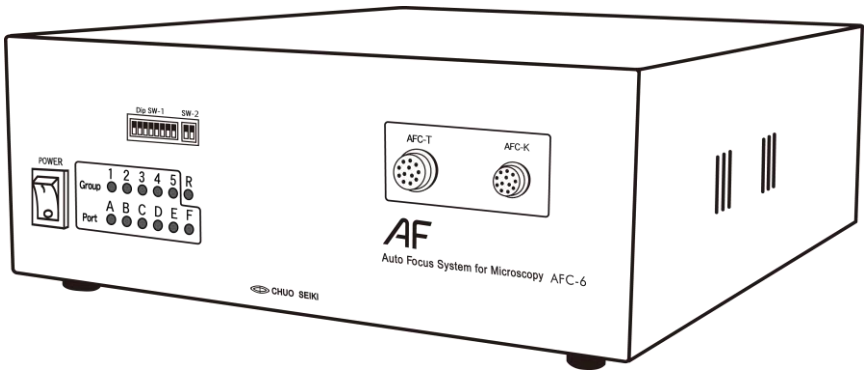
AF
Auto Focus System for Microscopy **AFC-6**

# Auto Focus Controller

# AFC-6

# INSTRUCTION MANUAL

## - Communication Commands -




CHUO PRECISION INDUSTRIAL CO.,LTD.

## Introduction

Thank you for purchasing our Auto Focus Controller AFC.
AFC is an exclusive controller for our Auto Focus Microscopes and Auto Focus Units. This INSTRUCTION MANUAL provides specifications, operational methods and precautions for AFC. Please read this manual thoroughly before using this product. In order to deliver sufficient information for the full understandings of the functions and performance of this product, we hope the users find this manual helpful.

## Outline of this manual

AFC-6 instruction manual consists of following five sections.

| | |
|---|---|
| Section 1 | AFC Main Unit |
| Section 2 | Parameters |
| Section 3 | Communication Commands |
| Section 4 | I/O Ports |
| Section 5 | Operation Box |

Please read each section carefully to understand the product and for the proper use before using AFC for the first time.

Section 1 AFC Main Unit
Describes product specifications and main functions of AFC-6.

Section 2 Parameters
Describes control parameters of AFC-6.

Section 3 Communication Commands
Description for controlling AFC-6 with communication.

Section 4 I/O Ports
Description for controlling AFC-6 with I/O port connection.
Only limited functions are controllable.

Section 5 Operation Box
Description for controlling AFC-6 with operation box.

## Expressions used in this manual

■Abbreviations

Following abbreviations are used in this manual. Please refer to the following list and replace as appropriate.

| | |
|---|---|
| AF | : Auto Focus |
| AFC | : Auto Focus controller |
| Auto Focus mode | : Collective term for following Auto Focus movements; SC0, SC1, SC2, SC3, SC4, SC5, SC6, SC7, AF0, AF2, PF, PFH, PN and PNH |
| AF mode | : Auto Focus mode |
| Search | : Search for AF signal |
| Peak detection | : Peak detection of AF signal |
| AF driving section | : Driving section to move lens tube to z-axis direction |
| Pattern driving section | : Driving section to project AF patterns (*not included in some models) |

■Typestyle

**Bold (gothic)** typefaces are used to call attention or emphasize in this instruction manual.

■Numerical values

Decimal values are used in principle. "0x" is added before the first digit of a numerical value when hexadecimal values are used. For instance, "1000" in a decimal system are expressed as “0x03E8” in a hexadecimal system.

■Hardware

Hardware, such as keys, LED and switches of AFC, Auto Focus Microscope, Auto Focus Unit, are expressed in the following ways: **[…] KEY, […] LED, and […] SWITCH**.

Examples : **[Home] KEY**
**[A] LED**
**[POWER] SWITCH**

■Communications

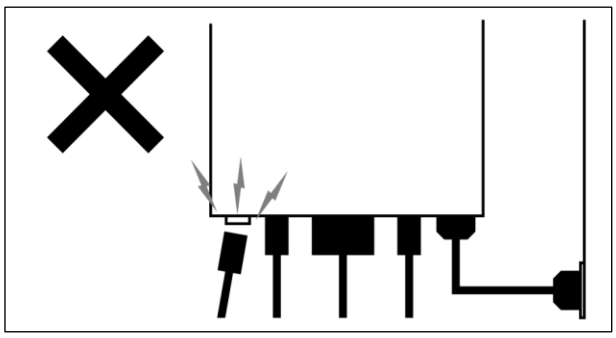
Communications are performed via RS-232C. In RS-232C communications, data sent from an external device to AFC is referred to as “**command**.” Data sent from AFC to an external device is simply referred to as “**data**”. For expressions of commands and data, special characters are used in addition to regular alphanumeric characters. These are control characters called delimiters which indicate the break (end) of commands or data. Delimiters used in AFC are ASCII code characters 10 (0x0A) and 13 (0x0D), which are referred to as “Line Feed” ($L_F$) and “Carriage Return” ($C_R$) respectively.

■I/O ports

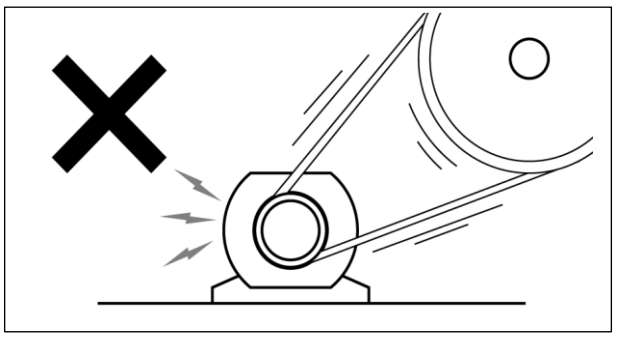
The I/O ports of AFC are normally maintained at TTL level (+5V). This state is called TTL level (+ 5V) or H level in this manual. When keeping input port at COMMON level (0V), it is referred to as input to I / O port or setting to L level.

## ⚠ Precautions

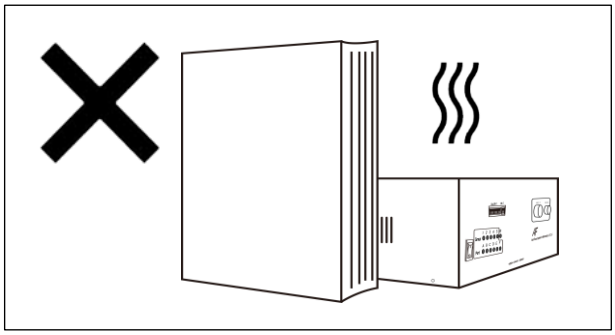
Never do the following actions as it may cause a malfunction.



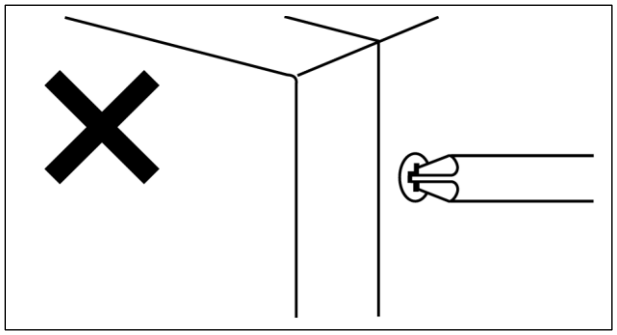
- Do not use other than the provided power cable.
- Never disconnect the connector while the power is turned on. Turn off the power before connecting and disconnecting the connector.
- Place the device where AC inlet is accessible when connecting.



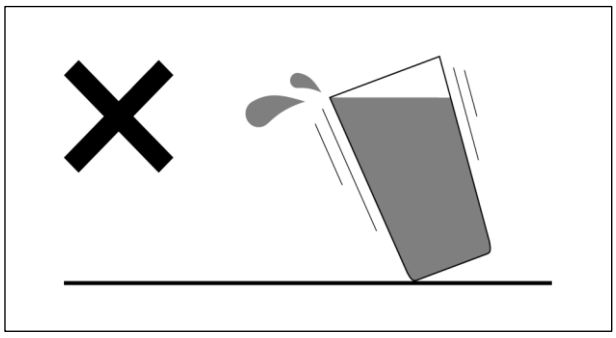
- Use the AC100-240V (50/60Hz) power source.
- Do not use the product near a large generator or heavy electrical appliances, or equipment radiating strong electro-magnetic fields in the neighborhood, as it may cause a malfunction to the product.
- As this product is composed of precision parts, avoid physical impact and minimize vibration when in use.



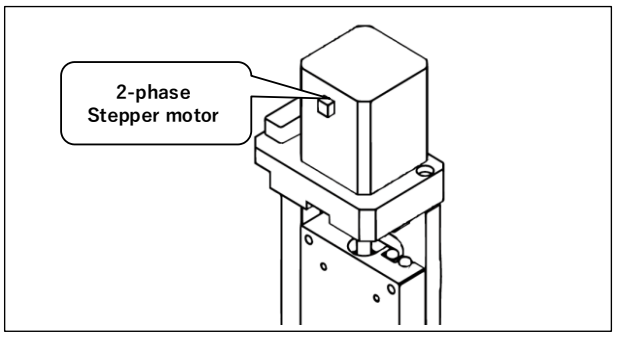
- The product generates considerable heat while it is charged with electricity. Never block the heat discharge slit. Do not use in a place where ventilation is insufficient.
- Use the product at least 100 mm away from surrounding objects.



- Do not disassemble or modify the product.
- To prevent scratches, use soft cloth to wipe only the surface when cleaning the device.
- Do not open the cabinet. Do not modify the product by replacing parts. It may cause a fire, electric shock or malfunction.



- Install on a flat surface.
- Avoid contact with water. It is extremely dangerous when the device gets wet.




- The motor that can be used with this product is 2-phase stepper motor. Any motor different from this type (e.g. 5-phase stepper mortor, servomotor) cannot be driven.

# *Section 3*

# Communication Commands

## Contents

# 1. Communication specifications

## ■ Connection

Use **straight cables** to connect control units which communicate with AFC main unit. RS-232C connector of AFC main unit is male type D-sub 9 pin. Please use female type D-sub 9 pin connector for cables connecting to AFC.

## ■ Communication specifications

| | |
|---|---|
| **Baud rate [bps]** | 600/2400/4800/9600/19200(initial setting)/38400 |
| **Data bits** | 8bits |
| **Parity** | None |
| **Stop bits** | 2bits |
| **X flow control** | unavailable |
| **Delimiter** | PC → AFC: $C_R + L_F$<br>AFC → PC: $C_R + L_F$<br>$C_R$: Carriage Return<br>$L_F$: Line Feed |

# 2. Communication command list

## ■ List of AF commands

| | | |
|---|---|---|
| SC0 | Performs search operation and peak detection operation within the signal detection range followed by AF trace operation<br>General operation of CHUO Auto Focus operation | p30 |
| SC1 | Performs search operation and peak detection operation within specified signal detection range centering on previous just focus detection position followed by AF trace operation | p31 |
| SC2 | Performs peak detection operation within signal detection range followed by AF trace operation | p32 |
| SC3 | Performs peak detection operation within specified signal detection range centering on previous just focus detection position followed by AF trace operation | p33 |
| SC4 | Performs search operation and peak detection operation within specified signal detection range centering on current position followed by AF trace operation | p34 |
| SC5 | Performs peak detection operation within specified signal detection range centering on current position followed by AF trace operation | p35 |
| SC6 | Performs search operation and peak detection operation within specified signal detection range from current position to [NEAR] direction followed by AF trace operation | p36 |
| SC7 | Performs search operation and peak detection operation within specified signal detection range from current position to [FAR] direction followed by AF trace operation | p37 |
| AF0 | Performs AF trace operation from current position | p10 |
| AF2 | Performs AF trace operation after moving to previous just focus detection position | p11 |
| PF | Performs peak detection operation from current position to [FAR] direction for specified number of pulses followed by AF trace operation<br>Number of pulses are specified in decimal | p24 |
| PFH | Specifies number of pulses for PF operation in hexadecimal | p24 |
| PN | Performs peak detection operation from current position to [NEAR] direction for specified number of pulses followed by AF trace operation<br>Number of pulses are specified in decimal | p25 |
| PNH | Specifies number of pulses for PN operation in hexadecimal | p25 |
| Y | Stops AF status notification during AF trace operation (AF operation continues) | p44 |
| Z | Resumes AF status notification after canceling Y command AF status notification stop status during AF trace operation | p44 |
| Q | Stops operation | p27 |

## ■ List of AF driving unit commands

| | | |
|---|---|---|
| G | Moves AF driving unit to specified coordinate (Home_Speed) (decimal) | p 18 |
| GH | Specifies coordinate for G operation in hexadecimal | p 18 |
| F | Moves AF driving unit from current position to [FAR] direction for specified number of pulses (Home_Speed) (decimal) | p 16 |
| FH | Specifies number of pulses for F operation in hexadecimal | p 16 |
| N | Moves AF driving unit from current position to [NEAR] direction for specified number of pulses (Home_Speed) (decimal) | p 20 |
| NH | Specifies number of pulses for N operation in hexadecimal | p 20 |
| FL | Moves AF driving unit to [FAR] side hard limit (position of limit sensor detection) (Home_Speed) | p 16 |
| NL | Moves AF driving unit to [NEAR] side hard limit (position of limit sensor detection) (Home_Speed) | p 20 |
| ASPD | Reads out coordinates of FSP/NSP/MSP/STOP (decimal) | p 13 |
| ASP | Reads out ASP coordinate in hexadecimal | p 13 |
| FSPD | Moves AF driving unit to FSP (Home_Speed) and reads out stop position (decimal) | p 17 |
| FSP | Reads out stop position of FSP operation in hexadecimal | p 17 |
| NSPD | Moves AF driving unit to NSP (Home_Speed) and reads out stop position (decimal) | p 21 |
| NSP | Reads out stop position of NSP operation in hexadecimal | p 21 |
| MSPD | Reads out coordinate of MSP (decimal) | p 19 |
| MSP | Reads out MSP coordinate in hexadecimal | p 19 |
| STPD | Moves AF driving unit to STOP (Home_Speed) and reads out stop position (decimal) | p 42 |
| STP | Reads out stop position of STP operation in hexadecimal | p 42 |
| Q | Stops operation | p 27 |

