R-net Omni Dual Input Device Operation

With PGDT's R-net Omni, it is now possible to operate and control all of the functions on a powered wheelchair using two separate Specialty Input Devices (SIDs). This unique functionality comes as standard on every R-net Omni, thanks to the presence of a second input port. Dual SID operation offers a number of benefits, not only when user fatigue is a factor or simple and elegant switching between SIDs on an assessment chair is required. This Applications Note documents three typical dual SID installations.

Prior to reviewing some representative examples of twin SID usage, it is helpful to understand some of the reasons for fitting an R-net Omni in the first instance. For users unable to operate a standard Joystick Module, the Omni provides an ideal gateway to a wide range of Specialty Input Devices. These include specialist joysticks, switches, head controls, sip & puff apparatus and single switch scanners. In addition to controlling drive and seating, each SID connected to the Omni can operate environmental controls and communication aids via an R-net 'IOM', as well as a PC mouse through our new Bluetooth module. Each SID can be assigned to control either specific or multiple drive Profiles, providing safe control of all powerchair functions.

The R-net Omni features a large, full color LCD screen with real-time clock and speedometer, housed in a compact and ergonomic package. Much consideration has been given to the screen layouts, to ensure they present the user information in the clearest and most user-friendly way. In addition, the content and order of user menus is fully customizable, a feature that ensures the most frequently used and popular functions can be accessed in the most efficient way.

There are 3 easy methods of programming the Omni – OBP, PC or DTT. On-Board Programming (OBP) makes use of the Omni's integral push-buttons and LCD screen to quickly change settings unique to the user, while the R-net PC Programmer is ideal for a workshop-based environment when a more in-depth set-up of the powerchair is required. PGDT has also recently introduced the DTT, an intuitive hand-held programming tool with extensive diagnostic capabilities. For simplicity, it will be assumed that OBP is the preferred method of programming for the remainder of this Applications Note, although the DTT's menus and parameters are organized in an almost identical fashion.

The following examples highlight some of the configurations that are possible when using the R-net Omni.

Example One

An existing Omni user has difficulty operating their joystick at certain times during the day. A 3-axis switched head control must be fitted as an alternate SID to assist the user during these periods.

Let us assume that a 'light-touch' joystick and User Switch are already fitted to the base of the Omni in 'Port 1' and 'U1' respectively. The joystick has control of three drive Profiles, 'Indoor', 'Outdoor' and 'Sport'. In addition, the user is able to operate several seating actuators, an environmental control and their PC with the existing set-up.

Two new Profiles, exclusively accessible via the head control, must first be added – one for indoor use and one for outdoor use. Although not generally considered appropriate, it would be possible to include a sixth profile allowing access to a sports program via the head control.

On-Board Programming Mode (OBP) must first be entered. The access method will be set by the powerchair OEM and may require a hardware key (Dongle) to be connected. Alternatively, it may be possible to enter OBP via a push-button sequence. Once in OBP, utilising the Omni's own navigation keys, select the 'Profiles' group and enable Profiles 4 and 5 by amending the values under 'Pr4' and 'Pr5' to 'Yes'.

> OBP>Profiles: *set Pr4 and Pr5 to Yes*

This will allow the user to access two new Profiles. The amendments will be written directly to the R-net system as the value is changed. Appropriate values for speed, acceleration, braking etc. for the two head control profiles can now be written using the 'Speeds' group in the OBP menu. If the values desired closely match an existing Profile, the 'Copy Profile' facility can be used to expedite this process.

> OBP>System>Copy Profile: *follow on-screen instructions*

Simply access the 'System' group in OBP, then scroll down to 'Copy Profile'. On entering 'Copy Profile', select the Profile that you wish to copy e.g. Profile 1. Press the 'Right' navigation key on the Omni to select where the Profile should be copied to, e.g. Profile 4. Use the 'Right' navigation key again to begin the automatic copying process. All of the values in Profile 1 will be replicated in Profile 4. Whilst this is happening, a timer symbol will be displayed on the Omni's screen. A green 'tick' symbol will indicate when the process has been completed. If you wish to rename the Profiles, this can be done at a later date using a PC programmer.

The next step is to assign 'Port 2', the head control connection, to Profiles 4 and 5. Access the 'Omni' group from OBP and then select 'Profiled'. Amend the values under 'Pr4' and 'Pr5' to '2' using the '+' key on the Omni's front panel.

> OBP>Omni>Profiled: *assign Profiles 4 and 5 to Port 2*

Once this is done, you will notice a small figure '1' appear in the top left hand section of the Omni's standby screen. This indicates that Port 1 is currently in use. To configure Port 2 to accept a 3-axis switched head control, access the 'Omni' group once again using OBP and then select 'Port2'.

