CONTROL COMMAND PROTOCOL FOR

VK-S454 SERIES

CONTENTS

PART
ONE

* EXTERNAL CONTROL

1. Communication protocol

Communication between the microcomputer of the camera and the PC is available by using the RS-232C protocol. The microcomputer receives each control command given by the PC and echoes it back to the PC.

2. Connect condition

Data length	8 bit
Stop bit	1 bit
Parity	even
Baudrate	4800 bps

3. Communication data format

All communication data consist of eight or ten ASCII characters (8 bytes or 10 bytes).
The format of the communication data is shown in Fig. 1.

a) Normal command

Communication data start with the character ":" (colon).

b) Special command

Communication data start with the character "/"(slash).

(a) 8 bytes format [Normal command]

1st byte 8th byte

: CM A3 A2 A1 A0 D1 D0

CM	Command as follows R :Read 1 byte data of micro-Com. RAM or EEPROM W :Write 1 byte data of micro-Com. RAM or EEPROM
A3-A0	Address data of micro-Com. RAM or EEPROM (write in hex. 0000-FFFF)
D1-D0	Data of micro-Com. RAM or EEPROM (write in hex. 00-FF)

(b) 10 bytes format [Normal command]

1st byte 10th byte

: CM A3 A2 A1 A0 D3 D2 D1 D0

CM	Command as follows r :Read 2 bytes data of micro-Com. RAM or EEPROM w :Write 2 bytes data of micro-Com. RAM or EEPROM
A3-A0	Address data of micro-Com. RAM or EEPROM (write in hex. 0000-FFFF)
D3-D0	Data of micro-Com. RAM or EEPROM (write in hex. 0000-FFFF)

(c) 8 bytes format [Special command]

1st byte 8th byte

/ CM D5 D4 D3 D2 D1 D0

CM	Command as follows M : <Privacy mask> DEGREE WRITE command
D5-D0	Data of micro-Com. RAM or EEPROM (write in hex. 000000-FFFFFF)

Fig. 1 Communication data format

4. Control commands

a) Switch the auto focus / manual focus

:RFF0E00
:WFF0EX ₁X₀
bit 3 of X ₁X₀ :0-Auto 1-Manual

or

:WFCBBA8 ;Change
:WFCBBFE ;Neutral

b) Move focus to FAR in manual focus mode :WFCBBA9

;Start
:WFCBBFE ;Stop

c) Move focus to NEAR in manual focus mode :WFCBBAA

;Start
:WFCBBFE ;Stop

d) Move zoom to TELE

:WFCBB99 ;Start
:WFCBBFE ;Stop

e) Move zoom to WIDE

:WFCBB9B ;Start
:WFCBBFE ;Stop

f) Select the zoom speed of optical zoom

:RFDFC00
:WFDFCX ₁X₀

Super HIGH SPEED (2. 9 s) ;
X ₁X₀: Set bit 3 of echo back data to "0".
Set bit 2 of echo back data to "1".
HIGH SPEED (4.2 s);
X ₁X₀: Set bit 3 of echo back data to "0".
Set bit 2 of echo back data to "0".
NORMAL SPEED (5.8 s);
X ₁X₀: Set bit 3 of echo back data to "1".
Set bit 2 of echo back data to "0".

[Note] mark : for "Zoom Trace Preset Mode" only

g) Get the status of zoom position

:RFC9100

If echo back data is not "FF", zoom position is calculated by following equation.

zoom position = 23 x 256 / (XX + 1)

XX; echo back data

If echo back data is "FF", then following commands should be sent.

:rF7200000

Echo back data shows zoom position.

[Please refer to the attached Table.1.]

Table.1 Zoom position data table (reference value)

Zoom position	x1	x2	x3	x4	x5	x6	x7	x8
Echoback data	182A less	2F13 less	3AE2 less	427C Less	47F3 less	4C29 less	4F9B less	528F less
Zoom position	x9	x10	x11	x12	x13	x14	x15	x16
Echoback data	5512 less	5742 less	5948 less	5B18 less	5C9E less	5E0A less	5F3E less	6048 less
Zoom position	x17	x18	x19	x20	x21	x22	x23	
Echoback data	6136 less	61FA less	62A2 less	632E less	639E Less	63D6 less	63D6 more	

h) Switch the continuous digi. zoom ON/OFF :RFCCB00

:WFCCBX ,X₀

X,X₀=00 ; OFF X ,X₀=01 ; ON

i) Set the maximum mag. tuning value in continuous digi. zoom ON mode

:WFDF0X ,X₀

X,X₀ (hex) = {256 - (256 / MM)} (dec)

MM; maximum mag.

[EX. mag.1; MM=1 -> X ,X₀=00

mag.2; MM=2 -> X ,X₀=80]

j) Switch the instant digi. zoom ON/OFF

:RFF0F00

:WFF0FX ,X₀

bit 7 of X ,X₀ : 0-OFF 1-ON

k) Set the instant mag. tuning value in instant digi. zoom ON mode

:WFDE6X ,X₀

X,X₀ (hex) = IM * 10(dec)

IM; instant mag.