## ■ List of pattern driving unit commands

| | | |
|---|---|---|
| SF | Moves pattern driving unit from current position to [FAR] direction for specified number of pulses (SX_Speed) (decimal) | p 38 |
| SFH | Specifies number of pulses for SF operation in hexadecimal | p 38 |
| SN | Moves pattern driving unit from current position to [NEAR] direction for specified number of pulses (SX_Speed) (decimal) | p 41 |
| SNH | Specifies number of pulses for SN operation in hexadecimal | p 41 |
| SFL | Moves pattern driving unit to [FAR] side hard limit (position of limit sensor detection) (SX_Speed) | p 39 |
| SNL | Moves pattern driving unit to [NEAR] side hard limit (position of limit sensor detection) (SX_Speed) | p 41 |

## ■ List of position information commands

| | | |
|---|---|---|
| AB | Rewrites current coordinate of AF driving unit to specified value (decimal) | p 9 |
| ABH | Rewrites value specified by AB in hexadecimal | p 9 |
| ASPD | Reads out coordinates of FSP/NSP/MSP/STOP (decimal) | p 13 |
| ASP | Reads out ASP coordinate in hexadecimal | p 13 |
| DP | Reads out current position of AF driving unit (decimal) | p 15 |
| HP | Reads out DP coordinate in hexadecimal | p 18 |
| SDP | Reads out current position of pattern driving unit (decimal) | p 38 |
| SHP | Reads out SDP coordinate in hexadecimal | p 39 |
| FSPD | Moves AF driving unit to FSP (Home_Speed) and reads out stop position (decimal) | p 17 |
| FSP | Reads out stop position of FSP operation in hexadecimal | p 17 |
| NSPD | Moves AF driving unit to NSP (Home_Speed) and reads out stop position (decimal) | p 21 |
| NSP | Reads out stop position of NSP operation in hexadecimal | p 21 |
| MSPD | Reads out coordinate of MSP (decimal) | p 19 |
| MSP | Reads out MSP coordinate in hexadecimal | p 19 |
| STPD | Moves AF driving unit to STOP (Home_Speed) and reads out stop position (decimal) | p 42 |
| STP | Reads out stop position of STP operation in hexadecimal | p 42 |

## ■ List of adjustment commands

| | | |
|---|---|---|
| ASPD | Reads out coordinates of FSP/NSP/MSP/STOP (decimal) | p 13 |
| ASP | Reads out ASP coordinate in hexadecimal | p 13 |
| AT | Reads out values of INT/AGC (decimal) | p 14 |
| BPOD | Reads out sensor signal BPF INPUT voltage (Ach, Bch) (decimal) | p 14 |
| BPO | Reads out BPO voltage value in hexadecimal | p 14 |
| SIGD | Reads out sensor signal and AF signal voltage values for Ach and Bch (decimal) | p 40 |
| SIG | Reads out SIG voltage value in hexadecimal | p 40 |
| FSPD | Moves AF driving unit to FSP (Home_Speed) and reads out stop position (decimal) | p 17 |
| FSP | Reads out stop position of FSP operation in hexadecimal | p 17 |
| NSPD | Moves AF driving unit to NSP (Home_Speed) and reads out stop position (decimal) | p 21 |
| NSP | Reads out stop position of NSP operation in hexadecimal | p 21 |
| MSPD | Reads out coordinate of MSP (decimal) | p 19 |
| MSP | Reads out MSP coordinate in hexadecimal | p 19 |
| STPD | Moves AF driving unit to STOP (Home_Speed) and reads out stop position (decimal) | p 42 |
| STP | Reads out stop position of STP operation in hexadecimal | p 42 |
| VR2D | Reads out setting value of BPF (decimal) | p 43 |

| | | |
|---|---|---|
| VR2 | Reads out value of VR2 in hexadecimal | p 43 |
| VR3D | Reads out setting value of Balance (decimal) | p 43 |
| VR3 | Reads out value of VR3 in hexadecimal | p 43 |

## ■ Auto adjustment commands

| | | |
|---|---|---|
| AJB | AF auto adjustment command<br>Adjusts Balance automatically<br>*Not supported in AFC-5 mode | p 12 |
| AJF | AF auto adjustment command<br>Adjusts BPF automatically<br>*Not supported in AFC-5 mode | p 12 |
| AJP | AF auto adjustment command<br>Adjusts Pattern-INF automatically<br>*Not supported in AFC-5 mode | p 13 |

## ■ Other commands

| | | |
|---|---|---|
| EPS | Reads out setting value of focus determination tolerance factor for previous just focus position<br>If just focus determination has not been performed after power is turned on, setting value of Epsilon will be read out | p 15 |
| MOT | Reads out number of steps of driving unit stepper motor (decimal) | p 19 |
| RST | Returns AF driving unit to HOME position | p 28 |
| RSTX | Returns AF driving unit to HOME position (travel range is between FL and NL) | p 29 |
| RESET | Initializes operation for parameters<br>*Not supported in AFC-5 mode | p 27 |
| RESTA | Resets main unit to same status as power cycle<br>*Not supported in AFC-5 mode | p 28 |
| VER | Reads out AFC version (main unit version and DSP version)<br>*Reads out main unit version only for AFC-5 mode | p 42 |
| FW | Saves all currently set parameters to backup memory<br>*Not supported in AFC-5 mode | p 17 |
| P | Reads and writes parameters (no access to backup memory)<br>*Not supported in AFC-5 mode | p 22 |
| POT | Checks current port or change port<br>*Not supported in AFC-5 mode | p 26 |

# 3. Response command list

## ■ General response from AFC

| | |
|---|---|
| G | Accepts travel command and starts traveling |
| K | Notifies successful command completion |
| S | Starts search |
| P | Starts peak detection |
| A | Starts AF trace operation |
| LS | Limit sensor detection |
| LN | NEAR soft limit detection |
| CE | Returns this error when format is incorrect |
| FE | Search voltage detection error (insufficient light intensity/incorrect search range setting) |
| PE | Peak detection error |
| AE | Auto adjustment error |
| RP | Notifies completion of HOME return |

## ■ AF status notification from AFC

Notification from AFC during AF trace operation. These notifications are sent intermittently during AF trace operation. Note that AF trace operation will not be automatically terminated by AF status notification.

| | |
|---|---|
| J | Completed just focus |
| JF | Moved to [FAR] direction and completed just focus (When AF-Direct setting value is 1) |
| JN | Moved to [NEAR] direction and completed just focus (When AF-Direct setting value is 1) |
| H | Focused but signal is too high |
| L | Focused but signal is too low |
| B | AF driving unit is under operation |
| LS | Detected limit sensor |
| LN | Detected NEAR soft limit |

* In addition to these, there are R, !0, and !1. However these are response commands for the adjustment software only. Ignore these responses.

# 4. Command details

Details of communication commands are described in alphabetical order.

## ■ AB/ABH (AB(dec)/ABH(hex) : Rewriting coordinate value of current position)

[Name] AB/ABH

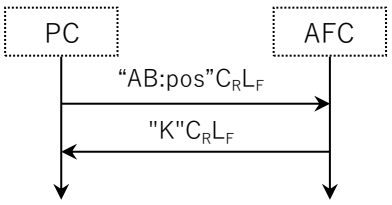
[Function] Rewrites current coordinate of AF driving unit to specified value.

[Format] “AB:pos”$C_RL_F$ pos: Setting coordinate value
Input range: AB=512-16777215(dec), ABH=0x00200-0xFFFFFF(hex)

[Example] “AB:12800” $C_RL_F$ Set current coordinate value to 12800.

[Details] Use AB to set decimal numbers and ABH to set hexadecimal numbers.

[Flowchart]




[Response] K

■ AF0 (Auto Focus AF0)

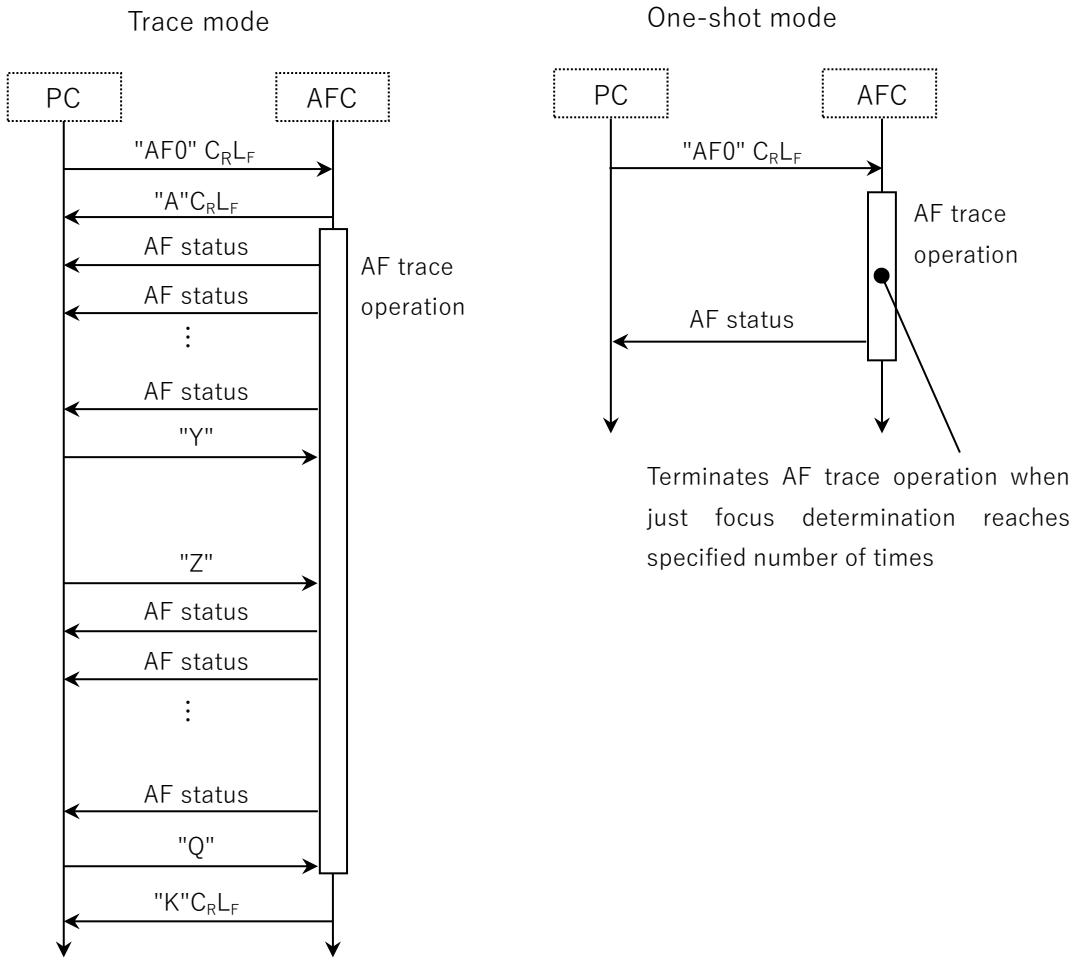
[Name] AF0

[Function] Performs AF trace operation from current position.

[Format] "AF0" $C_RL_F$

[Details] Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




Accepts Y/Z/Q during execution.

[Response] A, K, J, JF, JN, H, L, B, LS, LN

[cf.] AF2, SC0, SC1, SC2, SC3, SC4, SC5, SC6, SC7, PF, PFH, PN, PNH

■ AF2 (Auto Focus AF2)

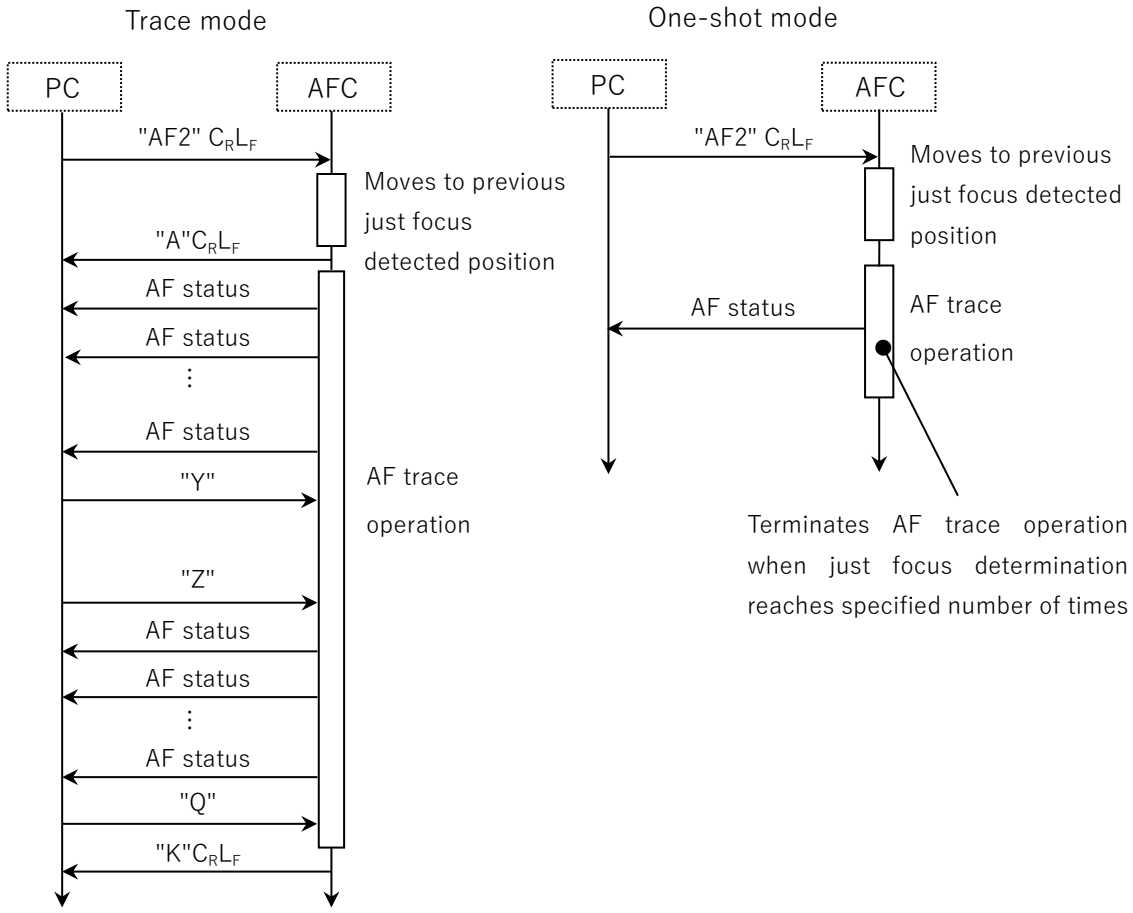
[Name] AF2

[Function] Performs AF trace operation after moving to previous just focus detection position.

[Format] "AF2" $C_RL_F$

[Details] Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in one-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




Accepts Y/Z/Q during execution.