The screen should be highlighted on 'SID'. Using the '+' and '-' keys on the Omni's front panel, alter the current SID to display '3Swi'.

OBP>Omni>Port2>SID: *set Port 2 to 3-switch type SID*

In addition to physically connecting the head control to the 9-way D-type connector on the Omni's base, labelled 'Port 2', PGDT strongly recommend fitting a second normally closed User Switch into the jack socket marked 'U2'. This second switch provides a fail-safe for SIDs that may already have an integral mode switch fitted. In addition to selecting available operating Modes, this second switch provides an emergency stop function, toggles drive and actuator direction (for head controls) and can be used to put the Omni into a 'sleep' state. If the light-touch joystick is currently the SID operating the powerchair, the 'U2' switch can be used to transfer control to the 3-axis SID. Likewise, operating the switch connected to 'U1' will transfer control back to the light-touch joystick. This straightforward functionality provides a convenient method for the user to switch between available SIDs. When the 3-axis SID is selected, a small figure '2' will be shown in the top left hand section of the Omni's screen to indicate that Port 2 is currently in use.

For the second SID to operate seating actuators, the environmental control and a PC via an R-net Bluetooth module, all Modes must be enabled in the first Profile used by the 3-axis device. Access the 'Modes' group from OBP and then program each value to 'Yes', in the first profile controlled by the second SID; 'Prf 4' in this example.

> OBP>Omni>Modes: *enable all Modes to be controlled by the second SID in profile 4*

To complete the installation, all of the parameters in the 'Port2' subgroup of the 'Omni' branch should be programmed to match the head control and the abilities of the user. Within this group there are a number of parameters designed specifically to assist operation of the powerchair with a 3-axis switched device.

Switch Medium (OBP>Omni>Port2>Switches)

A single operation of the relevant user switch will usually toggle drive direction. To access the User Menu, an individual must perform a double click operation within a programmable time period. If this proves difficult, the parameter 'Switch Medium' can be utilized. Firstly, set the 'Double Click Time' to '0' secs (OBP>Omni>Port2>Switches). Now, when the user switch is operated and held for a period equal to the value of 'Switch Medium', the Omni will interpret the operation as a conventional User Switch operation, i.e., the User Menu will be entered. If the User Switch is operated for a time less than that of 'Switch Medium', a direction toggle will occur. In all cases, if the User Switch is operated for a period greater than 'Switch Long', the Omni will enter a 'sleep' state. It can be awoken again with a single User Switch operation.

Menu Scan Rate (OBP>Omni>Port2>Controls)

Rather than rely on repeated operations of the 'forward/reverse' command to navigate the User Menu, an automatic scanning rate can be programmed. This parameter also sets the scanning rate for the 'Lights' and 'Settings' Menus.

Fwd/Rev Auto Toggle (OBP>Omni>Port2>Controls)

This parameter provides an alternative method of changing direction with a 3-axis SID. There are two programmable options, 'On' and 'Off'. If set to 'On', then an operation of the SID's 'Fwd/Rev' command can be used to change the selected drive direction. This is achieved by operating and releasing the 'Fwd/Rev' command within a two second period. This will change the previously selected drive direction. To drive in the newly selected drive direction, the 'Fwd/Rev' command must be operated again within a further two seconds. If this two-second period passes without another 'Fwd/Rev' command, then the selected drive direction will revert back to the original setting. If set to 'Off', then a short operation of the User Switch selects a new direction and double clicks of the same switch change Mode. The additional parameter, 'Fwd/Rev Auto Toggle Time', sets the period in which the user must operate the 'Fwd/Rev' command to be effective. Although the default time is two seconds, this can be adjusted between 0.5s and 5s in steps of 0.25s.

Actuator Axes (OBP>Omni>Port2>Controls)

This parameter sets which SID direction commands are used to select the available seating actuator movements, (axes). If set to 'Left/Right' then a left SID command will select the available actuator axes and a

right SID command will move the selected axis. The direction of movement is changed via a short operation of the right SID command. If set to 'Right/Left', this logic is reversed.

Summary:
The user now has 5 Profiles – Profiles 1, 2 and 3 for the 'light-action' joystick and Profiles 4 and 5 for the head control. Both of these input devices can be used to control drive, seating and environmental devices. Whenever the user needs to switch between the input devices, this is simply achieved through operation of the 'local profile' switch.

Example Two

An existing Omni user has difficulty operating their joystick at certain times during the day. A sip & puff device must be fitted as an alternate SID to assist the user during these periods.