(more than 1.0 and 0.1 step)

[EX. mag.1; IM=1.0 -> X ,X₀=0A

mag.2; IM=2.0 -> X ,X₀=14 ; max.]

l) Switch the auto / manual white balance

:RFBFF00
:WFBFFX $_1X_0$
bit 3 of X $_1X_0$: 0-Auto 1-Manual

m) Set the white balance (R gain) tuning value in manual white balance mode

:wFBBCX $_3X_2X_1X_0$
$X_3X_2X_1X_0$: tuning value
(min. H'0080, max. H'03FF)
data range: H'0080 - H'00FF
H'0180 - H'01FF
H'0280 - H'02FF
H'0380 - H'03FF

n) Set the white balance (B gain) tuning value in manual white balance mode

:wFBBEX $_3X_2X_1X_0$
$X_3X_2X_1X_0$: tuning value
(min. H'0080, max. H'03FF)
data range: H'0080 - H'00FF
H'0180 - H'01FF
H'0280 - H'02FF
H'0380 - H'03FF

o) Switch the Reverse ON/OFF

:RFF3000
:WFF30X $_1X_0$
X_1X_0=00 ; OFF X $_1X_0$=01 ; ON

p) Switch the instant fade(black) ON/OFF

:RFF3200
:WFF32X $_1X_0$
X_1X_0=00 ; OFF X $_1X_0$=01 ; ON

q) Switch the Image Freeze ON/OFF

:RFF3300
:WFF33X $_1X_0$
X_1X_0=00 ; OFF X $_1X_0$=01 ; ON

5. Others

[Note] mark : It is available after power reset.
Default value in EEPROM area are subject to change without notice.

a) Get the camera type

[EEPROM area]
:RE1EDX ,X
:RE1EEX ,X

Type data (X ,X =)

MODEL	**VK-S454**	VK-S454E
TYPE	Hi-BAND	Hi-BAND
FORMAT	NTSC	PAL
EEPROM area "**E1ED** "	**B1**	**B1**
EEPROM area "**E1EE** "	**0X**	**1X**

b) Set the auto iris control level tuning value in auto exposure mode

i) Iris offset (average) level (**WDR OFF**)

[RAM area]
:WFD9EX ,X (X ,X =00 - FF ; 256 step)

ii) Iris offset (average) level (**WDR ON**)

[RAM area]
:WFD90X ,X (X ,X =00 - FF ; 256 step)

iii) Iris offset (peak) level (**WDR OFF**)

[RAM area]
:WFD9FX ,X (X ,X =00 - 7F ; 128 step)

c) Switch the back light compensation (BLC) ON/OFF (**WDR OFF ONLY**)

[RAM area]
:RFECE0
:WFECEX ,X
X ,X =00 ; OFF X ,X =02 ; ON

[note] BLC ON is WDR ON mode only.

d) Set the BLC level tuning value in BLC ON mode (**WDR OFF ONLY**)

[RAM area]
:WFD8EX $_1X_0$ (X_1X_0=00 - FF ; 256 step)

e) Set the chroma suppression level tuning value in AGC range

[RAM area]

AGC gain		- AGC ON	:WFC10X $_4Y_4$
AGC gain	AGC ON	- 1/3 maximum AGC level	:WFC11X $_3Y_3$
AGC gain	1/3 maximum AGC level	- 2/3 maximum AGC level	:WFC12X $_2Y_2$
AGC gain	2/3 maximum AGC level	- maximum AGC level	:WFC13X $_1Y_1$
AGC gain	Maximum AGC level	-	:WFC14X $_0Y_0$

(X_7X_6=00 - FF ; 256 step)

darker (H'00) < center (H'7F) < brighter (H'FF)

[Note] maximum AGC level setting at **page 13** - item i)
chroma suppression level tuning values at Fig. 1

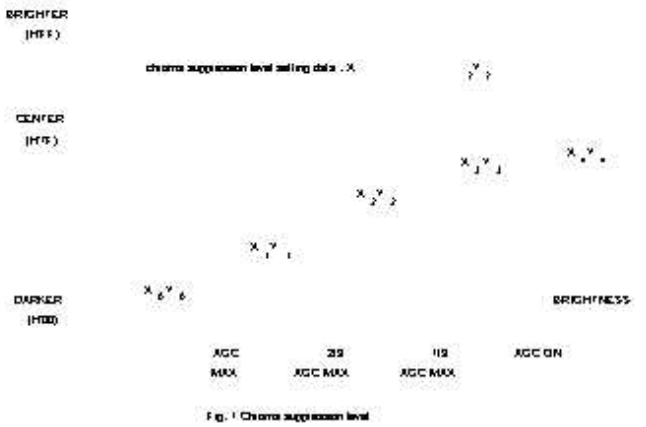


Fig. 1 Chroma suppression level

f) Select the manual aperture mode

[RAM area]