[Response] A, K, J, JF, JN, H, L, B, LS, LN

[cf.] AF0, SC0, SC1, SC2, SC3, SC4, SC5, SC6, SC7, PF, PFH, PN, PNH

■ AJB (Auto adjustment mode: Auto adjustment of Balance)

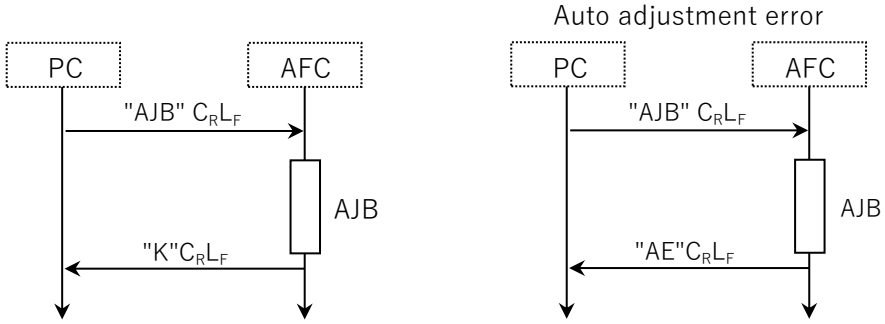
[Name] AJB

[Function] Performs AF Auto adjustment of parameter No.022: Balance.

[Format] “AJB” $C_RL_F$

[Details] Balance value is automatically adjusted to maintain voltage difference between Ach and Bch within specified value at targeted focus position. This command will be executed when pattern driving unit is disabled. Executing this command while enabling pattern driving unit will lead to command error. Failed Auto adjustment results in error (AE). Command error occurs in AFC-5 mode.

[Flowchart]




[Response] K, AE

[cf.] AJF, AJP

■ AJF (Auto adjustment mode: Auto adjustment of BPF)

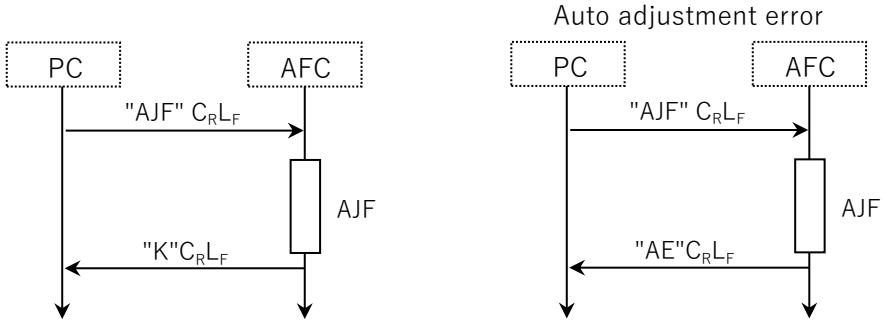
[Name] AJF

[Function] Performs AF Auto adjustment of parameter No.021: BPF.

[Format] “AJF” $C_RL_F$

[Details] BPF value is automatically adjusted to bring INT/AGC to targeted value. Failed Auto adjustment results in error (AE). Command error occurs in AFC-5 mode.

[Flowchart]




[Response] K, AE

[cf.] AJB, AJP

■ AJP (Auto adjustment mode: Auto adjustment of Pattern-INF)

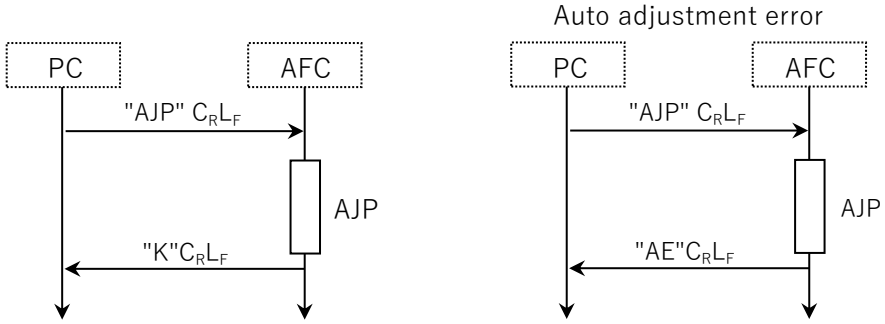
[Name] AJP

[Function] Performs AF Auto adjustment of parameter No.023: Pattern-INF.

[Format] “AJP” $C_RL_F$

[Details] Pattern-INF value is automatically adjusted to bring focus position at targeted focus position after Auto Focus. This command will be executed when pattern driving unit is enabled. Executing this command while disabling pattern driving unit will lead to command error. Failed Auto adjustment results in error (AE). Command error occurs in AFC-5 mode.

[Flowchart]




[Response] K, AE

[cf.] AJB, AJF

■ ASPD/ASP (ASPD(dec)/ASP(hex) : FSP, NSP, MSP, STOP output)

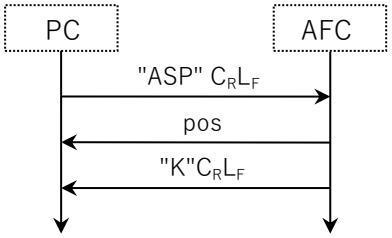
[Name] ASPD/ASP

[Function] Reads out coordinates of FSP, NSP, MSP and STOP.

[Format] “ASP” $C_RL_F$

[Details] Reads out position of each search point for current port in the order of FSP, MSP, NSP and STOP. Use ASPD to read in decimal numbers and ASP in hexadecimal numbers. ASPD leads to command error in AFC-5 mode.

[Flowchart]




[Response] pos, K

pos : 512 -16777215(dec), 0x00000200 - 0x00FFFFFF (hex)

[cf.] FSP, MSP, NSP, STP, FSPD, MSPD, NSPD, STPD

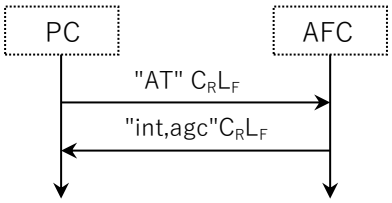
■ AT (Reading INT and AGC status values)

[Name] AT

[Function] Reads out values of INT/AGC (decimal).

[Format] “AT” $C_RL_F$

[Flowchart]




[Response] int, agc

int : 0000 - 0007

agc: 0000 - 0007

■ BPOD/BPO (BPOD(dec)/BPO(hex) : Reading output voltage right before BPF)

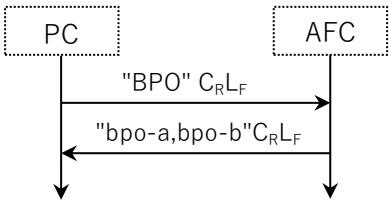
[Name] BPOD/BPO

[Function] Reads out sensor signal BPF INPUT voltage (Ach, Bch).

[Format] “BPO” $C_RL_F$

[Details] Use BPOD to read out in decimal numbers and BPO in hexadecimal numbers. BPOD leads to command error in AFC-5 mode.

[Flowchart]




[Response] bpo-a, bpo-b

bpo-a : 0 - 65535(dec), 0x0000 - 0xFFFF(hex)

bpo-b : 0 - 65535(dec), 0x0000 - 0xFFFF(hex)

■ DP (Reading out current position)

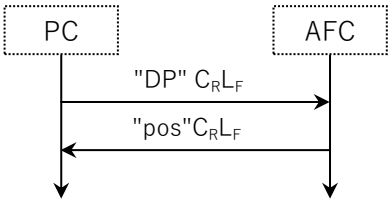
[Name] DP

[Function] Reads out current position of AF driving unit (decimal).

[Format] "DP" $C_RL_F$

[Details] Use DP to read out in decimal numbers and HP in hexadecimal numbers.

[Flowchart]




[Response] pos

pos current position : 512 - 16777215(dec)

[cf.] HP

■ EPS (Reading out ε )

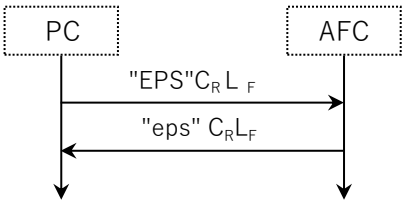
[Name] EPS

[Function] Reads out setting value of focus determination tolerance factor ( ε 1 or ε 2) for previous just focus position. If just focus determination has not been performed after power is turned on, setting value of ε 1 will be read out.

[Format] "EPS" $C_RL_F$

[Details] Reads out focus determination tolerance factor of ε 1 if the last just focus position is within the range of ε 1. If it is within the range of ε 2, it reads out focus determination tolerance factor of ε 2.

[Flowchart]




[Response] eps

eps focus determination tolerance factor : 1 - 7

■ F/FH (F(dec)/FH(hex) : [FAR] direction travel for specified pulses)

[Name] F/FH

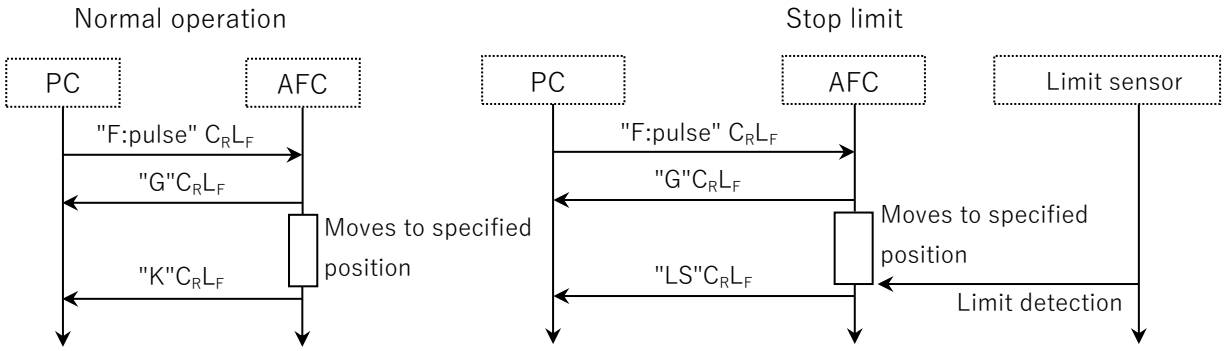
[Function] Moves AF driving unit from current position to [FAR] direction for specified number of pulses. Travel speed is Home_Speed.

[Format] “F:pulse” $C_RL_F$ pulse: Distance [pulses]
Input range: F=0-16777215(dec), FH=0x000000-0xFFFFFF(hex)

[Example] “F:1000” $C_RL_F$ Moves to [FAR] direction for 1000 pulses.

[Details] Use F to specify in decimal numbers and FH in hexadecimal numbers.

[Flowchart]




[Response] G, K, LS, LN

[cf.] N, NH

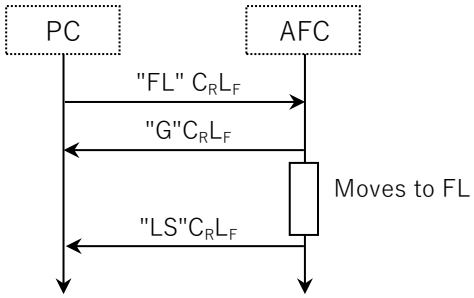
■ FL ([FAR] limit travel)

[Name] FL

[Function] Moves AF driving unit to [FAR] side hard limit (position of limit sensor detection). Travel speed is Home_Speed.

[Format] “FL” $C_RL_F$

[Flowchart]




[Response] G, LS

[cf.] NL

■ FSPD/FSP (FSPD(dec)/FSP(hex) : Reading out coordinates after moving to FSP)

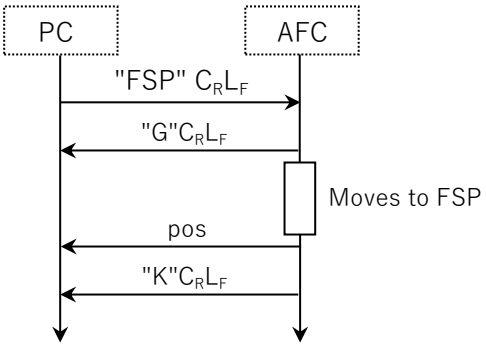
[Name] FSPD/FSP

[Function] Moves AF driving unit to FSP and reads out stop position. Travel speed is Home_Speed.

[Format] "FSP" $C_RL_F$

[Details] Moves AF driving unit to FSP and reads out coordinate position. Use FSPD to read out in decimal numbers and FSP in hexadecimal numbers. FSPD leads to command error in AFC-5 mode.

[Flowchart]




[Response] pos, G, K, LS

pos : 512 - 16777215(dec), 0x00000200 - 0x00FFFFFF(hex)

[cf.] ASP, MSP, NSP, STP, ASPD, MSPD, NSPD, STPD

■ FW (Overwriting and updating all parameters to backup memory)

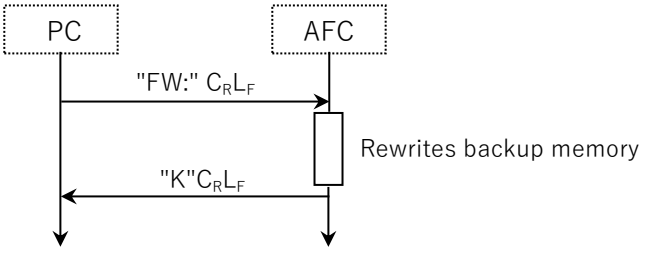
[Name] FW

[Function] Saves all currently set parameters to backup memory.

[Format] "FW" $C_RL_F$

[Details] Updates all parameter contents in backup memory to current contents. This command leads to command error in AFC-5 mode.

[Flowchart]




[Response] K

■ G/GH (G(dec)/GH(hex) : Moving to specified position)

[Name] G

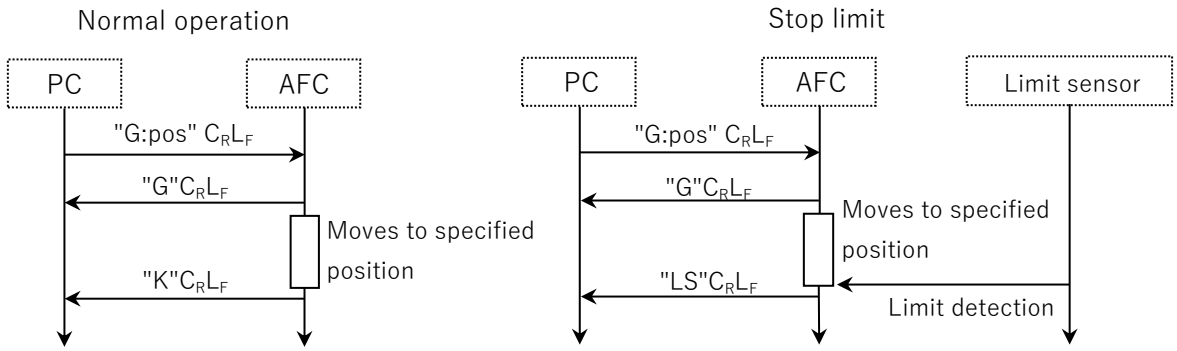
[Function] Moves AF driving unit to specified coordinate. Travel speed is Home_Speed.