As in example one, let us assume that a 'light-touch' joystick and User Switch are already fitted to the base of the Omni in 'Port 1' and 'U1' respectively, and the joystick has control of two drive Profiles, 'Indoor' and 'Outdoor'. In addition, the user is able to operate several seating actuators, an environmental control and their PC with the existing set-up.

In this particular example, two new Profiles exclusively accessible via the sip & puff device will be added – one for indoor use and one for outdoor use. Although not generally considered appropriate, it would be possible to include a fifth Profile allowing access to a sports program via the second SID.

Begin by adding two additional Profiles and programming appropriate values for speed, acceleration, braking etc. using the same steps followed in example one. Next, assign 'Port 2' to Profiles 3 and 4. To configure Port 2 to accept a sip & puff SID, access the 'Omni' group once again using OBP and then select 'Port2'. The screen should be highlighted on 'SID'. Using the '+' and '-' keys on the Omni's front panel, alter the current SID to display 'SpPf'.

> OBP>Profiles: *set Pr3 and Pr4 to Yes*
>
> OBP>Omni>Profiled: *set Profiles 3 and 4 to Port 2*
>
> OBP>Omni>Port 2>SID: *set Port 2 to sip & puff type SID*

The sip & puff device can now be simply and intuitively calibrated to match the user's operating abilities. From OBP mode, follow the path detailed below, using the 'Right' navigation button on the front of the Omni:

> Omni>Global>Sip and Puff>Calibrate.

A screen like the one shown below should appear.
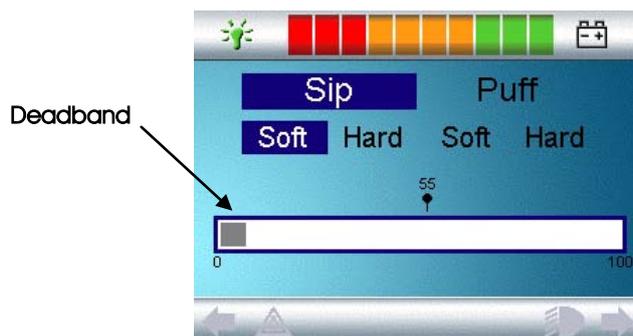
'Soft Sip' will be highlighted first. The user must now make a series of soft sips. After each sip, a live readout of the current pressure will be displayed on the screen in the form of a line within the 0 – 100 scale. Repeated soft sips will produce a 'band' of values. During this process it may be beneficial for the user to look away from the screen. This prevents 'false' values where the user may be trying to attain earlier levels. Once you are satisfied that the user can produce a soft sip consistently within this band, use the 'Right' navigation button on the front of the Omni to highlight 'Hard Sip'. The user must now make a series of hard sips to produce a new 'Hard Sip' band. Ideally there should be as much difference as possible between the Soft Sip and Hard Sip values. To aid the Omni's differentiation between these pressures, the installer should move the Threshold Marker, (shown in the following diagram), to the middle of the gap between the hardest soft command and the softest hard command. This is done via the + / - buttons on the front of the Omni. Once a suitable threshold is set, use the 'Right' navigation button on the front of the Omni to highlight 'Soft Puff'.
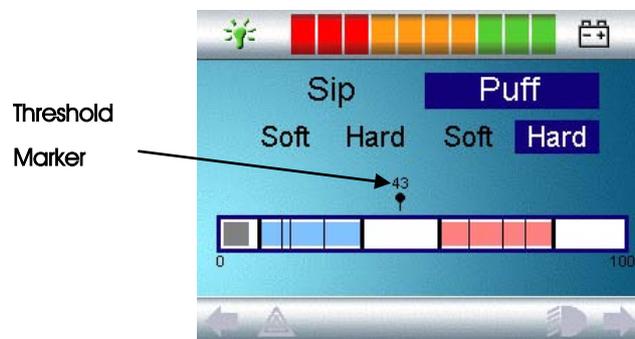
Now repeat the sequence of instructions for both soft and hard puffs including the 'Threshold' setting. Once calibration has been performed, use the 'Right' navigation button on the front of the Omni to return to the 'Calibrate' option in the Sip and Puff branch of OBP. Please note that all values must be greater than the 'Deadband' setting for calibration to be performed successfully.

As with example one, for the second SID to operate seating actuators, the environmental control and a PC via an R-net Bluetooth module, all modes must be enabled in the first Profile used by the sip & puff device. Access the 'Modes' group from OBP and then program each value to 'Yes', in the first profile controlled by the second SID; 'Prf 3' in this example.

