

FURUNO

NAV*pilot*

Model NAVpilot-700/711C

AUTOPILOT

**Hamilton Jet Drive
MECS and BlueArrow Interfacing Guide**



Introduction:

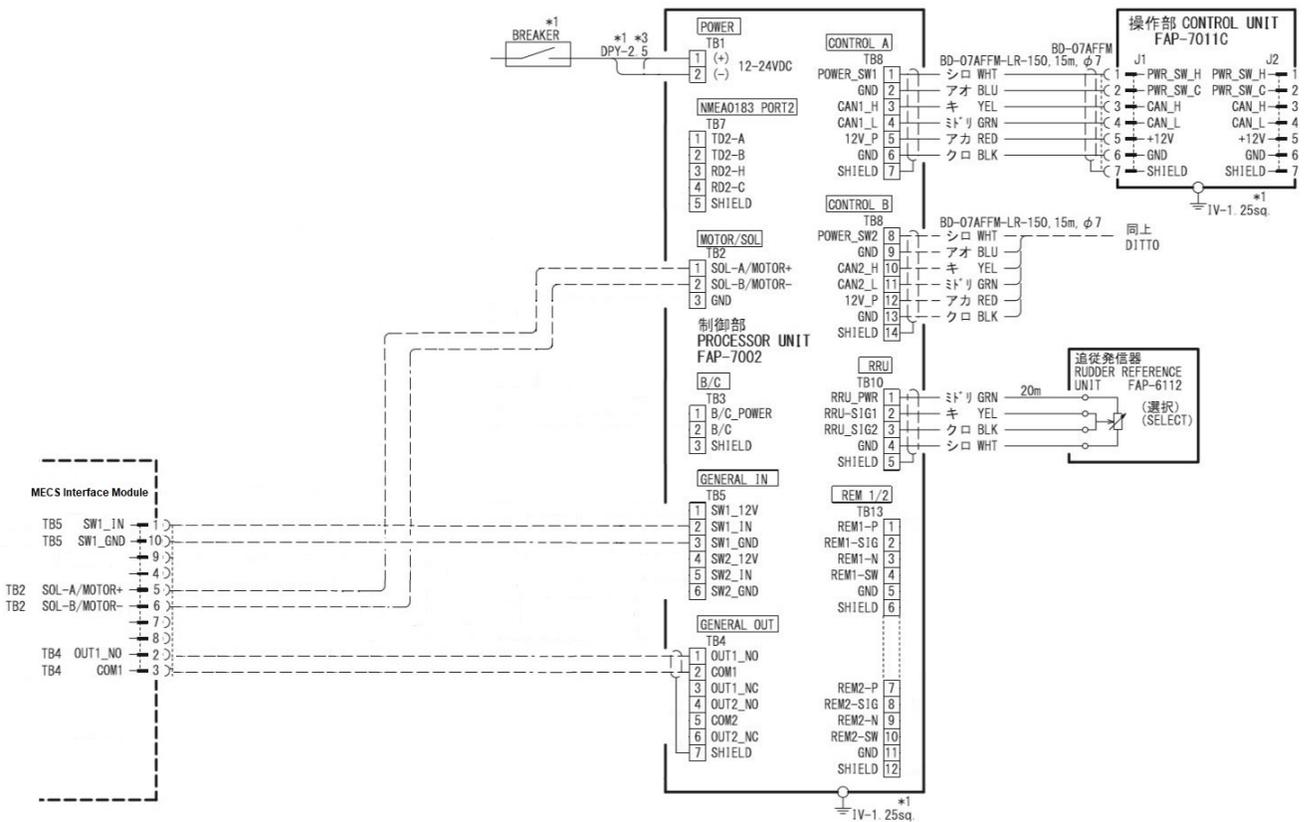
There are many drive units that can be interfaced with the NAVpilot 711C. From common Reversible Pump sets, Linear Actuators, Mechanical drives to solenoid systems and "Drive-By-Wire" systems. The NAVpilot can interface with them all. This also includes a variety of Hamilton Jet Drives, such as the MECS (Modular Electronic Control System) and BlueArrow.

