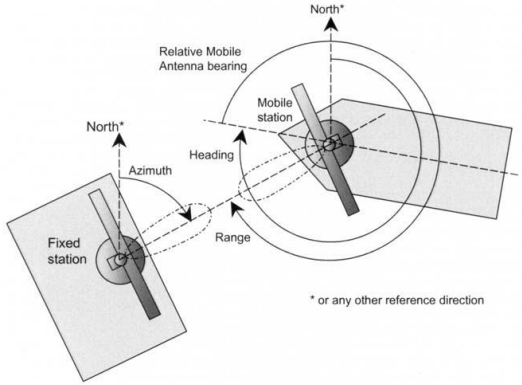
Artemis Mk4

Technical training

Version mar 2008-e

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

Operate the system

- Free line of sight?
- Correct frequency pair selected?
- Correct address code selected?

Tanker software (F)

- <menu> <2> <4> <next> <2> → F software.
- <menu> <2> <1> “station code” (see list) Artemis is setup with address code, frequency pair and mode (Mk3 or Mk4).
- “+100” station code for Mk4 mode.

Issue: c

ARTEMIS MK IV SOFTWARE VERSION F09A1A1

Automatic frequency, address code and configuration setting

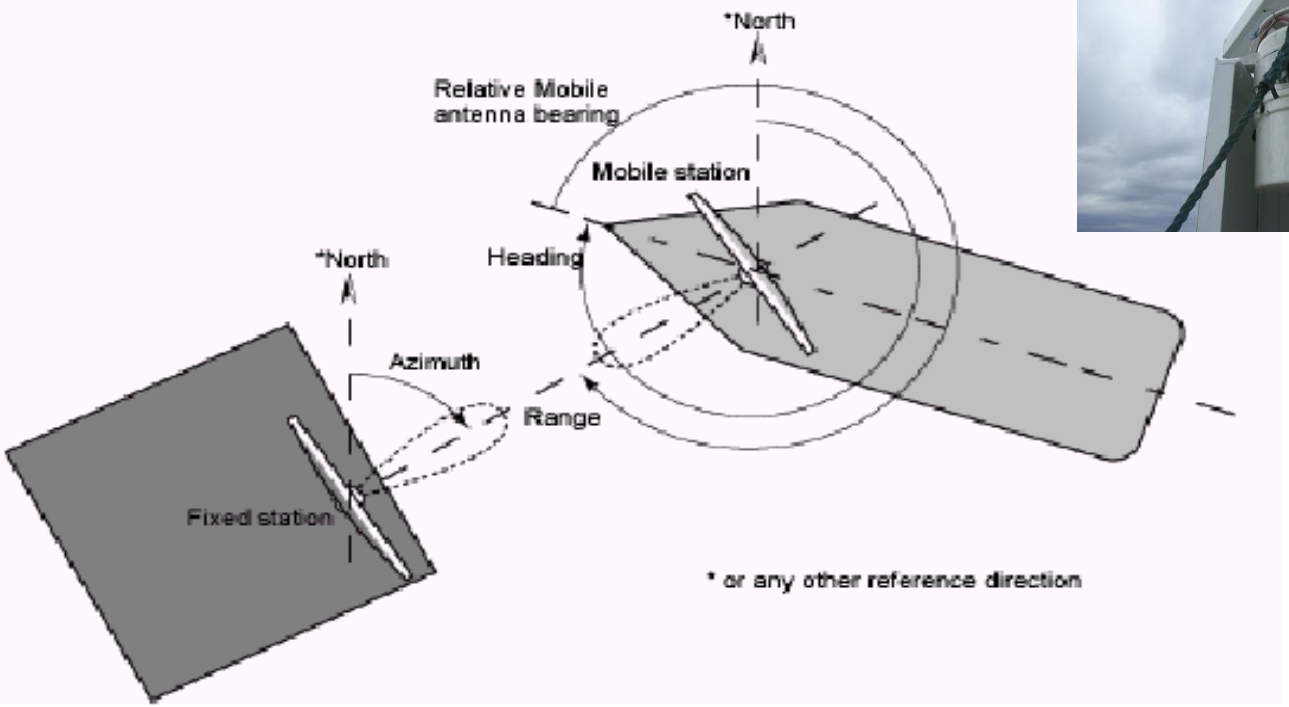
FIX STATION OR BEACON LOCATION	STATION ADDRESS CODE MK IV	ADDRESS CODE MK IV	ADDRESS CODE MKIII-S	FREQ. PAIR	MOBILE FREQUENCY (MHz)	FIX/BEACON FREQUENCY (MHz)	CONFI-GURA-TION
	0	0	0	3	9270	9300	MK3
GULLF 1	1	1	11	3	9270	9300	MK3
GULLF 2	2	2	22	3	9270	9300	MK3
STAT 'A' SSV	3	3	33	3	9270	9300	MK3
STAT 'B' SSV	4	4	44	3	9270	9300	MK3
STAT 'C' SSV	5	5	55	3	9270	9300	MK3
	6	6	66	3	9270	9300	MK3
	7	7	77	3	9270	9300	MK3
	8	8	88	3	9270	9300	MK3
	9	9	99	3	9270	9300	MK3
STAT 'A' OLS 'A'	10	10	AA	0	9200	9230	MK3
STAT 'B' OLS 'B'	11	11	BB	2	9230	9200	MK4
SPM 'C'	12	12	CC	3	9270	9300	MK3
STAT 'C' OLS 'A'	13	13	DD	0	9200	9230	MK3
STAT 'A' OLS B	14	14	EE	2	9230	9200	MK4
STAT 'A' OLS 'A'	26	10	AA	0	9200	9230	MK3
SPM 'C'	28	12	CC	0	9200	9230	MK3
STAT 'C' OLS 'A'	29	13	DD	0	9200	9230	MK3
SPM 1	30	14	EE	0	9200	9230	MK3
SPM 2	31	15	FF	0	9200	9230	MK3

Specification

- Frequency band : 9.2 - 9.3GHz
  4 Selectable frequency pairs
- Distance measurement 10-30Km
  1 m standard deviation
  0.1m resolution
- Azimuth measurement 0-360 degrees
  0.02 degree standard deviation
  0.001 degree resolution
- Supply voltage 24 VDC (16-40V),
- Station compatible with MKV and MKIII (When UCM installed)

