MLR FX312 GPS-RECEIVER

TECHNICAL DATA INPUT AND OUTPUT REFERENCE

4.1 DATA INPUT AND DATA OUTPUT -

4.1.1 NMEA 180 SIMPLE FORMAT (AUTOMATIC PILOT)

8 DATA bits, D7 bit = 0, 1 STOP bit, even parity, rates 4 s.

The message carries one byte only, with XTE from D0 to D5 in NM.

D6 = 1

D7 = 0

Example

D7	D6	D5	D4	D3	D2	D1	D0	
0 1	1	1	1	1	1	1		- Maximum portside XTE
0	1	1	0	0	0	0	0	- On correct course
0	1	0	0	0	0	0	0	- Maximum starboard XTE

NMEA 180 simple and NMEA 180 complex format data are transmitted one after the other.

4.1.2 NMEA 182 OR NMEA 180 COMPLEX

8 DATA bits, D7 bit = 1, 1 STOP bit, 1200 bauds, even parity, rate 4 s.
Message characters are ASCII with D7 = 1

$ M P N X.X X X T X X X X X D X X . X X, X X X X D X X . X X, X

Start Cross Track Error Azimuth in degrees L = Port R = Starboard Latitude N = North S = South Longitude E = East W = West

nul E T X X = ASCII character
Block end

4.1.3 NMEA 183

8 DATA bits, 2 STOP bits, without parity, 4800 BAUDS.
NMEA 183 format is a succession of several blocks of ASCII characters. When the GPS does not calculate any datas (no reception), the blocks are empty.

Note : To use the Echonav cockpit repetitor, select the sentences which start with the letter E (i.e. : EGGA).

*hh = checksum in the NMEA183 2.0 version only.

• AAM: waypoint arrival alarm

$GPAAM, A/V, A/V, X.X, N, C--C * hh

A/V: arrival circle entered: yes = A ; no = V
A/V: perpendicular passed at waypoint : yes = A ; no = V
X.X, N: arrival circle radius, nautical miles
C- -C: waypoint ID

• APB : autopilot sentence B

$GPAPB, A/V, A/V, 0.05,R,L, N, A/V, A/V, 000,M, WPT001, 268,M, XXX,M *hh

A/V	:status : V = LORAN-C blink or SNR warning A = general warning flag for other navigation systems When a reliable fix is not available
A/V	:status : V = LORAN-C cycle lock warning flag, A = OK or not used
0.05	:magnitude of XTE (cross track error)
R/L	:direction to steer, R/L
N	:XTE units, nautical miles
A/V	:arrival circle entered, A = yes ; V = no
A/V	:perpendicular passed at waypoint, A = yes, V = no
000,M	:bearing originate destination, M/T
WPT001	:destination waypoint ID
268,M	:bearing, present position to destination, magnetic or true
XXX, M	:heading to steer to destination waypoint, magnetic or true

• BWC : bearing and distance to waypoint

$GPBWC, 150858, 4710.75,N, 00117.61,W, 269,T, 269,M, 1.36,N, WPT001 *46

150858	:UTC of observation
4710.75,N	:waypoint latitude, N/S
00117.61,W	:waypoint longitude, E/W
269,T	:bearing, degrees true
269,M	:bearing, degrees magnetic
1.36,N	:distance, nautical miles
WPT001	:waypoint ID

• GGA : global positionning system (GPS) fix data

• GGAC in hundredth

$GPGGA, 063901, 4710.78,N, 00115.60,W, 0/1/2, 08, 02.7, 0144,M, -049,M, X.X, XXXX *47

063901	:UTC of position
4710.78,N	:latitude, N/S
00115.60,W	:longitude, E/W
0/1/2	:GPS quality indicator (note 1)
08	:number of satellites in use, 00-12, may be different from the number in view
02.7	:horizontal dilution of precision
0144,M	:antenna altitude above/below mean sea level (geoid), units of antenna altitude
-049,M	:geoidal separation (see note 3), units of geoidal separation
X.X	:age of differential GPS data (see note 2)
XXXX	:differential reference station ID, 0000-1023

• GGAM in thousands

- Same phrase
- Same variables used except latitude and longitude in thousandth of minute.

