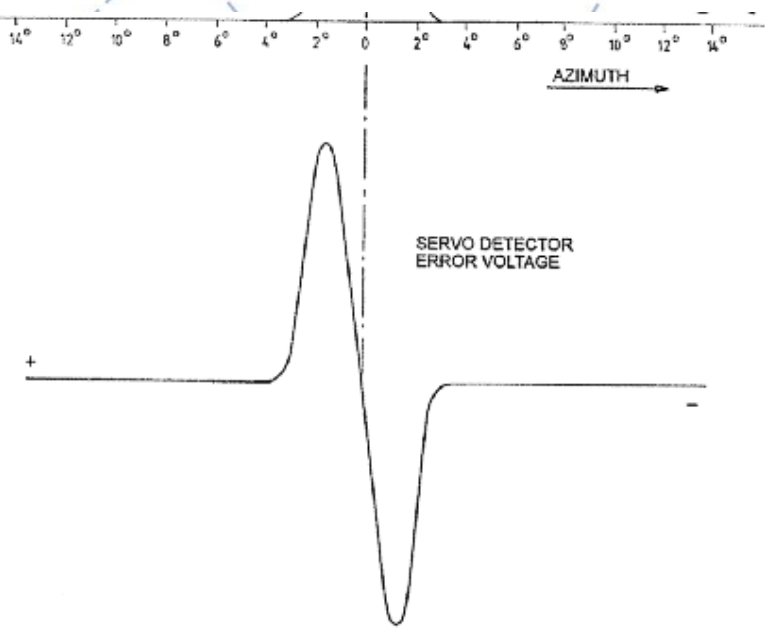
RESON

Sum Diff pattern



Error correction voltage

- Drives motor
- Amplitude proportional of deviation incoming wave front
- Polarity depend of direction incoming wave front (max 3 degrees)

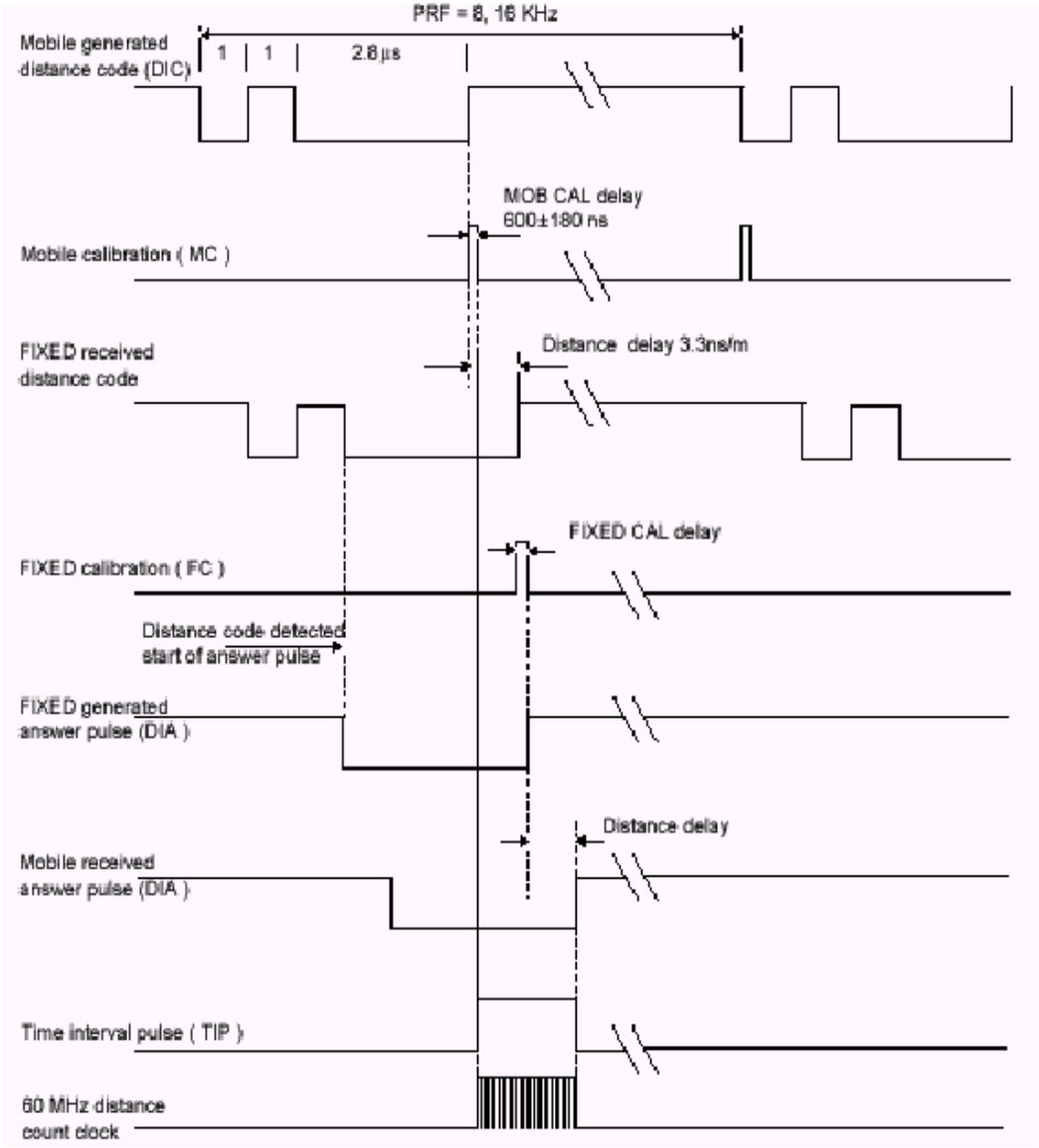


Phase shifter adjustment

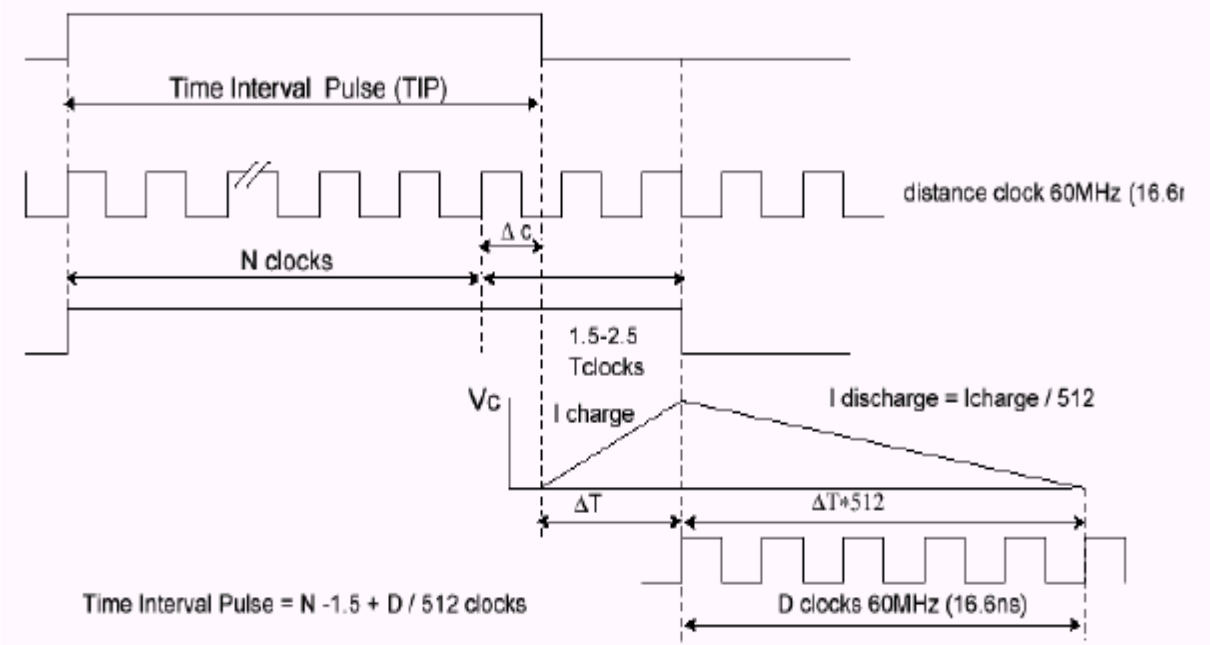
- Could be needed by scanner replacement
- In lock: SUM max, diff min and phase diff 90 degrees
- Engineer note. (Measurement at AUP)
- 2 degrees out of lock: phase difference sum/diff 0 degree or 180 degrees. (measured at AUP) and servo voltage high value.
- If phase shifter miss-adjusted ; Distance instable, poor signal level, poor or no lock. Could be frequency sensitive

Distance measurement principle

- Same as MK4
- Time measurement between transmit and receive pulse
  - S=(VxT)\2
- Radar interference : filter
- Future separate Mk5 method