In addition to physically connecting the sip & puff device to the pneumatic input connector on the Omni base, PGDT strongly recommends fitting a second normally closed User Switch into the jack socket marked 'U2'. This switch can take many forms and popular types for this application could be either a pneumatic switch or an 'IR' lip-type switch. In addition to selecting available operating Modes, this second switch provides an emergency stop function and can be used to put the Omni into a 'sleep' state. If the light-touch joystick is currently the SID operating the powerchair, the 'U2' switch can be used to transfer control to the sip & puff SID. Likewise, operating the switch connected to 'U1' will transfer control back to the light-touch joystick. This straightforward functionality provides a convenient method for the user to switch between available SIDs. When the sip & puff SID is selected, a small figure '2' will be shown in the top left hand section of the Omni's screen to indicate that Port 2 is currently in use.

To complete the installation, all of the parameters in the 'Port 2' subgroup of the 'Omni' branch should be programmed to match the sip & puff device and the abilities of the user. Within this group there are a number of parameters designed specifically to assist operation of the powerchair with a sip & puff SID.

Puff Ramp Up (OBP>Omni>Global>Sip and Puff)

This parameter sets the time allowed to ramp up to a hard puff from zero pressure. Whenever a hard puff is attempted, there is a period of time when the pneumatic pressure is below the Puff Threshold. This could be falsely interpreted by the Omni as a soft puff command. Different users will have differing abilities in terms of

how quickly they can generate sufficient pressure to pass this threshold. Puff Ramp Up allows the user more time to reach the Puff Threshold. If this threshold is not reached within the Puff Ramp Up time, a soft puff will be interpreted, provided the pressure is above the value set for Deadband.

Puff Ramp Down (OBP>Omni>Global>Sip and Puff)

This parameter sets the time allowed to ramp down to zero pressure from a hard puff. When a hard puff has finished, there is a period of time when the pneumatic pressure is below the Puff Threshold but still above the value for Deadband. This could be falsely interpreted by the Omni as a soft puff command. Puff

Ramp Down allows the user sufficient time to reach the Deadband without unintentionally providing a soft puff. If this Deadband is not reached within the Puff Ramp Down time, a soft puff will be interpreted, provided the pressure is below the Puff Threshold.

Sip Ramp Up / Down (OBP>Omni>Global>Sip and Puff)

These 2 parameters operate the same way as Puff Ramp Up / Down but for Sip commands.

Double Click Time (OBP>Omni>Global>Sip and Puff)

This parameter sets the period of time during which two pneumatic commands must be detected, in order to be interpreted as a 'double-click'. If set to '0s' no double-click facility will be supported.

Timeout to Menu (OBP>Omni>Port2>Controls)

This parameter sets the period of SID inactivity before the User Menu will appear. The programmable range is 0s to 60s in steps of 1s.

Summary:
The user now has 4 Profiles – Profiles 1 and 2 for the 'light-action' joystick; and Profiles 3 and 4 for the sip & puff device. Both of these input devices can be used to control drive, seating and environmental devices. Whenever the user needs to switch between the input devices, this is simply achieved through operation of the 'local profile' switch.

Example Three

An attendant wishes to be able to alter a client's seating position but is unable to operate their single-profile scanning control. Although a standard R-net Dual Attendant Module could be fitted to provide this functionality, a remote 5-switch device is preferred for freedom of movement.

In this particular example, only one new Profile, exclusively accessible to the attendant is required. Begin by adding the new Profile, using the same steps followed in the previous examples. There is no need to program speeds, acceleration, braking etc., as the attendant only requires access to seating Mode. To configure Port 2 to accept a 5-switch SID, access the 'Omni' group once again using OBP and then select 'Port2'. The screen should be highlighted on 'SID'. Using the '+' and '-' keys on the Omni's front panel, alter the current SID to display 'Swi'.

As this second SID is only required to operate seating actuators, access the 'Modes' group from OBP and then set 'Mode 2' to 'Yes' against the profile specific to the attendant; 'Prf 2' in this example. As the attendant does not require drive, set 'Mode 1' to 'No'.

The 5-switch device will already have its own integral fifth switch so it is not strictly essential to fit a second User Switch into the jack socket marked 'U2'. However, for a truly fail-safe system, PGDT recommend fitting a second normally closed switch to provide added security should the 5-switch device develop a fault. When the attendant wishes to alter the client's seating position they simply operate either the fifth switch in their device or the switch connected to 'U2'. This will transfer control of the powerchair to the 5-switch device.

Operating the switch connected to 'U1' will transfer control back to the user's scanning SID. Once the 5-switch SID is selected, a small figure '2' will be shown in the top left hand section of the Omni's screen to indicate that Port 2 is currently in use.

Summary:
The user still has the original Profile available, however, an additional Profile has been added. This Profile can be selected by an Attendant, who can then use a remote 5-switch device to make seat adjustments.

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