ENGINEERING CHANGE ORDER

Number 03-		
Project Engineer: Stephen L. Robinson	Cross Ref. Doc. Type & Number: None	Page 1 of 1
Change Requested By: Stephen L. Robinson		

Description of Change

Release of technical documentation for archive:

Tamron Lens Protocol, Dec. 24, 1997

Reason for Change None

Scope of Change

- ☐ Changes Form, Fit, or Function
- ☐ Other performance enhancement
- ☒ Internal

Type of Change

- ☐ New Product
- ☐ Error
- ☐ Design Improvement
- ☒ Additional Info
- ☐ Cost Reduction
- ☐ Conform to Present Practices

Material Disposition

- ☒ None
- ☐ Scrap
- ☐ Rework
  - ☐ Finished Goods
  - ☐ Work In Progress
  - ☐ Stock
- ☐ Running Change

Documentation Affected

Product Model Number: None

Drawing Number	Old Rev	New Rev
None		

Approvals	Engineering Signature		Date
	Materials Signature		Date
Cost Impact	0	New Comp. Cost	0
Obsol. Impact	0	New Comp. Lead Time	0

Manager's Initials in Appropriate Box

☐ EWS ☐ Hot ☒ Normal

Required Tasks (use attachments if necessary)	Initials	Date
Manufacturing None		
Production None		
Materials None		
Stock Room None		
Sales / Marketing None		
Repair None		
Quality Assurance None		
Other None		

TAMRON

FAX MESSAGE

TO : Pelco
Mr. Norbert Stiepel
FROM : Koji Masunari
DATE : January 19, 1998
REF :
PAGE : ___ of

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-6289 :(048)-685-4185

Dear Mr. Norbert Stiepel,

Re: 1/4" Zoom Lens

We apologize for our belated reply to your fax dated January 5.
We would like to reply as follows:

1. Regarding the para-4 in our fax dated 12/24, we wrote to confirm the meeting in Tokyo in December.
From para-1 to para 3, they are our wishes.

   We have found an error in our fax dd 12/24.
In para 3-2) in the page 2, "non-parity" is correct instead of "parity".

2. Regarding the intervals, (c) is within 40msec which is for busy time of the lens. That is to say, if the start bit is not sent from the lens during 40msec, it means that the lens is in error or the communication line is disconnected.
Regarding the time of (d), it is up to the user. For instance, 0 sec or 1 sec is OK.

3. You are right. The SO data in the page 4 is not correct. It is 14Eh.

4. The time of (a) is within 20msec and the time of (b) is also within 20msec. In the period of (a), if the lens cannot catch the start bit over 20msec, it goes time out and it will wait the start bit of 1st data (control data) to come from the user.
The time of (b) is settled to treat that the lens is in error if the lens does not send the start bit within 20msec to the user.
Please also note that the time for (c) is the period in which the lens is busy and it is within 40msec.

5. We are now trying to make the program with 2400bps.

6. STX is used by one of your request and we would like to refer this in our fax.

Should you have any question, please do not hesitate to contact us.

Tamron/Masunari

To: Koji Masunari
From: Norbert Stiepel
Date: 1/5/97

Dear Koji,

Included is a copy of the specification you sent me.

Page 2,3,5 → 1. We are not sure if parity is being used? Sometimes it is added, sometimes removed. (If check sum is used, parity is not essential)

Page 3 → 2. Valves for certain time intervals

Page 4 → 3. SO Line Data is this correct

Page 4 → 4. Time ∅ for (a) and (B) is Less than 40 msec or can it be continuous at 40 msec?

Page 4 → 5. Let us know if 2400 bps cannot be used.

Page 5 → 6. Is STX a message header you will use?

Thanks Norbert

TAMRON

FAX MESSAGE

TO : Pelco
Mr. Norbert Stiepel
FROM: Koji Masunari
DATE : December 24, 1997
REF :
PAGE : 1 of 6