• GGAD in ten thousandth

- Same phrase
- Same variables used except latitude and longitude in ten thousandth of minute.

• GLL : latitude and longitude

• GLLC in hundredth

$GPGLL, 4710.74,N, 00115.60,W, 080523, A/V *hh

4710.74,N	:latitude, N/S
00115.60,W	:longitude, E/W
080523	:UTC of position
A/V	:status, A = data valid

• GLLM in thousands

- Same phrase
- Same variables used except latitude and longitude in thousandth of minute.

• GSA : GPS DOP and active satellites

$GPGSA, a, X, XX, XX, XX, XX, XX, XX, XX, XX, XX, XX, XX, X.X, X.X, X.X *hh

a	:M, manual, forced to operate in 2D or 3D mode
	:A, automatic, allowed to automatically switch 2D/3D
X	:1 = fix not available ; 2 = 2D ; 3 = 3D
XX	:(12 fois), PRN numbers of satellites used in solution (null for unused fields)
X.X	:PDOP
X.X	:HDOP
X.X	:VDOP

• GSV : GPS satellites in view

$GPGSV, X, X, XX, XX, XX, XXX, XX....., XX, XX, XXX, XX *hh

X	:total number of message, 1 to 3
X	:message number 1 to 3
XX	:total number of satellites in view
XX	:satellite PRN number
XX	:elevation, degrees, 90° maximum
XXX	:azimuth, degrees true, 000 to 539
XX	:SNR (C/no) 00-99 dB, null when not tracking

• MSK : MSK receiver interface

$GPMSK, X.X, a, X.X, a, X.X *hh

X.X	:beacon frequency (283.5-325.0 kHz)
a	:auto/manual frequency
X.X	:beacon bit rate (25,50,100,200), bit/s

a	:auto/manual bit rate
X.X	:interval for sending $--MSS (status) (s)

• RMB : recommended minimum navigation information

$GPRMB, A/V, 0.00,R, -WPT--, WPT001, 4710.699,N, 00117.697,W, 001.3, 269.0, 000.0, A/V *22

A/V	:data status : V = navigation receiver warning
0.00,R	:cross track error (see note 2) nautical miles, direction to steer L/R
-WPT--	:origin waypoint ID
WPT001	:destination waypoint ID
4710.699,N	:destination waypoint latitude, N/S
00117.697,W	:destination waypoint longitude, E/W
001.3	:range to destination, nautical miles
269.0	:bearing to destination, degrees true
000.0	:destination closing velocity, knots
A/V	:arrival status : A = arrival circle entered or perpendicular passed
***22**	:checksum version 1.5 and 2.0

According to the NMEA norm, the sentence RMB should be transmitted simultaneously with the sentence RMC.

• RMC : recommended minimum specific GPS/TRANSIT data

$GPRMC, 070206, A/V, 4710.756,N, 00115.580,W, 000.0, 134, 080498, 000,W *70

070206	:UTC of position
A/V	:status : V = navigation receiver warning
4710.756,N	:latitude, N/S
00115.580,W	:longitude, W/E
000.0	:speed over ground, knots
134	:course over ground, degrees true
080498	:date : dd/mm/yy
000,W	:magnetic variation, degrees (E : negative correction ; W : positive correction)

• VTG : course over ground and ground speed

$GPVTG, 134,T, 000,M, 000.0,N, 000.0,K *66

134,T	:course degrees true
000,M	:course degrees magnetic
000.0,N	:speed, knots
000.0,K	:speed, Km/h

• XTE : cross track error, measured

$GPXTE, A/V, A/V, 0.00, L, N *6E

A/V	:status : A = OK or not used V = general warning flag when a reliable fix is not available
A/V	:status : A = OK or not used V = general warning flag when a reliable fix is not available
0.00	:magnitude of cross