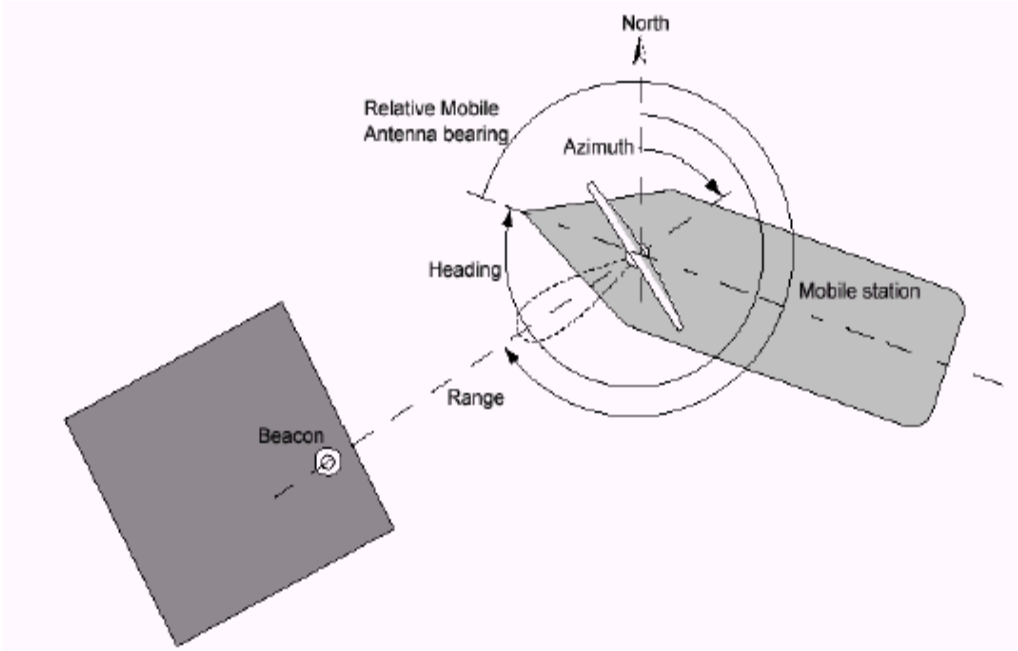
Fix - Mob configuration

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



Beacon-Mob configuration

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



Main functions

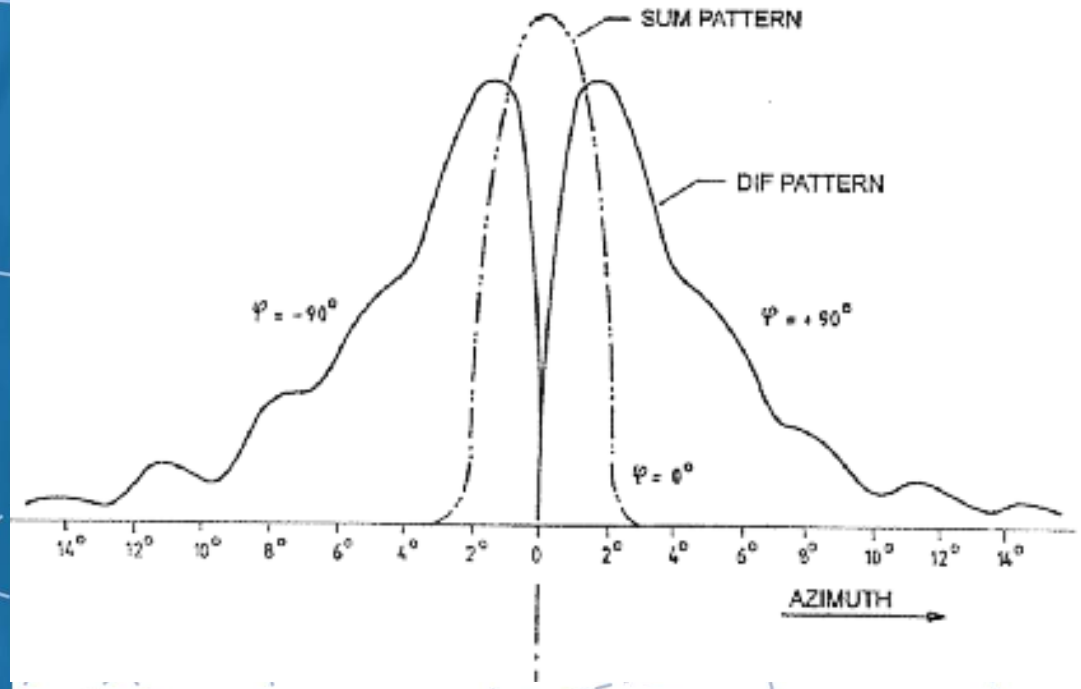
- Locking and tracking
- Distance measurement
- Azimuth measurement
- Communication

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

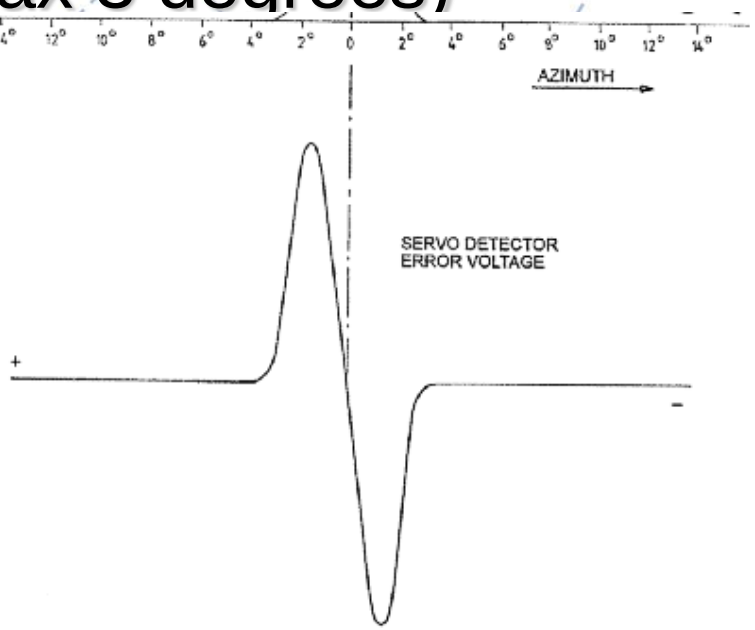
  Difference pattern: zero signal in broadside differing 180 deg. in phase
- Servo detector creates error voltage (amplitude and polarity depends of incoming wave front)