:RFBFF00
:WFBFFX ₁X₀
X₁X₀: Set bit 1 of echo back data to "1".
[bit 1 of X ₁X₀: 0-Auto 1-Manual]

g) Set the horizontal aperture level tuning value

:WFBF6X ₁X₀ (X₁X₀=00 - 3F ; 64 step)

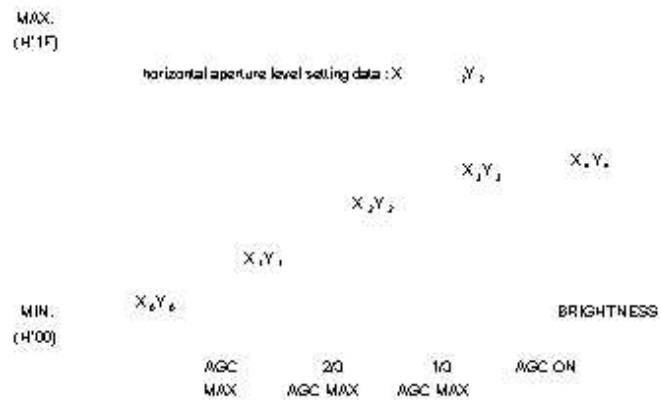


Fig. 2 horizontal aperture level

h) Set the vertical aperture level tuning value

:WFBF9X ₁X₀ (X₁X₀=00 - 3F ; 64 step)

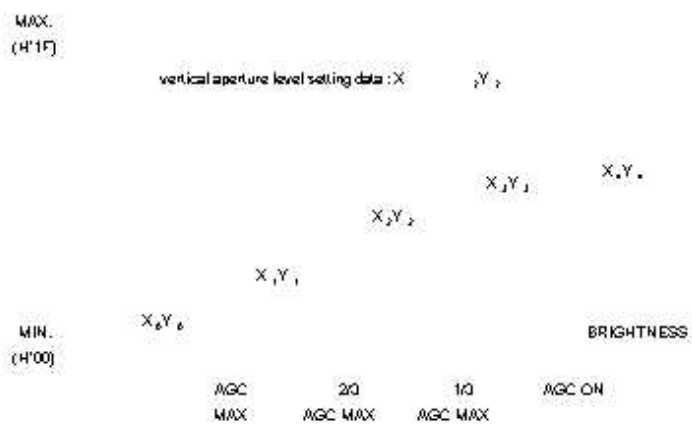


Fig. 3 vertical aperture level

i) Set the maximum AGC gain tuning value in AGC ON mode

[RAM area]

:wFD46X $_3X_2X_1X_0$

($X_3X_2X_1X_0$=0000 - 0500 ; 0.03125dB/step)

[$X_3X_2X_1X_0$=0000 ; 0dB ,
$X_3X_2X_1X_0$=0500 ; 40dB]

j) Change Communication Baudrate

[EEPROM area]

:WE05EX $_1X_0$
(X_1X_0=80 or 00
; 4800 bps , even Parity ; default
X_1X_0=B0 ; 9600 bps , even Parity
X_1X_0=C0 ; 4800 bps , non Parity
X_1X_0=F0 ; 9600 bps , non Parity)

k) Set RAM initialize (Reset to EEPROM programmed default)

[RAM area]

:WFCAC00

PART
TWO

* PROGRAM AE CONTROL COMMAND
* IR REMOVE CONTROL COMMAND
* WIDE DYNAMIC RANGE COMMAND

1. Program AE mode
   The following Control Commands are Program AE added to **VK-S454**.

Program AE control	Program AE		[WDR ON/OFF]
	Program AER 1	[IR Remove - 1]	[WDR ON/OFF]
	Program AER 2	[IR Remove - 2]	[WDR ON/OFF]
	Program AE+ (DSS)		[WDR ON/OFF]
	Program AER+1	(DSS) [IR Remove - 1]	[WDR ON/OFF]
	Program AER+2	(DSS) [IR Remove - 2]	[WDR ON/OFF]
	Program AER+3	(DSS) [IR Remove - 3]	[WDR ON/OFF]
	Shutter priority		
	Exposure priority		
	AGC priority		

[Note] mark is default mode.

VK-S454 Program AE control

2. Program AE mode

a) Function of program AE mode

[Please attached Table 1.]

