Appendix - 1 REMOTE CONTROL MODE

Remote Control of the PR-740/745 is accomplished using commands sent from the PC in ASCII (text) strings to the instrument. These commands are then executed and the requested information including measured values or instrument setup parameters are returned to the PC.

The PR-740/745 is controlled from a personal computer over the Universal Serial Bus (USB) interface. This is achieved by using a driver that parses appropriate ASCII (text) commands from the PC application then transmits them over the USB I/F to the PR-740/745.

Communication protocol is identical to RS-232 communications. The USB driver emulates an RS-232 interface including opening a COM: port, setting a baud rate, parity, stop bits and flow control. This makes Remote Control operations available for application software written in Microsoft Visual Basic, Microsoft C++ or any other language that is capable of opening communicating via a COM: port.

Note: ***While the PR-740/745 is in Remote Mode, the instrument's touch screen is disabled.***

INSTALLING THE USB DRIVER

Prior to commencing *Remote Mode* operations, the **PR-7xx Utilities** software including the USB driver must be installed on your Windows based PC running Windows XP (or later) operating systems. Please refer to the USB portion of the *Connectivity* section for complete installation instructions.

USING REMOTE CONTROL COMMANDS

1. From the XP desktop, right mouse click on ***My Computer*.**

Appendix 1 – Remote Control Mode

REMOTE CONTROL COMMAND SUMMARY

The following table summarizes all valid Remote Control commands and responses from the PR-740/745. Detailed descriptions including parameters passed with each command are detailed in the **Commands** section.

Command	Description
A	Sends an Abort command to the instrument to prematurely end a measurement.
B	Sets LCD backlight level
C	Clears current session instrument errors
D	Request data from the PR-740/745
E	Toggles the Echo (full duplex) mode
F	Measure frequency of light source
I	Requests instrument status or / error report from PR-740/745
L	Defines measurement title – Maximum of 20 characters.
M	Measure command for the PR-740/745. Returned data depends on the accompanying switches.
O	Data logger commands
P	Monitor the progress of a measurement. Must be used with the 'T' command.
T	Trigger. Initiate a measurement using current instrument set-up parameters. No data is returned. The 'D' command and appropriate switch must be sent to retrieve data following a "T" initiated measurement.
Q	Quit (exit) remote mode.
R	Recall stored measurement
S	Set up measurement parameters
V	View last measurement error code.
X	Sets LCD contrast level.
Z	Reset commands

TABLE 6 - PR-740/745 REMOTE MODE COMMAND SUMMARY.

Usage:

<...> Optional Entry,

[...] Mandatory entry

(...) Comment, NOT PART OF THE COMMAND

Note: ***The default values, e.g. apertures, exposure time etc. are those used for the measurement before the instrument was set to Remote Control Mode or, if in Remote Mode, the value from the previous command.***

Appendix 1 – Remote Control Mode

REMOTE CONTROL COMMAND DETAIL

Command	Description
A	**Purpose**: Abort measurement in progress **Syntax**: A[CR] **Response**: 0000, [CR][LF] Measurement aborted. 0001, [CR][LF] No measurement in progress
B	**Purpose**: Set LCD backlight level **Syntax**: Bnn[CR] Bnn = Backlight / Brightness level in percentage. Range of nn = 0 to 100% **Response**: Backlight set to nn %
C	**Purpose**: Clears the current instrument error **Syntax**: C[CR] **Response**: None
D	**Purpose**: Download data from the PR-7xx **Syntax**: D<data code>[CR] **Response**: 0000,<data>[CR][LF] If all OK, else NNNN[CR][LF] (NNNNN = Error code) *Note: <data> in response code refers to the specific measurement data set returned based on the data code sent to the instrument. Refer to the Data Code section for details..*
E	**Purpose**: Full Duplex (Echo) ON / OFF **Syntax**: E[CR] **Response**: None
F	**Purpose**: Measure frequency of light source **Syntax**: F[CR] **Response**: 0000,ff.ff Hertz (Period = nnnnn milliseconds) If all OK else NNNN[CR][LF] (NNNN = Error code)
I	**Purpose**: Return instrument status / error report **Syntax**: I[CR] **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
L	**Purpose**: Assign measurement description **Syntax**: L<Character String with max length of 20 characters>[CR] **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) Note: Entry remains valid for the duration of the current Remote Mode session or until a new L command is issued. If L[CR] is issued with an empty string, the current description is returned.
M	**Purpose**: Make a Measurement with the PR-7xx **Syntax**: M<data code>[CR] **Response**: 0000,<data>[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) *Note: <data> in response code refers to the specific measurement data set returned based on the data code sent to the instrument. Refer to the Data Code section for specific information.*
O	Initialize Data Logger Mode. Data Logger Mode acts like a printer, automatically sending measurement result data over the USB interface following a measurement. Data types can be defined by the user through switches. ***Note: Data Logging is supported on PR-740 / PR-745 firmware versions 2.58 and above only. Contact Photo Research for upgrade information.***