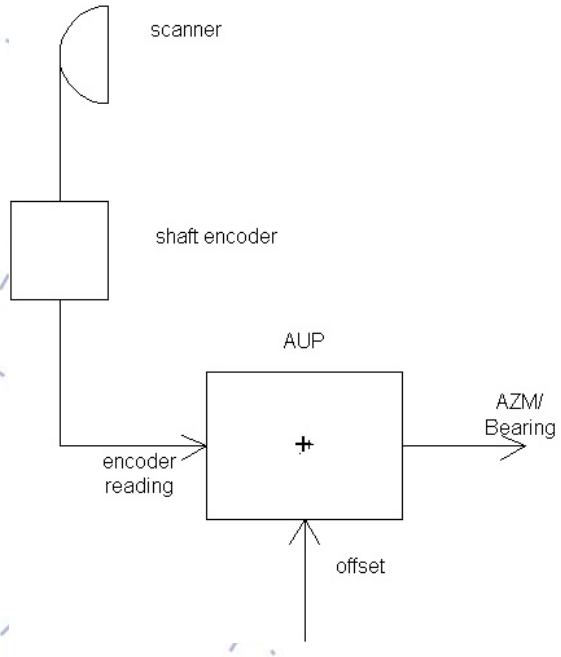

PRF = 8, 16 KHz
Mobile generated distance code (DIC)
1
1
2.8 µs
MOB CAL delay 600±180 ns
Mobile calibration (MC)
FIXED received distance code
Distance delay 3.3ns/m
FIXED CAL delay
FIXED calibration (FC)
Distance code detected start of answer pulse
FIXED generated answer pulse (DIA)
Distance delay
Mobile received answer pulse (DIA)
Time interval pulse (TIP)
60 MHz distance count clock

Time interval measurement



- 1 clock pulse = distance 4.9m
- Charge time cap=1.5 clock pulse + dC=dT
- Discharge time=512XdT ->clock count D
- Total clock count=N-1.5-(D/512)

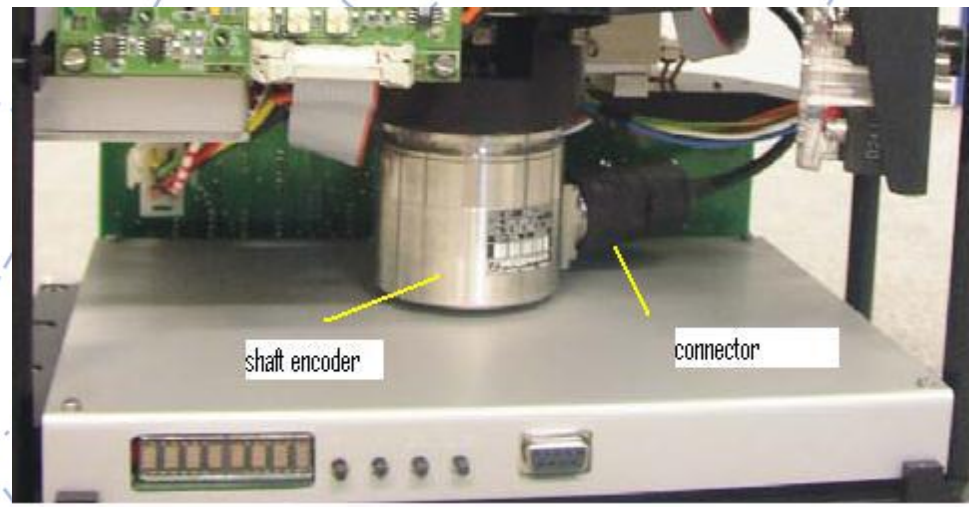
Azimuth & Bearing measurement



- Azimuth – Fix.
- Bearing - Mobile
- A 17 bits gray code optical encoder (accuracy 0.001 degrees) coupled to antenna shaft
- Serial message inputted to antenna unit processor board (AUP)
- AUP add offset for alignment.

Exercise 1

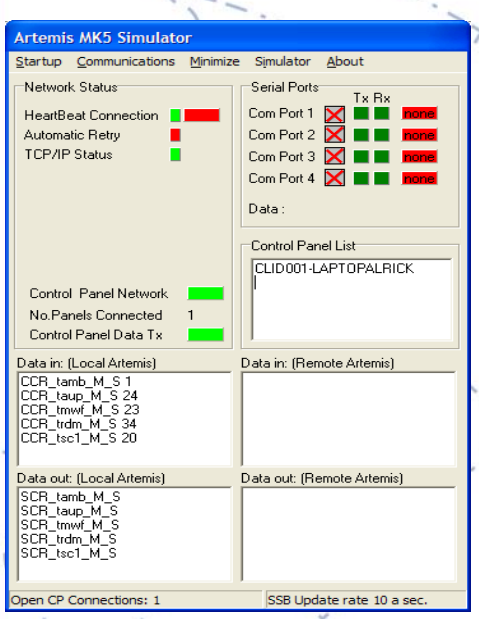
- Remove and place back shaft encoder.
- Align scanner to 180º

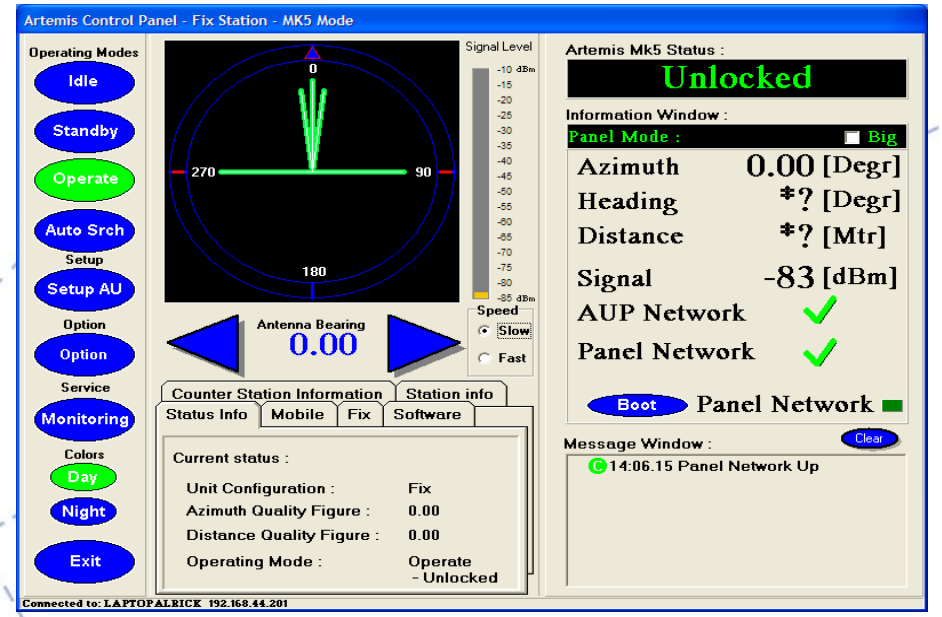


Communication

- Ethernet communication (100m max) –> Select Advanced protocol
- RS422 communication–> Select RS422/232 protocol and com port of computer. (A RS422-232 converter must be used)

HMI (Human interface)





- Network program
- Control panel program

RESON

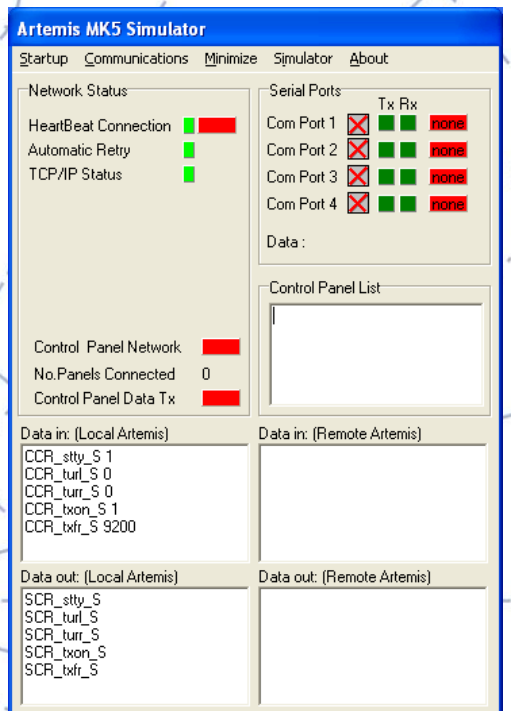
Installing the HMI

- TCP/IP address 192.168.044.201
- “.” as decimal separator (language setting)
- Change screen resolution to fill screen
- C:\artemismk5
- 2 shortcuts on desktop (network and control panel)

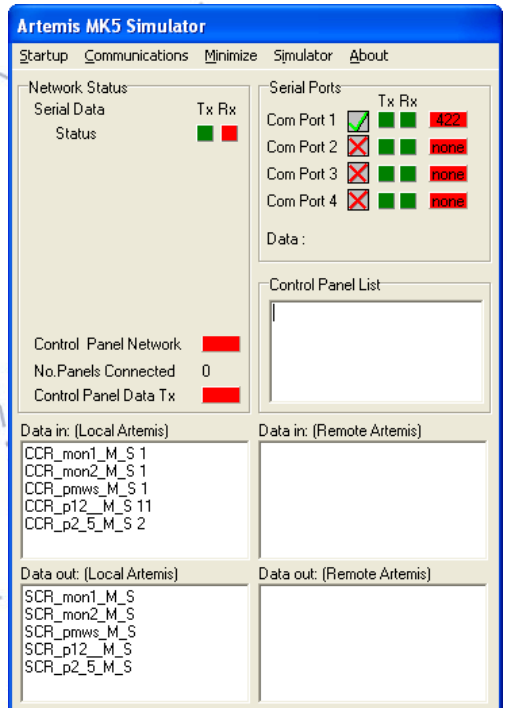
Network

- Communication with Antenna unit
- RS422 or advanced protocol

Ethernet communication:

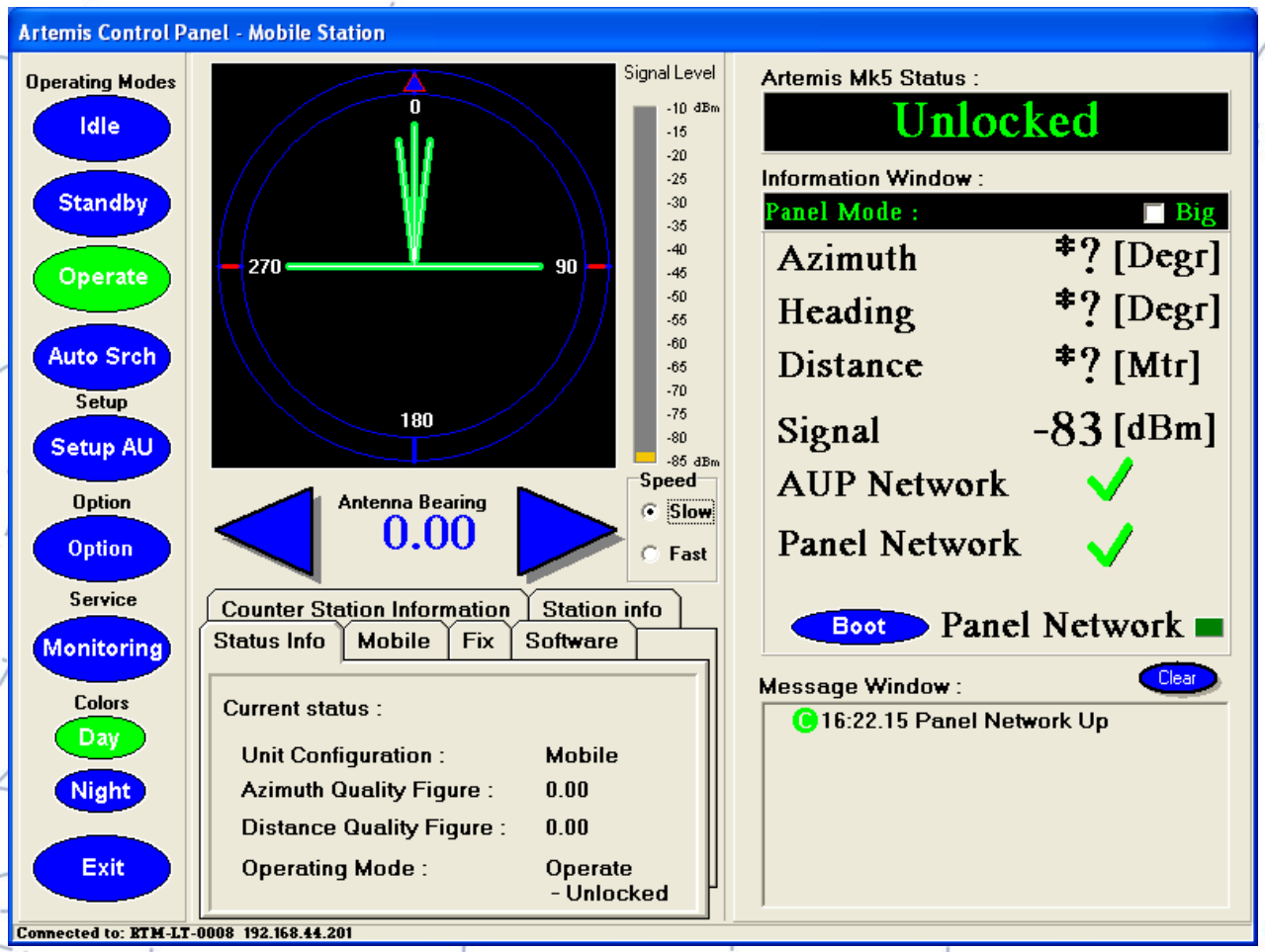


RS422/RS232 communication

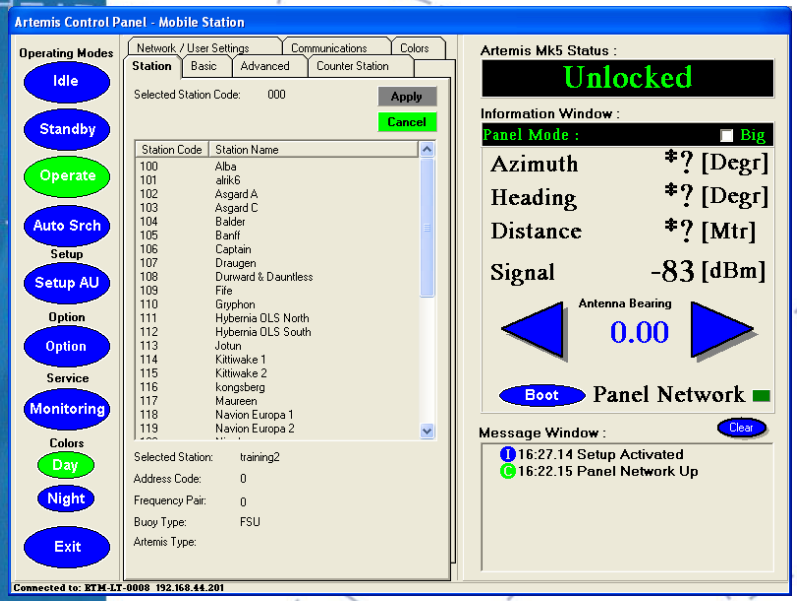


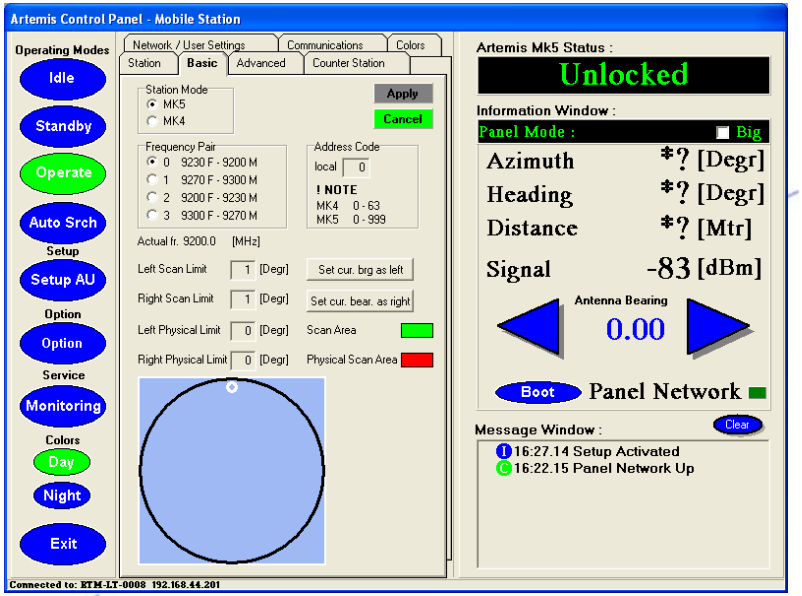
Control panel

- Operate page



Setup


Artemis Control Panel - Mobile Station
Operating Modes
Idle
Standby
Operate
Auto Srch
Setup
Setup AU
Option
Option
Service
Monitoring
Colors
Day
Night
Exit
Network / User Settings
Communications
Colors
Station
Basic
Advanced
Counter Station
Selected Station Code: 000
Apply
Cancel
Station Code
Station Name
100 Alba
101 alrik6
102 Asgard A
103 Asgard C
104 Balder
105 Banff
106 Captain
107 Draugen
108 Durward & Dauntless
109 Fife
110 Gryphon
111 Hybernia OLS North
112 Hybernia OLS South
113 Jotun
114 Kittiwake 1
115 Kittiwake 2
116 kongsberg
117 Maureen
118 Navion Europa 1
119 Navion Europa 2
Selected Station: training2
Address Code: 0
Frequency Pair: 0
Buoy Type: FSU
Artemis Type:
Artemis Mk5 Status :
Unlocked
Information Window :
Panel Mode :
Big
Azimuth *? [Degr]
Heading *? [Degr]
Distance *? [Mtr]
Signal -83 [dBm]
Antenna Bearing
0.00
Boot
Panel Network
Message Window :
Clear
16:27.14 Setup Activated
16:22.15 Panel Network Up
Connected to: RTM-LT-0008 192.168.44.201