[Format] "G:pos" $C_RL_F$ pos: Destination coordinates
Input range: G=512-16777215(dec), GH=0x000200-0xFFFFFF(hex)

[Example] "G:1000" $C_RL_F$ Moves to position of coordinate 1000.

[Details] Moves AF driving unit to specified position. Use G to specify in decimal numbers and GH in hexadecimal numbers.

[Flowchart]




[Response] G, K, LS, LN

■ HP (Reading out current position)

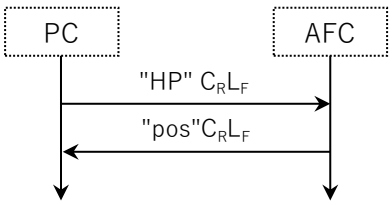
[Name] HP

[Function] Reads out current position of AF driving unit (hex ).

[Format] "HP" $C_RL_F$

[Details] Use DP to read out in decimal numbers and HP in hexadecimal numbers.

[Flowchart]




[Response] pos
pos : 0x00000200 - 0x00FFFFFF(hex)

[cf.] DP

## ■ MOT (Reading driving resolution setting of AF driving unit)

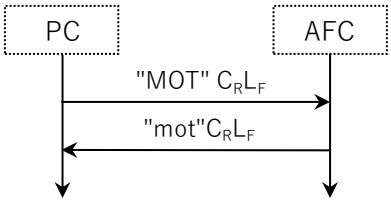
[Name] MOT

[Function] Reads out number of steps of driving unit stepper motor.

[Format] “MOT” $C_RL_F$

[Details] Reads AF driving unit resolution setting (number of steps per motor revolution: step/rev) set by AFC parameter Motor-Div.

[Flowchart]




[Response] mot

mot resolution : 3200, 6400, 12800

## ■ MSPD/MSP (MSPD(dec)/MSP(hex) : Reading out MSP)

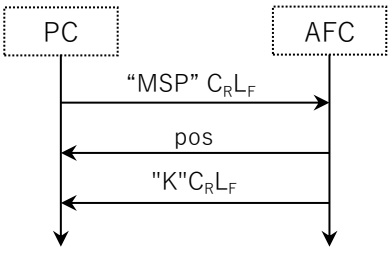
[Name] MSPD/MSP

[Function] Reads out MSP coordinate.

[Format] “MSP” $C_RL_F$

[Details] Use MSPD to read out in decimal numbers and MSP in hexadecimal numbers. MSPD leads to command error in AFC-5 mode.

[Flowchart]




[Response] pos, K

pos: 512 - 16777215(dec), 0x00000200 - 0x00FFFFFF(hex)

[cf.] ASP, FSP, NSP, STP, ASPD, FSPD, NSPD, STPD

■ N/NH (N(dec)/NH(hex) : [NEAR] direction travel for specified pulses)

[Name] N/NH

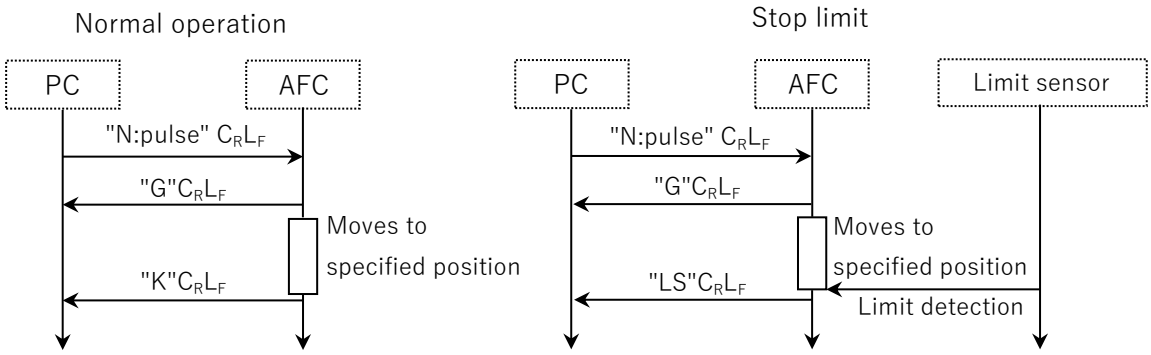
[Function] Moves AF driving unit from current position to [NEAR] direction for specified number of pulses. Travel speed is Home_Speed.

[Format] “N:pulse” $C_RL_F$ pulse: Distance [pulses]
Input range: N=0-16777215(dec), NH=0x000000-0xFFFFFF(hex)

[Example] “N:1000” $C_RL_F$ Moves to [NEAR] direction for 1000 pulses.

[Details] Use N to specify in decimal numbers and NH in hexadecimal numbers.

[Flowchart]




[Response] G, K, LS, LN

[cf.] F, FH, NH

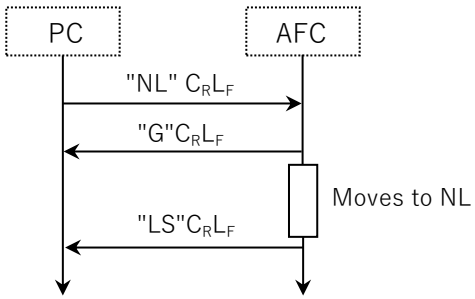
■ NL ([NEAR] limit travel)

[Name] NL

[Function] Moves AF driving unit to [NEAR] side hard limit. Travel speed is Home_Speed.

[Format] “NL” $C_RL_F$

[Flowchart]




[Response] G, LS, LN

[cf.] FL

## ■ NSPD/NSP (NSPD(dec)/NSP(hex) : NSP travel)

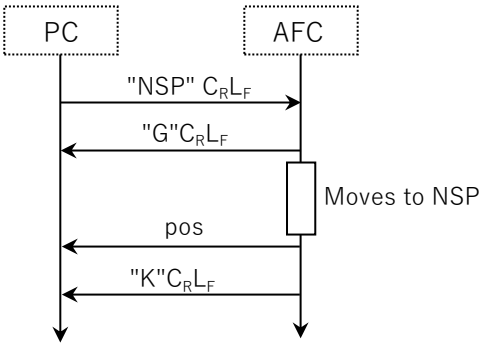
[Name] NSPD/NSP

[Function] Moves AF driving unit to NSP and reads out stop position. Travel speed is Home_Speed.

[Format] “NSP” $C_RL_F$

[Details] Moves AF driving unit to NSP ([NEAR] search point) and reads out coordinate position. Use NSPD to read out in decimal numbers and NSP in hexadecimal numbers. NSPD leads to command error in AFC-5 mode.

[Flowchart]




[Response] pos, G, K, LS, LN

pos: 512 - 16777215(dec), 0x00000200 - 0x00FFFFFF(hex)

[cf.] ASP, FSP, MSP, STP, ASPD, FSPD, MSPD, STPD

■ P (Parameter write/read)

[Name] P

[Function] Reads and writes parameters (no access to backup memory).

[Format] <Write>

・Port parameters

"P:pno,group+A+value+B+value+C+value+D+value+E+value+F+value" $C_RL_F$

*+is a notation for explanation. Please delete upon execution.

pno: Parameter number to rewrite

Input range: Valid parameter (dec)

group: Group of port group

Input range: 1–5

value: Data to write

Input range: Follows each parameter specification (dec) Does not rewrite corresponding port for "_"

・System parameters

"P:pno,value" $C_RL_F$

pno: Parameter number to rewrite

Input range: Valid parameter (dec)

value: Data to write

Input range: Follows each parameter specification (dec)

< Read >

・Port parameters

"P:group+G+pno+R" $C_RL_F$

*+is a notation for explanation. Please delete upon execution.

・System parameters

"P:pno+R" $C_RL_F$

*+is a notation for explanation. Please delete upon execution.

[Example] P:002,01A1000B2000C3000D4000E5000F6000

Writes 1000 to A port, 2000 to B port, 3000 to C port, 4000 to D port, 5000 to E port and 6000 to F port of group 1 for parameter No. 002.

P:002,01A1000B_C_D_E_F_

Writes 1000 to A port of group 1 for parameter No.002. B, C, D, E and F ports of group 1 for parameter No.002are not written.

P:002,01A1000B_C3000D_E_F6000

Writes 1000 to A port, 3000 to C port and 6000 to F port of group 1 for parameter No. 002. B, D and E ports of group 1 for parameter No. 002are not written.

P:623,1000

Writes 1000 to parameter No.623.

P:01G002R

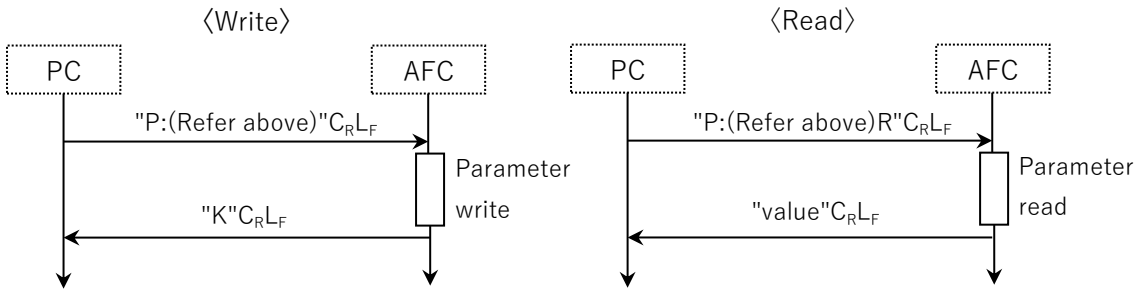
Reads out parameter No. 002 for all ports in group 1.

P:623R

Reads out parameter No.623.

[Details] Reads and writes contents of specified parameters (no access to backup memory). Written data follows the parameter specifications. This command leads to command error in AFC-5 mode.

[Flowchart]




[Response] <Write> K
<Read> value (value depends on the parameter number)

■ PF/PFH (PF(dec)/PFH(hex) : Auto Focus PF/PFH)

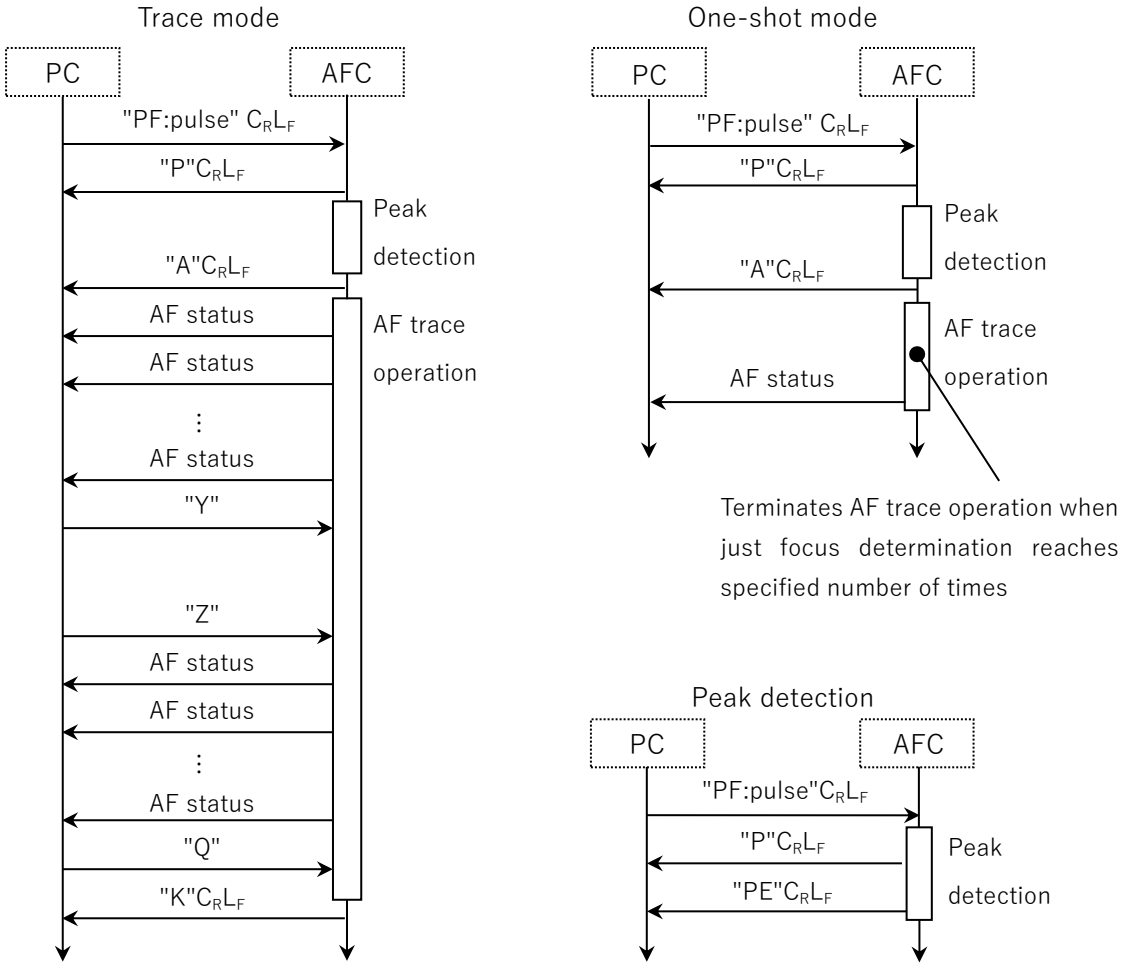
[Name] PF/PFH

[Function] Performs peak detection operation from current position to [FAR] direction for specified number of pulses followed by AF trace operation.

[Format] "PF: pulse" $C_RL_F$ pulse: Distance [pulses]
Input range: PF=0-16777215(dec)
PFH=0x000000-0xFFFFFF(hex)

[Details] Use PF to specify in decimal numbers and PFH in hexadecimal numbers. Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in one-shot mode. Set number of just focus determination with parameter.