Table. 1 Program AE mode table

Program AE mode / function	DSS	IR Remove	WDR
Program AE		[Manual]	[on/off]
Program AER1 [IR Remove 1]		[auto] : **Hi sensitivity**	[on/off]
Program AER2 [IR Remove 2]		[auto] : **Mid sensitivity**	[on/off]
Program AE+ (DSS)	[auto]	[Manual]	[on/off]
Program AER+1 (DSS) [IR Remove 1]	[auto]	[auto] : **Hi sensitivity**	[on/off]
Program AER+2 (DSS) [IR Remove 2]	[auto]	[auto] : **Mid sensitivity**	[on/off]
Program AER+3 (DSS) [IR Remove 3]	[auto]	[auto] : **Lo sensitivity**	[on/off]
Shutter priority	[Manual]	[Manual]	
Exposure priority		[Manual]	
AGC priority		[Manual]	

b) Mode switch

:RFCC800
:WFCC8X ,X₀

[Please attached Table 2.]

Table. 2 Program AE mode data

Program AE mode	X₁X₀
Program AE	00
Program AER [IR Remove 1]	10
Program AER [IR Remove 2]	20
Program AE+ (DSS)	01
Program AER+ (DSS) [IR Remove 1]	11
Program AER+ (DSS) [IR Remove 2]	21
Program AER+ (DSS) [IR Remove 3]	31
Shutter priority	07
Exposure priority	08
AGC priority	09

3. Digital Slow Shutter

a) Digital slow shutter status

:RFCC700

Echo back data is digital slow shutter status.
[Please attached Table 3.]

Table. 3 Digital slow shutter table

X_1X_0 (echo back data)	Shutter Speed (s) NTSC	PAL
01	- 1/60	- 1/50
02	1/60 - 1/30	1/50 - 1/25
04	1/30 - 1/15	1/25 - 1/12
08	1/15 - 1/ 8	1/12 - 1/ 6
10 [default]	1/ 8 - 1/ 4	1/ 6 - 1/ 3
20	1/ 4 - 1/ 2	1/ 3 - 1/ 1.5

b) Auto digital slow shutter limit

:R11E500
:W11E5X $_1X_0$

[Please attached Table 4.]

Table. 4 Digital slow shutter limit table

X_1X_0 (echo back data)	Shutter Speed (s) NTSC	PAL
01	1/60	1/50
02	1/30	1/25
04	1/15	1/12
08	1/ 8	1/ 6
10 [default]	1/ 4	1/ 3
20	1/ 2	1/ 1.5

4. IR Remove

a) IR remove status

:RFFE700

Echo back data is IR remove status.
[Please attached Table. 5.]

Table. 5 IR remove status table

X_1X_0 (echo back data)	
00	IR cut filter OFF
01	IR cut filter ON

b) Switch the IR ON / OFF manual control

:RFFE600
:WFFE6X $_1X_0$
[Please attached Table. 6.]

Table. 6 IR remove status table
X_1X_0
(echo back data)

C0	IR cut filter OFF=>ON
80	IR cut filter ON =>OFF

[Note] This mode is Program AE and Program AE+ and priority (shutter/exposure/AGC) mode only.
(as shown on page 18 Table 1, mark).

5. Shutter priority

a) Mode switch

:RFCC800
:WFCC8X $_1X_0$
X_1X_0=07

b) Set the shutter speed tuning value

:RFCC900
:WFCC9X $_1X_0$
X_1X_0; tuning value
[Please refer to the attached Table.7.]

Table. 7 Shutter speed data table in shutter priority mode

X_1X_0 (setting data)	Shutter Speed (s) NTSC	PAL
00	1/2	1/1.5
01	1/4	1/3
02	1/8	1/6
03	1/15	1/12
04	1/30	1/25
05	1/60	1/50
06	1/120	1/100
07	1/180	1/150
08	1/250	1/250
09	1/500	1/500
0A	1/1000	1/1000
0B	1/2000	1/2000
0C	1/4000	1/4000
0D	1/10000	1/10000
0E	**1/30000**	**1/30000**

6. Exposure priority

a) Mode switch

:RFCC800
:WFCC8X $_1X_0$
X_1X_0=08

b) Set the exposure tuning value

:RFCC900
:WFCC9X $_1X_0$
X_1X_0; tuning value

[Please refer to the attached Table.8.]

Table. 8 Exposure data table in exposure priority mode

F-value	X_1X_0(setting data)
F1.6	00
F2.2	01
F3.2	02
F4.4	03
F6.4	04
F8.8	05
F12	06
F17	07
F24	08
F34	09

7. AGC priority

a) Mode switch

:RFCC800
:WFCC8X $_1X_0$
X_1X_0=09

b) Set the AGC tuning value

:RFCC900
:WFCC9X $_1X_0$
X_1X_0; tuning value

[Please refer to the attached Table.9.]

Table. 9 AGC data table in AGC priority mode

AGC gain	X_1X_0(setting data)
0 [dB]	00
6 [dB]	01
12 [dB]	02
18 [dB]	03
24 [dB]	04
30 [dB]	05

8. WIDE DYNAMIC RANGE

a) Mode switch

:RFF3200

:WFF32X X_1X_0

X_1X_0=00 ; OFF [default]

X_1X_0=01 ; ON

PART

THREE

* PRIVACY MASK

1. Function Specification:

a) Setting:

Send the position data (A, B) and the width data (C, D) via RS232C to set the masking zone.

i) Center position data:

Signed 256-formalized assume data for the display screen (705 [H] x 240 [V]).

ii) Width data:

Non-signed 256-formalized assume data for the display screen (705 [H] x 240[V]).