Appendix 1 – Remote Control Mode

Command	Description
P	**Purpose:** Monitor measurement progress. **Syntax**: P[CR] **Response**: 0000,<data>[CR][LF] Measurement has finished or not initiated. 0001 [CR][LF] Measurement in progress.
Q	**Purpose**: Quit (Exit) Remote mode Syntax: Q Response: None
R	**Purpose**: Recall stored measurement data from the PR-7xx **Syntax**: R<data code>,<Measurement #>,<filename.ext>[CR] **Response**: 0000,<data>[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) **Special Syntax** 1 (Recall from RAM only): **Syntax**: R<data code>,0[CR] Recall last written measurement **Response**: 0000,<data>[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) **Special Syntax** 2 (Recall from RAM only): **Syntax**: R<data code>,+[CR] Increments the Measurement ID (measurement number) and recalls the data. **Response**: 0000,<data>[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) *Note: If data code is not specified, code 1 will be sent. If filename.ext is not specified, data returned will be that stored in the internal memory (RAM) of the instrument instead of the SD card.* *<data> in response code refers to the specific measurement data set returned based on the data code sent to the instrument. Refer to the Data Code section for specific information.*
S	**Purpose**: Assign instrument and measurement set up parameters **Syntax**: S[specifier][CR] **Response**: 0000[CR][LF] If all OK 0001[CR][LF] Measurement in progress
T	**Purpose**: Trigger (initiate) a measurement **Syntax**: T[specifier][CR] **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
V	**Purpose**: View / Report last measurement error **Syntax**: V[CR] **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Measurement error code)
X	**Purpose**: Set the display contrast . **Syntax**: Xnnn where nnn is the contrast in % - Range 0 to 100% **Response**: “Contrast set to nnn %” See the Setup Command section for complete details
Z	**Purpose**: Enable Reset Command Mode **Syntax**: ZEnableReset **Response**: 00000,Reset Commands Enabled **Reset Commands:** ZResetPreferences – Reset all Preferences values to factory default. ZResetSetup – Reset all Setup values to factory default. *NOTE: All Reset Commands will shut down the instrument after they are executed.*

Appendix 1 – Remote Control Mode

SETUP COMMANDS

Setup Commands are used to specify instrument and measurement parameters for the next measurement. To specify more than one parameter, sequential setup commands may be sent to the instrument before the measurement is initiated.

The default parameters are those used during the measurement immediately before Remote Mode operations are initiated. If Remote Mode operations are under way, the default setup values for the upcoming measuring are those defined in the last Setup (S_ command).

Setup Command	Description
SA	**Select Add-on Accessory 1** An Add-on accessory is one that is used in conjunction with a primary accessory. For example, a neutral density filter (Add-on Accessory) used with the MS-75 (Primary Accessory). Up to 3 Add-on accessories can be specified for a measurement. **Syntax**: SAn[CR] **Where**: n = Accessory code **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) *Note: Accessory Codes can be found by running report 116 (command D116). See the Data Codes section for specific details.* *Note: To deselect Add-on accessories, send the command SA-1. Selecting a different Primary accessory also deselects Add-on accessories.*
SB	**Select Add-on Accessory 2** An Add-on accessory is one that is used in conjunction with a primary accessory. For example, a neutral density filter (Add-on Accessory) used with the MS-75 (Primary Accessory). Up to 3 Add-on accessories can be specified for a measurement. **Syntax**: SBn[CR] **Where**: n = Accessory code **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) *Note: Accessory Codes can be found by running report 116 (command D116). See the Data Codes section for specific details.* *Note: To deselect Add-on accessories, send the command SA-1. Selecting a different Primary accessory also deselects Add-on accessories.*