[Flowchart]




[Response] P, A, K, LS, LN, PE
AF status : J, JF, JN, H, L, B, LS, LN
*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC0, SC1, SC2, SC3, SC4, SC5, SC6, SC7, PN, PNH

■ PN/PNH (PN(dec)/PNH(hex) : Auto Focus PN/PNH)

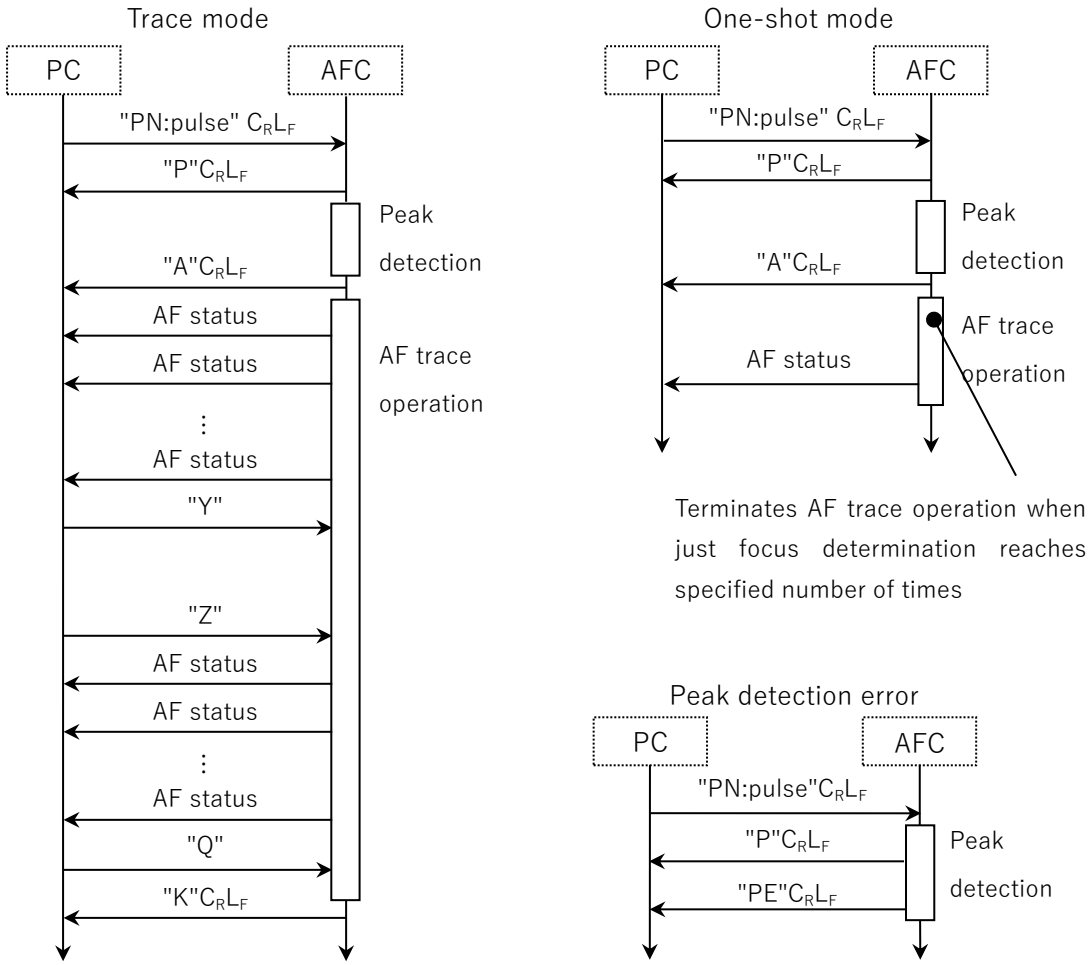
[Name] PN/PNH

[Function] Performs peak detection operation from current position to [NEAR] direction for specified number of pulses followed by AF trace operation.

[Format] "PN:pulse" $C_RL_F$ pulse: Distance [pulses]
Input range: PN=0-16777215(dec)
PNH＝0x000000-0xFFFFFF(hex)

[Details] Use PN to specify in decimal numbers and PNH in hexadecimal numbers. Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in one-shot mode. Set number of just focus determination with parameter.

[Flowchart]




[Response] P, A, K, LS, LN, PE
AF status : J, JF, JN, H, L, B, LS, LN
*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC0, SC1, SC2, SC3, SC4, SC5, SC6, SC7, PF, PFH

■ POT (Checking and changing port group)

[Name] POT

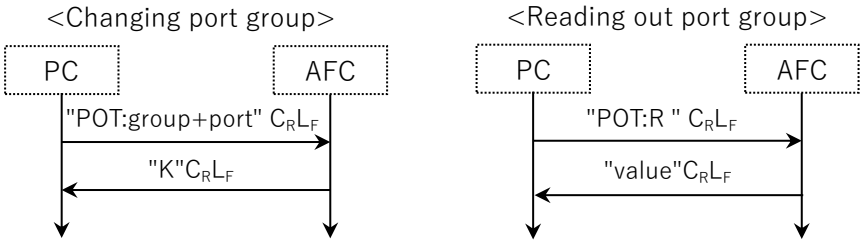
[Function] Checks or changes controlling port group.
*This command is not to enable physical switching of objective lens (revolver operation)

[Format] <Changing port group>
"POT:group+port" $C_RL_F$ *+ is a notation for explanation. Please delete upon execution.
group: Group of port group Input range: 1 - 5
port: Port of port group Input range: A - F
<Reading out port group>
"POT:R" $C_RL_F$

[Example] "POT:2B" $C_RL_F$ : Changes to B port of group 2
"POT:R" $C_RL_F$ : Returns current port group

[Details] There are 1, 2, 3, 4 and 5 for group, and A, B, C, D, E and F for port.
This command leads to command error in AFC-5 mode.

[Flowchart]




[Response] K

## ■ Q (Operation stop)

[Name] Q

[Function] Stops operation

[Format] “Q” $C_RL_F$

[Details] Auto Focus mode will be terminated during Auto Focus mode. Stops when it is travelling. Executing this command will result in normal termination if it is not moving. This command functions without delimiter.

[Flowchart] Please refer to each travel command.

[Response] K

## ■ RESET (Initializing all parameters)

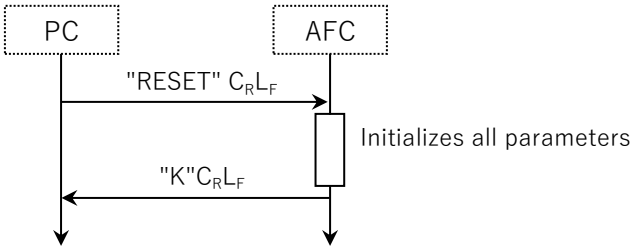
[Name] RESET

[Function] Initializes operation for all parameters.

[Format] “RESET” $C_RL_F$

[Details] Initializes all parameters. There are two initialization contents; factory default value and lens tube adjusted default value. Either is selectable with Dip switch. This command leads to command error in AFC-5 mode.

[Flowchart]




[Response] K

[cf.] RESTA

## ■ RESTA (Same operation as power cycle)

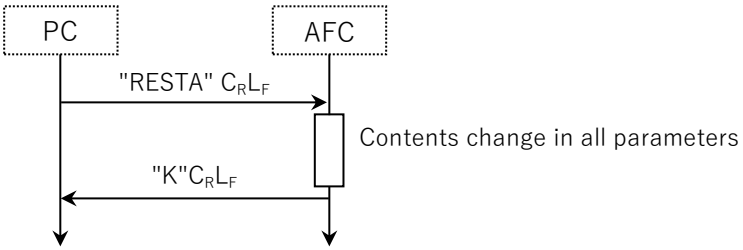
[Name] RESTA

[Function] Resets main unit to same status as power cycle.

[Format] “RESTA” $C_RL_F$

[Details] This command leads to command error in AFC-5 mode.

[Flowchart]




[Response] K

[cf.] RESET, FW

## ■ RST (HOME return)

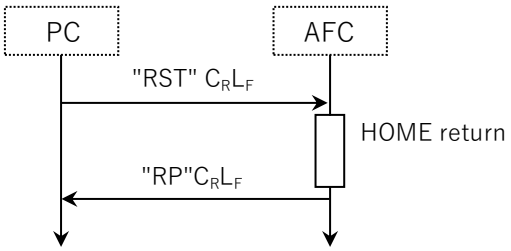
[Name] RST

[Function] Returns AF driving unit to HOME position.

[Format] “RST” $C_RL_F$

[Details] Operation to move AF driving unit to [FAR] limit, setting coordinates to 512 and to travel to STOP point (parameter STOP).

[Flowchart]




[Response] RP, LS, LN

[cf.] RSTX

■ RSTX (HOME return 2)

[Name] RSTX

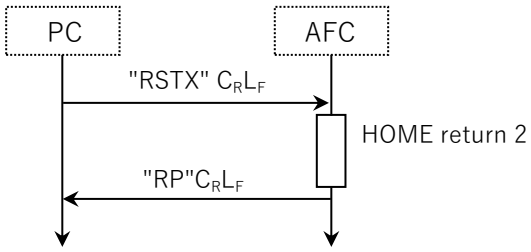
[Function] Returns AF driving unit to HOME position.

[Format] "RSTX" $C_RL_F$

[Details] Performs HOME return for full travel area. HOME return operation for full travel area is to perform the following operations in order.

① Moves driving unit to [NEAR] limit
② Moves driving unit to [FAR] limit
③ Sets coordinates to 512
④ Moves back to STOP point (parameter STOP)

[Flowchart]




[Response] RP, LS, LN

[cf.] RST

**Caution!!** **Please pay attention to position of AF driving unit when performing this operation. Depending on alignments for limit position of AF driving unit and sample, sample and objective lens may be in contact. This may cause damage to sample and/or objective lens.**

■ SC0 (Auto Focus SC0)

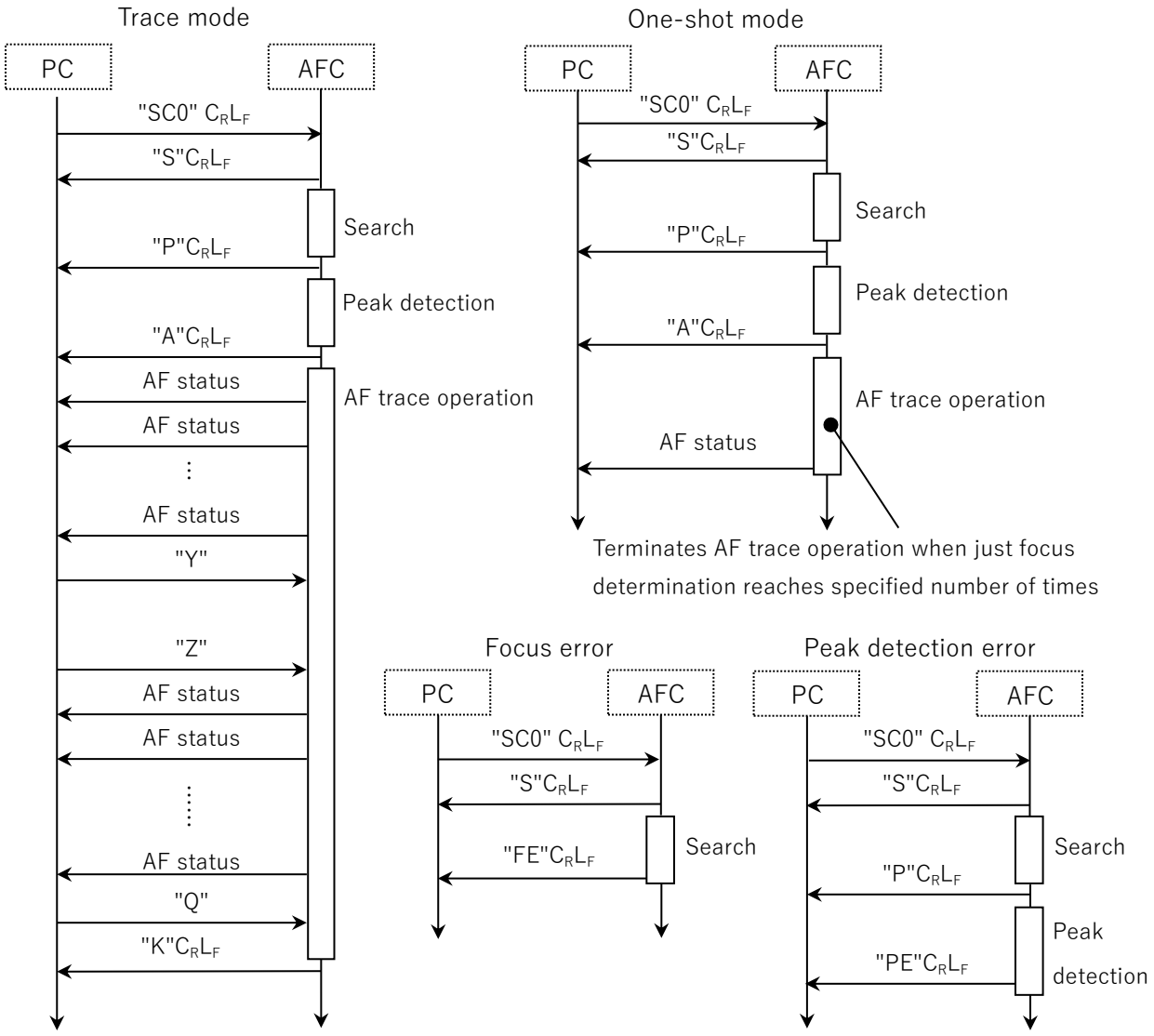
[Name] SC0

[Function] Performs search operation and peak detection operation within the signal detection range followed by AF trace operation. General operation of CHUO Auto Focus operation.