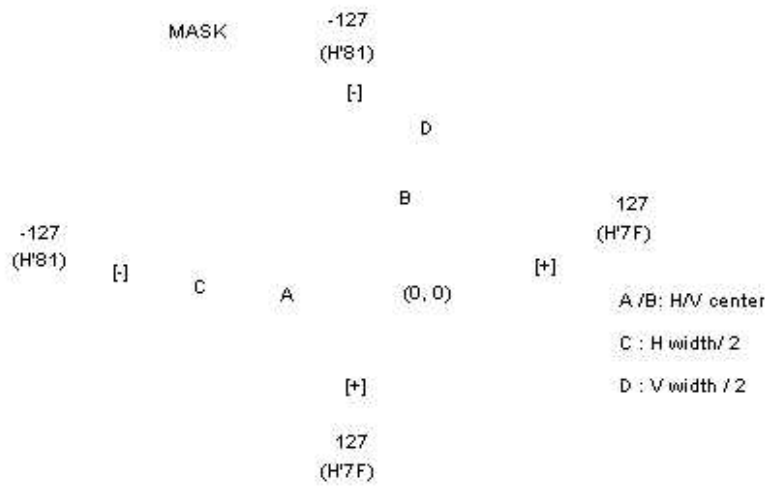


Fig. 1 Coordinate axis for Privacy Mask

b) Decomposability for the masking setting (Display screen):

[H Decomposability]: 2.753 pixels

[V Decomposability]: 0.937 H

c) Masking zone display:

Masking ON/OFF and Gray Scale gradation can be set.

And it will be No display (Standby),if H/V width data=0.

d) Number of masking zone:

Maximum 2 position /zone.

e) Interlocking control with Zooming.

Compensate the masking zone size data according to the zooming (Optical/Digital) ratio.

2. Interlocking control with Panning and Tilting:

a) Pan / Tilt angle:

Center of Pan/Tilt angle is set at the center of the Video display screen <fig. 2 (x, y)> and this center angle data (x, y) will be memorized for each masking setting. Set the absolute position angle data during Pan/Tilt operation.
(Set reference position as optionally)

b) Pan/Tilt movement amount:

Movement Amount (MA) can be calculated as follow:
MA = tan[d] x f value

[d]= (Current angle [P] -> Initial setting angle [Q]) < Refer to fig. 4 >
Note: In case of [d] > 60 degree: Set limit as [d]=60degree < refer to fig. 3 >

Therefore, In order to maintain the interlocking the masking zone movement with Pan/Tilt Movement the angle data should be updated during Pan/Tilt operation.

c) Pan/Tilt angle decomposability:

Set every 1/8 degree (H'000~H'B40).

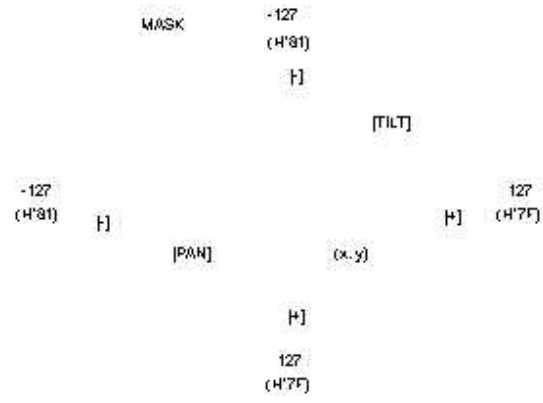
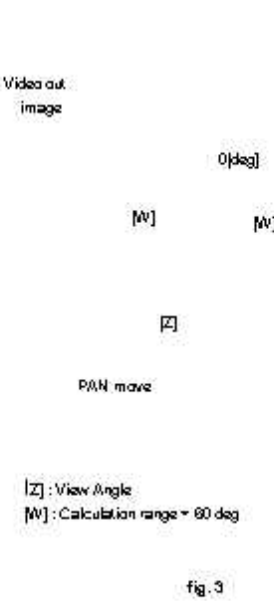
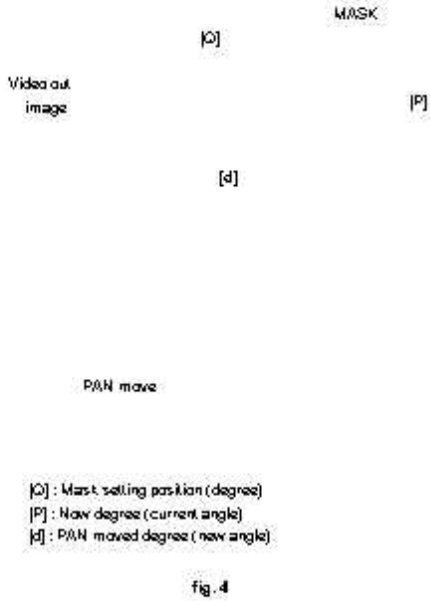


fig. 2



[Z] : View Angle
[W] : Calculation range = 60 deg

fig. 3



[O] : Mask setting position (degree)
[P] : Now degree (current angle)
[d] : PAN moved degree (new angle)

fig. 4

3. New communication command format for the Privacy Masking:

a) Center position and width data command:
Use conventional command format for setting.

