A GUIDE TO THE TRAVATO KL/GL SHORE POWER CURRENT LIMITING CONTROLS

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V1.0 7/10/2023

CONTENTS

Introduction

This guide is for the Travato KL/GL owner that wants to operate their coach's Shore Power current limiting controls with confidence. There are two and they are persistently confusing – Charge Rate Setting (CRS), on the Pure^3 touchscreen control panel, and the SELECT button on the Power Control System (PCS) panel that changes the current at which the PCS begins shedding coach AC loads. Both help to keep your rig from overloading a Shore Power

connection. Unfortunately, the Travato Operator's Manual does not explain their operation clearly.

If you're not technically inclined, fear not; you hardly need to touch these controls and don't have to be a geek to effectively use them. We've included some simple Guidelines that will work for almost all use cases, with a more technical treatment for the curious.

Please also read section 6-9 of the Travato Operator's Manual and Volta's excellent User Guides for your Pure^3 system (VIP-VSP or FLEX) downloadable from the Volta website.

APPLICABILITY

This guide is applicable to all KL and GL model years but uses the newer Pure^3 FLEX system terminology. As you read, note that the terms "Max Branch Amps" (MBA) and "Charge Rate Setting" (CRS) are interchangeable. This guide uses SELECT to refer to the process of pressing the SELECT button on the PCS front panel to change its current limit.

SIMPLE SYSTEM DESCRIPTION

The Precision Circuits Power Control System (PCS) manages all the 120VAC loads in the Travato. It will automatically shed 2 of the heaviest loads to keep 120VAC current demand within bounds. You can set these bounds with the PCS control panel **SELECT** button. When you plug in you may need to adjust using **SELECT** to match the capacity of the Shore Power connection.

When you plug in to Shore Power, the rig switches the 120VAC loads from the Power Pack to Shore Power. It also hooks up a Shore Power Charger to replenish the Power Pack. The Shore Power Charger has its own current limiter, with its own control, **Charge Rate Selection**, or **CRS**. As with the PCS, you may also need to adjust CRS to match the capacity of the Shore Power connection.

When both the Shore Power Charger and coach AC loads are on at the same time, the *total shore power current* can overload the Shore Power connection. However, the Shore Power Charger has a people-friendly feature: it will throttle back its charging current and slow down charging to keep total Shore Power current under the capacity of the Shore Power connection. So long as the total current draw of the coach's AC loads stays under CRS, the Pure^3 system will automatically accommodate occupant needs, recharging the Power Pack as much as possible while keeping total shore power current below CRS. How cool is that?

Of course, there are system limits, options, and idiosyncrasies that you may come up against. Below are some simple Guidelines that will work for almost all use cases.

If you want a deeper understanding of your rig's Shore Power current limiting controls and/or want to extract the most from them, read on beyond the next section.

QUICK AND EASY GUIDELINES

1. **Match SERVICE to the capacity of your shore power connection**. You should check SERVICE every time you plug in, but always when using a 15A or 20A connection since SERVICE normally reverts to 30A at every plug in or power up.

2. **Leave CRS at its default value of 15A**. You may not charge as fast as possible – or not at all if you run the A/C on Hi Cool or the Truma on EL2 – but the Pure[3] engine alternator charges the coach so quickly when driving that shore power charging is often unnecessary. You will be very unlikely to blow any residential circuit with the charger, and after a few hours you may *still* have recharged nicely. No pressure!

3. **Match CRS to the capacity of your shore power connection if you need to charge as fast as possible**. Whenever total AC load current exceeds CRS, the coach does not charge, so keep your coach AC load use well below CRS until the SOC reaches an acceptable level. If you want to know your AC load use, the PCS can tell you - see the procedure in *Measuring Charging Current and Coach AC Load Current* section.

4. **Check if your Shore Power connection is powering other loads as well as your coach**. The effective capacity of a 15A connection, for example, might be much less than 15A and you could trip its breaker. If you can't unplug those other loads, see the *In-Depth Rules and Recommendations* and *Idiosyncrasies* sections for how to deal with this.

LET'S GET TECHNICAL (…TECHNICAL…)[1]

BASICS

The diagram of the Pure[3] system in the Travato Operator's manual is neither complete nor very useful. Figure 1 below is far better.

[1] Sorry – an old Olivia Newton John song came to mind.