Setup Command	Description
SC	**Select Add-on Accessory 3** An Add-on accessory is one that is used in conjunction with a primary accessory. For example, a neutral density filter (Add-on Accessory) used with the MS-75 (Primary Accessory). Up to 3 Add-on accessories can be specified for a measurement. **Syntax**: SCn[CR] **Where**: n = Accessory code **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) *Note: Accessory Codes can be found by running report 116 (command D116). See the Data Codes section for specific details.* *Note: To deselect Add-on accessories, send the command SA-1. Selecting a different Primary accessory also deselects Add-on accessories.*
SD	**Select Dark Current Mode (PR-740/745 only)** Two dark current modes are available – Standard and Smart Dark. In Standard Mode, the instrument measures the detector dark current after each light measurement. If Smart Dark is enabled and two successive measurements yield the same exposure time then the dark current values from the first measurement are used for the second (and possibly successive) measurements. **Syntax**: SDn[CR] **Where**: n=Dark Current Mode 0 = Disable Smart Dark 1 = Enable Smart Dark **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
SE	**Select Exposure Time** Enter the Exposure (Integration) time for the next measurement in milliseconds. Possible values are 12 – 120,000 (6 sec.) for *Standard Mode, and* 12 - 300,000 (5 min.) for *Extended Mode.* See the H specifier for more information on setting *Standard* or *Extended* Modes. To set the instrument to **Adaptive Exposure,** send **SE0** (ttttt = 0) **Syntax**: SEttttt[CR] **Where**: ttttt = exposure time in milliseconds **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)

Setup Command	Description
SF	**Aperture Select** Select the aperture to be used for the next measurement. **Syntax**: SFa[CR] **Where**: a = aperture code **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) *Note: See Data Code 117 for details on aperture codes.*
SG	**Speed Mode** Select the Speed Mode for the next measurement. Choices are Normal, 1X Fast, 2X Fast and 4X Fast. **Syntax**: SGg[CR] **Where**: g = Gain 0 = Normal (DEFAULT), 1 = Fast 2 = 2X Fast 3 = 4X Fast **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
SH	**Sensitivity Mode** Select the Sensitivity Mode for the next measurement. The two available modes are Standard and Extended. In *Standard* Mode, the exposure time range is 12 ms to 120,000 ms (6 sec.). In *Extended* Mode, the upper limit is extended to 300,000 ms (5 min.). **Syntax**: SHm[CR] **Where**: m = Sensitivity Mode 0 = Standard Mode 1 = Extended Mode **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
SK	**User Sync Frequency** Enter the frequency (in Hertz) of the source being measured. The range is 20 to 400 Hz. This command works in unison with the *SYNC Mode* setting. See the S specifier for complete details on setting the *SYNC Mode.* **Syntax**: SKfff[CR] **Where**: fff = frequency in Hertz. Range is 20 to 400 **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)

Setup Command	Description
SN	**Cycles to Average** Defines the number of measurements (cycles) to average when calculating photometric and colorimetric values. The average of the spectra are used to calculate other values. The range of cycles to average is 1 to 99. The default is 1. **Syntax**: SNaa[CR] **Where**: aa = Cycles to Average Range 1 to 99 **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
SO	**CIE Observer** Photometric and Colorimetric values can be calculated using either CIE 2° or 10° Standard Observer data sets. Use this specifier to choose the CIE data set for calculations for the next measurement. The default is 2°. **Syntax**: SOn[CR] **Where**: n = CIE Observer 2 = 2° 10 = 10° **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
SP	**Primary Accessory** A Primary Accessory is one that replaces the standard objective lens (typically the MS-75) during use and can be used in conjunction with an Add-on Accessory. **Syntax**: SPnn[CR] **Where**: nn = Accessory Code **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code) *Note: Accessory Codes can be found by running report 116 (command D116). See the Data Codes section for specific details.*