[Format] "SC0" $C_RL_F$

[Details] Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




[Response] S, P, A, K, LS, LN, FE, PE

AF status : J, JF, JN, H, L, B, LS, LN

*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC1, SC2, SC3, SC4, SC5, SC6, SC7, PF, PFH, PN, PNH

■ SC1 (Auto Focus SC1)

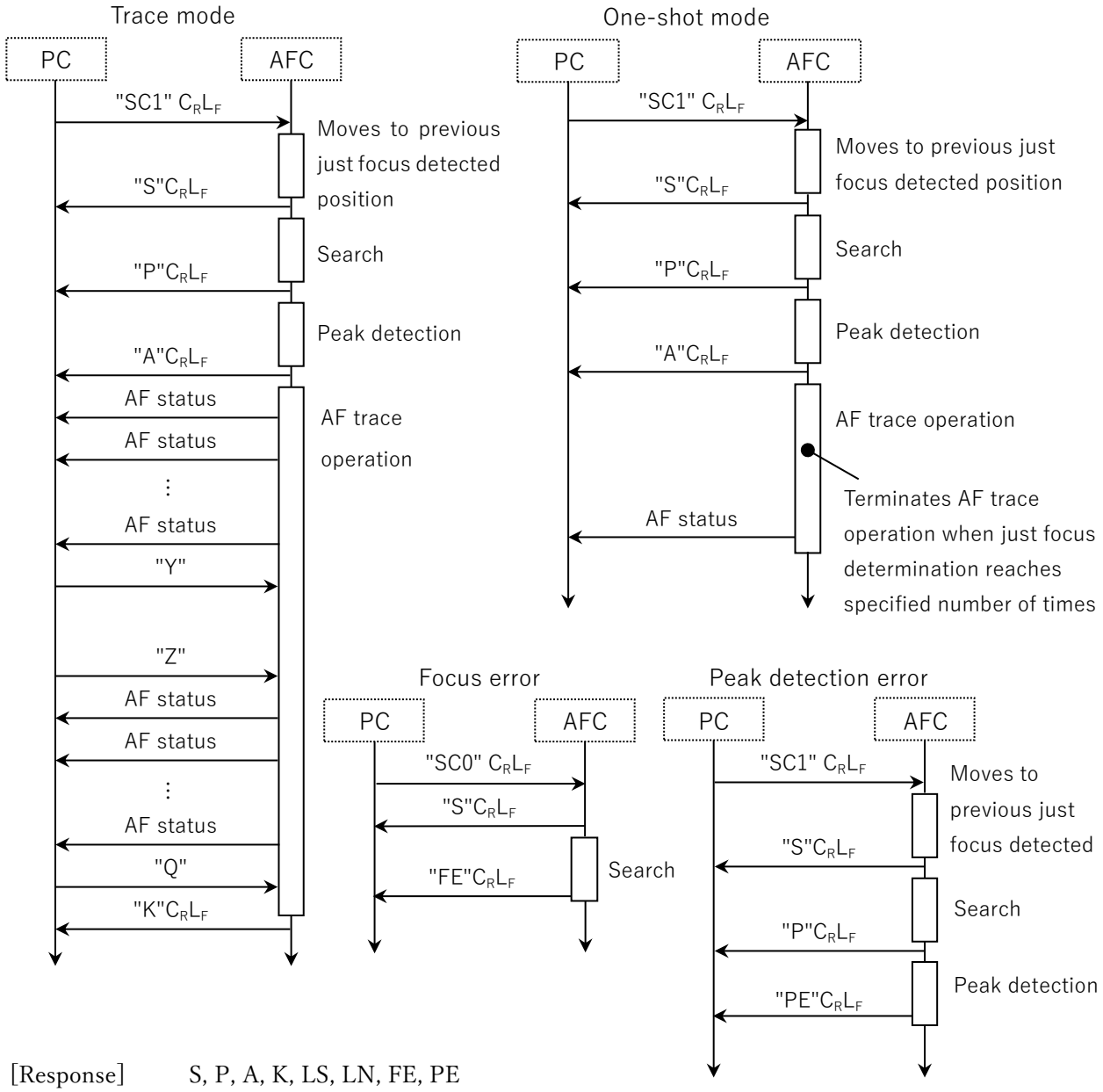
[Name] SC1

[Function] Performs search operation and peak detection operation within specified signal detection range centering on previous just focus detection position followed by AF trace operation

[Format] "SC1" $C_RL_F$

[Details] Search range is set with parameter No.006: 2nd_Area. Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




[Response] S, P, A, K, LS, LN, FE, PE

AF status : J, JF, JN, H, L, B, LS, LN

*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC0, SC2, SC3, SC4, SC5, SC6, SC7, PF, PFH, PN, PNH

■ SC2 (Auto Focus SC2)

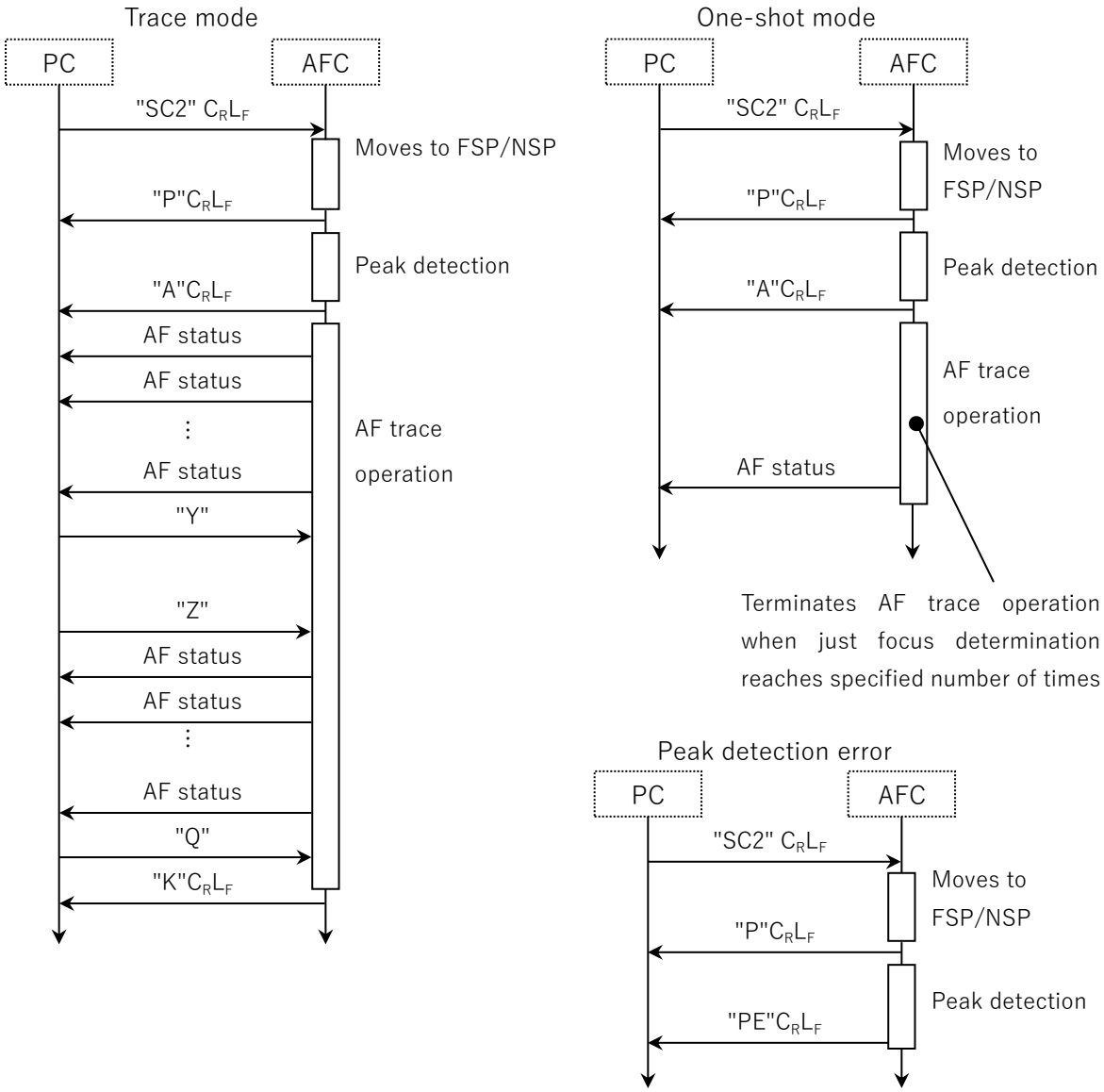
[Name] SC2

[Function] Performs peak detection operation within signal detection range followed by AF trace operation.

[Format] "SC2" $C_RL_F$

[Details] Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




[Response] P, A, K, LS, LN, PE

AF status : J, JF, JN, H, L, B, LS, LN

*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC0, SC1, SC3, SC4, SC5, SC6, SC7, PF, PFH, PN, PNH

■ SC3 (Auto Focus SC3)

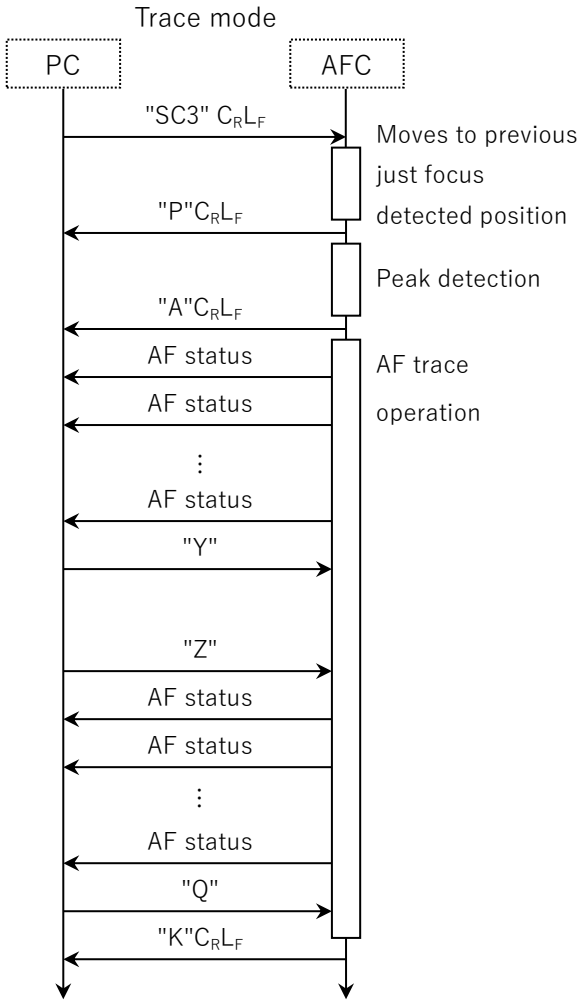
[Name] SC3

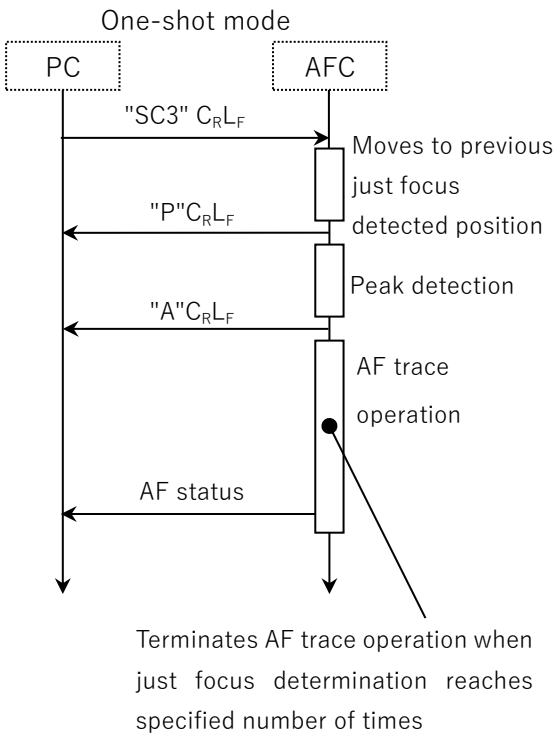
[Function] Performs peak detection operation within specified signal detection range centering on previous just focus detection position followed by AF trace operation.

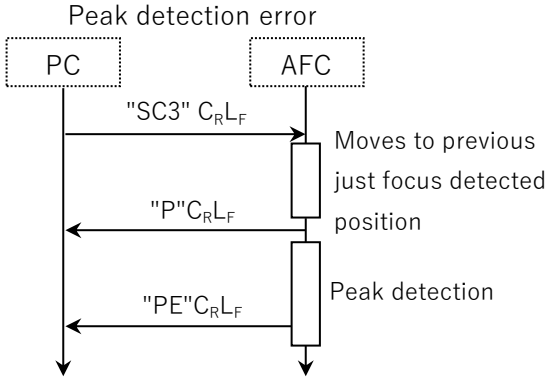
[Format] "SC3" $C_RL_F$

[Details] Peak detection range is set with parameter 2nd_Area. Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




[Response] P, A, K, LS, LN, PE

AF status : J, JF, JN, H, L, B, LS, LN

*operation continues and status notifications are sent intermittently

[cf.] AF0, AF2, SC0, SC1, SC2, SC4, SC5, SC6, SC7, PF, PFH, PN, PNH

■ SC4 (Auto Focus SC4)

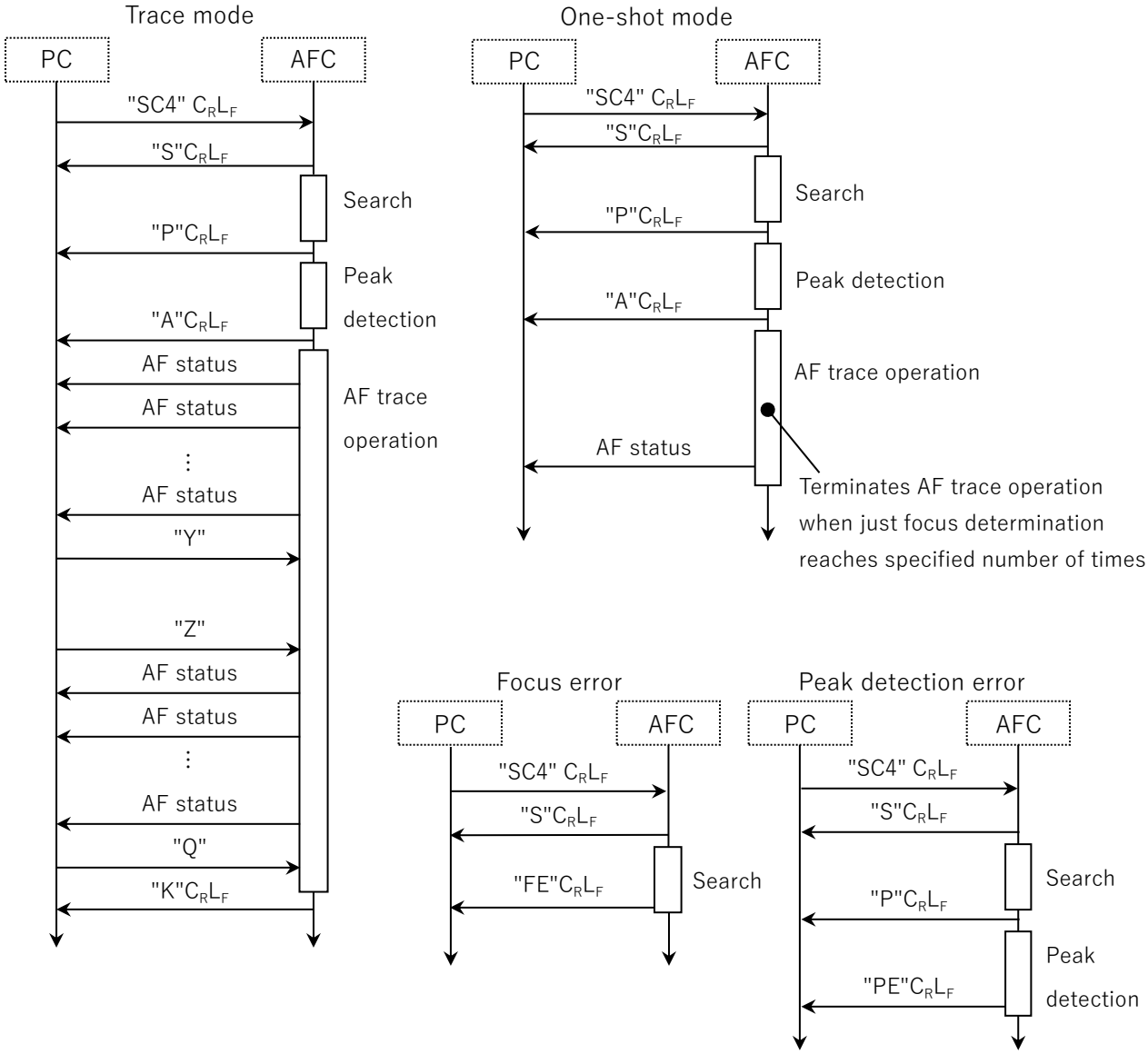
[Name] SC4

[Function] Performs search operation and peak detection operation within specified signal detection range centering on current position followed by AF trace operation.

[Format] "SC4" $C_RL_F$

[Details] Search range is set with parameter 2nd_Area. Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




[Response] S, P, A, K, LS, LN, FE, PE

AF status : J, JF, JN, H, L, B, LS, LN

*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC0, SC1, SC2, SC3, SC5, SC6, SC7, PF, PFH, PN, PNH

■ SC5 (Auto Focus SC5)

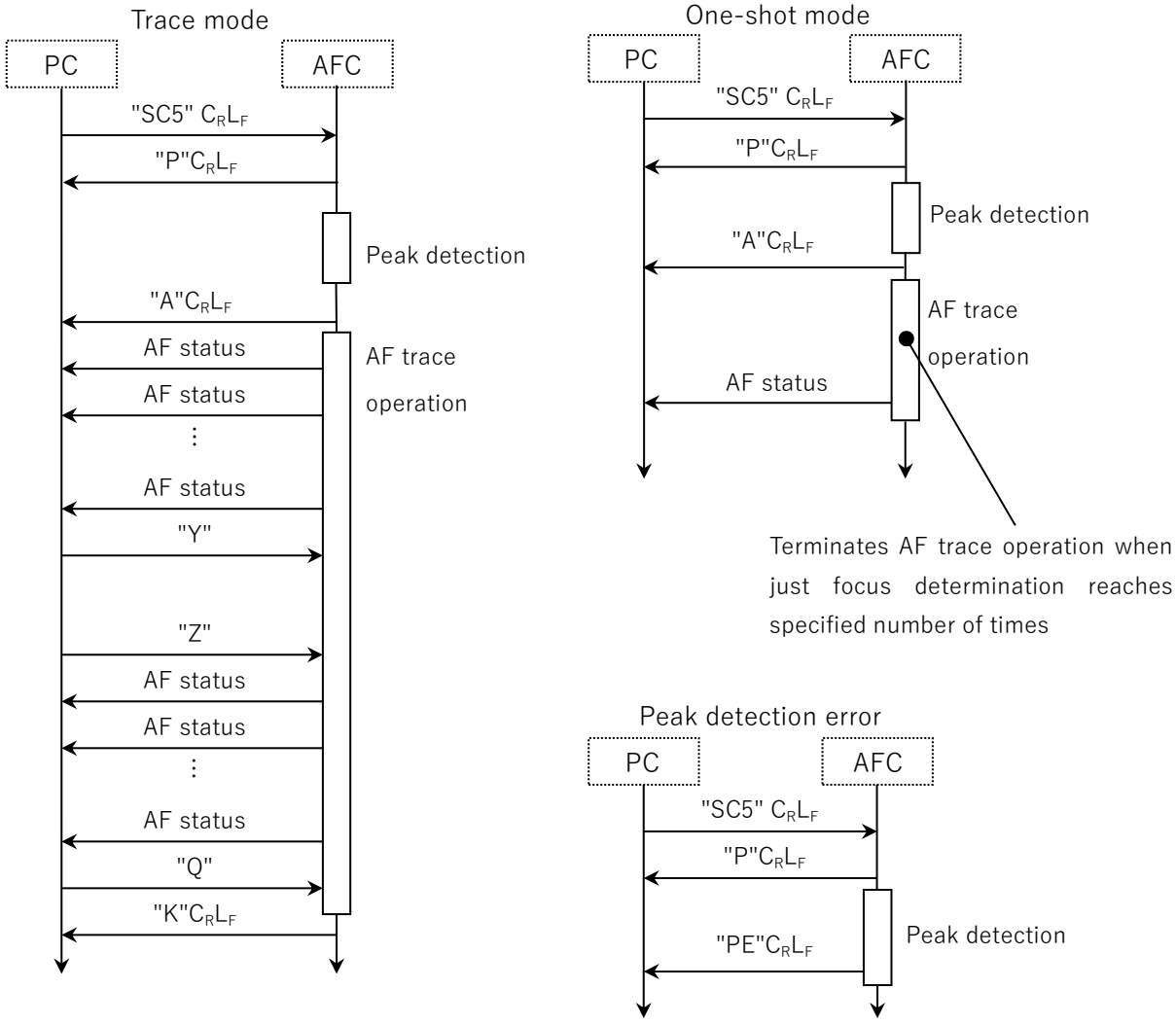
[Name] SC5

[Function] Performs peak detection operation within specified signal detection range centering on current position followed by AF trace operation.

[Format] "SC5" $C_RL_F$

[Details] Peak detection range is set with parameter 2nd_Area. Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




[Response] P, A, K, LS, LN, PE

AF status : J, JF, JN, H, L, B, LS, LN

*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC0, SC1, SC2, SC3, SC4, SC6, SC7, PF, PFH, PN, PNH

■ SC6 (Auto Focus SC6)

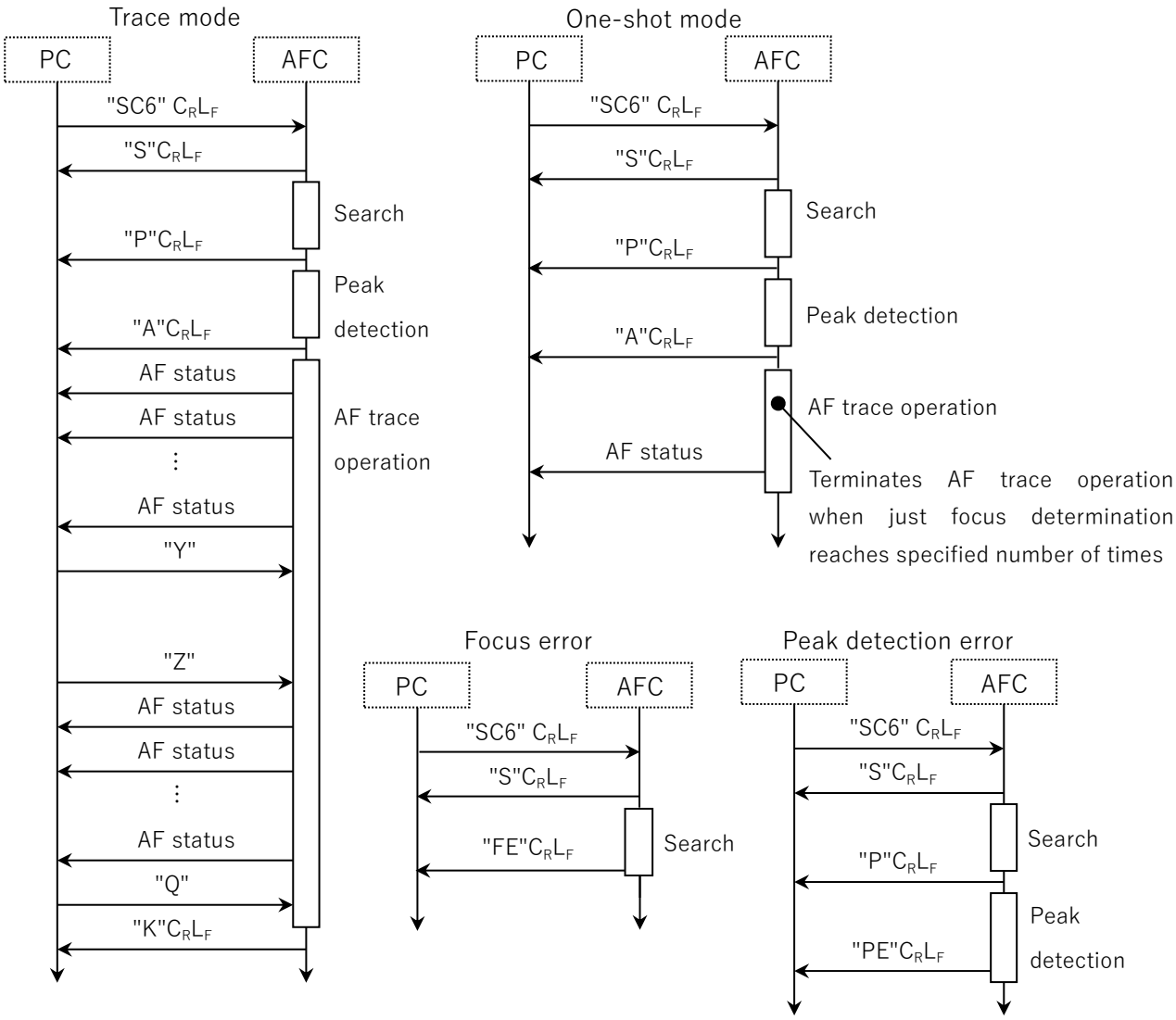
[Name] SC6

[Function] Performs search operation and peak detection operation within specified signal detection range from current position to [NEAR] direction followed by AF trace operation.

[Format] "SC6" $C_RL_F$

[Details] Search range is set to parameter SC6-7_Pulse. Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




[Response] S, P, A, K, LS, LN, FE, PE

AF status : J, JF, JN, H, L, B, LS, LN

*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC0, SC1, SC2, SC3, SC4, SC5, SC7, PF, PFH, PN, PNH

■ SC7 (Auto Focus SC7)

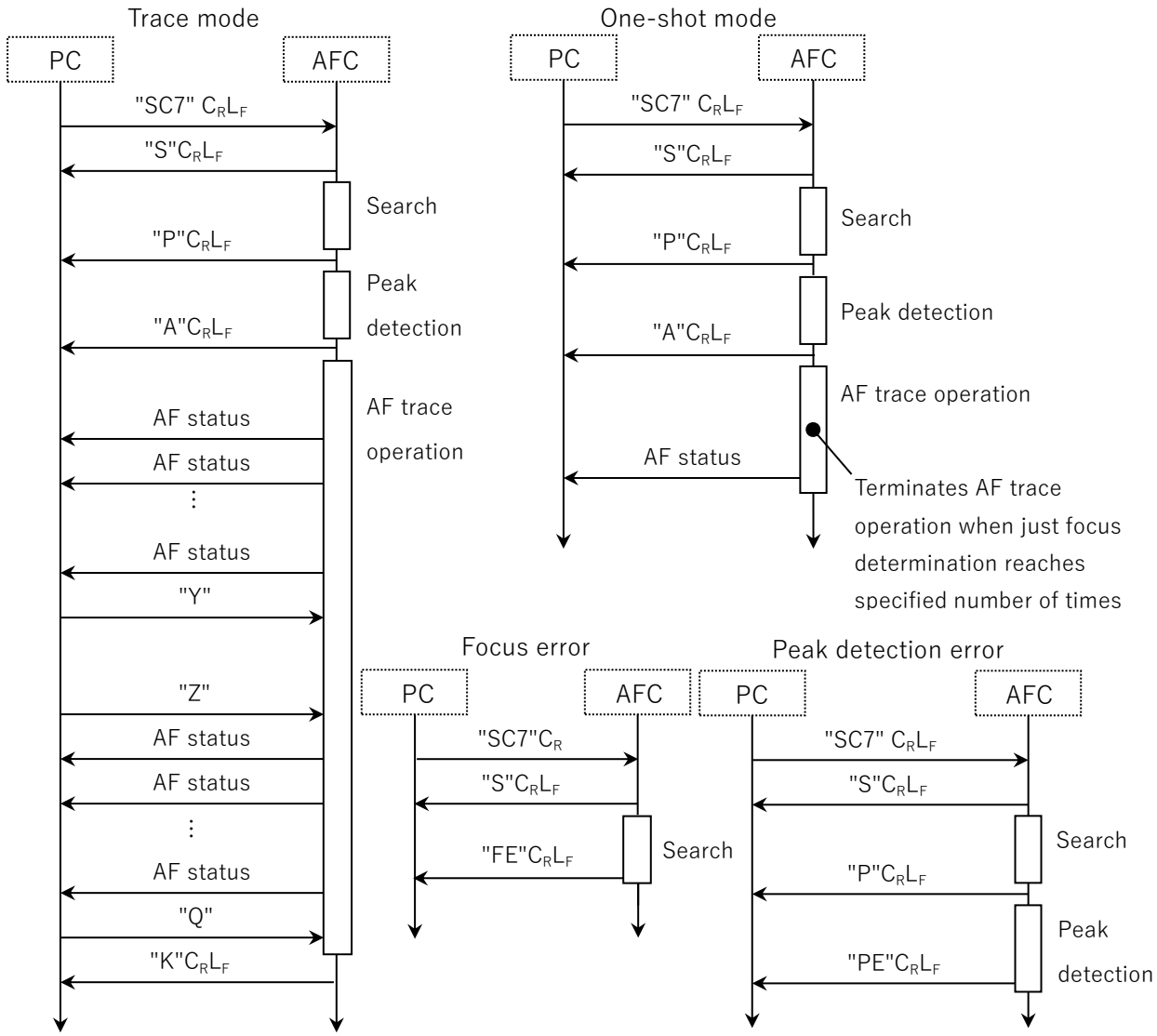
[Name] SC7

[Function] Performs search operation and peak detection operation within specified signal detection range from current position to [FAR] direction followed by AF trace operation.