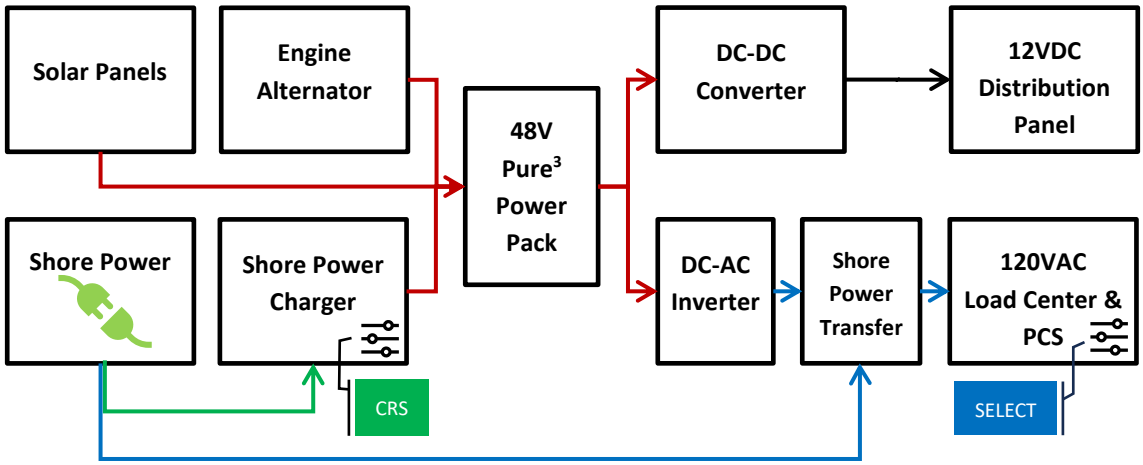

Figure 1. Pure³ System functional schematic. 48V paths in red, 12VDC in black, 120VAC coach power in blue, 120VAC charger power in green. CRS and SELECT are the 120VAC current limit controls for their associated components. Pack heaters are not shown.

Now we can see that the Pure³ system includes a power pack which provide energy for 2 different types of power – 12VDC and 120VAC - and that can be replenished by 3 different sources – Solar, Engine Alternator, and Shore Power.

When not plugged in to Shore Power the power pack supplies both 12VDC and 120VAC, but when we plug in to a Shore Power connection, The coach switches its 120VAC loads to the shore connection and fires up the Shore Power Charger.

These two load paths each have their own current limiter control: the PCS' SELECT button and the charger's CRS.

SELECT

The Power Control System (PCS) manages the current drawn by the coach's AC loads. It sheds the heaviest 2 loads (the Air Conditioner and the Truma EL1/EL2 heating coils) in sequence when the AC Load Center current gets too high. Press the SELECT button on the PCS panel to set the current where load shedding begins.

The PCS SERVICE display should automatically set to 30A - the maximum capacity of the AC Load Center circuit breaker - when connected to shore power or when the inverter is on[2]. When on battery power you don't need to set anything. When plugged in to a 20A or 15A Shore Power connection, you manually SELECT 20A or 15A to match the capacity of the connection.

[2] Some owners have reported that on their coaches SERVICE doesn't revert but remembers its last setting.

CRS

The Pure 3 Shore Power Charger can draw 30A – a lot – from the 120VAC Shore Power connection to charge the power pack, but it can't tell if the Shore Power connection can supply that much current. You must tell the Charger the maximum charging current it can draw with the CRS setting.

CRS defaults to 15A to avoid tripping the breaker of a typical residential 120VAC circuit, but you can set it lower or as high as 30A if the shore power connection will allow.

PEOPLE FRIENDLY CURRENT CONTROL

It's rare to *not* operate Coach AC loads at the same time as the Shore Power Charger. If all that CRS and SELECT did was limit their respective component's input currents, the shore power breaker would quickly trip as total shore power current can climb as high as the sum of these two settings. Coach occupants would prefer that the system keep shore power current in check AND power flowing to the coach AC loads even if the power pack could use some charging. The Pure 3 Shore Power charger meets both these needs by monitoring the *total* shore power current flowing into the coach, as shown in Figure 2.