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185
cc. Mr. Hank Nagashima

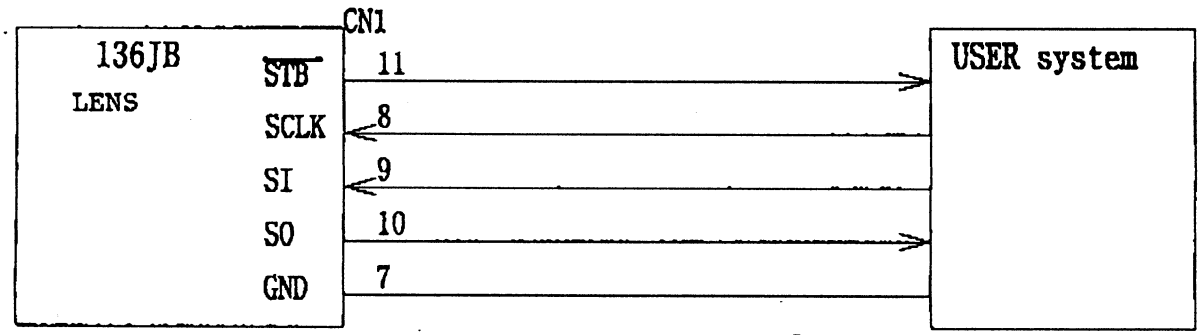
Dear Norbert Stiepel,

Re: 1/4" Zoom Lens

We are now proceeding the development to change the control software to asynchronous. In order to maintain competitive price range, the best way is to use the current micro processor. And considering the performance and the capacity of the CPU, we would like to propose as follows:

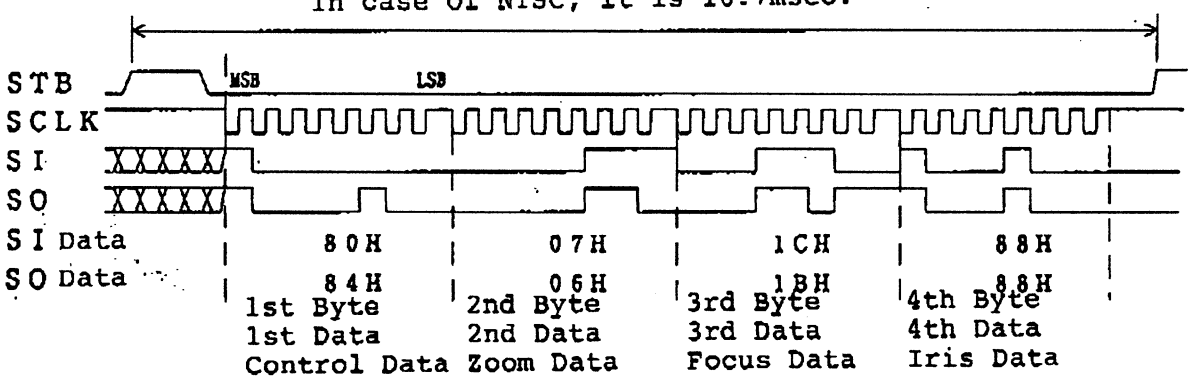
1. Micro Processor in use: uPD78014 series

2. Current communication method
   1) Communication Interface



STB, SCLK, SI & SO lines are TTL level.

   2) Timing



* SO data are the data which show the lens condition and SI data are the data which are set by the user.

TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

PAGE : 2 of 6

VARIFOCAL by TAMRON

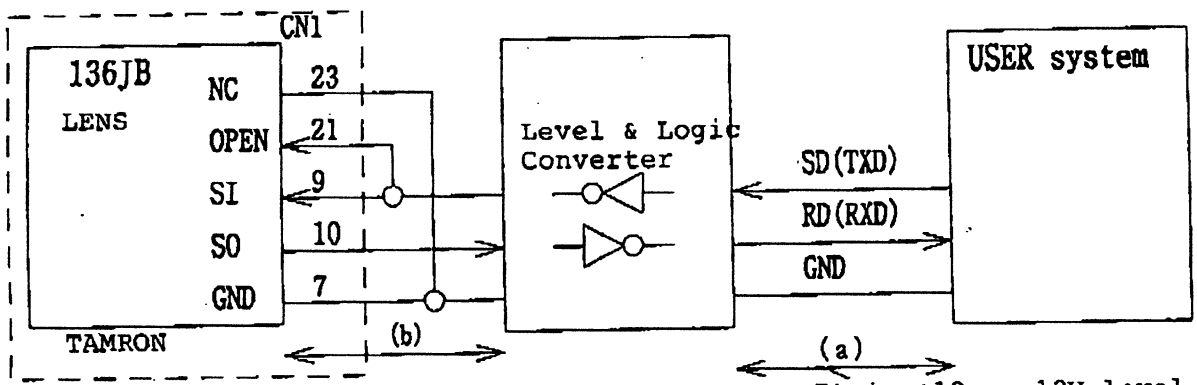
Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

For more details, please refer to the protocol manual which we sent to you before.