Setup Command	Description
SR	**Bandwidth Select** For instruments supplied with the Multiple Bandwidth option, instructs the instrument which bandwidth to use during the next measurement. **Syntax**: SRb[CR] **Where**: b = Bandwidth 0 = 2 nm bandwidth (4 nm for PR-745) 1 = 4 nm bandwidth (8nm for PR-745) 3 = 8 nm bandwidth (14 nm for PR-745) **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
SS	**Sync Mode** Instructs the instrument to adjust the exposure time, when using Adaptive Sensitivity mode, to the nearest even multiple of the refresh rate (frequency) of the source. Choices are *No Sync, Auto Sync, and User Frequency.* In *Auto Sync* mode, the instrument measures the frequency of the source to determine its period. The exposure time is then automatically altered so that it is an even multiple of the source period (1/frequency). *User Frequency* will adjust the exposure time based on a user enter frequency in Hertz as entered using the SK command. See the *User Sync Frequency* section for more details on defining the Sync frequency. **Syntax**: SQf[CR] **Where**: f = Sync mode 0 = No Sync 1 = Auto Sync 3 = User Frequency **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)
SU	**Photometric Units** Select *English* or *Metric (SI)* photometric values to be reported in the applicable Data Codes. **Syntax**: SUn[CR] **Where**: n = Units type 0 = English 1 = Metric (SI) **Response**: 0000[CR][LF] If all OK, else NNNN[CR][LF] (NNNN = Error code)

Appendix 1 – Remote Control Mode

MEASUREMENT AND DATA SEND CODES

Measurement and Data Send Codes are used to measure (**M** Command) and then specify returned data or acquire values without making a measurement (**D** command).

Either a **D** or an **M** can precede any of the following codes. For example, *M1 or D1 – M602 or D602*. If an M command is sent, a measurement will always be made even if the Data Code does not request measured values. For example, if *M116* is sent to the instrument, a measurement is made then a list of accessories is returned from the instrument.

In the following table, **qqqqq** is the returned error code. If **qqqqq** is all zeros (00000) no error has occurred during the request. All other values for **qqqqq** relate to an error condition. Refer to the Remote Mode Error Code section of the manual for a complete list of error codes and their meanings.

UUUU in the output format is the photometric unit type of the measurement per the following table:

Type	Code	Units	
Luminance	0	fL	cd/m²
Illuminance	1	fc	lux
Luminous Intensity	2	mcd	
Luminous Flux	3	lumens	

TABLE 7 - PHOTOMETRIC UNITS CODES

Note: ***Both qqqqq and UUUU are contained in every output and are not annotated below.***

All data fields are fixed length (except where otherwise noted) and comma delimited. Commas also serve as placeholders for empty fields.

Appendix 1 – Remote Control Mode

DATA CODE SUMMARY

The following table summarizes Data Codes and their meanings. For full details, please see the Expanded Code table following.

Data Code	Description
0	Repeat last response code
1	status, units, Photometric brightness, CIE 1931 x,y
2	status, units, CIE 1931 Tristimulus Values (X, Y, Z)
3	status, units, Photometric brightness, CIE 1976 u', v'
4	status, units, Photometric brightness, Correlated Color Temperature, Deviation from Plancks Locus in 1960 u,v units
5	status, units, Peak Wavelength, Integrated Power, Integrated Photon, WL, Spectral Data at each WL
6	status, units, Photometric brightness, CIE 1931 x, y, CIE 1976 u', v'
7	status, units, Photometric brightness, CIE 1960 u,v
8	status, Raw (uncorrected) light per pixel
9	status, Raw (uncorrected) Dark Current per pixel
10	status, Raw Light minus Dark Current per pixel
11	status, units, Scotopic Brightness
12	status, units, Photometric brightness, CIE 1931 x, y, CIE 1960 u, v
13	status, Gain description, exposure time in milliseconds
14	status, Sync mode description, sync period in milliseconds
15	Status, bandwidth used for last measurement
110	status, Instrument Serial Number
111	status, Instrument Name
112	status, Number of Accessories, Number of Apertures
114	status, Software Version
115	status, Battery status
116	status, Accessory List
117	status, Aperture List
118	status, Bandwidth list
120	status, Hardware configuration
200	status, Last Meas. Max Raw Light Value, Last Meas. Min Raw Light Value, Last Meas. Avg Raw Light Value.
201	status, Same as report 200 for Raw Dark
400	status, Contents of Last Measurement buffer.
401	status, Number of measurements stored in RAM
402	status, Directory of measurements stored in RAM. An error message is generated if there are no stored measurements.
411	status, List of files in SD card and number of stored measurements per file.
412, filename	Status, Directory of stored measurements in the file "filename" in SD card.
601	status, Current Setup Report – comma delimited
602	status, Current Setup Report, with labels.