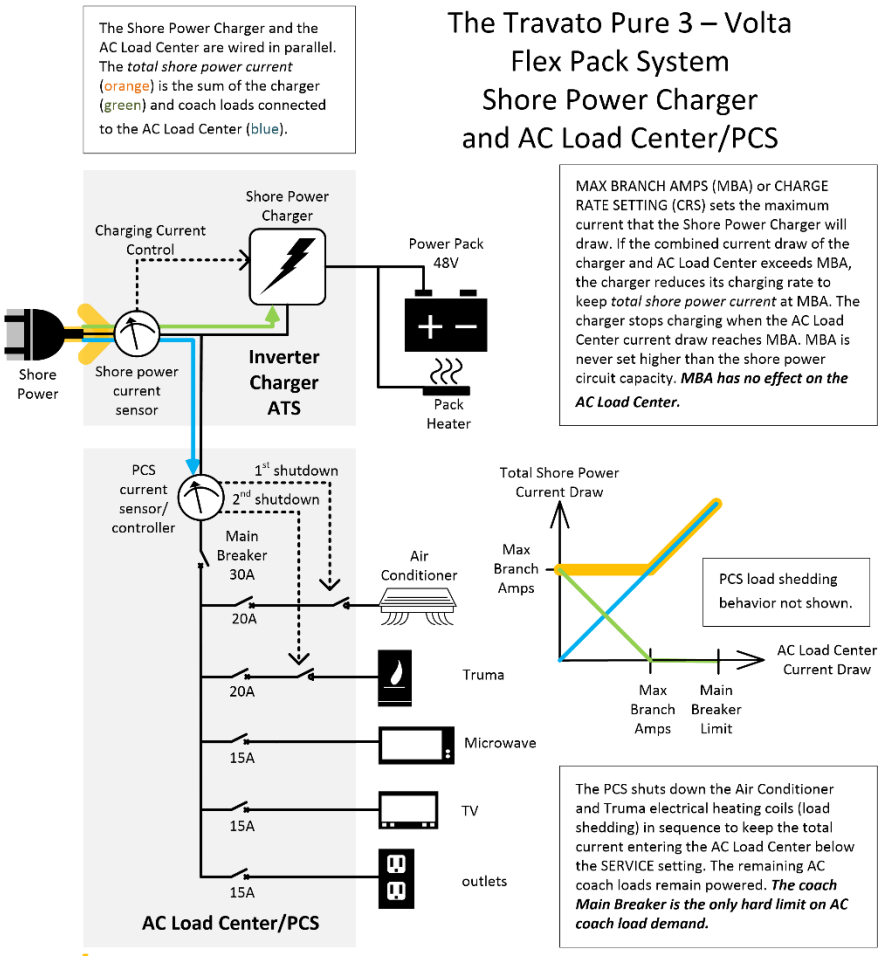

Figure 2. Detailed conceptual schematic of the Pure 3 120VAC circuitry and current limiters.

With no AC load active, the Shore Power Charger will charge according to the needs of the power pack, up to a maximum of CRS[3]. If a coach AC load (like the TV) is on at the same time as the charger, the charger will reduce its charging rate to keep the *total* shore power current at CRS. When coach AC loads exceed CRS, *the charger stops charging the power pack entirely*. If AC Load Center input current doesn't exceed CRS, total shore power current will not exceed CRS – exactly what occupants want.

IN-DEPTH RULES AND RECOMMENDATIONS

1. **When plugging in check the PCS SERVICE current and set it to the rating of the shore power circuit breaker.** The PCS should automatically set SERVICE current to 30A on power up or plug-in. It be manually set with the SELECT button to 20A or 15A afterwards. SERVICE current should also automatically return to 30A when you revert to battery power.

2. **Set CRS to at most the *practical* capacity of the shore power connection, if possible.** The practical capacity of the shore power connection is the rating of its circuit breaker less any active shore loads connected to it. Setting CRS higher risks the Shore Power Charger tripping the shore power circuit breaker. Note that CRS can be set to 0, 5, 10, 15, 20, 25, or 30A.

3. **Don't set CRS to 0A.** This shuts the Shore Power charger off. In FLEX system equipped coaches, the power pack heating pads will be disabled when the Pure 3 system is in Charge-Only mode (see Idiosyncrasies). This can lead to power pack cold-soaking in cold weather and prevent charging. Keep CRS at 5A or above.

4. **CRS may be set lower than the practical capacity of the shore power circuit, although there is generally no advantage to doing so**. The shore power charger will shut down when AC load center demand exceeds CRS and charging may be slower. The maximum of Shore Power Current will always limit at the current shown by the SERVICE message on the PCS control panel. This option may be used if you wish to trickle charge the Power Pack with no other coach load on, such as when the coach will be parked and plugged in for a few days' storage.

5. **For maximum Shore Power charging, keep your coach AC load use low with respect to CRS until the SOC reaches an acceptable level**.