3. Asynchronous system using the existing PC board
   1) It becomes as follows with 3 lines of the communication line.

Communication Interface



SI, SO & OPEN lines are TTL Level and it is a positive logic. NC is the port to switch synchronous and asynchronous.

It is +12v, -12V level. And it is negative logic.

(1) As the existing PC board is used, it does not contain Level and Logic Converter. (We will not design these.)
(2) "NC" (No.23 of the CN1) is necessary for switching synchronous to asynchronous (or vice versa) in our production line.
(3) "OPEN" (No.21 of CN1) is necessary to detect start bit from externally, as the current CPU has no UART.

2) In the above chart3-1) the line (b) is TTL level and the speed is 2400bps, ~~data~~ start bit 1, data length 8 bit, stop bit 1 and ~~parity~~. ODD Parity

1.

TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

PAGE : 3 of 6

VARIFOCAL by TAMRON

Vision With Precision

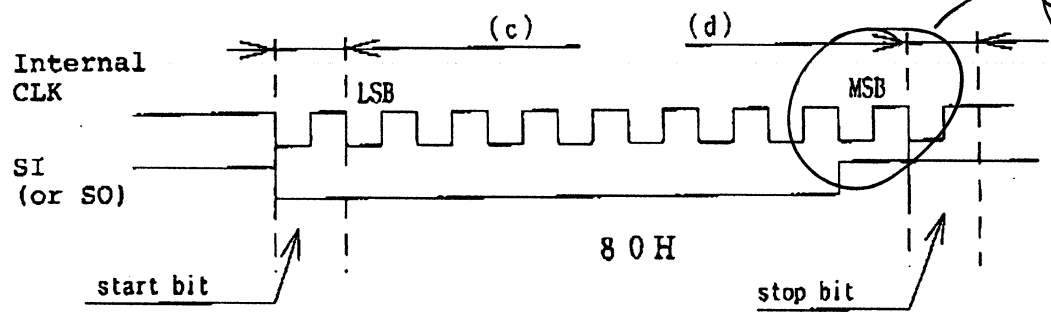
Omiya Head Office

1385, Hasunuma, Omiya, Saitama,Japan

TEL:(048)-684-9129

FAX:(048)-683-8289 :(048)-685-4185

Timing



parity ?

1.

(1) The time of (c) or (d) which is for the internal CLK is 1/2400 sec.
In order to make 1 byte communication, it becomes 1/2400 x 10bit = 1/240 = 4.17msec.

1.

check sum was added parity not essential.

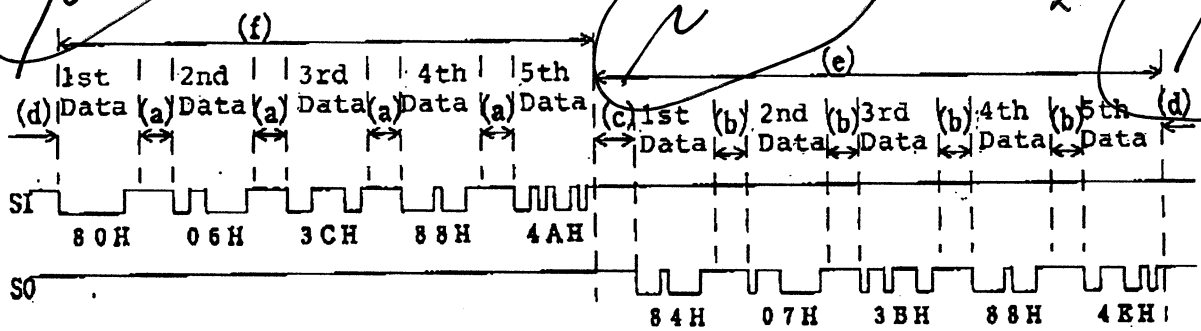
(2) The reason for No Parity is that the current CPU does not have a UART and we do not want consuming by doing parity check and processing to make a parity bit.

(3) Also in order to utilize current data format and procedure of the communication in the current software, it will be 5 byte communication. That is Check Sum 1 byte plus 4 byte data as shown in the chart No.2-2).
So it becomes partly double communication.