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)



Fault finding

- X-tall currents HS and SB mode
- Phase shifter: Deviation test

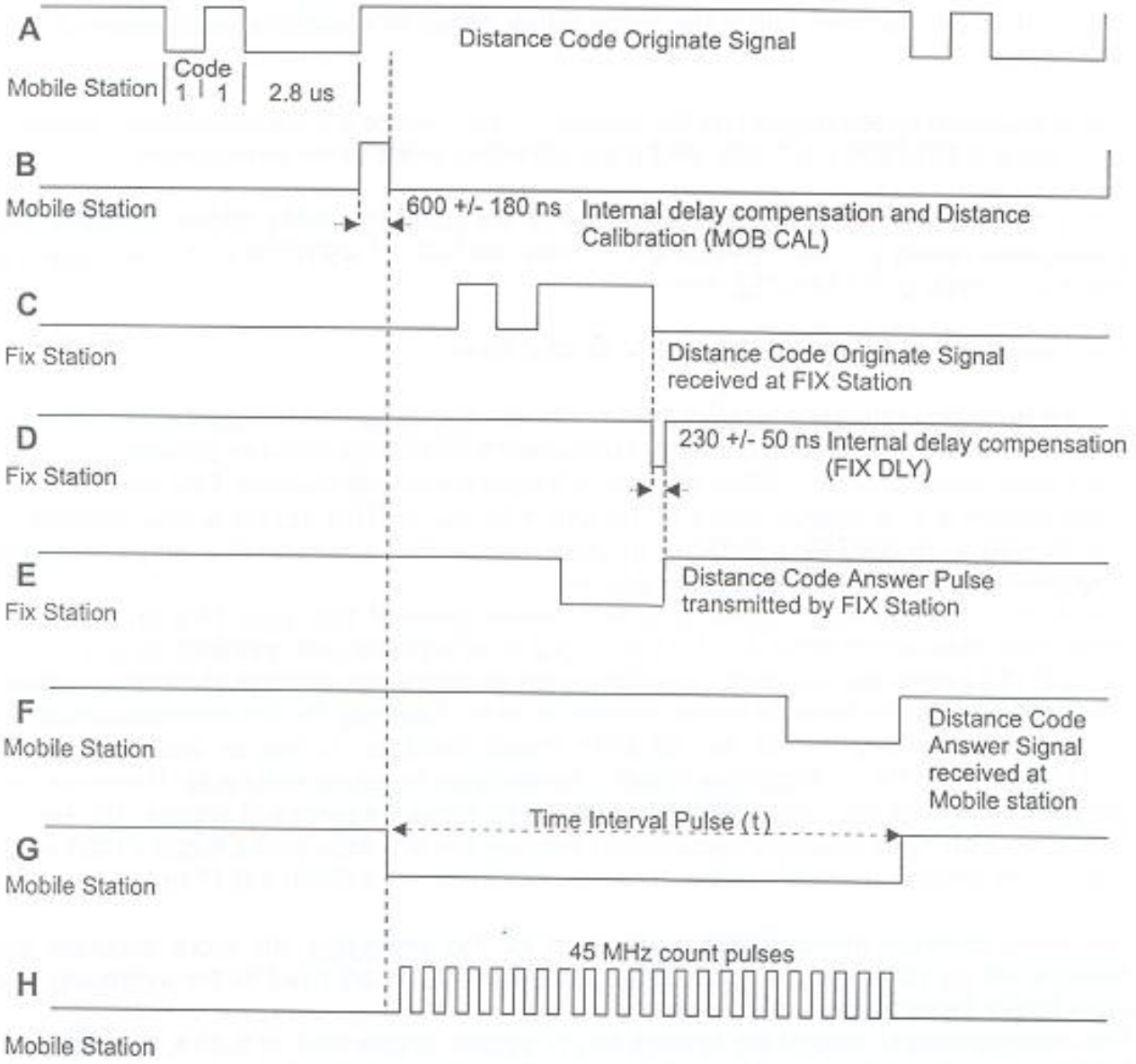
Distance measurement principle

Time measurement between transmit and receive pulse

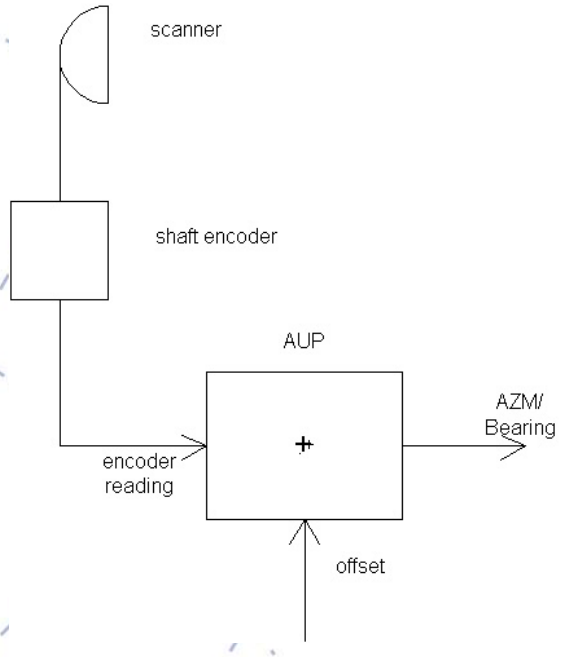
- S=(VxT)\2

- Radar interference : filter & design antenna
- Wobulator and averaging for better accuracy

RESON


A
Distance Code Originate Signal
Mobile Station
Code
1 1
2.8 us
B
Mobile Station
600 +/- 180 ns
Internal delay compensation and Distance Calibration (MOB CAL)
C
Fix Station
Distance Code Originate Signal received at FIX Station
D
Fix Station
230 +/- 50 ns Internal delay compensation (FIX DLY)
E
Fix Station
Distance Code Answer Pulse transmitted by FIX Station
F
Mobile Station
Distance Code Answer Signal received at Mobile station
Time Interval Pulse (t)
G
Mobile Station
45 MHz count pulses
H
Mobile Station

Azimuth measurement



- A 17 bits gray code optical encoder (accuracy 0.001 degrees) coupled to antenna shaft
- Serial message inputted to microprocesor input output module (MIO)
- MIO add offset for alignment.