[3] The Shore Power Charger protects the Power Pack by adjusting its charging current according to SOC.

IDIOSYNCRASIES

- **The Power Pack will discharge slowly even when you are connected to shore power**. This is because the Power Pack is always powering some DC load, automatic or operator-controlled. The Shore Power Charger will thus turn on occasionally to replenish the Power Pack. But if your AC loads exceed CRS, the Charger won't turn on.

- **Power Pack heating pads consume Shore Power, in different ways for FLEX and earlier Pure 3 systems**. Earlier KLs and GLs used 120VAC heating pads that draw their power from the output of the Automatic Transfer Switch *before* the AC Load Center. They add 1-2A to the total shore power current, so they may reduce charging current, but their current draw isn't monitored by the PCS and so may trigger apparent early load-shedding by the PCS.

  The heating pads on FLEX system KLs and GLs (2023 and later model years) are DC powered. When the coach is plugged in and the FLEX system turned on (solid green Volta button ring), they're powered directly from the power pack. Just like any other DC load, they will drain the Power Pack and cause the Shore Power charger to turn on occasionally to replenish SOC. When the coach is plugged in and in Charge-Only mode (flashing green Volta button ring), they're powered from the Shore Power Charger and when on reduce the Power Pack charging rate by about 2A. Always set CRS to 5A or greater. Setting it to 0A disables the heating pads when in Charge-Only mode and risks cold-soaking the Power Pack in cold weather.

MEASURING CHARGING CURRENT AND COACH AC LOAD CURRENT

Coach AC load current (the current flowing into the AC Load Center) can be measured by calling up the *RV current* display. Simply press the SCROLL button repeatedly until this message appears:

Figure 3. PCS coach AC load current ("RV current") display

The Pure[3] system does not display Shore Power Charger input current but does display closely related quantities. In FLEX system equipped coaches *Power Flow* is displayed on the home screen. Power Flow is the power flowing into the pack from the charger, solar panels, and alternator less any outflow from active loads, background or operator-controlled, DC or inverter-sourced AC. It is expressed in Watts and must be expressed as Current Flow at 120VAC by dividing by 120 before comparison to the PCS' RV current.

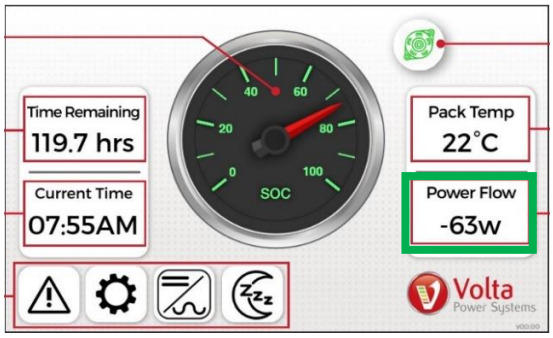

Figure 4. FLEX system control panel showing power flow from Power Pack.

Older Pure[3] systems with the pushbutton control panel will display the Power Pack charging voltage and current on the home screen when the Shore Power Charger is operating. This value is the actual charger output so is close to Shore Power Charger input current but must be expressed as current at 120VAC before use by multiplying the Volts reported X the Amps reported divided by 120.

Figure 5. Volta pushbutton control panel display showing charging current and voltage

ACCESSING CURRENT LIMITING CONTROLS IN THE COACH

CHARGE RATE SELECTION (ON COACHES WITH TOUCHSCREEN CONTROL PANELS)

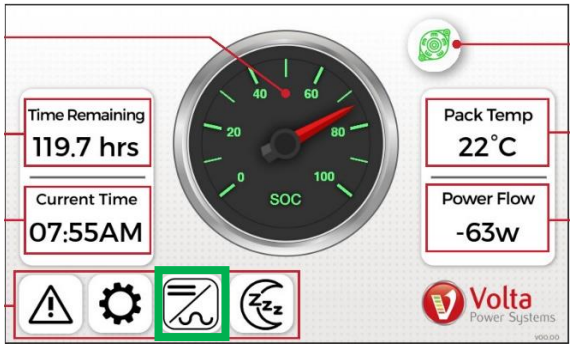

Figure 6. Volta touchscreen control panel home screen

1. Touch inverter icon (outlined in green) to access inverter status screen.

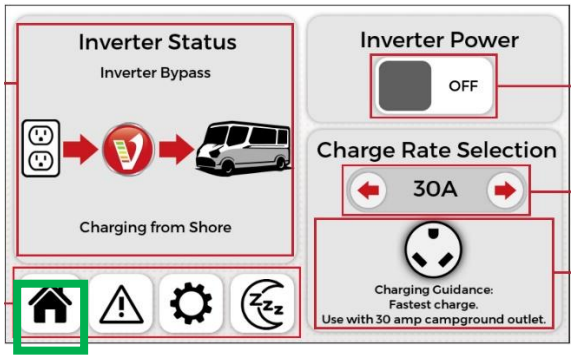

Figure 7. Volta Touchscreen control panel inverter status screen and Charge Rate Selection box.