2. Value ?

2. Value ?

2. Value ?



TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

PAGE : 4 of 6

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

(1) SI is the data being sent from the user and SO is the data being output from the lens.
(2) In the SI line, the following data are to be set from the user:

1st Data... Control Data
2nd Data... Zoom Data
3rd Data... Focus Data
4th Data... Iris Data
5th Data... Check Sum Data

Ex... 80h+06h+3Ch+88h=14Ah ---- 4Ah

In the SO line, the following data are set in the lens side:

1st Data... Control Data
2nd Data... Zoom Data
3rd Data... Focus Data
4th Data... Iris Data
5th Data... Cehck Sum Data

Ex... 84h+07h+3Bh+88h=14Ah ~~----~~ 4Eh

3. why has this changed. 14E

3. Can it be continuous or less than 40msec

(3) The time for (a) and (b) is within 40mSec.
(4) The period of (d) is the time that the lens wait for the start bit of the 1st data coming from the user.
(5) The period of (e) is the time that the lens outputs five data. It is within 0.1sec. The lens neglect the data if the user send the data during the period of (e).
(6) The period of (f) is the time that the user outputs five data. It is within 0.1sec. If the lens does not receive all the five data within 0.1sec, it goes time out and it wait start bit of 1st data from the user.

4.

5. Let us know

As we have not yet tested with the new asynchronous program, we are not 100% sure if we can realize 2400bps. If not, we may ask you 1200bps. We will keep you informing.
If you want to have 9600bps by changing the lens CPU, please note that even if you send commands to the lens with 9600bps continuously, the data which are sent just before are reflected.

4. Please reconfirm the following which both of us agreed in the Tokyo meeting in December :

1) Communication is made by TTL.
2) Your requested communication speed is 9600bps but our possible speed will be 2400bps. (We use 3 lines which is SI, SO and GND.)

TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

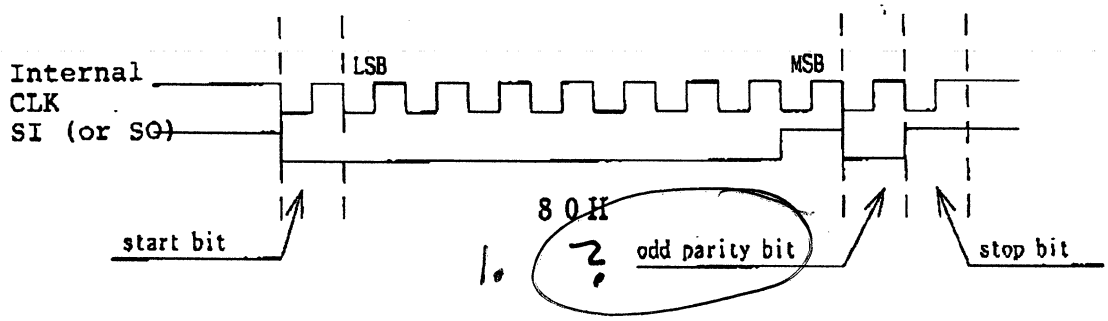
PAGE : 5 of 6

VARIFOCAL by TAMRON

Vision With Precision

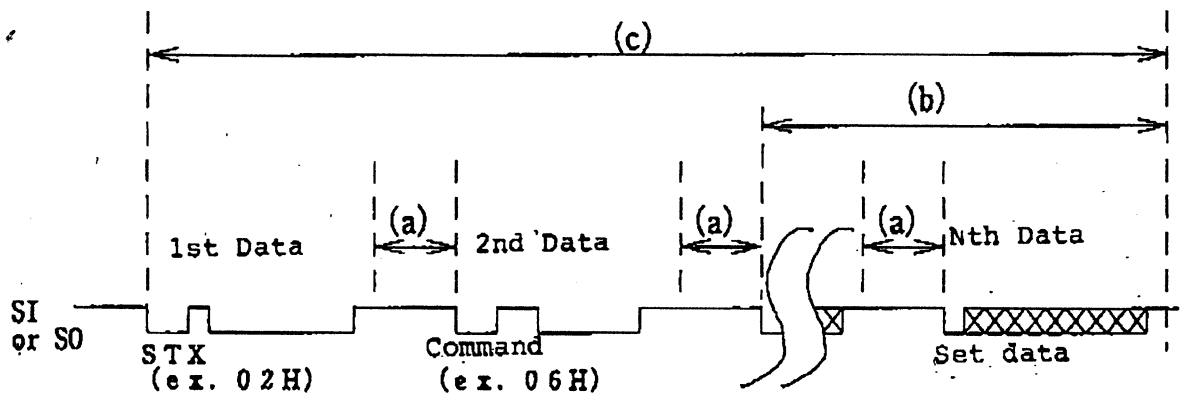
Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

3) Timing



(1) As for the odd parity, if there is HI with odd number, the parity bit becomes "0" and if there are HI with even number, the parity bit becomes "1".
(2) In order to send one data, 11 bits are required.