Exercise 1

- Remove and place back shaft encoder.
- Align scanner to 0º

Communication

- ABU-ABU FM
- ABU-EOP Multiplexed
- LCS Longs cable system coax

Operational winks

- Operate page
- Operate mode
- Configuration
- Freq and address code
- Monitor
- Communication

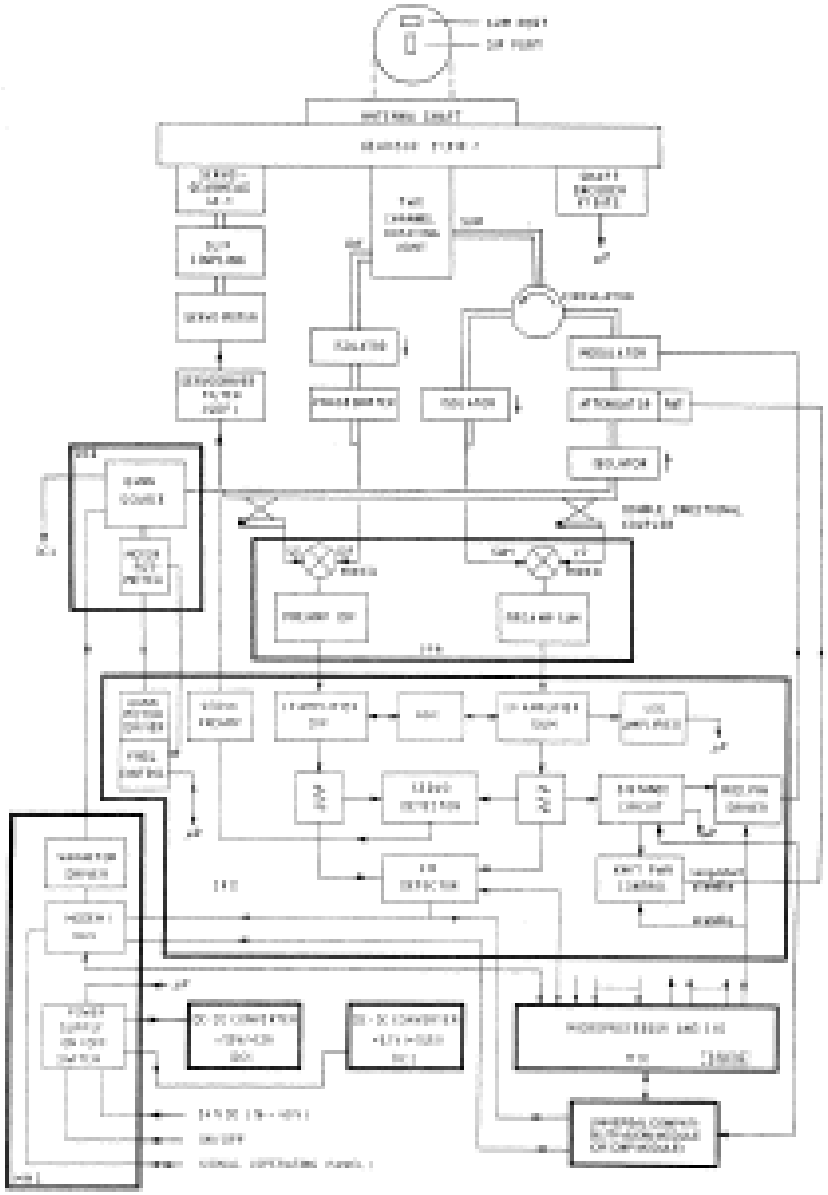
Exercise 2

- Configure the Artemis as Mobile.
- Frequency pair: 2
- Address code: 16
- Left scan sector 270º, Right scan sector 90º
- Per port: Baud rate in2400, out 2400, 8 N 2, telegram KA_BCD(ADB)
- Host port: 4800 8 N 1
- Volume: 0
- Operate mode: Hand search

Exercise 3

- Configure the Artemis as fix station
- Frequency pair: 3
- Address code: 24
- Left scan sector: 280º, right scan sector 100º
- Operate mode: Auto search

ABU block diagram



“Moving parts”

- Main gearbox
- Sub gearbox
- Slip coupling
- Servo motor
- Brushless motor

Exercise 3

- Remove motor assembly.
- Remove gearbox from motor assembly.

Waveguide parts

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

RESON

IF Preamplifier (IPA)

- Sum and Dif part
- Mixes incoming freq. with LO resulted in a 30MHz freq.
- X-tal currents

Modules

- DC1
- DC2
- UCM
- MMS
- MIO
- IFD
- BMD/ SDF

DC1

- Converts 24VDC into +12 & -12VDC
- Green led OK
- Red led current exceeds 2A

DC2

- Converts 24VDC into 5.1 & 10.5VDC
- Green led OK
- Red led current exceeds 2A

UCM

- Universal Compatibility Module
- Makes MK4 compatible with MK3
- Address and Azimuth transmission with MK4 digital
- Address And Azimuth transmission with MK3 by means of tones.

MMS

- Modem Multiplexer Supply module
- Supply control
- Communication ABU-ABU
- Communication ABU-EOP