Artemis Control Panel - Mobile Station
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Setup AU
Option
Option
Service
Monitoring
Colors
Day
Night
Exit
Network / User Settings
Communications
Colors
Station
Basic
Advanced
Counter Station
Station Mode
MK5
MK4
Apply
Cancel
Frequency Pair
0 9230 F - 9200 M
1 9270 F - 9300 M
2 9200 F - 9230 M
3 9300 F - 9270 M
Address Code
local 0
! NOTE
MK4 0 - 63
MK5 0 - 999
Actual fr. 9200.0 [MHz]
Left Scan Limit 1 [Degr]
Set cur. brg as left
Right Scan Limit 1 [Degr]
Set cur. bear. as right
Left Physical Limit 0 [Degr]
Scan Area
Right Physical Limit 0 [Degr]
Physical Scan Area
Artemis Mk5 Status :
Unlocked
Information Window :
Panel Mode :
Big
Azimuth *? [Degr]
Heading *? [Degr]
Distance *? [Mtr]
Signal -83 [dBm]
Antenna Bearing
0.00
Boot
Panel Network
Message Window :
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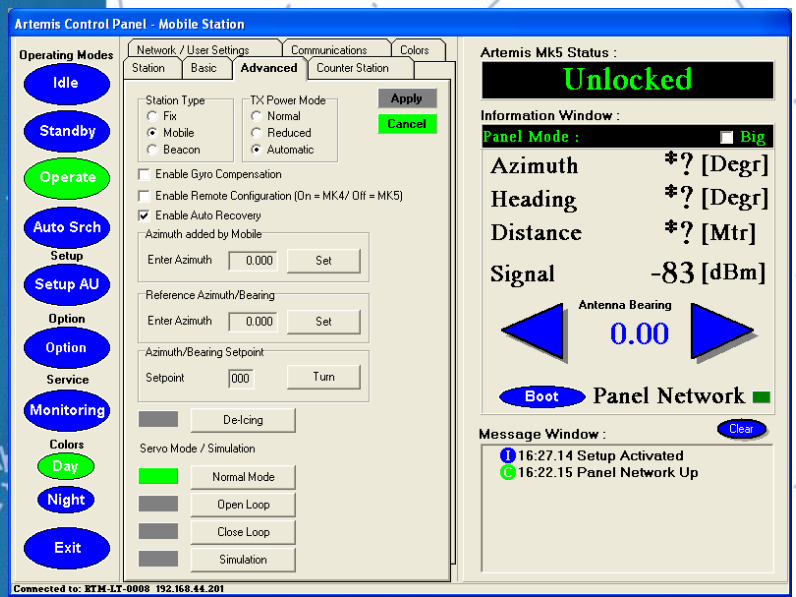
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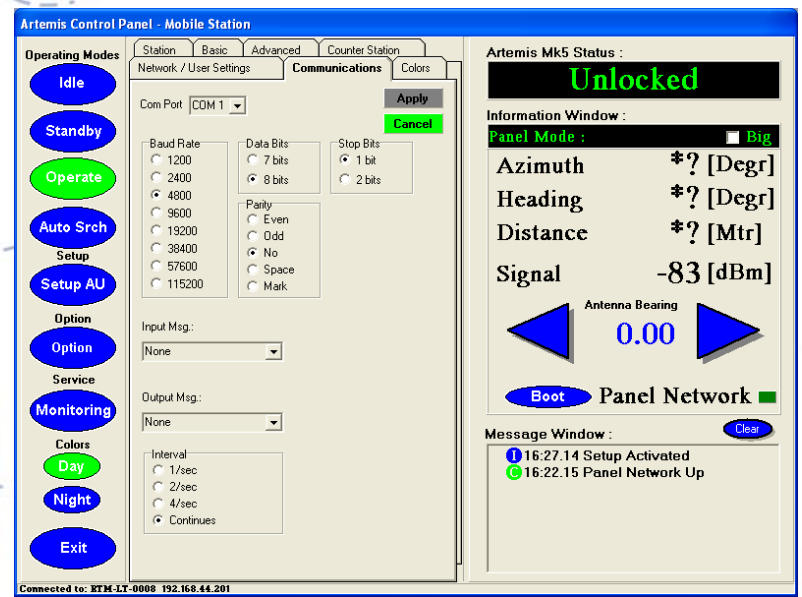
Idle
Standby
Operate
Auto Srch
Setup
Setup AU
Option
Option
Service
Monitoring
Colors
Day
Night
Exit
Network / User Settings
Communications
Colors
Station
Basic
Advanced
Counter Station
Station Type
Fix
Mobile
Beacon
TX Power Mode
Normal
Reduced
Automatic
Apply
Cancel
Enable Gyro Compensation
Enable Remote Configuration (On = MK4/ Off = MK5)
Enable Auto Recovery
Azimuth added by Mobile
Enter Azimuth 0.000 Set
Reference Azimuth/Bearing
Enter Azimuth 0.000 Set
Azimuth/Bearing Setpoint
Setpoint 000 Turn
De-Icing
Servo Mode / Simulation
Normal Mode
Open Loop
Close Loop
Simulation
Artemis Mk5 Status :
Unlocked
Information Window :
Panel Mode :
Big
Azimuth *? [Degr]
Heading *? [Degr]
Distance *? [Mtr]
Signal -83 [dBm]
Antenna Bearing
0.00
Boot
Panel Network
Message Window :
Clear
16:27.14 Setup Activated
16:22.15 Panel Network Up
Connected to: RTM-LT-0008 192.168.44.201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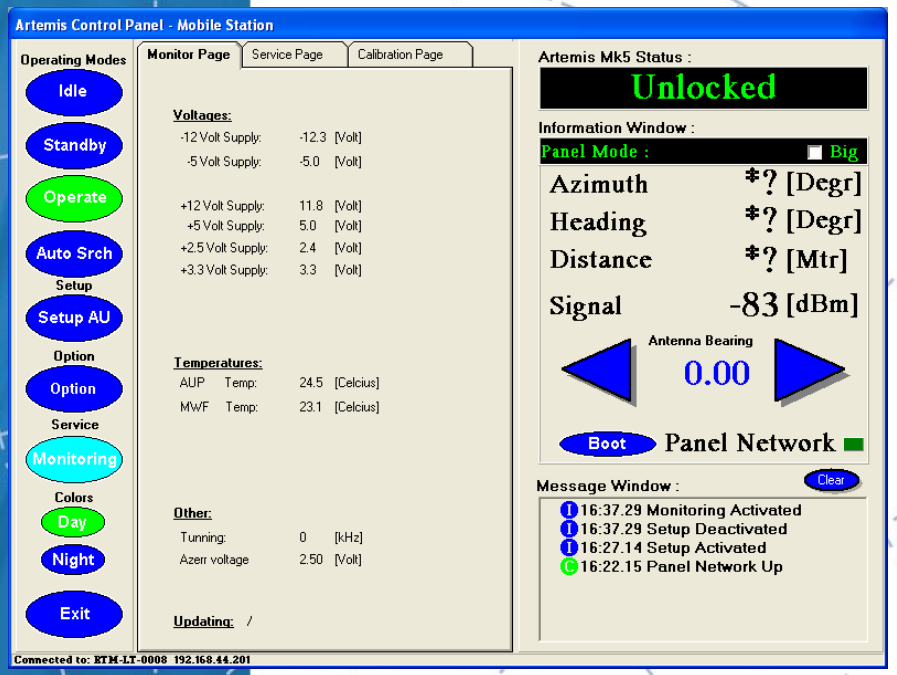
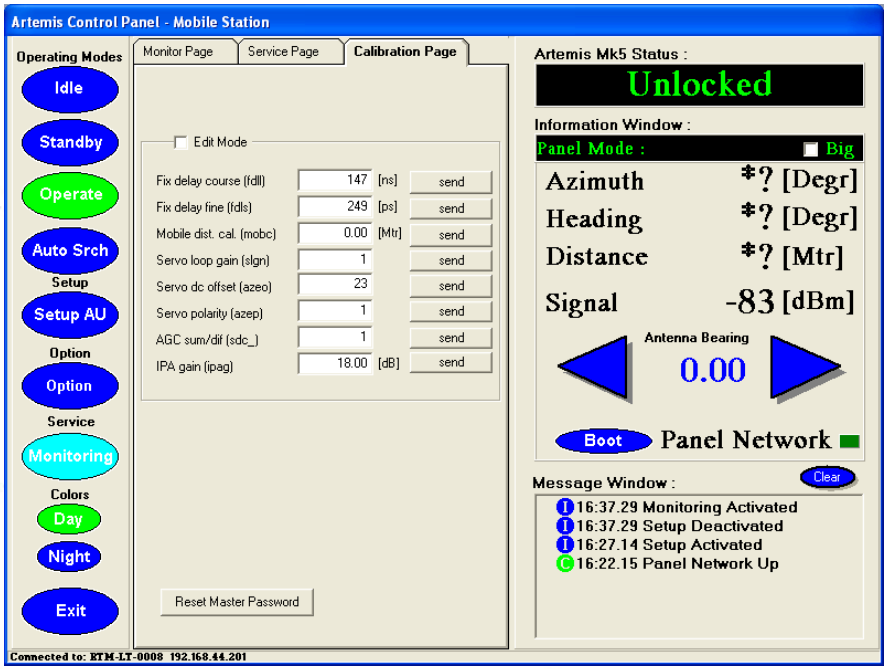
Operating Modes
Idle
Standby
Operate
Auto Srch
Setup
Setup AU
Option
Option
Service
Monitoring
Colors
Day
Night
Exit
Station
Basic
Advanced
Counter Station
Network / User Settings
Communications
Colors
Com Port COM 1
Apply
Cancel
Baud Rate
1200
2400
4800
9600
19200
38400
57600
115200
Data Bits
7 bits
8 bits
Stop Bits
1 bit
2 bits
Parity
Even
Odd
No
Space
Mark
Input Msg.:
None
Output Msg.:
None
Interval
1/sec
2/sec
4/sec
Continues
Artemis Mk5 Status :
Unlocked
Information Window :
Panel Mode :
Big
Azimuth *? [Degr]
Heading *? [Degr]
Distance *? [Mtr]
Signal -83 [dBm]
Antenna Bearing
0.00
Boot
Panel Network
Message Window :
Clear
16:27.14 Setup Activated
16:22.15 Panel Network Up
Connected to: RTM-LT-0008 192.168.44.201

Adjustments/settings

- Passwords “setup” or “Release”
- Current settings: <monitor> <service>
- Adjustments: <monitor> <calibration>

Monitor





RESON

Set up a Fix

- Alignment to reference point
- Setup scan sector
- Auto search mode
- Correct freq and address code
- Enable auto recovery!