The Hamilton MECS drive (used in larger commercial applications) and the smaller BlueArrow (for smaller recreational and Sport Fishing applications) have been interfaced with great success with our NAVpilot. The connection to Hamilton Jet Drives is very similar to the connect made to a "Drive-By-Wire" system. There is a lot going on between the NAVpilot and the Hamilton Drives. The Essentials are this: The pilot interfaces to the Controller and sends rudder commands to the Hamilton controller first, then it moves the jet nozzles. This means that the NAVpilot is not in direct control of the buckets, so it cannot be used for 360° rotation of the buckets for spins, side docking, maneuvering, or stabilizing, but it can control them for standard autopilot functions as it would any rudder.

The MECS VS1710 Drive:

Wiring the System:

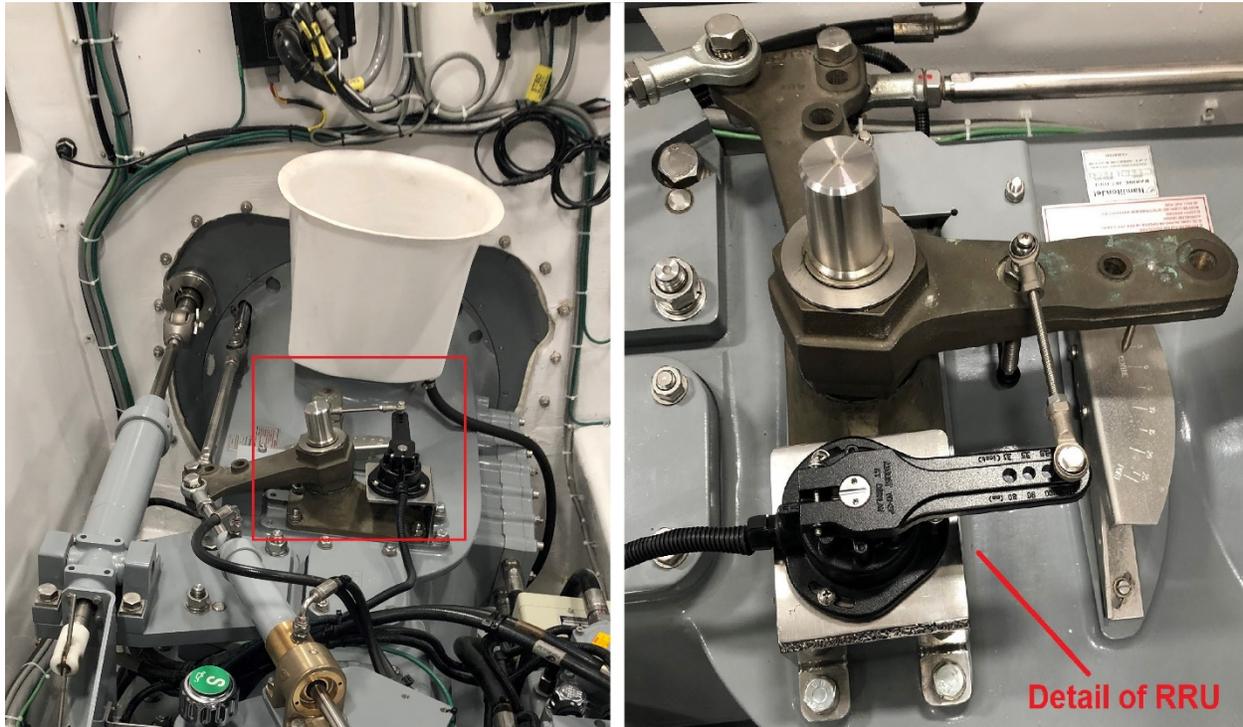
Below is an example of the wiring connections needed to connect this unit to the NAVpilot 711C processor:



Installing the RRU (Rudder Reference Unit):

Besides the interfacing between the NAVpilot and the MECS Controller, one of the most important parts is the RRU signal back to the NAVpilot.