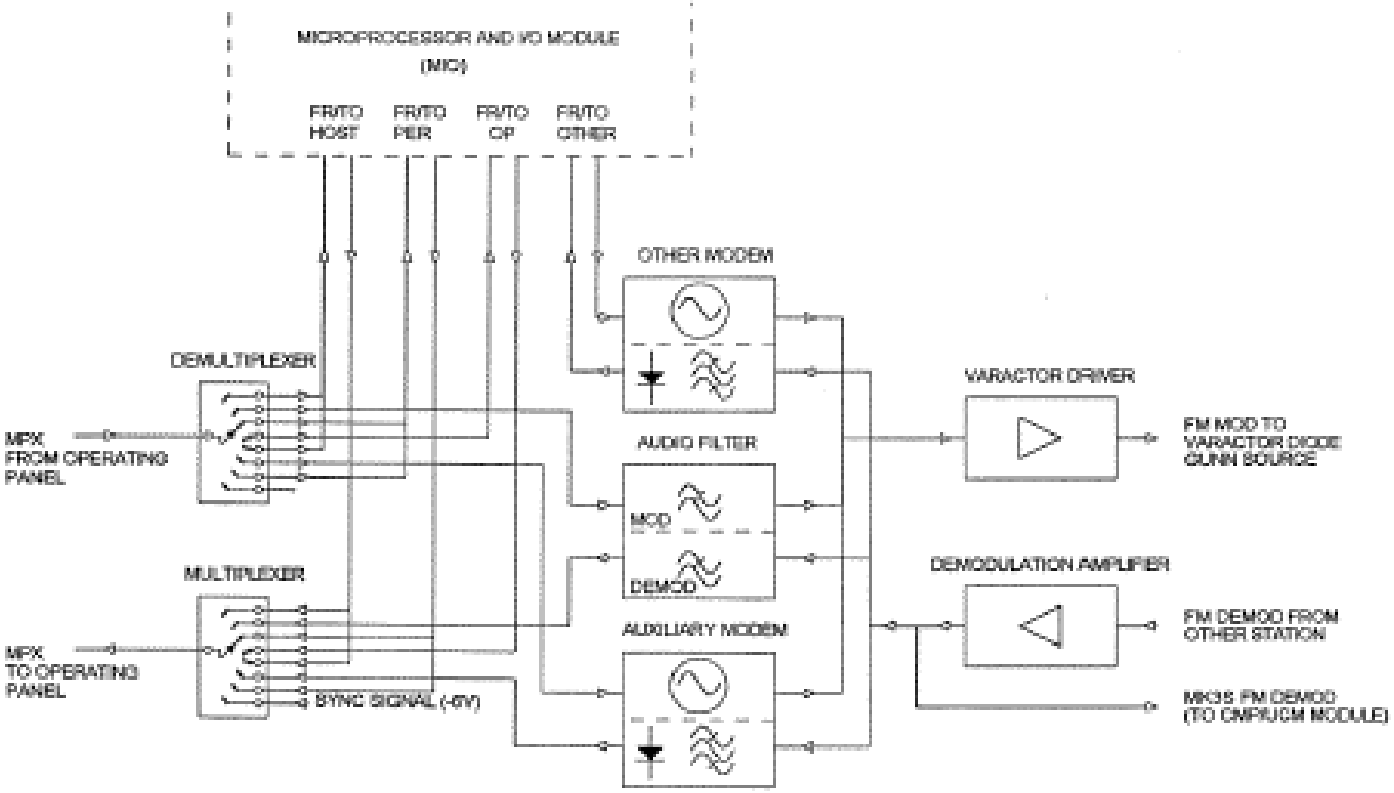
Supply control

- On/off control
- Reverse polarity protection
- Over-under voltage protection
- Supply voltage sensing

Communication

- Modem circuit AM modulates communication data
- Modulated data is FM modulated at varactor diode of freq source by varactor driver
- Communication to EOP by means of multipexer
- Host,PER,AUX,speech,keyboard,display and sync. Channel
- On/off separated channel

RESON


MICROPROCESSOR AND I/O MODULE
(MIC)
FR/TO HOST
FR/TO PER
FR/TO OP
FR/TO OTHER
OTHER MODEM
DEMULTIPLEXER
MPX FROM OPERATING PANEL
AUDIO FILTER
MOD
DEMOD
VARACTOR DRIVER
FM MOD TO VARACTOR DIODE GUNN SOURCE
MULTIPLEXER
MPX TO OPERATING PANEL
SYNC SIGNAL (-6V)
AUXILIARY MODEM
DEMODULATION AMPLIFIER
FM DEMOD FROM OTHER STATION
MK35 FM DEMOD (TO CMP/UCM MODULE)