[Format] "SC7" $C_RL_F$

[Details] Search range is set to parameter SC6-7_Pulse. Returns AF status during AF trace operation (Refer to "AF status notification from AFC (P8)" for AF status). AF trace operation is automatically terminated when just focus is detected for set number of times in One-shot mode. Set number of just focus determination with parameter JF.

[Flowchart]




[Response] S, P, A, K, LS, LN, FE, PE

AF status : J, JF, JN, H, L, B, LS, LN

*operation continues and status notifications are sent intermittently.

[cf.] AF0, AF2, SC0, SC1, SC2, SC3, SC4, SC5, SC6, PF, PFH, PN, PNH

■ SDP (Reading out pattern driving unit position)

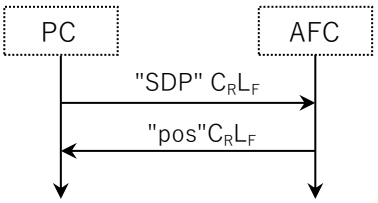
[Name] SDP

[Function] Reads out current position of pattern driving unit (decimal).

[Format] “SDP” $C_RL_F$

[Details] Use SDP to read out in decimal numbers and SHP in hexadecimal numbers.

[Flowchart]




[Response] pos

pos (current position) : 512 - 65535

[cf.] SHP

■ SF/SFH (SF(dec)/SFH(hex) : [FAR] direction travel of pattern driving unit for specified pulses)

[Name] SF/SFH

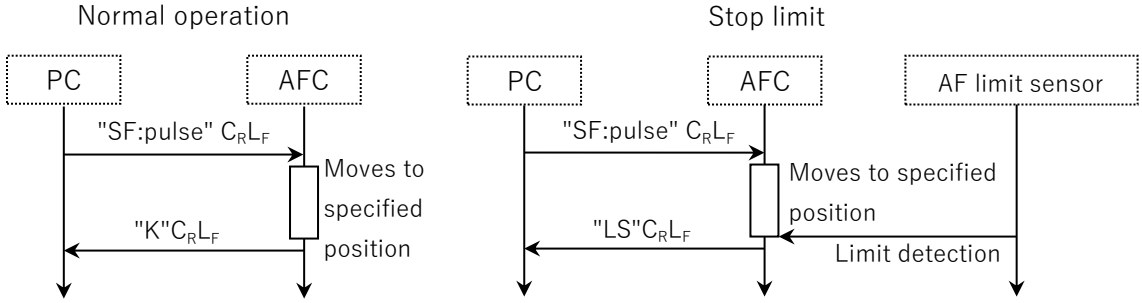
[Function] Moves pattern driving unit from current position to [FAR] direction for specified number of pulses. Travel speed is SX_Speed.

[Format] “SF:pulse” $C_RL_F$ pulse: Distance [pulses] Input range: SF=0-65535(dec), SFH=0x0000-0xFFFF(hex)

[Example] “SF:100” $C_RL_F$ Moves pattern driving unit to [FAR] direction for 1000 pulses.

[Details] Use SF to specify in decimal numbers and SFH in hexadecimal numbers.

[Flowchart]




[Response] K, LS

[cf.] SN, SNH

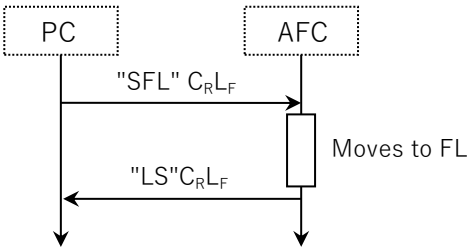
■ SFL ([FAR] limit travel of pattern driving unit)

[Name] SFL

[Function] Moves pattern driving unit to [FAR] side hard limit (position of limit sensor detection). Travel speed is SX_Speed.

[Format] “SFL” $C_RL_F$

[Flowchart]




[Response] LS

[cf.] SNL

■ SHP (Reading out pattern driving unit position)

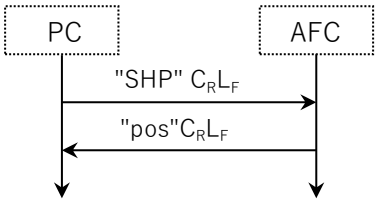
[Name] SHP

[Function] Reads out current position of pattern driving unit (hexadecimal).

[Format] “SHP” $C_RL_F$

[Details] Use SDP to read out in decimal numbers and SHP in hexadecimal numbers.

[Flowchart]




[Response] pos

pos (current position) : 0x0200 - 0xFFFF(hex)

[cf.] SDP

## ■ SIGD/SIG (SIGD(dec)/SIG(hex): AF signal, reading out sensor signal)

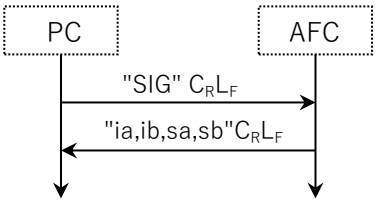
[Name] SIGD/SIG

[Function] Reads out sensor signal and AF signal voltage values for Ach and Bch.

[Format] “SIG” $C_RL_F$

[Details] Use SIGD to read in decimal numbers and SIG in hexadecimal numbers. SIGD leads to command error in AFC-5 mode.

[Flowchart]




[Response] ia,ib,sa,sb

ia A channel AF signal : 0 - 3500(dec), 0x0000 - 0x0DAC(hex)
ib B channel AF signal : 0 - 3500(dec), 0x0000 - 0x0DAC(hex)
sa A channel sensor signal : 0 - 3500(dec), 0x0000 - 0x0DAC(hex)
sb B channel sensor signal : 0 - 3500(dec), 0x0000 - 0x0DAC(hex)

■ SN/SNH (SN(dec)/SNH(hex) : [NEAR] direction travel of pattern driving unit for specified pulses)

[Name] SN/SNH

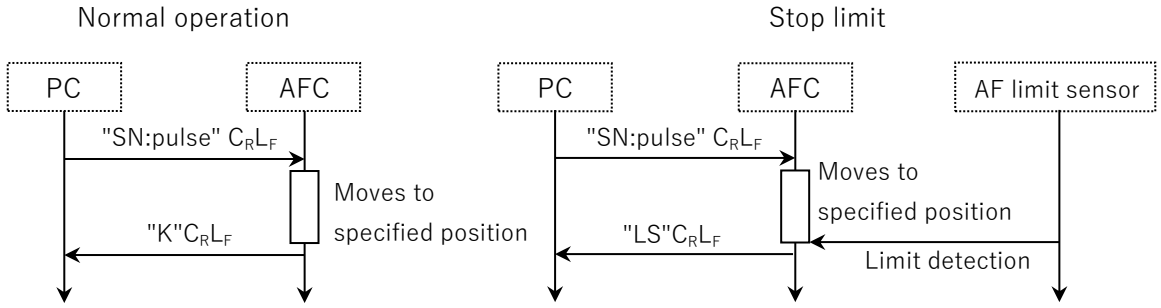
[Function] Moves pattern driving unit from current position to [NEAR] direction for specified number of pulses. Travel speed is SX_Speed.

[Format] "SN:pulse" $C_RL_F$ pulse: Distance [pulses] Input range: SN=0-65535(dec)
SNH=0x0000-0xFFFF(hex)

[Example] "SN: 100" $C_RL_F$ Moves pattern driving unit to [NEAR] direction for 1000 pulses.

[Details] Use SN to specify in decimal numbers and SNH in hexadecimal numbers.

[Flowchart]




[Response] K, LS

[cf.] SF, SFH

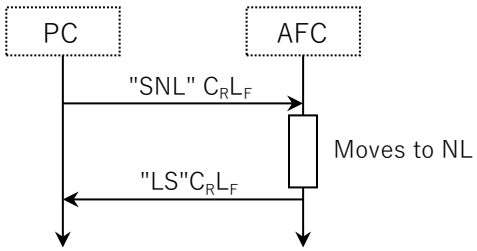
■ SNL ([NEAR] limit travel of pattern driving unit)

[Name] SNL

[Function] Moves pattern driving unit to [NEAR] side hard limit (position of limit sensor detection). Travel speed is SX_Speed.

[Format] "SNL" $C_RL_F$

[Flowchart]




[Response] LS

[cf.] SFL

■ STPD/STP (STPD(dec)/STP(hex) : Moving to STOP)

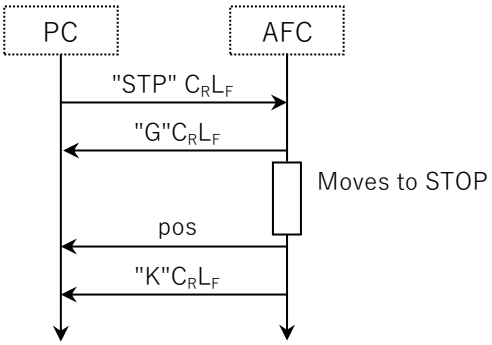
[Name] STP

[Function] Moves AF driving unit to STOP and reads out stop position. Travel speed is Home_Speed.

[Format] “STP” $C_RL_F$

[Details] Moves AF driving unit to STOP and reads out stop position. Use STPD to read out coordinate position in decimal numbers and STP in hexadecimal numbers. STPD leads to command error in AFC-5 mode.

[Flowchart]




[Response] pos, G, K, LS, LN

pos (stop position) : 512 - 16777215(dec), 0x00000200 - 0x00FFFFFF (hex)

[cf.] ASP, FSP, MSP, NSP, ASPD, FSPD, MSPD, NSPD

■ VER (Reading out version)

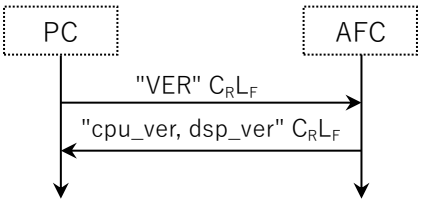
[Name] VER

[Function] Reads out AFC version.

[Format] “VER” $C_RL_F$

[Details] Reads out version of AFC internal program. Version is shown in letter string with optional character length.

[Flowchart]




[Response] AFC-6 CPU cpu_ver DSP dsp_ver

cpu_ver : CPU version

dsp_ver : DSP version

## ■ VR2D/VR2 (VR2D(dec)/VR2(hex) : Reading out BPF setting value)

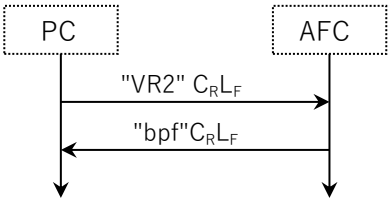
[Name] VR2D/VR2

[Function] Reads out setting value of BPF.

[Format] “VR2” $C_RL_F$

[Details] Use VR2D to read out in decimal numbers and VR2 in hexadecimal numbers. VR2D leads to command error in AFC-5 mode.

[Flowchart]




[Response] bpf

bpf (BPF) : 0 - 31(dec), 0x0000 - 0x001F(hex)

## ■ VR3D/VR3 (VR3D(dec)/VR3(hex) : Reading out Balance value)

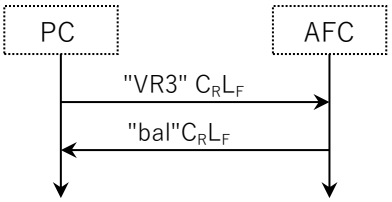
[Name] VR3D/VR3

[Function] Reads out setting value of Balance.

[Format] “VR3” $C_RL_F$

[Details] Use VR3D to read out in decimal numbers and VR3 in hexadecimal numbers. VR3D leads to command error in AFC-5 mode.

[Flowchart]




[Response] bal

bal (Balance) : 0 - 63(dec), 0x0000 - 0x003F(hex)

| ■ Y | (Stop AF status notification during AF operation) |
|---|---|
| [Name] | Y |
| [Function] | Stops AF status notification during AF trace operation (AF operation continues). |
| [Format] | "Y" $C_RL_F$ |
| [Details] | AF status notifications are sent intermittently during AF operation. This command stops this AF status notification during AF operation. Command execution will be ignored when AF status notification is on hold during AF operation. This command functions without delimiter. |
| [Flowchart] | Please refer to AF0, AF2, SC0, SC1, SC2, SC3, SC4, SC5, SC6, SC7, PF, PFH, PN and PNH. |
| [Response] | N/A |
| [cf.] | Z |

| ■ Z | (Canceling AF status notification stop during AF operation) |
|---|---|
| [Name] | Z |
| [Function] | Resumes AF status notification after canceling Y command AF status notification stop status during AF trace operation. |
| [Format] | "Z" $C_RL_F$ |
| [Details] | AF status notifications are sent intermittently during AF operation. This command cancels AF status notification stop status during AF operation. Command execution will be ignored when AF status notification is not on hold during AF operation. This command functions without delimiter. |
| [Flowchart] | Please refer to AF0, AF2, SC0, SC1, SC2, SC3, SC4, SC5, SC6, SC7, PF, PFH, PN and PNH. |
| [Response] | N/A |
| [cf.] | Y |

## 5. Command index

## Warranty and repair

■Warranty period

Repair services are available for free of charge in the event of technical failure under warranty period in accordance with CHUO regulations.

| | |
|---|---|
| **Warranty period** | **1 year from shipment** |

Repair costs will not be covered for following cases.

- Due to improper use, inappropriate repair or remodeling the product
- Due to applying external shock after purchasing the product
- Due to fire, earthquake, flood, lightning or other natural disasters
- Due to environmental pollution or by applying abnormal voltage
- For defects predetermined by CHUO not to apply this warranty
- Due to any use not following this instruction manual

■Repair service during warranty period

Please contact the authorized distributors or company of purchase for repair service.

■Repair service for out-of-warranty products

Contact the authorized distributors or company of purchase for out-of-warranty products. Repair services will be provided with charges depending on conditions. Please provide the following information in order to prepare and deliver effective repair services.

- Date of purchase, product name and manufacturing number
- Details of how the product is used
- Specific description of defects
- Matters that may be the cause of defect

Please note in advance that there may be cases that CHUO is unable to provide repair services.

All descriptions and specifications in this manual are subject to change without prior notice.
Please note in advance that products are also subject to change without prior notice.

Auto Focus Controller AFC-6　INSTRUCTION MANUAL

- Communication Commands -  Ver. 1.0

Oct. 31, 2019 YUA.

CHUO PRECISION INDUSTRIAL CO.,LTD.

Sales Division
Oikawa Bldg 3F, 1-5 Kanda Awajicho, Chiyoda-ku, Tokyo, 101-0063, Japan
TEL: +81-3-3257-1911　FAX: +81-3-3257-1915

A002-K016