Set up a Mobile

- Align to bow 0º
- Setup scan sector
- Communication for DP (com port, telegram and baud rate)
- Communication for Blom (com port, telegram and baud rate)
- Auto search or hand search
- Correct freq pair and address code or station code
- Enable auto recovery
- Only the communication settings are stored on the PC all other are stored in the AU.

Exercise 2

- Setup the Artemis with:
- Communication to the Artemis: ethernet
- Type: Mobile
- Tx power mode: automatic
- Frequency pair: 2
- Address: 22
- Left scan sector 90, Right scan sector 270
- Com1: Baud rate 2400/2400/7N2 Telegram ADB
- Enable auto recovery

Exercise 3

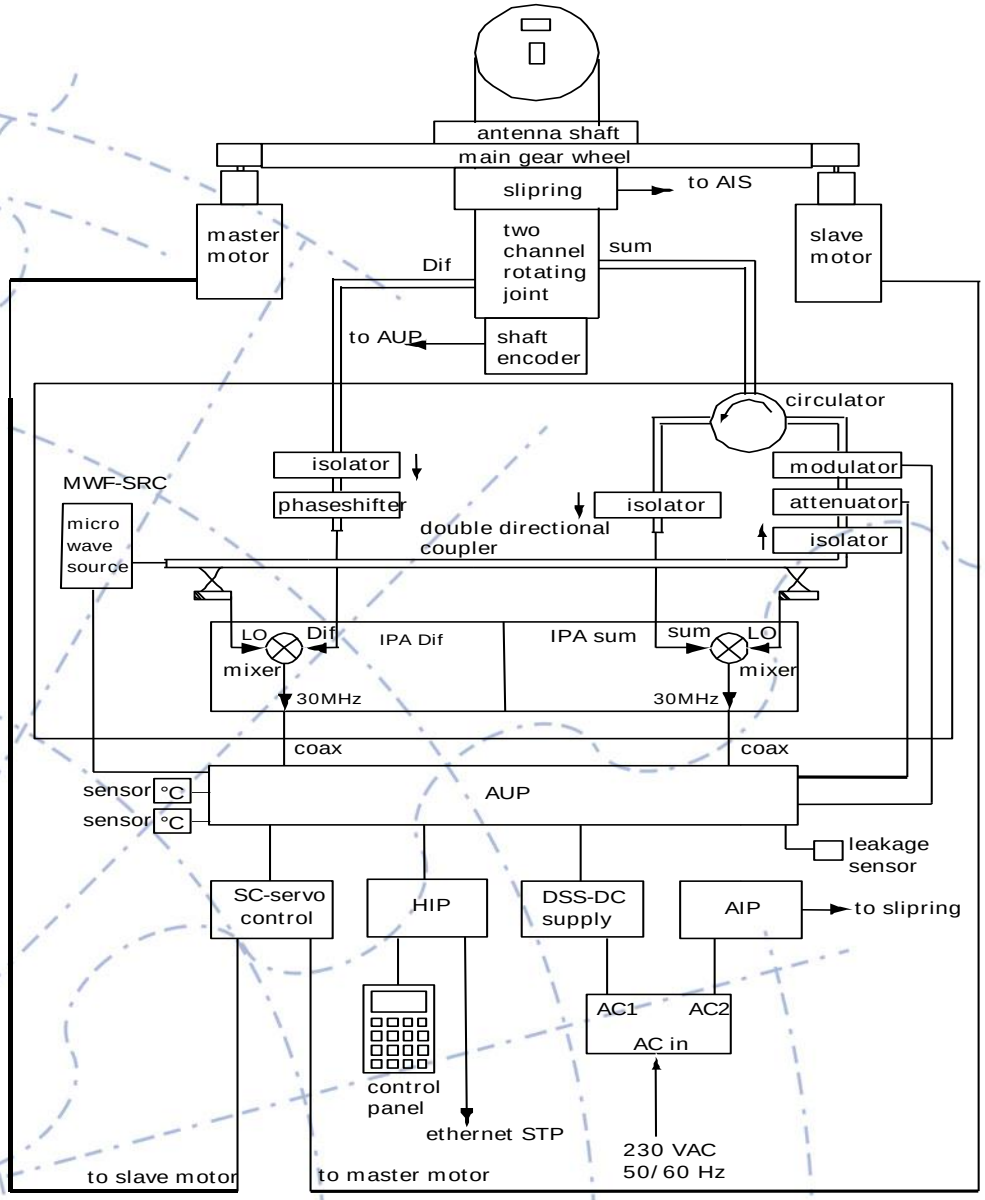
- Add a Buoy to station list:
- Name: Exercise
- Frequency pair:0
- Address code: 33
- Type: Mk4 fix

Exercise 4

- Setup a Artemis with:
- Communication to Artemis unit: Ethernet
- Station type: fix
- Left scan sector 250, right scan sector 100
- Frequency pair: 3
- Address code: 44
- Mode: Auto search
- Auto recovery enabled

Antenna unit

- Master and slave motor
- Servo control board
- Shaft encoder
- Antenna unit processor board (AUP)
- IF pre amplifier (IPA)
- Microwave source
- Communication board UTP (A5EOR)
- Power supply
- Several waveguide parts
- Optional anti icing power (AIP)


antenna shaft
main gear wheel
slipring
to AIS
master motor
two channel rotating joint
sum
Dif
slave motor
to AUP
shaft encoder
circulator
isolator
modulator
MWF-SRC
phaseshifter
isolator
attenuator
micro wave source
double directional coupler
isolator
LO
Dif
IPA Dif
IPA sum
sum
LO
mixer
mixer
30MHz
30MHz
coax
coax
sensor °C
sensor °C
AUP
leakage sensor
SC-servo control
HIP
DSS-DC supply
AIP
to slipring
AC1
AC2
AC in
control panel
ethernet STP
230 VAC 50/60 Hz
to slave motor
to master motor

RESON

Waveguide parts

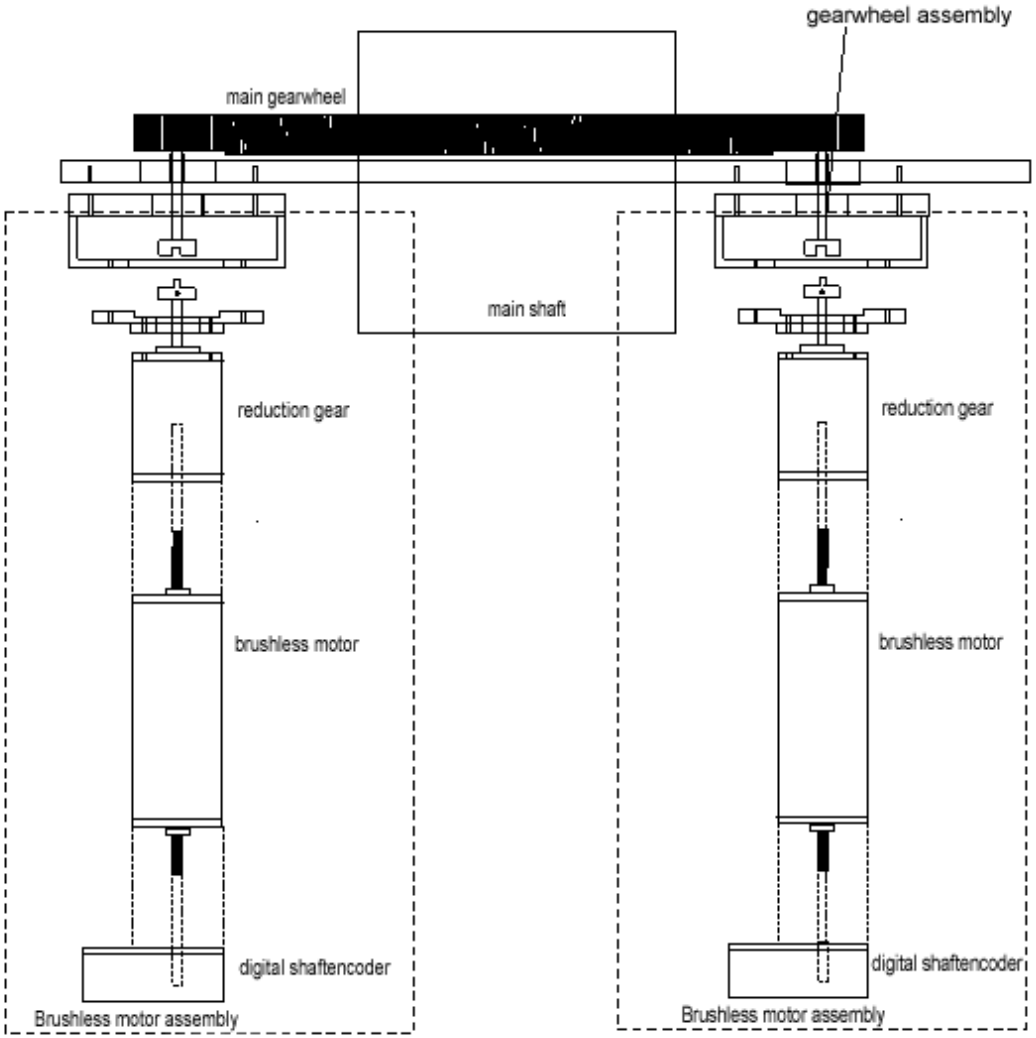
- Rotary joint
- Circulator
- Attenuator and modulator (pin diode)
- Isolator
- Double direction coupler
- Phase shifter

RESON

Good to know (waveguides)

- Some are compatible with MKIV
- Choking of modulator and attenuator
- Check pin diode
- Phase shifter adjustment
- Water damage

“Moving” parts



RESON

Motor assembly

- Drives and lock antenna
- Consists of
- Brushless motor
- Motor encoder for controlling speed and shaft position
- Reduction gear
- Replace as one part

Exercise 5

- Remove master motor
- Turn scanner with slave motor disconnected
- Turn scanner with master motor disconnected

Servo control board

- Consists of 2 DSP. Software loaded from AUP during start up.
- Controls master and slave motor

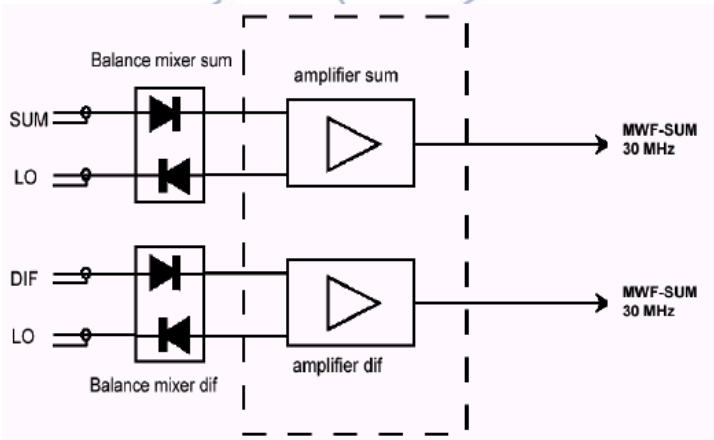
  speed, timing, current, couple and position
- Backlash reduction function when locked

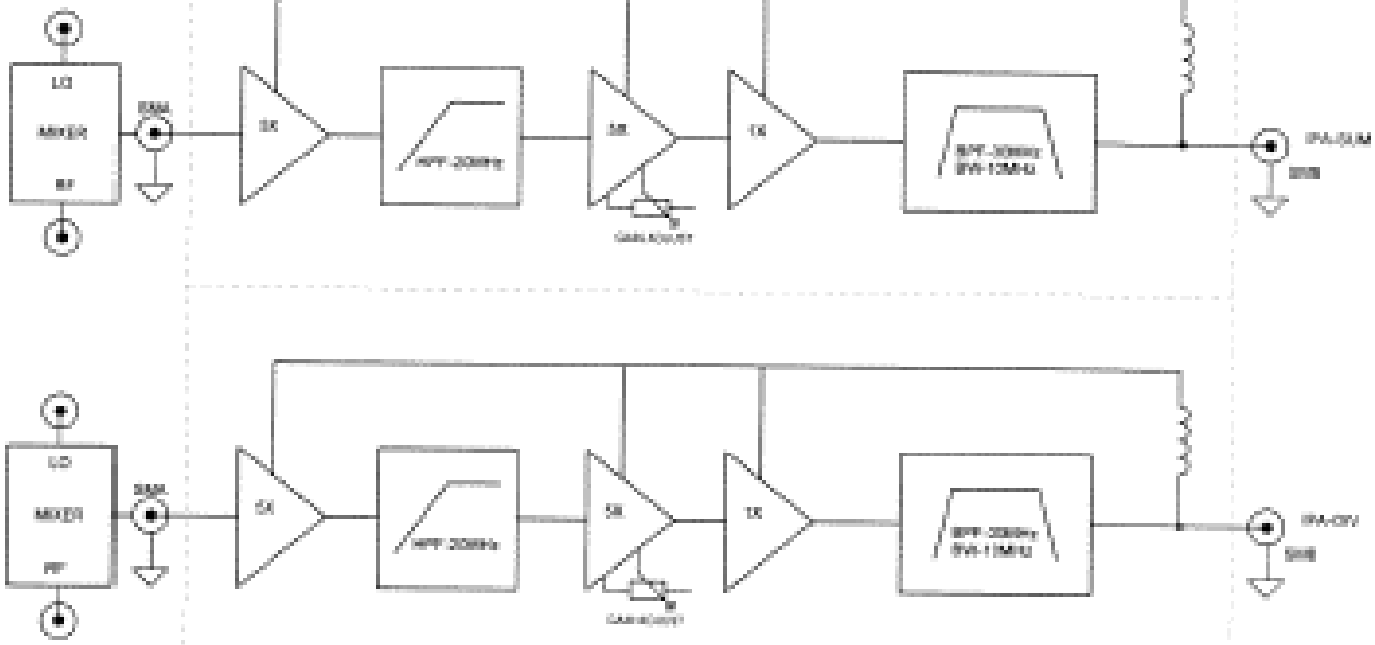
  Master in drive mode, slave in break mode analogue controlled
- In search mode only master and serial control of motors
- Power supply; +12V, -12V, +5V and 24V

RESON

IPA

- (IF and preamplifier module)
- Sum and DIF part
- Mixes incoming wave front with LO resulting in 30MHz output



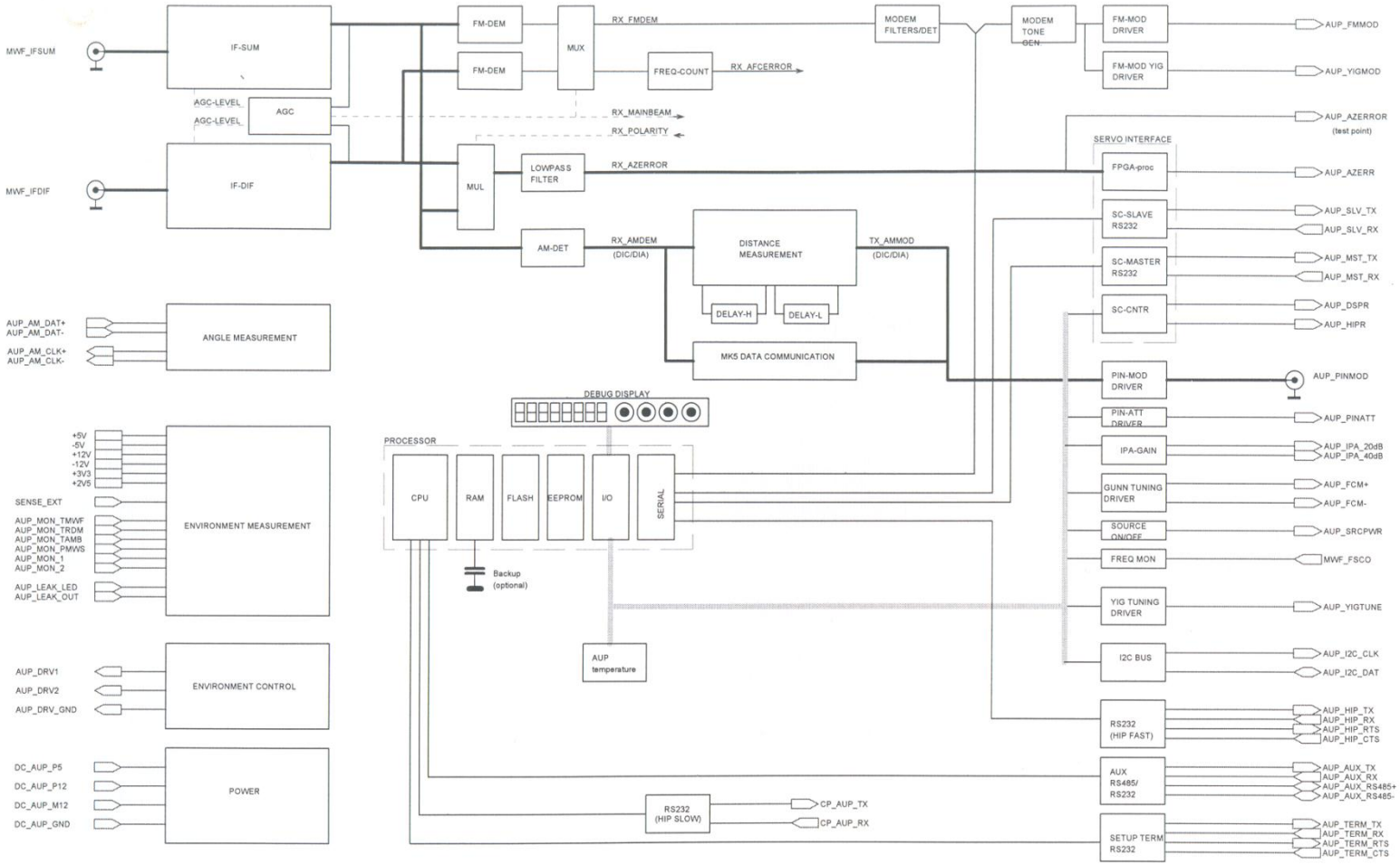

LO
MIXER
RF
IF
RF
LO
MIXER
RF
IF
RF

Good to know IPA

- 5V power
- Change complete
- No X-tall currents
- Suml and difl value on AUP
- Modifications

