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ARP-10 (OPTION)

⚠ WARNING



Hazardous voltage can shock, burn, or cause death.

Only qualified personnel should work in the unit.

This auto plotter is not designed to replace the human eye nor make decisions for the navigator. It is intended for use as an aid to navigation. Always maintain a watch while underway. Data obtained from this auto plotter should always be double checked against other sources to verify the reliability of the data.

This auto plotter automatically tracks a acquired radar target and calculates its course and speed, indicating it by a vector. Since the data generated by this unit are based on what radar targets are selected, the radar must always be optimally tuned for use with it to ensure that required targets will not be lost or unwanted targets such as sea returns and noise will not be acquired and tracked.

A target echo does not always mean a landmass, reef, ships or other surface objects but can imply returns from sea surface or precipitation. As the level of these returns varies with environment, the operator is required to properly adjust the STC (ant-clutter sea), FTC (anti-clutter rain) and GAIN controls to ensure that target echoes within the affected area are not eliminated from the radar screen. The optimum settings of these controls may slightly differ between the normal radar operation and plotting, and it is recommended to readjust them in accordance with the operating mode selected.

NOTICE

The installation must be done by a FURUNO representative or suitably qualified radar technician.

Authorities require this.

Keep magnets and magnetic fields away from the equipment.

Magnetic fields will distort the picture and can cause equipment malfunction. Be sure the unit is well away from equipment which gives off magnetic fields (speaker, power transformer, etc.).

The following items affect calculation accuracy.

- echo intensity
- radar transmission pulsewidth
- radar bearing error
- gyrocompass error
- own vessel or other vessel course change

Data for CPA, TCPA, etc. are approximations only. Always use data obtained prudently.

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Operation of ARP-10

General

The Auto Plotter ARP-10 is an optional circuit board which is accommodated in the display unit of the MODEL 1832, 1932 and 1942 radars.

The Auto Plotter permits manual or automatic acquisition and automatic tracking of up to 10 radar targets. An internal microprocessor calculates target data such as speeds and courses and displays the results in alphanumeric and by vectors. To ensure the reliability of the displayed target data, the radar must be properly adjusted for minimum sea returns and noise.

Principal Specifications

Acquisition and tracking:

- Acquisition of up to 10 targets between 0.2 and 16 nm.
- Automatic tracking of up to 10 acquired targets between 0.1 and 16 nm.

Vectors:

Vector length; 30 s, 1, 3, 6, 15, 30 min.

Orientation; True velocity or relative velocity

Past positions: 5 past positions at intervals of 15, 30 s, 1, 2, 3, 6 min.

Alarm: Visual and audible alarms against targets violating CPA/TCPA limits, Visual alarm against lost targets

Target discrimination: A target measuring about 800 m or more in the radial or circumferential direction is regarded as a landmass and not acquired or tracked. Echoes smaller than about 800 m are regarded as true targets.

Keys Used for Auto Plotter

The Auto plotter utilizes the following touchpad keys. Given below is a brief description of these keys.

MENU: Displays/Erases the main menu.

SELECT/CANCEL:

(Long press) Terminates plotting of the target selected with the cursor.

(Brief press) Displays the data of target selected with the cursor.

ACQ/ENTER: Acquires the target selected with the cursor.

ARP-10 MENU Operation

The ARP-10 MENU operation includes the followings;

Display: Turns on/off the plot symbols, past positions and target data.

All Cancel: Cancels the tracking of all targets.

Vector Ref: Selects relative vector or true vectors. To select your choice, open the ARP-10 menu, and the legend Rel and True appear on the "3. Vector Ref" line. Operate the omnipad. When your selection is in the reverse video, press the [ACQ/ENTER] key.

Vector Length: Selects vector time.

History: Selects past position plot interval.

CPA Set: Selects CPA alarm limit. When a target is predicted to come within this limit, an aural alarm sounds and at the same time the corresponding target symbol changes to a blinking triangle.

Note: If the preset CPA limit is set at OFF, a target which is on collision course will not produce an alarm.

TCPA Set: Selects TCPA alarm limit.

Auto ACQ: Turns on/off Auto Acquisition Area.

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Activating the Auto plotter

To activate the Auto Plotter, follow the steps shown below:

1. Adjust the GAIN, A/C SEA and A/C RAIN controls for proper radar picture.
2. Press the [MENU] key to open the main menu.
3. Operate the omnipad to select "ARP-10 MENU".
4. Press the [ACQ/ENTER] key. The menu shown in Figure AP-1 appears.