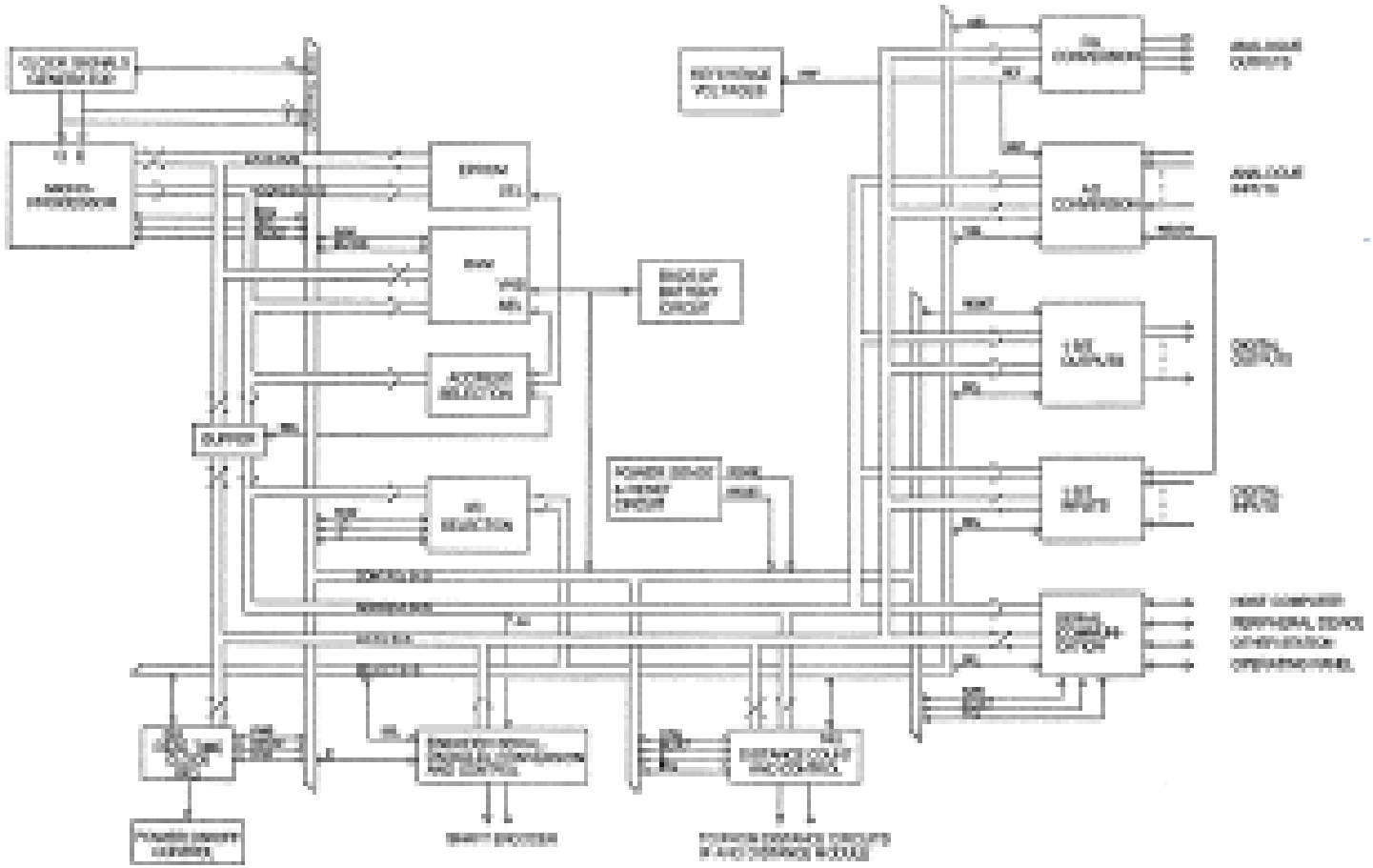
RESON

Replace MMS

- Power on/off
- Communication EOP
- No FM
- Led of on/off switch not lid

MIO

- Microprocessor and I/O module
- Runs program
- Encoder data conversion
- Distance count and control circuit
- DA conversion
- AD conversion
- Serial communication



RESON

Good to know

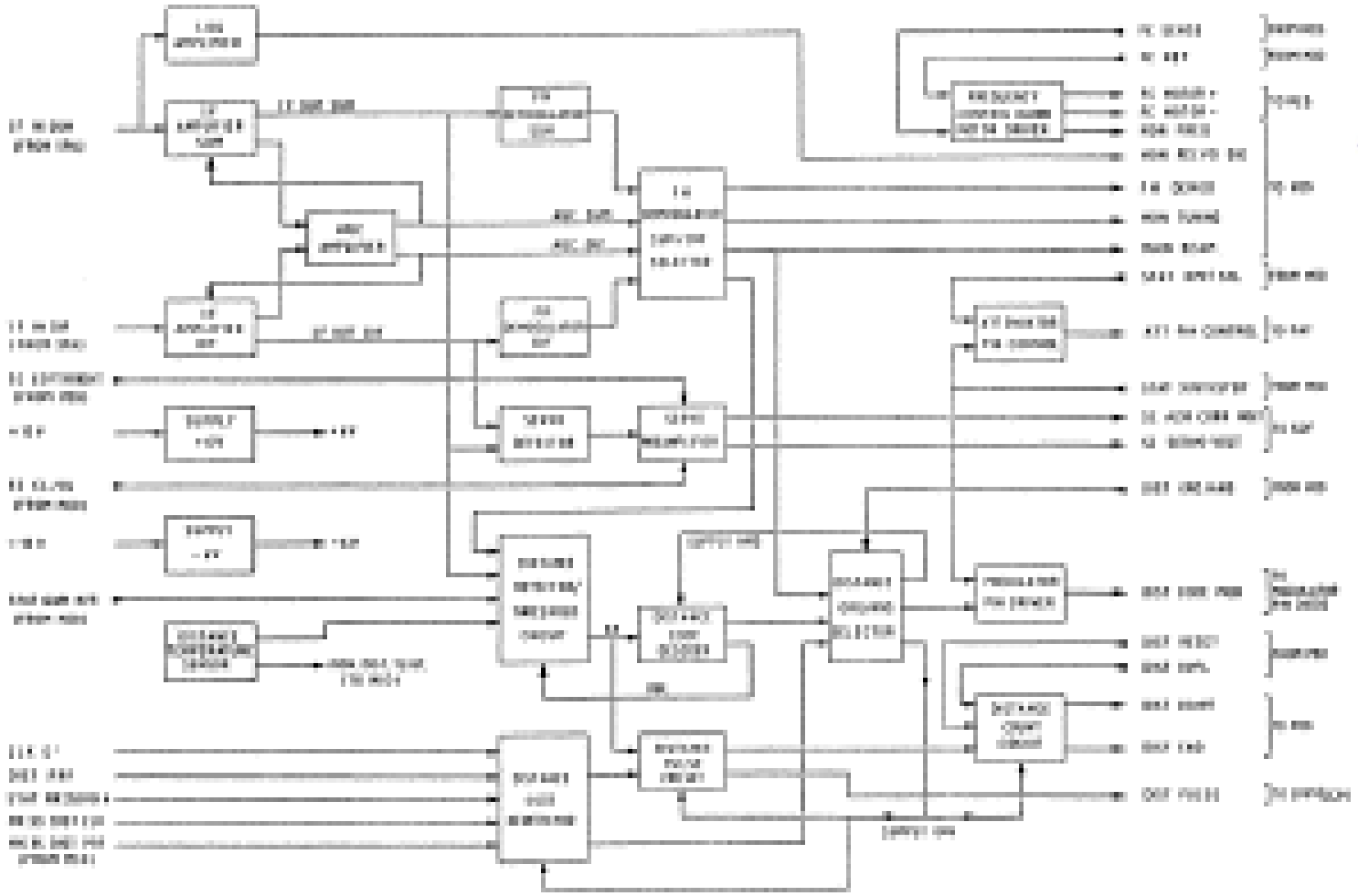
- E-software, F-software, G-software
- Eeprom
- Gearbox correction curve
- IRQ led
- Init button
- Backup batteries
- Generation host aux en per telegram