AUP functions

- Transmitter and receiver functions
- Lock and tracking control
- Distance measurement
- Angle measurement
- Environment measurement
- Interfacing with devices
- Controlling other modules



CHL
Lageweg 16
2222 AG Katwijk
Tel +31 (0)71 4025514
Fax +31 (0)71 4025078

Friday, August 27, 2004

Title	AUP Module	Sheet	4 of 10
Filename	MK5 Modules (AUP)		

Revnr.	Date	Drawn	Remarks
	2003-02-12	JMH	

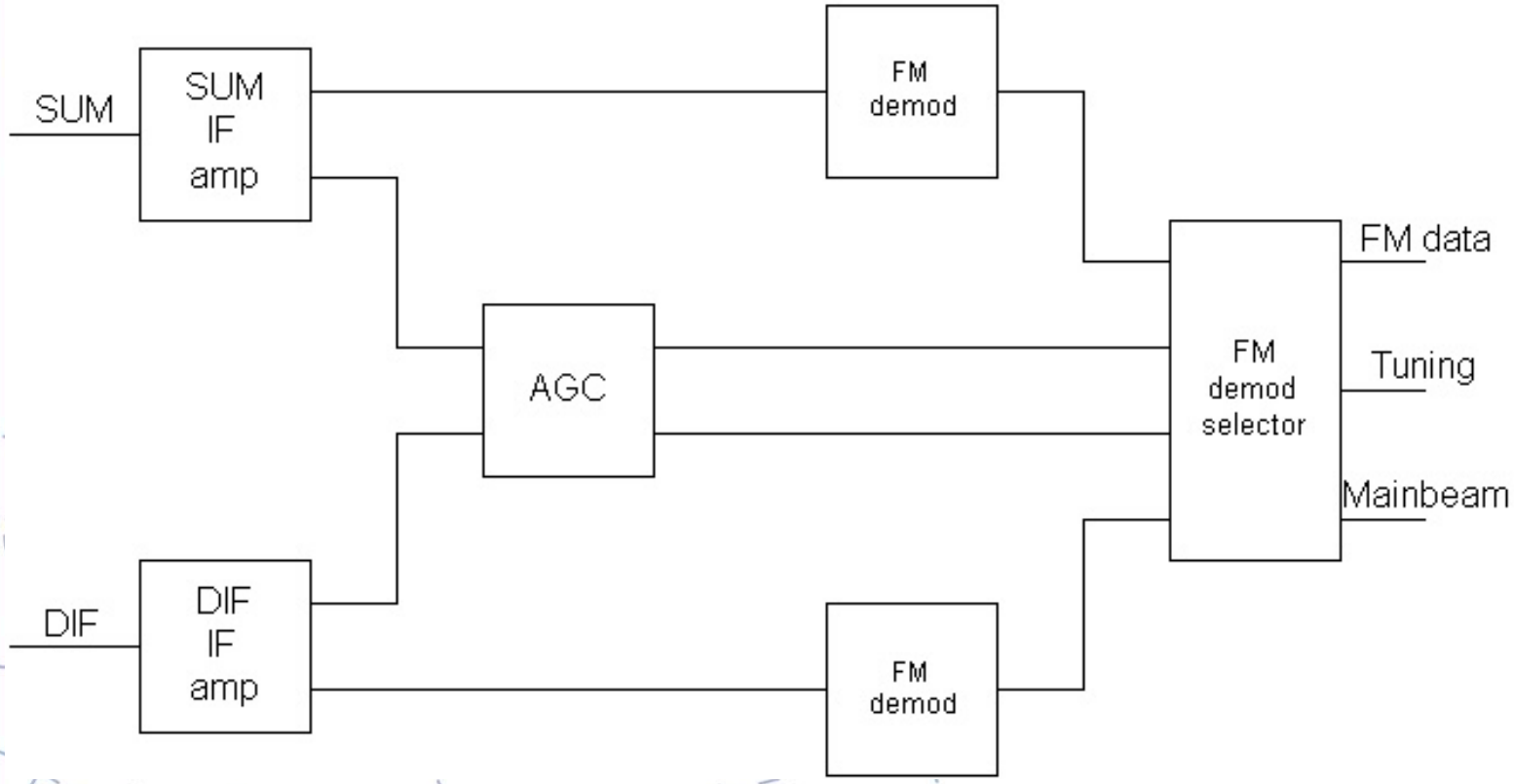
Appr.	Date	NO
<appr.>	<appr.date>	<no>

RESON

Transmit / receive functions

- AM Distance pulse (modulator)
- Standby, long and short control (attenuator)
- Gunn frequency control.
- FM modulation to gunn (varactor)
- IF SUM and DIF amplifier
- Main beam AGC selection
- FM demodulation
- Receiver signals (Rx_Azerr, Rx_polarity, AUP_Azerr, Rx_Mainbeam, Rx AFC error)

Receive


SUM
SUM IF amp
FM demod
FM data
Tuning
Mainbeam
FM demod selector
AGC
DIF
DIF IF amp
FM demod

Good to know (AUP)

- Reset button
- serial input for uploading software (AUP, VHDL and DSP)
- Test points and LED
- AUP menu control
- internal voltage 2.5V and 3.3V
- Start-up sequence (chapter 5.1)
- Error codes (chapter 5.3)
- 5V failure. (flat cable, power supply)

AUP software versions

- 3.36 Mk5=Mk4 mode
- 4.03 synthesizer source
- 5.10 RS422
- 6.08 Distance correction Mk4-Mk5
- 6.09 Remote Azimuth alignment bug fixed
- 6.13 Quality figure azimuth set to 1-9

Variables

- System depended:
  - Fix delay long (fdll)
  - Fix delay short (fdls)
  - Mobile calibration (mobc)
  - Servo loop gain (slgn)
  - Azimuth error polarity (azep)
- Board depended: (do not change when replace AUP)
  - IPA gain (Ipag)
  - Azimuth error offset (azeo)
  - Sum dif compensation (sdc)

Replacing AUP

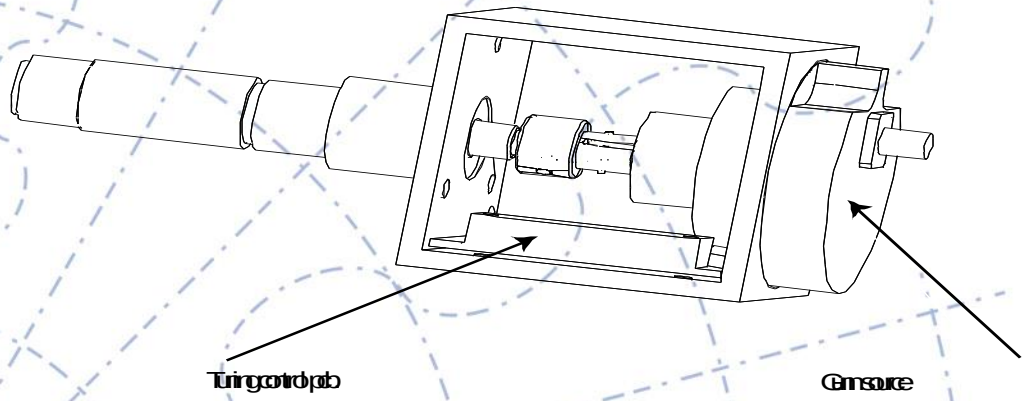
- Engineer note. System depended parameters and AUP depended parameters

Upgrading software AUP

- Notice calibration settings
- Check VHDL version
- 1:1 serial cable
- Check parameters transfer
- Open, reset, transmit and close port