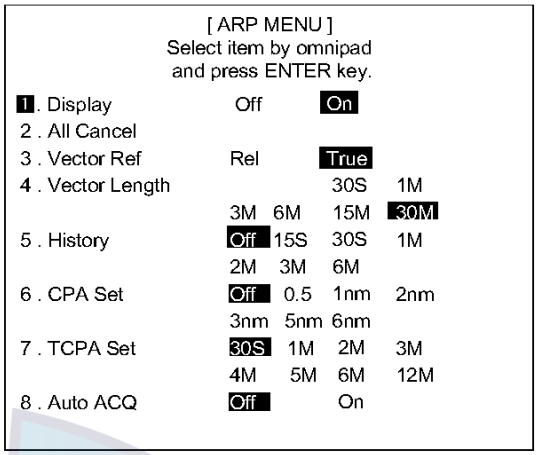


Figure AP-1 ARP Menu

5. Operate the omnipad to select the menu item "1. Display".
6. Operate the omnipad to select "On".
7. Press the [ACQ/ENTER] key.
8. Press the [MENU] key to close the menu.

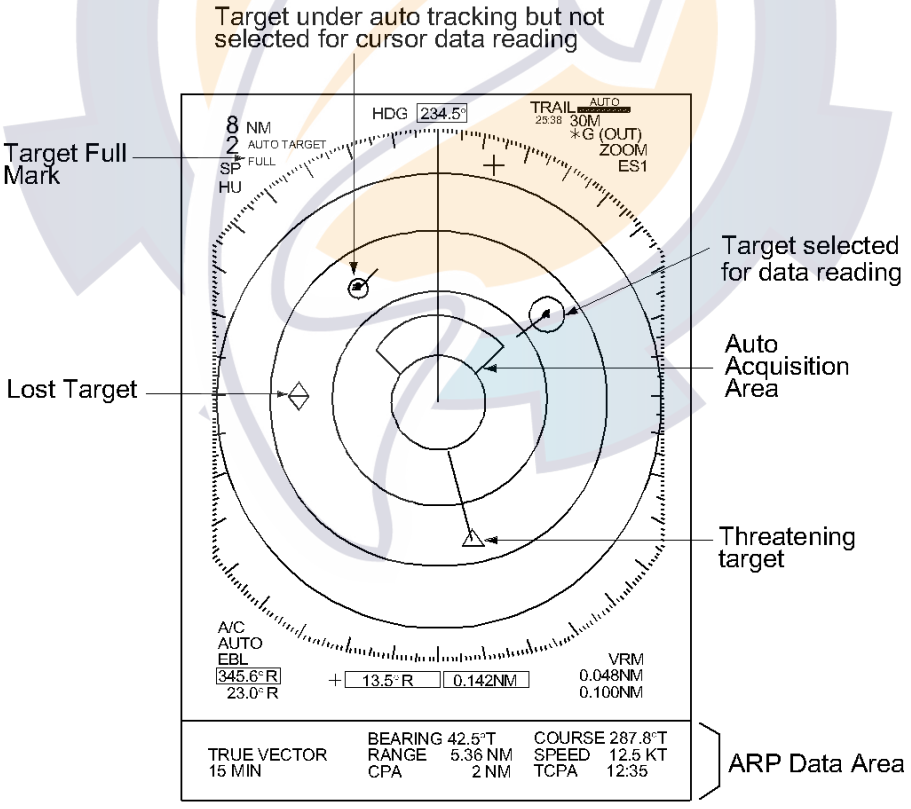


Figure AP-2 ARP Display

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Deactivating the Auto Plotter

To deactivate the Auto Plotter,

1. Open the "ARP-10 MENU".
2. Operate the omnipad to select the "1. Display".
5. Operate the omnipad to select "Off".
6. Press the [ACQ/ENTER] key.
7. Press the [MENU] key to close the menu.

Acquiring targets

Manual Acquisition

Follow the steps below to manually acquire a target. Up to 10 targets can be manually acquired.

1. Place the cursor (+) on a target of interest by operating the omnipad.
2. Press the [ACQ/ENTER] key.

The plot symbol changes its shape according to the status as below. A vector appears in about one minute after acquisition indicating the target's motion trend. If the target is consistently detected for three minutes, the plot symbol changes to a solid mark. If acquisition fails, the target symbol blinks and disappears shortly.



SQUARE (dotted)

Immediately after acquisition - Plot symbol shown in broken lines.



SQUARE (dotted with a vector)

One minute after acquisition - Vector still unreliable.



CIRCLE (Solid with a vector)

3 minutes after acquisition - Plot symbol changes to a solid circle indicating the stable tracking condition.



LARGE CIRCLE

The plot symbol of a target under tracking becomes twice as large as the normal symbol when the target is selected for data reading.

Note 1:The target to be acquired should be within 0.2 to 16 nm from own ship and not obscured by sea or rain clutter for successful acquisition.