TABLE 8 - DATA CODE SUMMARY

Appendix 1 – Remote Control Mode

DATA CODE DETAILS

The following table details available Data Codes including data examples. Each field is comma delimited. Most fields are fixed length, however some are variable length and are indicated as such.

As mentioned earlier in this section, these commands may be attached to a **D** or **M** command - for example, **M5** or **D5.** Commands may not be combined.

To make a measurement and return more than one data type, first send the **M** command with the first response code, the send successive codes using the **D** command until all required data types have been returned.

Data Code	Description
1	**Output Format**: qqqqq,U,Y.YYYe+ee,x.xxxx,y.yyyy[CRLF] **where**: Y = Photometric brightness (e.g. Luminance or Illuminance etc.) e = exponent x = CIE 1931 x y = 1931 y --- **Output Example**: 00000,0,1.865e+01,0.4035,0.4202
2	**Output Format:** qqqqq,U,X.XXXe+ee, Y.YYYe+ee, Z.ZZZe+ee CRLF **where:** X = CIE 1931 Tristimulus X (Red) Y = CIE 1931 Tristimulus Y (Green) Z = CIE 1931 Z (Blue) --- **Output Example**: 00000,0,6.136e+01,1.865e+01,2.681e+01
3	**Output Format**: qqqqq,U,Y.YYYe+ee,u'.u'u'u',v'.v'v'v' CRLF **where**: Y = Photometric brightness (e.g. Luminance or Illuminance etc.) e = exponent u'=CIE 1976 u' v'=CIE 1976 v' --- **Output Example**: 00000,0,1.865e+01,0.2231,0.5227
4	**Output Format**: qqqqq,U,Y.YYYe+ee,CCCCC,d.dddd CRLF **where**: Y = Photometric brightness (e.g. Luminance or Illuminance etc.) e = exponent CCCCC = Correlated Color Temperature in Kelvins d.dddd = CIE 1960 deviation from Planck's Black Body Radiator locus --- **Output Example** 00000,0,1.865e+01, 3757,0.0129

5	**Output Format**: qqqqq,U,w.wwwe+eee,i.iiie-ee,p.pppe+eeCRLF **where**: w.www = peak wavelength e = exponent i.iii = integrated radiometric value (sum of all spectral data times WL increment) p.ppp = integrated photon radiometric value wl,spectral dataCRLF wl,spectral dataCRLF wl,spectral dataCRLF **Output Example**: 00000,0,0.000e+000,1.827e-01,5.147e+01 380,1.627e- 382,9.910e-07 384,5.356e-06 386,5.725e-06 388,8.989e-06 390,1.127e-05
6	**Output Format**: qqqqq,U,Y.YYYe+ee,x.xxxx,y.yyyy,u'.u'u'u'u', v'.v'v'v'v'CRLF **where**: Y.YYY = Photometric brightness (e.g. Luminance or Illuminance etc.) e.ee = exponent x,xxxx = CIE 1931 x y.yyyy = CIE 1931 y u'.u'u'u'u' = CIE 1976 u' v'.v'v'v'v' = CIE 1976 v' **Output Example**: 00000,0,2.041e+01,0.4089,0.4151,0.2283,0.5215
7	**Output Format**: qqqqq,U,Y.YYYe+ee,u.uuuu,v.vvvv CRLF **where**: Y.YYY = Photometric brightness (e.g. Luminance or Illuminance etc.) e.ee = exponent u.uuuu = CIE 1976 u v.vvvv = CIE 1976 v **Output Example**: 00000,0,2.646e+03,0.2081,0.3519
8	**Output Format**: qqqqq, CRLF, lllll CRLF, lllll CRLF, lllll CRLF …… **where**: lllll = Raw signal (light) data (variable length from 1 to 5 digits) for all detector pixels from 0 to 511. **Output Example**: 00000, 3475 3426 3477 3451 3483 3459