While Hamilton does provide a built-in RRU in the MECS drive that has been used with some success, we highly recommend the use of the **Furuno FAP6112** RRU (provided with inboard models) for better precision. The RRU is mounted on top of the Jet drive as shown below (mounted to a Hamilton MECS VS1710 drive unit).



Setup:

Once the wiring connections are complete enter the Installation Menu of the NAVpilot to configure the Universal Port. To enter the Installation Menu, we need to Press and **hold** the MENU (Wrench) key while pressing the Roto-key three (3) times quickly. This will give access to the Installation Menu.

Next, scroll down the "Universal Port Setup"

1) Universal Port Setup:

Input 1: Set to "**Go STBY**"
Input 2: Set to "**DISABLE**"

Output 1: Set to "**AP Control**"
Output 2: Set to "**DISABLE**"

Go back to the main Installation Menu and scroll down and select "DockSide Setup" and make the following changes:

2) **Dockside Setup:**

RRU Type: **ROTARY**

RRU Limit Setup: This is easy but will require the engines running.

- 1) Go To "**Dockside Setup**" and select the "**Rudder Limit Setup**"
- 2) Clutch the MECS into gear and use the Joystick at the helm
- 3) Move the buckets hard to **PORT FIRST**, then set the Port Limit to 30°
- 4) Move the buckets hard to **STBRD**, then set the value at 30°
- 5) Center the buckets and select "**Set Center Rudder Position**" and press ENTER
- 6) Press Return to go back to the Dockside Menu.

Auto and Manual Rutter Limits: Set BOTH at 25° degrees.

3) **Rudder Test:**

After much testing, the following settings should make this go rather smoothly. The way the Hamilton MECS allows the NAVpilot to take command is via a command sent to the NAVpilot's Universal Input port.

Since the Universal Out 1 is wired as "Normally Open" to the MECS controller, this will require a change to the Digital Invert Signal settings on the MECS computer. Normally this would be set to "**30**" for regular use. If this is not changed, there will be a signal conflict between the AP Control Command and the Rudder Test Command causing the MECS to Alarm and Error out. Changing the Digital Invert Setting to "**20**" will allow the MECS to ignore the AP Control Command During the Rudder Test and any other possible conflicts in normal use.

To Change the Digital Invert Settings:

- 1) On the MECS JCM, Press "**ESCAPE**" Then select "**Jet Data Display**"
- 2) Press and hold the **Lower Left Yellow Button**, while pressing the **Upper Left Yellow button** repeatedly.
- 3) Enter the Password (The Factory Default is "**1111**"). This is done using the **UP** and **DOWN** arrows to select the correct digits.
- 4) Unit will display "Finding Modules", Then show "**Module: JCM#1/1**"
- 5) Scroll Down with the Down Arrow key to display "API #1/1" and press ENTER.
- 6) Using the Arrow keys to select "**DgSigIvrt (##)**" and press ENTER.
- 7) Select the desired setting (in our case, "**20**") and press ENTER to store the setting. Your Setting should now appear between the Brackets (20).
- 8) Press ESCAPE a few times to exit the setup menu.

Now we can perform the Rudder Test. You will need to start the engines and Clutch the MECS into gear. Select "**Rudder Test**" on the NAVpilot 711C Dockside Menu and make sure the buckets are centered before you begin. The NAVPilot will ask if the Rudders are Centered, select "**YES**". The test will not begin and take about 5 minutes to complete.