b) Pan/Tilt communication command:
Since the absolute angle date is used for setting, the angle data should be updated every field during Pan/Tilt operation and use the following new command format to maintain the movement of the interlocking masking zone with Pan/Tilt operation.

/ **M** **PPP** **TTT**

Start Special Command

ID for Masking

PAN Degree data

TILT Degree data

4. Additional new command:

a) New command list:

		Format	Command	Note
Masking On / Off switch		Current	Refer to i)	Common to Mask 1 & 2
Mask gradation setting		Current	Refer to ii)	Common to Mask 1 & 2
	H Center position	Current	Refer to iii)	
	H width data	Current	Refer to iii)	
	V Center position	Current	Refer to iii)	
Mask 1	V width data	Current	Refer to iii)	
	Mask setting Switch	Current	Refer to iii)	Use Initial Mask setting
	H Mask setting angle	Current	Refer to v)	1/16 degree notch angle data
	V Mask setting angle	Current	Refer to v)	1/16 degree notch angle data
	H Center position	Current	Refer to iv)	
	H width data	Current	Refer to iv)	
	V Center position	Current	Refer to iv)	
Mask 2	V width data	Current	Refer to iv)	
	Mask setting Switch	Current	Refer to iv)	Use Initial Mask setting
	H Mask setting angle	Current	Refer to v)	1/16 degree notch angle data
	V Mask setting angle	Current	Refer to v)	1/16 degree notch angle data
Panning data		New	Refer to vi)	Write only, Common to Mask 1 & 2.. 1/8 degree notch angle data
Tilting data		New	Refer to vi)	Write only, Common to Mark 1 & 2. 1/8 degree notch angle data

i) Switch the Privacy Mask ON/OFF

:RF9000
:WF900X $_1X_0$
X_1X_0=00 ; OFF
X_1X_0=03 ; ON [default]

ii) Privacy Mask shade setting

:RF90100
:WF901X $_1X_0$
(X_1X_0=00 - 0F ; 16 step)
H00 ; Black
H08 ; Gray [default]
H0F ; White

iii) Set the Privacy Mask position - MASK1

[New data set] :WF90EX $_1X_0$
H'01 ; New data set
Become H'00 after the data processing.
H'00 ; Mask data modify

[H center] :WF904X $_1X_0$
(X_1X_0=81 (nega) - 00 (center) - 7F (plus))

[V center] :WF905X $_1X_0$
(X_1X_0=81 (nega) - 00 (center) - 7F (plus))

[H size] :WF906X $_1X_0$
(X_1X_0=00 - 7F ; 128 step)

[V size] :WF907X $_1X_0$
(X_1X_0=00 - 7F ; 128 step)

iv) Set the Privacy Mask position - MASK2

[New data set] :WF90FX $_1X_0$
H'01 ; New data set
Become H'00 after the data processing
H'00 ; Mask data modify

[H center] :WF908X $_1X_0$
(X_1X_0=81 (nega) - 00 (center) - 7F (plus))

[V center] :WF909X $_1X_0$
(X_1X_0=81 (nega) - 00 (center) - 7F (plus))

[H size] :WF90AX $_1X_0$
(X_1X_0=00 - 7F ; 128 step)

[V size] :WF90BX $_1X_0$
(X_1X_0=00 - 7F ; 128 step)

v) Read the setting degree data of MASK1 / MASK2

:rF9140000 ; Mask 1 H degree data
(data range ; H'00000 - H'1680,
; 0.0625 degree/step)
:rF9160000 ; Mask 1 V degree data
(data range ; H'00000 - H'1680,
; 0.0625 degree/step)
:rF9180000 ; Mask 2 H degree data
(data range ; H'00000 - H'1680,
; 0.0625 degree/step)
:rF91A0000 ; Mask 2 V degree data
(data range ; H'00000 - H'1680,
; 0.0625 degree/step)