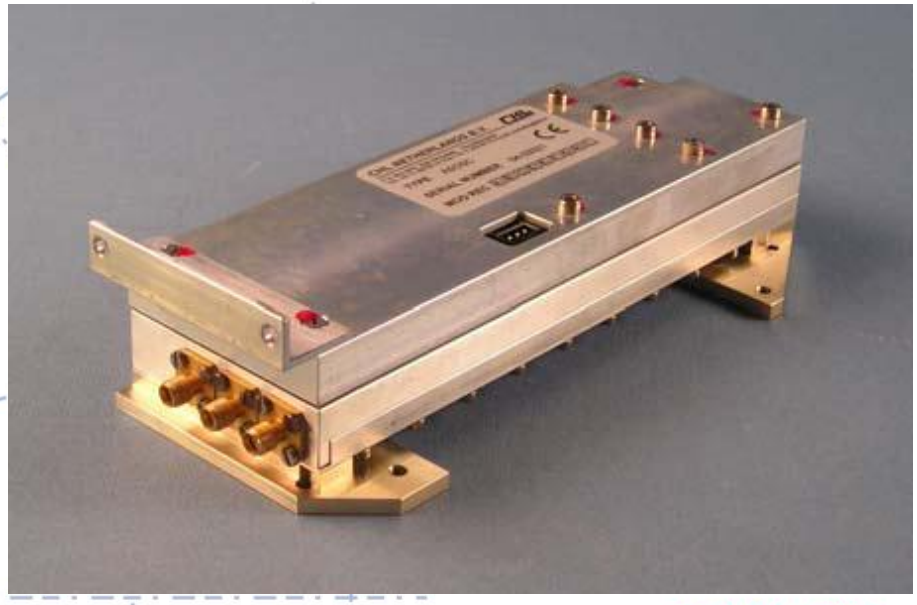
MCG

- (Motor controlled gunn source)
- “old” type of frequency source. Replaced by synthesizer
- consists of motor, potentiometer and gunn
- Gunn: Varactor diode, gunn diode



Synthesizer

- Frequency control based on PLL
- Flashing led for status PLL
- Double direction coupler implemented
- AUP software v4.03 or higher



Power supply

- Short circuit protected
- Output +5V, +12V, -12V, +24V, +10.5V
- 24V input possible!

DC supply (DSS) output usage	
+5V	AUP, HIP, KBD, SC-Servo control, MWFSRC
+12V	AUP, SC-Servo control, MWF-SRC
-12 V	AUP, SC-Servo control
+12.5	V MWF-SRC
+24 V	SC-Servo control

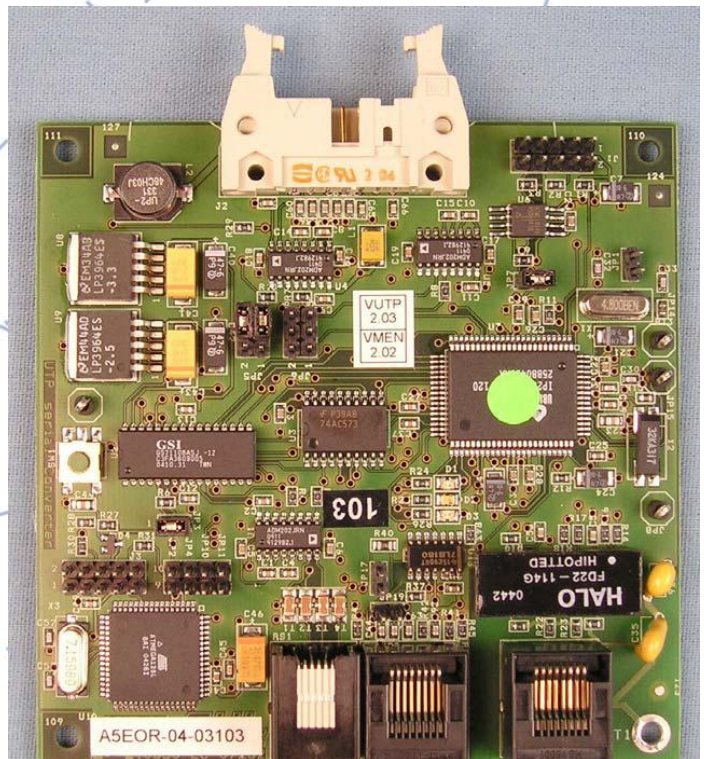
RESON

Communication board

- UTP (A5EOR)
- The old type HIP is replaced by UTP
- (HIP internal/ Build in keypad)
- UTP external keypad

UTP/A5EOR

- External control panel connection A5EOR
- Ethernet or RS422 output (v2.04)
- Software upload
- v1.10 different menu structure as v2.04
- “Advanced” protocol HMI when UTP used
- “RS422” protocol HMI when RS422 used.

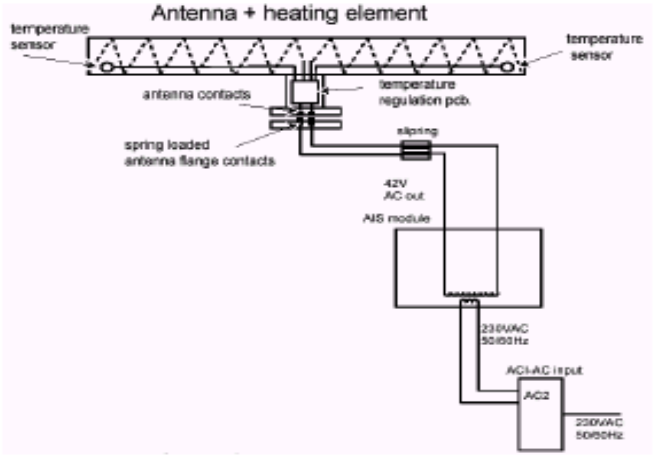


External keyboard

- Menu structure see chap 5.2.3 field service manual
- 2 software versions with different menu structure
- Overrule lock with arrow keys (AS)
- Press “0” to stop turning scanner when arrow key used

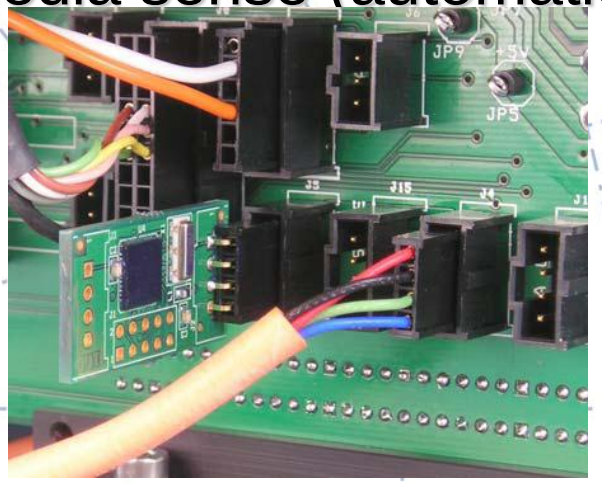
Antenna Heating

- Scanner, transformer and slip ring
- Regulator PCB and temp sensors inside scanner
- Transformer 220VAC-42VAC. Fused
- Slip ring inside unit.
- Switch on/off by HMI (De-icing box)

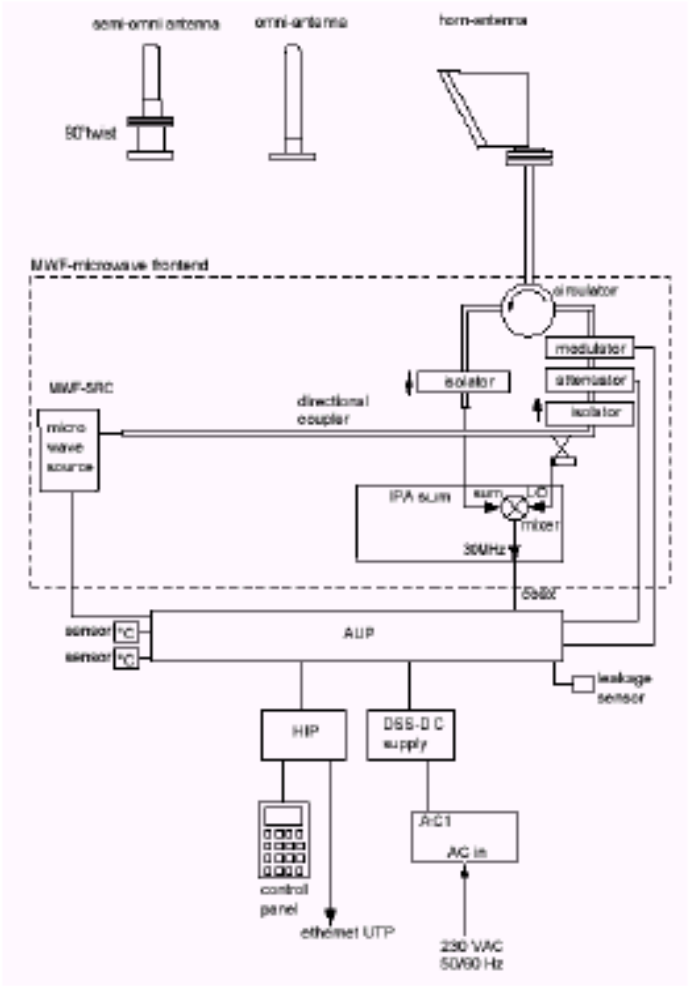


RS422 communication

- Distance up to 1000m
- Straight from antenna unit
- Dongle
- AUP software v5.x
- UTP software v2.x
- Uses serial port computer (per/host/rs422)
- Select Rs422 protocol HMI
- Disable media sense (automatic from of HMI 1.8.6)



BEACON



RESON

Faults

- No communication
- No signal
- Antenna not turning