9	**Output Format**: qqqqq, CRLF, ddddd CRLF, ddddd CRLF, ddddd CRLF **where**: ddddd = Raw signal (dark current) data (variable length from 1 to 5 digits) for all detector pixels from 0 to 511. **Output Example**: 00000, 120 135 122 130 131 123
10	**Output Format**: qqqqq, CRLF, ddddd CRLF, ddddd CRLF, ddddd CRLF **where**: ddddd = Raw signal (signal minus dark current) data (variable length from 1 to 5 digits) for all detector pixels from 0 to 511. **Output Example**: 00000, 120 135 122 130 131 123
11	**Output Format**: qqqqq,U,S.SSSe+eeCRLF **where**: S.SSS = scotopic luminance, e+ee = exponent **Output Example**: 00000,0,3.668e+01
12	**Output Format**: qqqqq,U,Y.YYYe+ee,x.xxxx,y.yyyy,u'.u'u'u'u', v'.v'v'v'v'CRLF **where**: Y.YYY = Photometric brightness (e.g. Luminance or Illuminance etc.) e.ee = exponent x.xxxx = CIE 1931 x, y.yyyy = CIE 1931 y u.uuuu = CIE 1960 u v.vvvv = CIE 1960 v **Output Example**: 00000,0,2.041e+01,0.4089,0.4151,0.2283,0.3477
13	**Output Format**: qqqqq,Gain description,nnnnnn msec CRLF **where**: Gain Description is a text description of the Gain Used **Possibilities are**: Normal, Fast, 2X Fast and 4X Fast nnnnnn = Last exposure time in milliseconds **Output Example**: 00000,Fast,16500 msec

14	**Output Format**: qqqqq,Sync mode description,nnnnnn Hertz CRLF **where**: Sync mode description = Sync mode in use. Possibilities are: Auto Sync, User Sync, None nnnnnn = Sync Frequency in Hertz **Output Example**: 00000,User Sync,120.00 Hertz
15	**Output Format**: qqqqq, Bandwidth description nm CRLF **where**: Bandwidth description = The bandwidth used for the last measurement in nm **Output Example**: 00000,8 nm
110	**Output Format**: qqqqq,ssssssss CRLF **where**: ssssssss = Instrument Serial Number **Output Example**: 00000,67065106
111	**Output Format**: qqqqq,mmmmmmCRLF **where**: mmmmmm = Instrument Model **Output Example**: 00000,PR-740
112	**Output Format**: qqqqq,ac,ap CRLF **where**: ac = number of calibrated accessories ap = number of calibrated apertures **Output Example**: 00000,1,4
114	**Output Format**: qqqqq,vvvvv CRLF **where**: vvvvv = Software version **Output Example**: 00000,2.79D
115	**Purpose: Battery Status** (optional) **Output Format**: qqqqq,v CRLF **where**: v = 0, Battery OK v = 1, Battery low **Output Example**: 00000,0

116	**Output Format**: qqqqq,nn,ss,tt,pp,rr CRLF **where**: nn = ID number of accessory ss = Accessory name (variable length) tt = Accessory type – Possibilities are: Primary or Addon pp = Photometry Mode – Possibilities are: Luminance, Illuminance, Luminous Intensity, or Luminous Flux rr = Radiometry Mode – Possibilities are: Radiance Irradiance Radiant Intensity or Radiant Flux **Output Example**: 00000,0,MS-75,Primary,Luminance,Radiance
117	**Output Format**: qqqqq,nn,ss,bw CRLF **where**: nn = ID number of aperture ss = Aperture Name bw = Effective Bandwidth **Output Example**: 00000,0,1 deg,0.00 00000,1,1/2 deg,0.00 00000,2,1/4 deg,0.00 00000,3,1/8 deg,0.00
118	**Output Format**: qqqqq,nn,ss,bw CRLF **where**: nn = ID number of bandwidth ss = Aperture Name bw = Effective Bandwidth **Output Example**: 00000,0,2 nm 00000,1,5 nm 00000,2,8 nm
120	**Output Format**: qqqqq,pp,bw,bb,ee,ii,nrp,frp,lrp CRLF **where**: pp = Number of spectral data points. bw = Bandwidth of instrument bb = Starting WL ee = Ending WL ii = WL Increment nrp = Number of detector elements pixels frp = First useable raw pixel number lrp = Last useable raw pixel number **Output Example**: 00000,201,0.00,380,780,2,256,7,247