Replace MIO

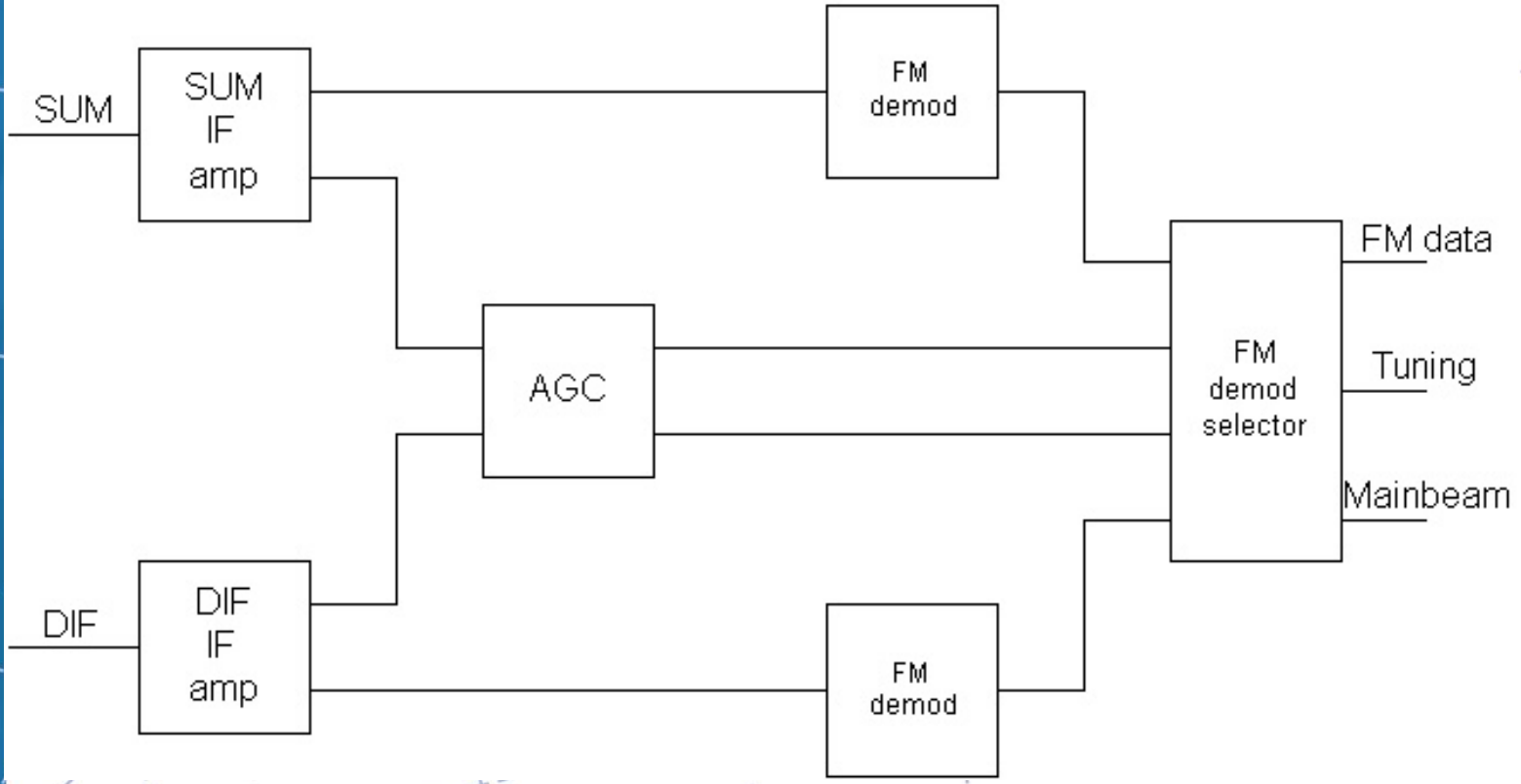
- No communication with EOP
- On/off control
- Telegram error
- Monitor values
- Distance
- Azimuth/ bearing
- Tuning and/or freq. control

IFD

- IF and Distance module
- Amplification sum and dif
- Measurement of signal strength
- Demodulation communication
- Tracking
- Distance pulses modulation and demodulation
- Frequency control
- Attenuation control



Receive


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

Replace IFD

- No tracking
- No lock
- No communication with EOP
- Distance measurement fails
- Signal level not OK
- Frequency control
- Be aware of distance calibration and polarity!!

BMD

- Brushless motor driver
- Drives motor
- Filter against oscillating scanner

SDF

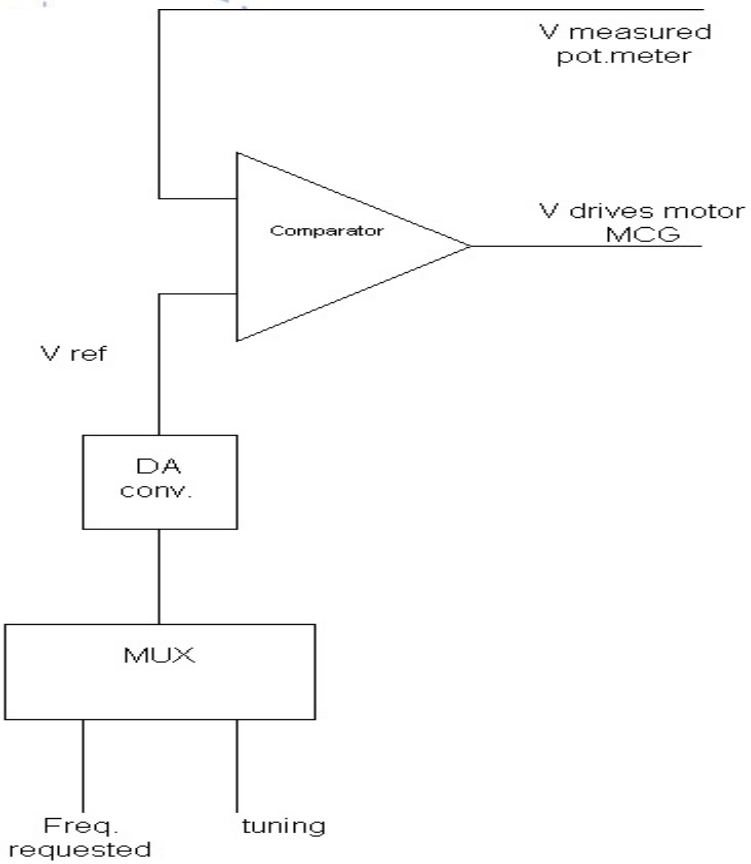
- Servo driver filter
- Drives servo motor
- Old type
- No filter

RCG

- Remote controlled gunn
- Consists of motor potentiometer and gunn source
- Gunn source: gunn diode and varactor