2. Press left or right arrows until desired CRS is reached. Consider charging guidance offered.
3. Press home icon (outlined in green) to return to home screen.

MAX BRANCH AMPS (ON COACHES WITH PUSHBUTTON CONTROL PANELS)

1. Unplug, then turn power on
2. Turn inverter on using ON/OFF button if not on

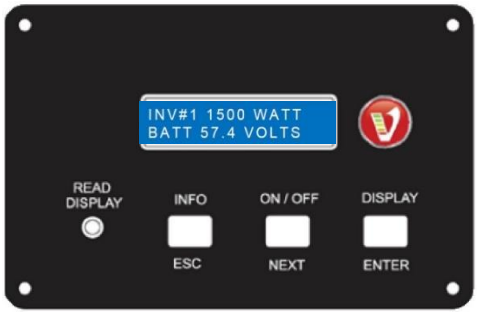

Figure 8. Volta pushbutton display control panel main screen with run-mode information

3. Press and hold the DISPLAY button for 5-10 seconds until the following display appears

Figure 9. Volta pushbutton control panel showing settings screen

4. Press NEXT until Max Branch Amps appears in the display
5. Press ENTER (S indicating settings change mode will appear in lower right of screen)
6. Press NEXT until desired value is reached
7. Press ENTER (READ DISPLAY LED will blink twice to confirm setting)

Figure 10.Volta pushbutton control screen showing MAX BRANCH AMPS setting

8. Press ESC repeatedly until main screen appears with RUN mode information.

POWER CONTROL SYSTEM CURRENT LIMIT (SERVICE-SELECT)

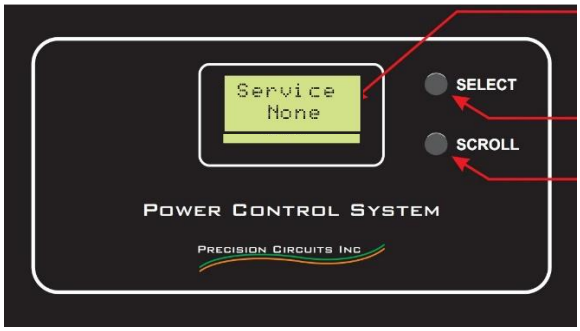

Figure 11. PCS display with no 120VAC detected - inverter off or no shore connection

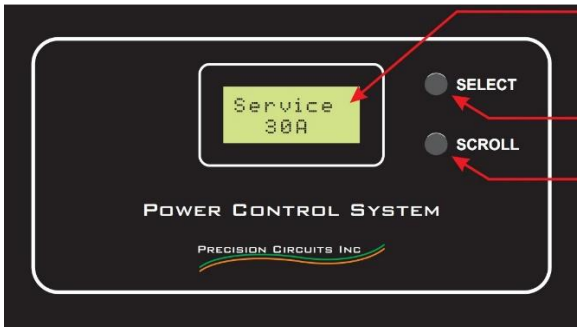

Figure 12. PCS display - 120VAC service detected, defaulting to 30A limit

Press SELECT button repeatedly until desired current is reached. Select no higher current than the capacity of the Shore Power connection.

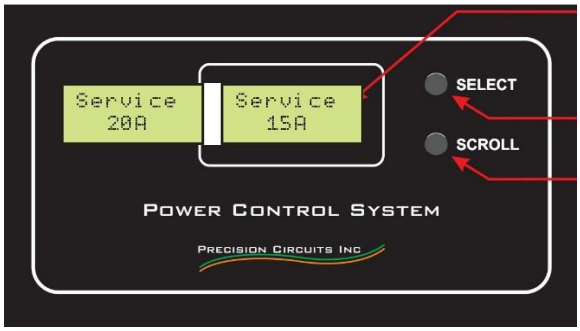

Figure 13. PCS display – available current limits