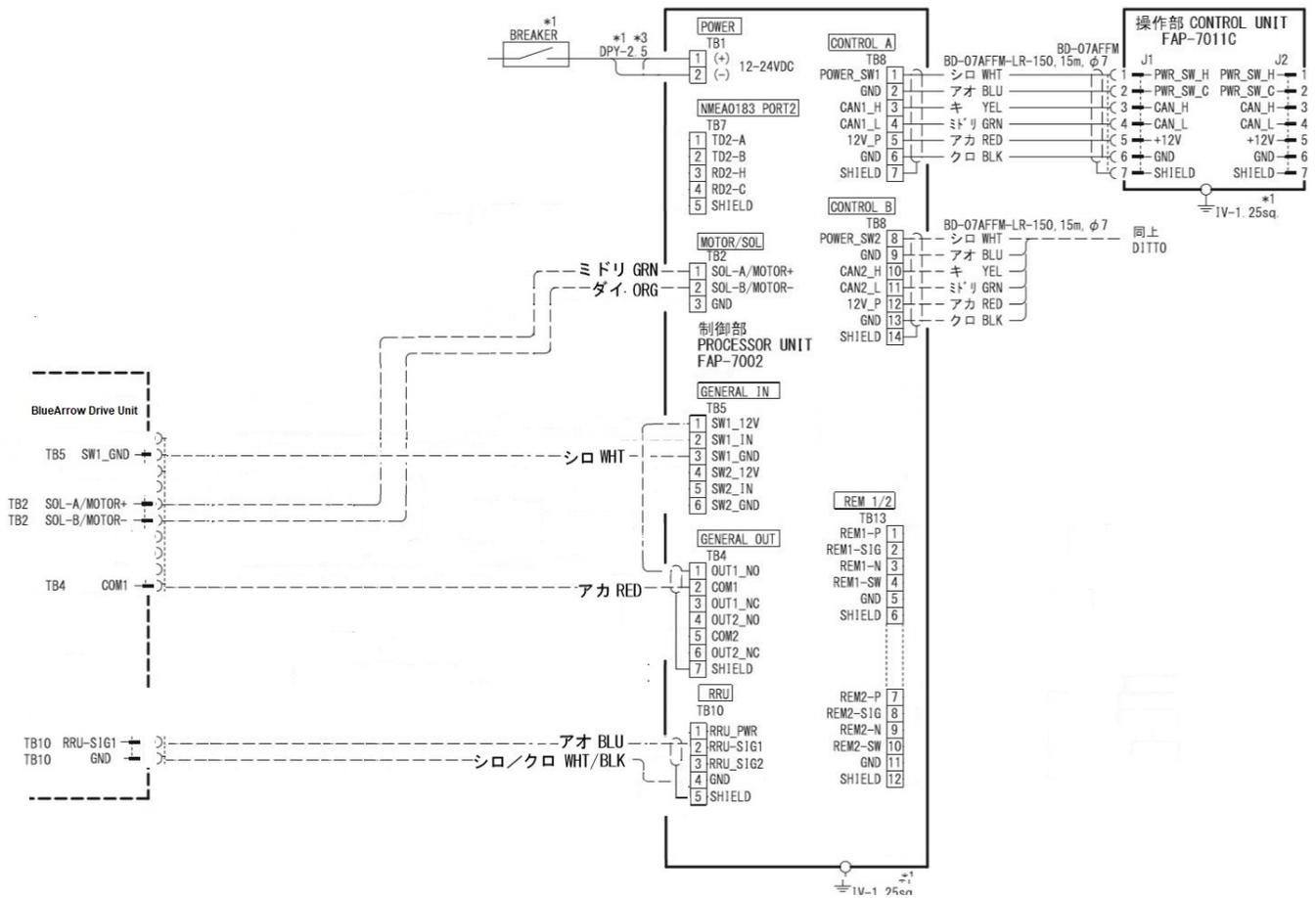
NOTE If for some reason the Rudder Test should fail, Set the **OU-1** setting to **"STBY"** and redo the Rudder test. When it completes it, Set the UO-1 setting back to **"AP Control"**.

The Hamilton BLUE ARROW Drive:

The Newly Introduced "Blue Arrow" Drive is a far more compact drive unit compared to the MECS VS1710 drives. There are also a few differences in wiring and setup, making them simpler.