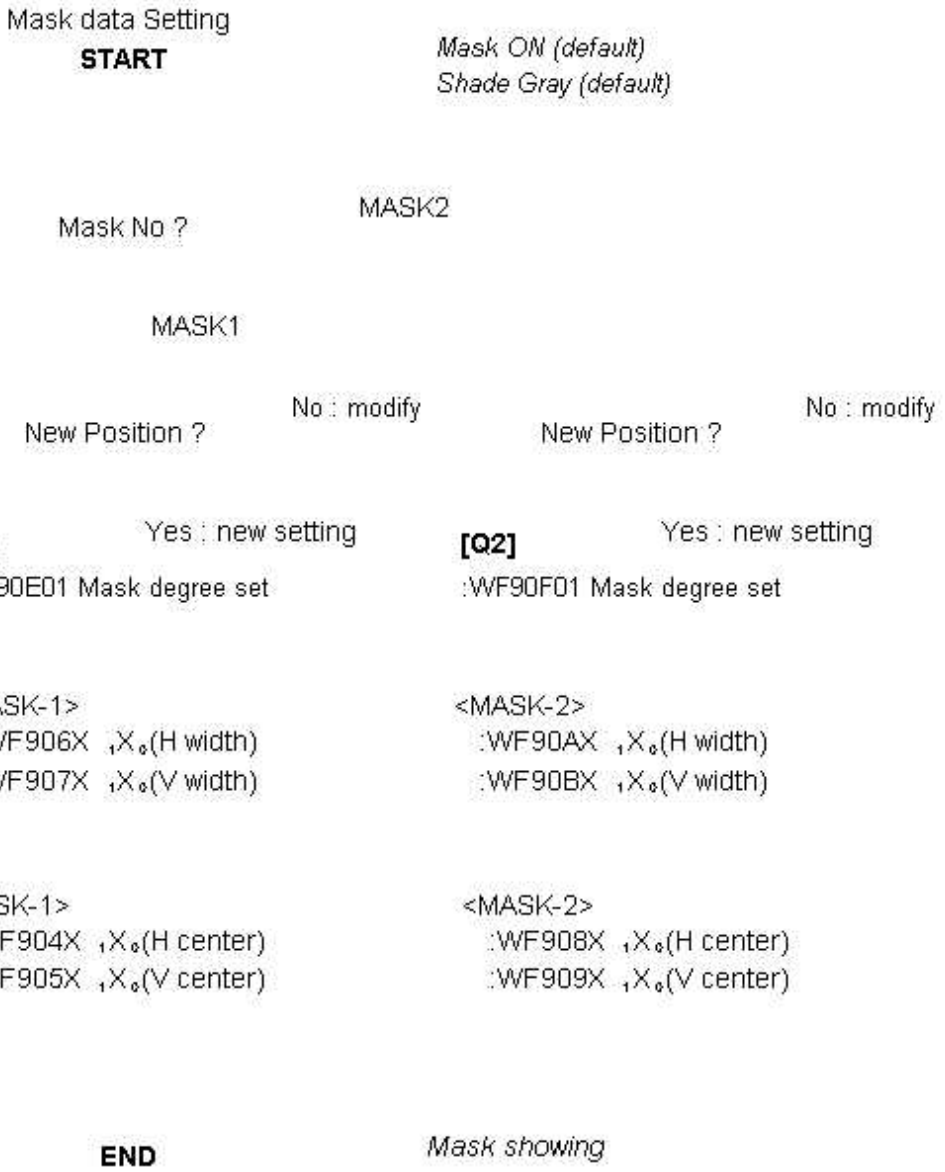
vi) Degree data (Pan / Tilt)

/MX $_2X_1X_0Y_2Y_1Y_0$[special write command]
$X_2X_1X_0$; PAN degree
$Y_2Y_1Y_0$; TILT degree
($X_2X_1X_0$/ $Y_2Y_1Y_0$000 - B40 ; 0.125 degree/step)

5. Flow Chart:

a) Center position, Width data setting:

Follow the flow chart below for the center position and width data setting.
Masking setting angle data will be memorized when [Q1][Q2] are sending.



b) PAN / TILT Angle data setting:

Refer to the flow chart below for the PAN / TILT angle setting:

PAN / TILT control

START

< Now position >
PAN ; SS [deg]
TILT ; VV [deg]

PAN moving ?

no

ye s

<PAN>
PAN degree = LL [deg]

< data calculation >
PPP = LL * 8 (trans data)

< data calculation >
LLL = SS * 8 (trance data)

TILT moving ?

no

yes

<TILT>
TILT degree = GG [deg]

< data calculation >
TTT = GG * 8 (trans data)

< data calculation >
TTT = VV * 8 (trance data)

<Set the now position>
/M PPP TTT

Mask moving

END

PART

FOUR

* CONTROL COMMAND TIMING

1. Timing table program AE command

(Fig. 1)

[Nete]
AE_MODE command address is 0xFCC8
[A] : Send to AE_MODE chamge command

The AE_MODE command

(Normal Shutter)
NTSC : - 1/60
PAL : - 1/50

FV

Min. 1 field

[A] [A]

(DS Shutter)
NTSC : 1/60 - 1/2
PAL : 1/50 - 1/1.5

FV

[A] Min. CC field [A]

[Nete]

CC	shutter speed (NTSC//PAL)
32 field ;	1/2 1/1.5
16 field ;	1/4 s s/// 1/3 sssss
842field ;	1/8 s // 1/6
field ;	1/15 s // 1/12
field ;	1/30 s // 1/25

Fig. 1 Changed to AE_MODE timing

2. Timing table after ZOOM commands (DSS mode only)

(Fig. 2)

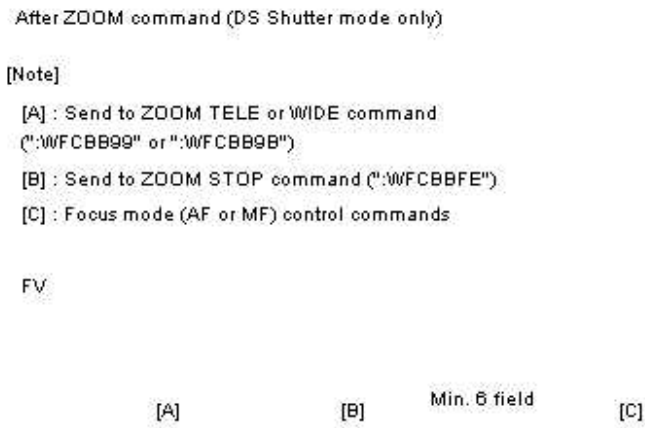


Fig. 2 After ZOOM commands timing

3. Timing table other commands

(Fig. 3)

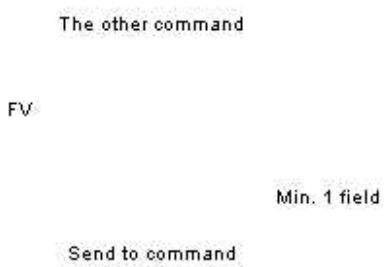


Fig. 3 Changed to other command timing

PART

FIVE

* FOCUS MODE IN DSS

1. Focus mode in DSS

Table 1

shutter speed		zoom	focus mode
NTSC/EIA	PAL/CCIR		
1/60 - 1/8	1/50 - 1/6	no	AF or MF
1/8 - 1/2	1/6 - 1/1.5	no	MF
1/60 - 1/2	1/50 - 1/1.5	yes[*1]	MF

[*1] The following fig.1 is zoom mode in DSS.

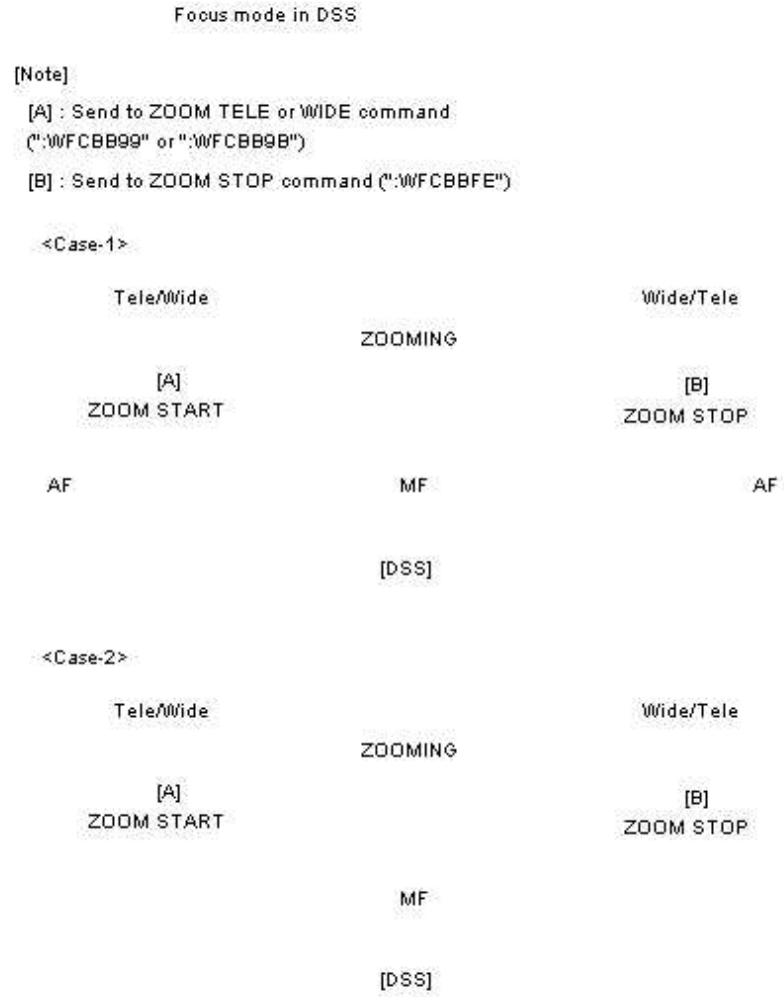


Fig. 1 Zoom mode in DSS

Notes:-