L	:direction to steer, L/R
N	:units, nautical miles

• ZDA : time and date

$GPZDA, 070252, 08, 04, 1998, XX, XX *hh

070252	:UTC
08	:day, 01 to 31
04	:month, 01 to 12
1998	:year
XX	:local zone description
XX	:local zone minutes description, same sign as local hours

• ZTG : UTC and time to destination waypoint

$GPZTG, 153252, XXXX00, WPT001 *hh

153252	:UTC of observation
XXXX00	:time to go, hh = 00 to 99
WPT001	:destination waypoint ID

• PML2 : to program the differential receiver

$PML2, XXX.X, X, X CR LF

XXX.X :	:DGPS frequency in kHz
X :	:type DGPS network
X :	:baud rate

• PML3 : information sent by the DGPS receiver

$PML3, XX, XXX, XXX.X, XX CR LF

XX :	:SNR of DGPS signal
XXX :	:percentage of error in the message
XXX.X :	:DGPS frequency in kHz used in the DGPS receiver
XX :	:number of satellites with DGPS correction

• PML5 : Grid co-ordinates

$PML5, XXXXXXXXX,4710.7056,N,00115.6984,W*XX

4710.78,N	:latitude, N/S
00115.60,W	:longitude, E/W

XXXXXXXXX	:1/10 000 MIN
XXXXXXXX	:1/1 000 MIN
XXXXXX	:1/10 MIN
XXXXX	:GRADES

XXX :UTM
XXXXXXX :LAMBERT1, LAMBERT 2, LAMBERT3, LAMBERT4

XXXXXXX :GR.BRIT (Britannic Grid)
XXXXXXX :GR.IREL (Ireland Grid)
XXXXXXX :GR.REUN (Reunion Island Grid)
XXXXXXX :GR.SUIS (Swiss Grid)
XXXXXXX :GR.TAIW (Taiwan GRID)

When the GPS does not calculate its position, the sentence is as follows :

$PML5, V*XX

4.1.4 WAYPOINT AND ROUTE

It is possible to load waypoints and routes, track and chart outline to a P.C. from your GPS, by selecting respectively the output formats 'WPTS+RTES', 'TRACK' or 'CHART OUTLINE'. It is also possible to load from a P.C. waypoints, routes or a chart outline to your receiver.

4.1.4.1 WAYPOINTS, ROUTES AND CHART OUTLINE DATA INPUTS

- Data input to receive waypoints

4800 bauds, 2 stops bits, no parity, ASCII characters

$xxWPL, llll.lll, h, ggggg.ggg, w, nnnnnn [i] [ccccccccccccccccccccc] [*kk] <0D> <0A>

The fields into brackets are facultative.

llll.lll	:Latitude in 1/1000 of minute ex 47°10.715' 4710.715
h	:ASCII letters N (North) or S (South)
ggggg.ggg	:Longitude in 1/1000 of minute ex 001°15.826' 00115.826
w	:ASCII letters E (East) or W (West)
nnnnnn	:Name of the WPT en ASCII characters (6 characters using letters A to Z, figures 0 to 9, ' ' (space) and ' – ' (minus))
i	:Icon of the WPT (ASCII character e, f, g, h, i, j, k, l, m, n) (not obligatory, default e)
cccccccc	:Comment in 2 lines of 11 characters using letters A to Z, 0 to 9, space minus (not obligatory)
kk	:Checksum of the sentence according to NMEA183

NOTE : The reception of points for the map uses the same format as WPT, but the name is not obligatory, name (nnnnnn) not obligatory. The first character of the comment is used for the specific parameters of the chart outline (see details hereafter).