200	**Output Format**: qqqqq, mxv, mnv, mav CRLF **where**: pp = Number of spectral data points. mxv = Max Value of Raw Light mnv = Min Value mav = Average Value **Output Example**: 00000,42268,2906,11135
201	**Same as D200 for Raw dark values.**
401	**Output Format**: qqqqq, CRLF **where**: qq - Number of stored measurements in RAM **Output Example**: 0000, 6
402	**Output Format**: qqqqq,dt,tm CRLF Directory of stored Measurements in RAM **where**: qq - ID of measurement dt = Date tm = Time **Output Example**: 1,01-30-2007 13:48:26 2,01-30-2007 13:49:09 3,01-30-2007 13:51:03
411	**Output Format**: filename.ext,qqqqq CRLF (List of files in SD Card). **where**: filename.ext = Filename with extension. qq = Number of stored measurements in file. **Output Example**: MK.mea, 1 TSTSAMP.mea, 2
412	**Output Format**: qqqqq,dd-dd-dddd,tt:tt:tt CRLF (Directory of measurements in file) **Syntax:** 412, ffffffff.eee **where**: qqqqqq = ID of measurement dd-dd-dddd = Date tt:tt:tt = Time ffffffff.eee = filename.ext **Output Example**: **00000** **1,07-03-2011 01:17:43** **2,07-03-2011 01:18:01**

601	**Output Format**: qqqqq,<Primary Lens>, <Addon1>, <Addon2>, <Addon3>, <Aperture>, <Units>, <Exposure Mode>,<Exposure Time (see note) > ,<Gain>, <Cycles>, <CIE Observer>, <DarkMode>, <SyncMode>, <CaptureMode>, <SyncPeriod>, <bandwidth>CRLF **Note**: **The exposure time reported in 601 and 602 (following) reports 0 if the instrument is set in Adaptive Exposure mode. To view the exposure time for the last measurement when the instrument is in Adaptive Exposure mode, send the D13 command.** **Output Example**: 00000,0,-1,-1,-1,0,0,0,0,0,1,2,0,0,0,60.00
602	**Output Format**: Current set report with text labels. Dark mode values: for reports [601] and [602] 0 Disable Smart Dark 1 Enable Smart Dark **Output Example**: 00000,MS-75,None,None,None,1 deg,English,Adaptive,0 msec,Normal,1 cycles,2 deg,No Smart Dark, Standard Sensitivity, No Sync,60.00 Hertz

Remote Control Error Codes

Remote Control Measurement Errors

Error	Meaning
-0001	Light source not constant.
-0002	Light overload – signal too intense.
-0003	Cannot Sync to light source. Light source frequency below 20Hz, above 400 Hz or signal too low to Sync.
-0004	Adaptive mode error.
-0008	Weak light – insufficient signal.
-0009	Sync Error.
-0010	Cannot Auto Sync to light source.
-0012	Adaptive mode time out. Light source not constant.

Remote Control Parsing Errors

Error	Meaning	Valid Values
-1000	Illegal command	
-1001	Too many fields in setup command	
-1002	Invalid primary accessory code	
-1003	Invalid Addon 1 accessory code	
-1004	Invalid Addon 2 accessory code	
-1005	Accessory is not a primary accessory	
-1006	Accessory is not an Addon accessory	
-1007	Accessory already selected	

Appendix 1 – Remote Control Mode

Error	Meaning	Valid Values
-1008	Invalid Aperture index (PR-740/745 only)	
-1009	Invalid units code	0 = English 1 = Metric (SI)
-1010	Invalid Exposure value	3 to 6000 ms PR-740/745 6 to 30,000 ms
-1011	Invalid Gain code	0 = Normal 1 = 1X for AC sources 2 = 10X 3 = 100X
-1012	Invalid average cycles	1 to 99
-1013	Invalid Calc Mode	
-1014	Invalid Trigger Mode	
-1015	Invalid CIE observer	2 or 10
-1017	Invalid Dark measurement mode	0 = Disable Smart Dark 1 = Enable Smart Dark
-1019	Invalid Sync mode	0 = No Sync 1 = Auto Sync 3 = User Frequency
-1021	Measurement title too long	> 20 characters
-1022	Measurement title field empty after sending L command	
-1023	Invalid user Sync period	20 to 400 Hz
-1024	Invalid R command	
-1025	Invalid Addon 3 accessory code	
-1026	Invalid sensitivity mode	0 = Standard Mode 1 = Extended Mode
-1035	Parameter not applicable to this instrument	
-2000	This error code is returned whenever a response code is requested that does not exist, or when no other D command has been sent previously.	