Pickle Multiplexer Explanatory Notes

This should be read alongside our diagram labelled "Pickle of Millbay, Multiplexer Circuits, April 2016 Rev G". All the instruments have a 12v supply, which is generally not shown.

At the heart of the set-up is the Brookhouse NMUX-AISC multiplexer which accepts all the nmea and Seatalk electronic data outputs (sentences) from the instruments, sorts them into an intelligible stream and outputs the sentences to any instrument which wants to listen to them. It very cleverly converts Seatalk (Raymarine's own data transfer protocol) into the more helpful nmea data protocol, which all other instruments understand. It also has a bespoke factory setting which gives input priority to one set of gps data over a second set of gps data, unless the first fails when the second is admitted. I told Brookhouse, in New Zealand, basically what I wanted to do and they set it up before posting it to me.

It is probably very confusing so I will describe what information goes into the multiplexer, as a starter.

The ST50 instruments output boat speed through the water, water depth, water temperature, distance sailed, true wind speed and direction, actual wind speed and direction, and compass direction. This goes into the Seatalk bus and then into the Seatalk terminal on the multiplexer.

The cockpit Chart Plotter, a Standard Horizon, has its own gps (Chart Plotter and GPS 1 shown in the grey box), and outputs through Port 1 (P1) the nmea sentences associated with a set course or a go-to a waypoint, and having its own gps, latitude, longitude, and speed over the ground. The gps data has priority over any other gps input, as set in the factory – see above. It also outputs a man overboard position. This information goes in to Channel 2 of the multiplexer.

Either the VHF/DSC (Standard Horizon) or the Radar (Furuno) output their data into Channel 3, depending on how the two pole two way switch is set. I have connected up both because they have outputs to do so. The VHF/DSC is supposed to output a DSC alert position hard wired to the Plotter but nothing appears there. I am not sure what the radar outputs, but it could be to a remote screen, which I do not have. Both instruments take in a lot of data, but more of that later.

The AIS and GPS 2 (Easy Ais) output to the specific ais Channel 4 on the multiplexer which has a faster data speed handling capability (38,400 b/s, instead of the slower 4800 b/s). Ship position and information, together with own boat position are output. The multiplexer blocks this own boat position gps data in favour of the gps data from the Chart Plotter (GPS 1) – as described above.

The RS 232 is both an input port, by USB from the Laptop, and an output port both to the Laptop and, in this case, to the Chart Plotter at the faster 38,400 b/s transfer rate – specifically the ais data. The Chart Plotter takes this in through its port 2 (P2) which is programed in the Plotter to accept it. The AIS and GPS 2 generate the ais data and the Plotter shows ship positions, speed and direction, and I can set alarms on the Plotter for closest point of approach etc. If you follow the circuit between the RS 232 port and the Plotter, there is a three pole two way switch within it which allows me to connect either the Transponder (SeaTraceR by Sevenstar Electronics) or the RS 232 port to the Plotter. The Transponder receives ais data from surrounding ships as well as transmitting Pickle's ais data. When switched to transmit the Transponder sends its ais data to the Plotter, whilst the switch simultaneously cuts off the AIS and GPS 2 ais data. This switching not only prevents two lots of similar, and potentially confusing data being sent to the Plotter but also ensures that should the AIS and GPS 2 fail, there is ais back-up from the Transponder. I personally think that ais information is some of the most precious on board.

The C Series port is, I think, for outputting to other Raymarine instruments, which I do not have.

The final output port is the RS 422 which has the lower speed. However a massive amount of data spews out of this, all in a neat sequence of course, which has to go to the Bus-bar to facilitate the connection of most of the instruments.

Working down from the top of my sketch, there are two NASA instruments which are mounted above the ST 50s and visible from the cockpit. They pick up their 12v supply from the Seatalk bus which is physically close by (the red wire). Via the Bus-bar the Log picks up boat speed and trip distance from the Chart Plotter. I had to resort to the NASA Log because the Chart Plotter is incapable of giving me a sensible trip distance on its display. The GPS Repeater gives me position, course to steer, rolling road, distance to waypoints etc., all vital stuff visible in strong sunlight. This data all comes from the Chart Plotter. Amazingly if we press the Man Overboard button on the Chart Plotter, this simple cheap NASA instrument will immediately tell you to go to port, starboard, ahead or even astern to get back to the MOB position; perfect in a challenging situation. The Chart Plotter will do this but it needs about four button presses to do so!

We have a Raymarine Life Tag system which through the Seatalk bus is connected permanently to the Autopilot. This ensures that it is always armed – and it screams at you to let you know, as well.

The CP 2 is a cheapo chart plotter, mounted in the stern cabin, which we use for night anchor watches. We set the alarms and the screen is easily visible from the deeply luxurious Moody 35's stern cabin bunk. The CP 2 has its own internal gps. Interestingly the CP 2 knows when the Life Tag is armed, so the latter must be outputting something.

The Raymarine Autopilot is an ST 50, and picks up most of its data (sail to wind, sail to compass) from the ST 50 instruments through the Seatalk bus, but any sail to waypoint or course to steer data it gets from the Chart Plotter, through, thankfully, an nmea input port.

The VHF/DSC gets its position, time and boat speed from the Chart Plotter. It also has a dedicated link to the Chart Plotter (for showing a DSC alert position on the screen), but this never seems to work.

The Chart Plotter is set to take in all sorts of data – wind, water depth etc. but I am unable to get it to display it despite seeing the nmea sentences happily going in.

The Radar takes in and displays position, boat speed, course steered and a few other things; surprisingly a go-to position, as a small cross on the screen, when set on the Chart Plotter.

I have shown an FM radio linked to the AIS. The AIS uses the masthead vhf aerial, as does the FM radio, but all through a splitter, which prioritises any vhf traffic.

The Transponder also has a USB output, which connects with the Laptop. This allows one to programme the Transponder with Pickle's ais information, and it also sends all received ship's information to the Laptop.

The Laptop is a very old device which has been upgraded to run on Windows 10 with Euronav Seapro 3000 installed as the navigating software. I cannot praise Euronav enough, for what is an easy, informative, comprehensive piece of software. I can display any of the nmea data in the system on the screen. I can tell immediately if something is not working. The ais data includes ships names, sizes (shown on screen) passage data, speed etc etc. You can set alarms for anything. I could ramble on. All the ST50 stuff is there, including a rolling water depth chart. For longer trips we can plan a course between a series of waypoints set on screen, check for a good departure time (all the tide data is in there), save it and then send it to the Chart Plotter as a route. The route can then be called up on the Plotter, where it appears on the screen, and we can set a "go-to" the route. The Autopilot can then take Pickle along the route, changing direction at the waypoints, allowing us to just keep a look-out. The NASA GPS Repeater sets itself to the new waypoint as each one is passed. I can also drive the Autopilot from the Laptop direct, should the Plotter fail. As a last resort I have a GPS dongle which goes in to the Laptop so that we have a total navigational backup if we lose all power.

When I originally designed the circuitry I had no idea if it would work. In fact it all works very well, but not being an electronic engineer, I do not know why. The multiplexer is very clever indeed, despite us asking it to do far more than I am sure it was designed for.

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