The sentences must be spaced out by 0.5 seconds.
- **a:** No beep, continuous line
- **b:** No beep, dotted line

- c: No beep, new start of continuous line
- d: No beep, new start of dotted line
- e: With beep, continuous line
- f : With beep, dotted line
- g: With beep, new start of continuous line
- h: With beep, new start of dotted line

- Data input to receive a route

$xxRTE, a, b, C, nn, cccccc, cccccc, [cccccc], [cccccc], [cccccc], [cccccc], [cccccc], [cccccc], [cccccc], [*kk] <0D> <0A>

The fields into brackets are facultative.

a	:Number of sentences of the route (start form 1 (ASCII))
b	:Number of the sentence transmitted (start from 1 (ASCII))
nn	:Number of the route 0 to 19
cccccc	:Name of the WPT in ASCII (6 characters using letters A to Z, figures 0 9, space, minus)
kk	:Checksum of the sentence according to NMEA183

The loading of the route can use a few sentences, but they must be transmitted in the right order and without stop. A route has a minimum of 2 waypoints and a maximum of 20.
You must load the waypoints before the route, if the route uses waypoints which are not in the GPS they will be replace by ------.

4.1.4.2 WAYPOINTS, ROUTES, TRACK AND CHART OUTLINE DATA OUTPUTS

- Data output to send waypoints

4800 bauds, 2 stops bits, no parity, ASCII characters

$xxGPWPL, llll.lll, h, ggggg.ggg, w, nnnnnn, i, ccccccccccccccccccccc *kk <0D> <0A>

llll.lll	:Latitude in 1/1000 of minute ex 47°10.715' 4710.715
h	:ASCII letters N (North) or S (South)
ggggg.ggg	:Longitude in 1/1000 of minute ex 001°15.826' 00115.826
w	:ASCII letters E (East) or W (West)
nnnnnn	:Name of the WPT en ASCII characters (6 characters using letters A to Z, figures 0 to 9, ' ' (space) and ' – ' (minus))
i	:Icon of the WPT (ASCII character e, f, g, h, i, j, k, l, m, n) (not obligatory, default e)
cccccccc	:Comment in 2 lines of 11 characters using letters A to Z, 0 to 9, space minus (not obligatory)
kk	:Checksum of the sentence according to NMEA183

- Data output to send the track and the chart outline

Name of the waypoints for the track = TRCXXX with XXX = 001 to 250
Name of the waypoints for the chart outline = PDCXXX with XXX = 001 to 250

With first character of the comment :
- a: No beep, continuous line
- b: No beep, dotted line

- c: No beep, new start of continuous line
- d: No beep, new start of dotted line
- e: With beep, continuous line
- f : With beep, dotted line
- g: With beep, new start of continuous line
- h: With beep, new start of dotted line

- Data output to send a route

$xxGPRTE, a, b, C, nn, cccccc, cccccc, cccccc, cccccc, cccccc *kk <0D> <0A>

a	:Number of sentences of the route (start form 1 (ASCII))
b	:Number of the sentence transmitted (start from 1 (ASCII))
nn	:Number of the route 0 to 19
cccccc	:Name of the WPT in ASCII (6 characters using letters A to Z, figures 0 9, space, minus)
kk	:Checksum of the sentence according to NMEA183

The loading of the route can use a few sentences, but they must be transmitted in the right order and without stop. A route has a minimum of 2 waypoints and a maximum of 20.The number of message for a route vary from 1 to 4. In the case the receiver does not have any route, no sentence starting with RTE is sent from the receiver.

In the case the receiver has neither route or waypoints, the following sentence is sent $GPWPL,,,,,*xx where xx represents the checksum.

In any cases, the checksum of a sentence corresponds to the hexadecimal addition of all the characters of the sentence (except the checksum itself), the $ at the beginning of the sentence and the star precede the checksum. This sum is converted into 2 ASCII characters (0 to 9, A to F). The most significant character is the first to be transmitted.
For instance : - $GPGLL, 5057.970, N, 00146.110, E, 142451, A*27.
The checksum in hexadecimal is 27.- $GPVTG, 089.0, T,,, 15.2, N, , *7F.
The checksum in hexadecimal is 7F.