Note 2:When you want to acquire 11th target, cancel tracking one of less important targets.

Note 3:When auto acquisition mode (Auto ACQ) is on, up to 5 targets can be acquired. For detail, see next section titled Automatic Acquisition.

⚠ WARNING

When a tracked target nears another tracked target, the targets may be "swapped." When two targets come close to each other, one of the two can become a "lost target." Should this happen, reacquisition of the "lost target" is required after the two targets have separated.

Automatic Acquisition

The Auto plotter ARP-10 can acquire up to 5 targets automatically by setting the Auto Acquisition area predefined in the system. If Auto ACQ is selected after more than 5 targets have been manually acquired, only the remaining capacity of targets can be automatically acquired. Example; when 7 targets acquired manually, then the Auto ACQ is switched on only 3 targets can be acquire automatically. When five targets have been automatically acquired, "AUTO TARGET FULL" message appears at top left corner on the display.

Setting Auto Acquisition Area

Auto acquisition area is predefined between 2.0 and 2.5 nm in range and 45° on either side of the heading line in bearing. If a target come into this area, it is acquired automatically.

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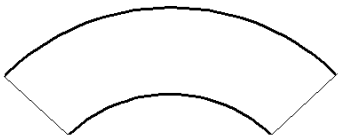


Figure AP-4 Auto acquisition area

Follow the steps shown below to activate the auto acquisition area;

1. Open the "ARP-10 MENU".
2. Select "8. Auto ACQ" by operating the omnipad.
3. Operate the omnipad to select "On".
4. Press the [ACQ/ENTER] key.
5. Press the [MENU] key to close the menu.

Terminating Tracking of Targets

When the Auto Plotter has acquired 10 targets, no more acquisition occurs unless targets are lost. Should this happen, cancel tracking of individual targets or all targets by the procedure described below.

Individual Targets

Place the cursor (+) on a target which you do not want to be tracked any longer by operating the omnipad and press and hold down the [SELECT/CANCEL] key.

All Targets

All targets can be canceled from "ARP-10 MENU" at a time.

1. Open the "ARP-10 MENU".
2. Select "2. All Cancel".
3. Press the [ACQ/ENTER] key.

Displaying Target Data

The Auto Plotter calculates motion trends (range, bearing, course, speed, CPA and TCPA) of all targets under tracking at the ARP Data area.

To turn ARP data on;

1. Press the [MENU] key.
2. Select the "DISP DATA".
3. Press the [ACQ/ENTER] key to select the message for "ARP" or "NAV and ARP ".
4. Press the [ACQ/ENTER] key to set.
5. Press the [MENU] key to close the menu.

⚠ CAUTION

At the speed under 5 kts the target data is displayed with a delay because of filtration.

Place the cursor on a wanted target and press the [SELECT/CANCEL] key. Data on the selected target is displayed at the bottom of the screen. The symbol of the selected target gets twice as large as the normal circle. The data includes the follows;

RNG/BRG (Range/Bearing): Range and bearing from own ship to the last-plotted or selected target position with suffix "T" (True) or "M" (Magnetic). For true bearings suffix "T" is used in case of gyrocompass input and suffix "M" is used in case of magnetic compass input.

COURSE/SPEED (Course/Speed): Course and speed are displayed for the last-plotted or selected target with suffix "T" (True) or "M" (Magnetic). For true bearings suffix "T" is used in case of gyrocompass input and suffix "M" is used in case of magnetic compass input.

CPA (Closest Point of Approach) is the closest range a target will approach to own ship. Do not mix it with the operator preset CPA alarm limit.

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TCPA is the time to CPA measured with present speeds of own ship and the targets. Both CPA and TCPA are automatically calculated. When a target ship has passed clear of own ship, the CPA is displayed and the TCPA appears as "**.*". TCPA is counted up to 99.9 min. and beyond this it is indicated as TCPA>99.9 min.

Mode and length of Vectors

True or Relative Vector

Target vectors are displayed in relative or true mode. Own ship does not have a vector in relative mode.

Vector Length

From the ARP-10 MENU, Vector Length can be set to 30 seconds, 1, 3, 6, 15 or 30 minutes and the selected vector time is indicated on the screen.

The vector tip shows an estimated position of the target after the selected vector time elapses. It can be valuable to extend the vector length to evaluate the risk of collision with any target.

Past position Display

The Auto Plotter displays equally time-spaced dots (maximum 5 dots) marking the past positions of any targets being tracked.

If a target changes its speed, the spacing will be uneven. If it changes the course, its plotted course will not be a straight line in TM mode.

Operational Warnings

There are two main situations which cause the Auto plotter to trigger visual and audible alarms.

- CPA/TCPA alarm
- Lost target alarm

CPA/TCPA Alarm

Visual and audible alarm are generated when the predicted CPA and TCPA of any target become less than their preset limits. The audible alarm continues for 10 seconds.

The Auto plotter ARP-10 continuously monitors the predicted range at the Closest Point of Approach (CPA) and predicted time to CPA (TCPA) of each tracked target to own ship.

When the predicted CPA of any target becomes smaller than a preset CPA alarm range and its predicted TCPA less than a preset TCPA alarm limit, the ARP-10 releases an audible alarm. In addition, the target plot symbol changes to a triangle and flashes together with its vector.

Provided that this feature is used correctly, it will help prevent the risk of collision by alerting you to threatening targets. It is important that GAIN, A/C SEA, A/C RAIN and other radar controls are properly adjusted and the Auto Plotter is set up so that it can track targets effectively.

CPA/TCPA alarm ranges must be set up properly taking into consideration the size, tonnage, speed, turning performance and other characteristics of own ship.

⚠ WARNING

The CPA/TCPA alarm feature should never be relied upon as a sole means for detecting the risk of collision.
The navigator is not relieved of the responsibility to keep visual lookout for avoiding collisions, whether or not the radar or other plotting aid is in use.

Follow the steps shown below to set the CPA/TCPA alarm ranges:

1. Open the "ARP-10 MENU".
2. On the "CPA Set" line, select a CPA limit desired. (Off, 0.5, 1, 2, 3, 5, 6 nm)
3. Press the [ACQ/ENTER] key.

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4. On the "TCPA Set" line, select a TCPA limit desired. (30s, 1, 2, 3, 4, 5, 6, 12M)
5. Press the [ACQ/ENTER] key.
6. Press the [MENU] key to close the menu.

The flashing of the triangle plot symbol and vector remain on the screen until the dangerous situation is no longer present or you intentionally terminate tracking of the target by using the [SELECT/CANCEL] key.

Lost Target Alarm

When the system detects a loss of a tracked target, the target symbol becomes a flashing diamond.

Installation of ARP-10

Necessary Parts

ARP-10 (000-086-852)

Name	Type	Code No.	Qty
ARP-10 Board	18P9007	008-476-930	1
Spacer	SQ-20	000-801-650	3
Spring Washer	M3 C5191W	000-864-204	3
Pan Head Screw	M3x8 C2700W	000-881-404	3
Pan Head Screw (w/washer) *	3x8 SWRM10	000-805-774	3

* Not used.

Mounting (For technician only)

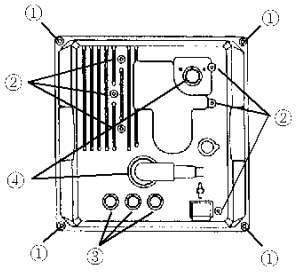
1. Remove the cover from the display unit as follows.

   ① Unscrew four binding screws (M4 x 10).

   ② Unfasten six binding screws (M3 x 10).

   ③ Remove three rubber covers to loosen three hex nuts.

   ④ Loosen two hex nuts.

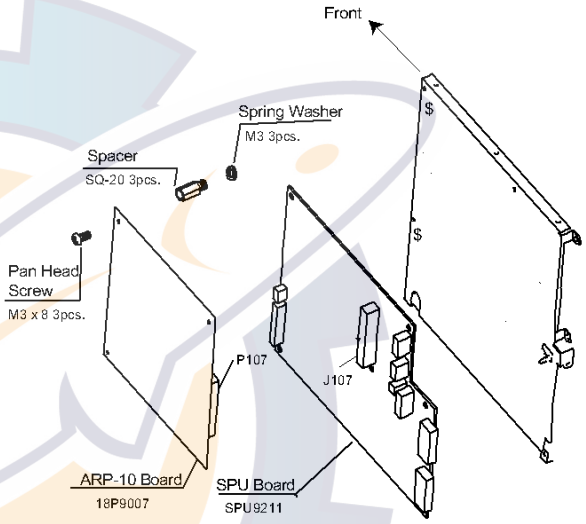


2. Attach the ARP-10 Board to the right-hand chassis of the display unit, using the spacer supplied as follows.

   1) Fasten three spacers tightly.

   2) Attach the P107 connector on ARP-10 Board to J107 connector on SPU Board.

   3) Tighten three pan head screws to fix the ARP-10 Board.



$: Pull the front panel slightly to fix these screws.

Input Signal Check

Place the radar in transmit condition after connecting the speed and heading sensor. Make sure the following items are OK on Self Test menu.

- SPEED
- COURSE
- TRIGGER

Video Signal Check

Make sure the follows on Self Test menu.

- VIDEO : OK
- Adjust GAIN, A/C SEA and A/C RAIN so that the readout for FE-DATA 1 and 2 are less than 1,000.