Wiring the System:

The Wiring on the BlueArrow Drive is a bit different from the MECS as it includes its own Rudder Sensor built in. The drive is also pre-wired. The wiring is shown below:



Dockside Setup:

- 1) Enter the NAVpilot **Installation Menu** (Press and hold the MENU [Wrench] key while pressing the Roto-key three (3) times quickly).
- 2) Select "**Universal Port**" and press ENTER.
- 3) Set "**Out Port1**" to "**AP Control**". All other settings remain "**Disable**".
- 4) Press **MENU** to go back to the Installation Menu
- 5) Select "**Dockside Setup**" and press ENTER.
- 6) Select RRU type must be set to "**LINEAR**"
- 7) Continue on through the rest of the Dockside Setup as outlined in the NAVpilot 711C installation Manual (Starting with **Section 3.5, pages 3-6 to 3-14**)

Once the Setup is complete and the and the Rudder Test has been completed, the pilot will be ready for Sea Trial.

Appendix:

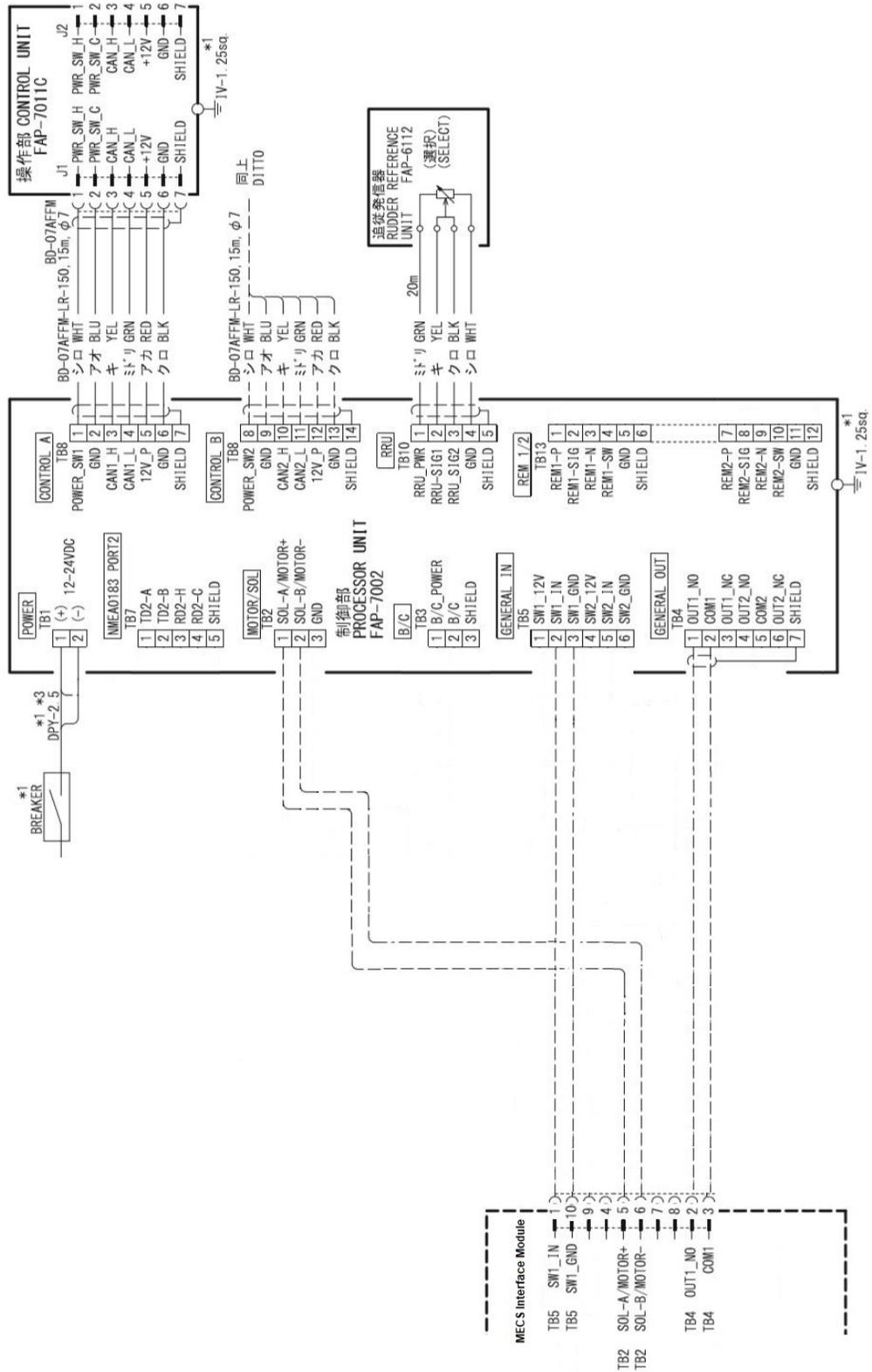
MECS Drive Wiring and Settings Chart:

HamiltonJet			
Furuno NavPilot 700 Series with FAP-7002 Processor to MECS Autopilot Interface Application Notes			
P.S. Webb		12/12/2017	
API to AP Wiring			
FAP-7002	Signal	Wire Color	API
MOTOR/SOL	TB2-1	SOL-A/MOTOR A (1k Resistor to TB2-3)	5
	TB2-2	SOL-B/MOTOR B (1k Resistor to TB2-3)	6
	TB2-3	GND	2
Universal Output	TB4-1	OUT1 NO	3
	TB4-2	OUT1 Common	2
Universal Input	TB5-2	SW1 IN	10
	TB5-3	SW1 GND	1
RRU	TB10-2	RRU-SIG	7
	TB10-4	RRU GND	8
API Settings			
J1	2-3		
WISEL1	1-2		
VSEL1	1-2		
VSEL2	1-2		
VSEL3	2-3		
Demand Type	Digital		
Station	Set Appropriately		
Feedback Type	PWM		
Steering Speed	4		
Return Speed	4		
DgSigInvrt	f0		
R58 & R60	Adjust for 1.6v (Port), 2.5v (Center), 3.4v (Starboard)		
NavPilot Settings			
Ship's Characteristics:			
Boat Type:	"Planing" or "Semi-Displace" as appropriate.		
Universal Port:			
Input port 1:	"Go Stby"		
Output Port 1:	"AP Control"		
Dockside Setup Menu:			
Select RRU Type:	Rotary (Inboard)		
Rudder Limit Setup	Follow on screen instructions. Use normal mode to move port jet's steering to center, port, and starboard while pressing appropriate buttons on autopilot. Set "measured value" to 25 by turning the knob.		
Detecting Drive Unit:	The autopilot will "learn" how to move the steering. Observe "PRT1", "STBD1", and AP_On1" LEDs on API PCB to determine if inputs are being properly switched.		

BlueArrow Wiring and Settings Chart:

HamiltonJet			
Furuno NavPilot 711c to Blue Arrow Autopilot Interface			
T. Underwood		Draft	6/16/201
Blue Arrow to AP 711c Wiring			
FAP-7002		Signal	Wire
MOTOR/SOL	TB2-1	SOL-A/MOTOR +	Green
	TB2-2	SOL-B/MOTOR -	Orange
	TB2-3	GND	White
Universal Output	TB4-1	General out 1 – N/O	Red
	TB4-2	General out 1 – COM	Jump to TB5-1
Universal Input	TB5-1	12vdc	Jump to TB4-2
RRU	TB10-2	RRU-SIG1	Blue
	TB10-4	GND	White / Black
BA Settings			
Type	Digital		
Slew Rate	90		
Port Demand	DC*		
STBD Demand	DC*		
Mid Demand	DC*		
Port Feedback	18		
STBD Feedback	26		
Mid Feedback	34		

MECS Connection Diagram:



BlueArrow Connection Diagram:

