RS-485 Quick Start Guide

Professional FW Version 6.2

RS-485 is a serial communication standard. RS-485 is a good option compared to SDI-12 if you need longer cabling. RS-485 can operate with up to 3000 ft of cable. The disadvantage compared to SDI-12 is that RS-485 does draw more power. Broadcast address: "///" if there is a single probe on the bus. 4.1, 4.0, 3.0, 2.8 and 2.7 firmware versions have a different array of commands. Contact Stevens Water for more information.

Model Numbers

Version Part # Suffix	
02	Professional, w/25 ft. cable
04	Professional, w/50 ft. cable
06	Professional, w/100 ft. cable

Power

Power Requirements	9 to 16 VDC (12VDC Ideal)
Power Consumption	<10 mA Idle, 30 mA for 2s Active

Wiring

Red Wire	+ Power Input
Black Wire	Ground
White Wire	Data inverting Signal Negative (-) A
Green Wire	Data non-inverting Signal Positive (+) B

Communication Settings

Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

All commands sent must end with a "Carriage Return" "Line Feed" pair.

Addressing

Lowercase ‘aaa’ is used to represent the address. The default address is “000”.

RS-485 Command	Response	Description	Access Level
aaaXR_AD	<Current Address>	Read Address	Read Only
aaaXW_AD_<New Address>	<New Address>	Write Address	Write Only

Identification

RS-485 Command	Response	Description	Access Level
aaaXR_SN	aaa<Serial Number>	Read Serial Number	Read Only
aaaXR_FV	aaa<Firmware Version>	Read Firmware Version	Read Only
aaaXR_MN	aaa<Model Number>	Read Model Number	Read Only

Measurement

RS-485 Command	Response	Description	Access Level
aaaTR	-	Request Measurement	Read Only
aaaT<0-1>	aaa<values>	Read Measurement Set 0 or 1	Read Only
aaaXR_T<0-1>	aaa<values>	Read Parameters in Measurement Set 0 or 1	Read Only
aaaXR_QM	aaa<X/0>	Read Quick Mode Selection X – Quick Mode Disabled 0 – Quick Mode Enabled	Read Only
aaaXW_QM_X	aaaX	Disable Quick Mode	Read Only
aaaXW_QM_0	aaa0	Enable Quick Mode	Write Only

The following tables list the values and units:

Selector Order	Parameter	Unit
F	Soil Moisture	Water fraction by Volume (wfv)
G	Soil Temperature	Celsius (C)
H	Soil Temperature	Fahrenheit (F)
I	Bulk EC (Temperature Corrected)	Siemens/Meter (S/m)
J	Bulk EC	Siemens/Meter (S/m)
K	Pore Water EC	Siemens/Meter (S/m)
L	Real Dielectric Permittivity	-
M	Imaginary Dielectric Permittivity	-
N	Imaginary Dielectric Permittivity (Temperature corrected)	-
O	Dielectric Loss Tangent	-
P	Diode Temperature	Celsius (C)

RS485 Measurement Sets									
Command	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**
T0, Transmit Set 0	F	I	G	H	J	L	M	K	O
T1, Transmit Set 1	L	M	N	O	P				

Pore Water Offset

RS-485 Command	Response	Description	Access Level
aaaXR_PWOS	aaa<Current Offset>	Read Pore Water Offset	Read Only
aaaXR_PWOS_<New Offset>	aaa<New Offset>	Write Pore Water Offset	Write Only
aaaXD_PWOS	aaa+3.4	Reset Pore Water Offset to default 3.4	Write Only

Calibration

The following extended command will change the coefficients in one of two general formulas that translate the real dielectric permittivity to soil moisture. In many cases, the HydraProbe will not need to be recalibrated. The default General calibration has been heavily reviewed and will provide reasonable accuracy for most applications. If you need to change the calibration or if a custom calibration is required, we recommend referring to the HydraProbe user manual for more information.

RS-485 Command	Response	Description	Access Level
aaaXR_SOIL	aaa<G/O/R/C/K>	Get current calibration soil type G – General O – Organic R – Rockwool C – Custom 1 K – Custom 2	Read Only
aaaXW_SOIL_<New Soil Type>	aaa<G/O/R/C/K>	Write calibration soil type G – General O – Organic R – Rockwool C – Custom 1 K – Custom 2	Write Only
aaaXR_COEFA	aaa<A>	Read coefficient A	Read Only
aaaXR_COEFB	aaa<B>	Read coefficient B	Read Only
aaaXR_COEFC	aaa<C>	Read coefficient C	Read Only
aaaXR_COEFD	aaa<D>	Read coefficient D	Read Only
aaaXR_COEFE	aaa<E>	Read coefficient E	Read Only
aaaXR_COEFF	aaa<F>	Read coefficient F	Read Only
aaaXR_COEF	aaa<A><B><C><D><E><F>	Read all coefficients	Read Only
aaaXW_COEFA_<A>	aaa<A>	Write coefficient A	Write Only
aaaXW_COEFB_<B>	aaa<B>	Write coefficient B	Write Only
aaaXW_COEFC_<C>	aaa<C>	Write coefficient C	Write Only
aaaXW_COEFD_<D>	aaa<D>	Write coefficient D	Write Only

aaaXW_COEFE_<E>	aaa<E>	Write coefficient E	Write Only
aaaXW_COEFF_<F>	aaa<F>	Write coefficient F	Write Only
aaaXD_COEF	aaa<A><B><C><D><E><F>	Reset all coefficient to default	Write Only

Accuracy and Ranges

Parameter	
Soil moisture for inorganic mineral soils	Accuracy*: +/- 0.01 WFV for most soils (m^3,m^{-3}) +/- <0.03 for fine textured soil (typical) Range: From Complete Dry to Full Saturation (0% to 100% of saturation)
Bulk EC	Accuracy: +/- 2.0% or 0.02 S/m Whichever is greater Range: 0 to 1.0 S/m
Temperature	Accuracy: +/- 0.3 °C Range: -40 to 75 °C
Inter-Sensor Variability	+/- 0.012 WFV (typical)
Pore Water EC	Hilhorst Equation, depends on soil conditions

*Accuracy of soil moisture depends on the soil and is highly variable.