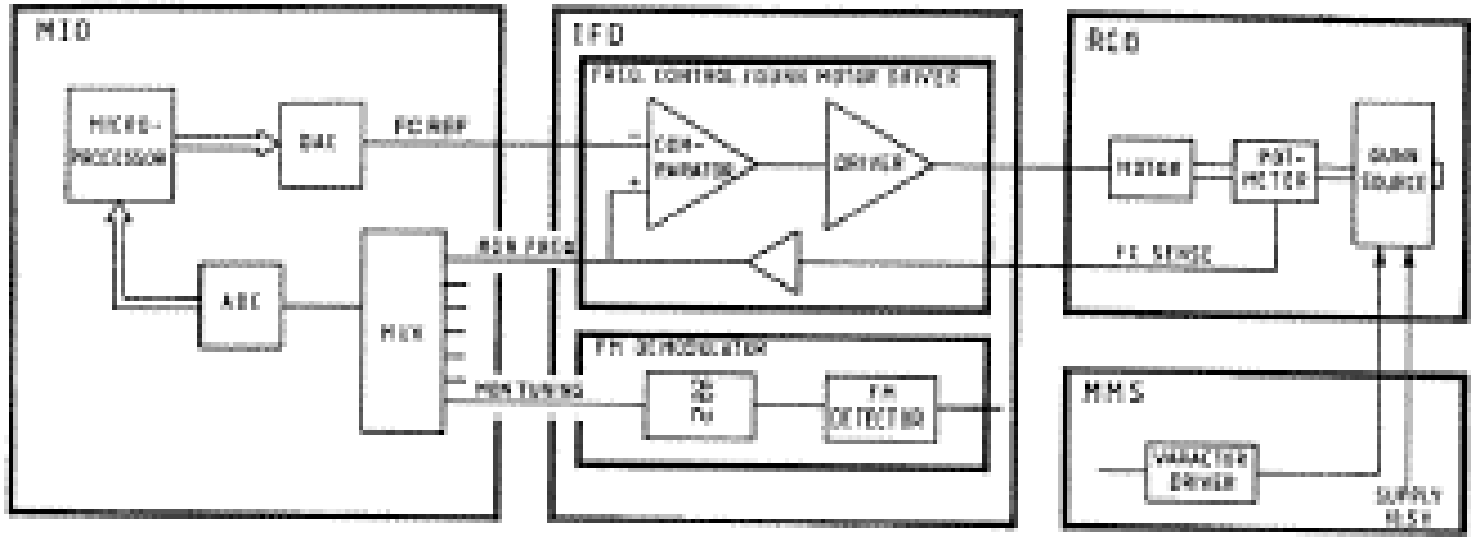
RESON

Frequency control RCG



- motor drive until voltage potentiometer is equal to voltage (pot. Meter) of corresponding frequency setting

Frequency control



EOP

- External operate panel
- Output ports
- Link for VDI

11.2 Peripheral Port

The PERIPHERAL port outputs the Artemis position data, distance and azimuth, autonomously. Currently, there is a choice of six output formats. The PERIPHERAL port can also accept data from external devices like a gyro compass. The PERIPHERAL port can either be wired for RS232C/RS423A or 20 mA current loop.
The data send and receive baudrate can be set to 50, 110, 134, 200, 300, 600, 1050, 1200, 2400, 4800, 7200 or 9600. The number of data bits can be set to 7 or 8 (odd, even or no parity). The number of stop bits can be set to 1 or 2. To set these values, select display page 252 (PER. CONNECTION) on the Extended Operating Panel.

11.2.1 Electrical Connection

Figure 11-5 gives the pin lay-out and pin assignment of the PER (peripheral) in/out port. The connector required is HRS type RM12BPG-4P or equivalent. The maximum cable length for RS232C is 15 metres, for RS423A 400 metres, and for 20 mA current loop 300 metres.

PIN	RS232C/RS423A	20 mA CURRENT LOOP
1	GROUND	IN +
2	RECEIVE DATA	OUT +
3	TRANSMIT DATA	OUT -
4	RECEIVE GROUND	IN -

Fig. 11-5: Pin Lay-out and Pin Assignment Peripheral Socket

11.2.2 Selection RS232C (RS423A) / 20 mA Current Loop

The peripheral port is by default wired for RS232C/RS423A. The procedure to wire the port for either RS232C/RS423A or 20 mA current loop is described below:

1) Unscrew and remove the sides of the EOP
2) Carefully lift the top of the EOP
3) Connect the connector of the cable originating from the PER socket to P113 for RS232C/RS423A and to P116 for 20 mA current loop (see figure 11-6)
4) Position jumper I2 according figure 11-6
5) Reassemble the EOP.

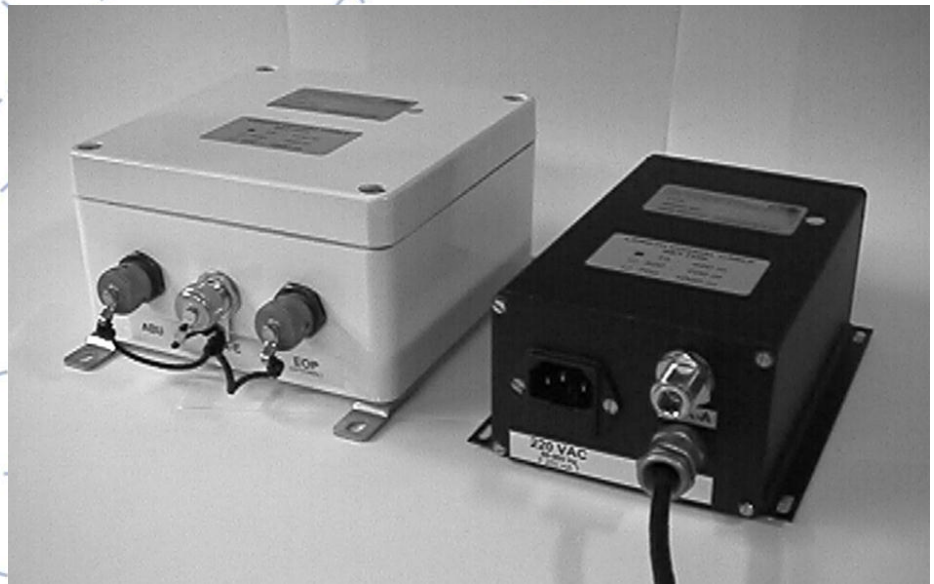
Note: *The current loop is to be driven by the peripheral device connected.*

BOP

- Basic operate panel
- Only to be used with FIX

LCS

- Long cable system
- Transfers Artemis signals into a coaxial signal to overcome longer distance
- LCA-E bridge end
- LCA-A ABU end
- Volume set to 5 or lower



VDI

- Video data interface
- Artemis display data shown on display

Heating

- Heating device
- Slip ring
- Antenna 10 ohm
- Sensor 740 ohm

Monitor page

- X-tal currents
- Tuning
- Servo
- Voltages
- Actual frequency

Maintenance

- Connectors
- Water ingress
- Visual antenna
- O-ring
- SRU