4) Communication procedure and format
STX and command are used. The values are determined by Tamron. Also number of the data and value to be set are also determined by Tamron.



(1) Communication procedure for SI/SO operation will be determined by Tamron.
(2) Spec. for (a), (b) & (c) are also determined by Tamron.

TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

PAGE : 6 of 6

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

Please let us have your comment as soon as possible and if you have questions, please do not hesitate to contact us.

Thanking you, we remain with best regards,

Tamron Co., Ltd.

Koji Masunari
Special Equipment Div.

TAMRON

FAX MESSAGE

TO : Pelco
Mr. Norbert Stiepel
FROM : Koji Masunari
DATE : December 24, 1997
REF :
PAGE : 1 of 6

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185
cc. Mr. Hank Nagashima

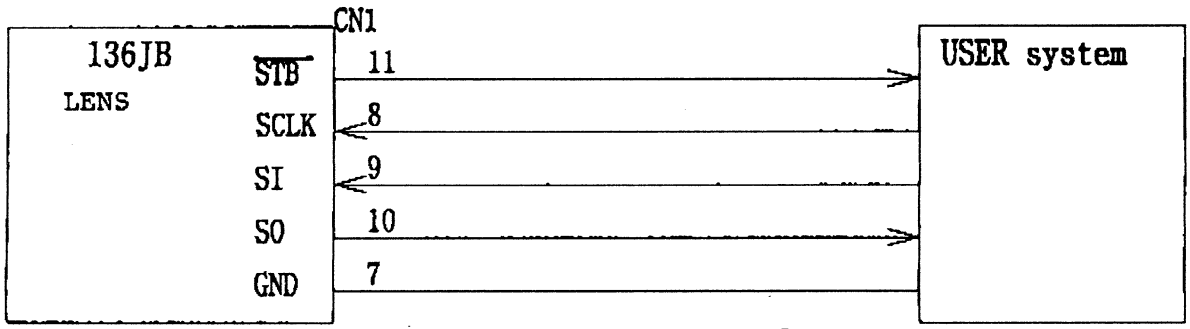
Dear Norbert Stiepel,

Re: 1/4" Zoom Lens

We are now proceeding the development to change the control software to asynchronous. In order to maintain competitive price range, the best way is to use the current micro processor. And considering the performance and the capacity of the CPU, we would like to propose as follows:

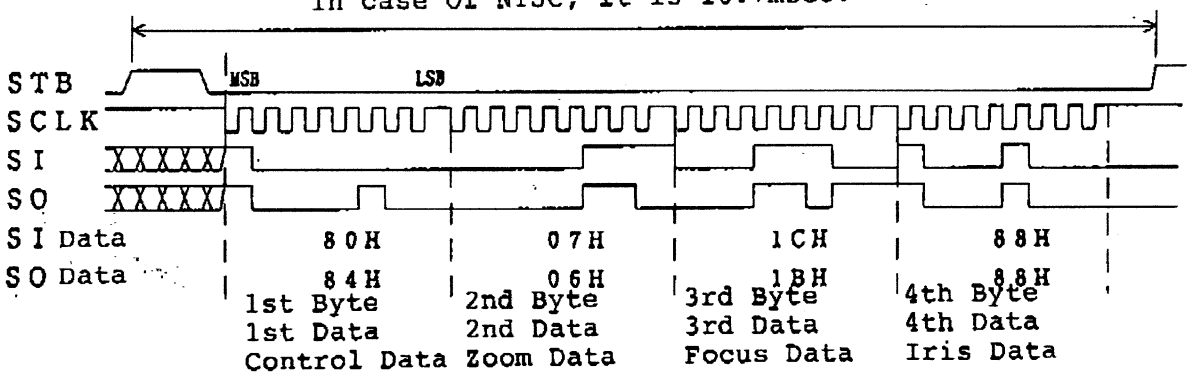
1. Micro Processor in use: uPD78014 series

2. Current communication method
   1) Communication Interface



STB, SCLK, SI & SO lines are TTL level.

   2) Timing



* SO data are the data which show the lens condition and SI data are the data which are set by the user.

TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

PAGE : 2 of 6

VARIFOCAL by TAMRON

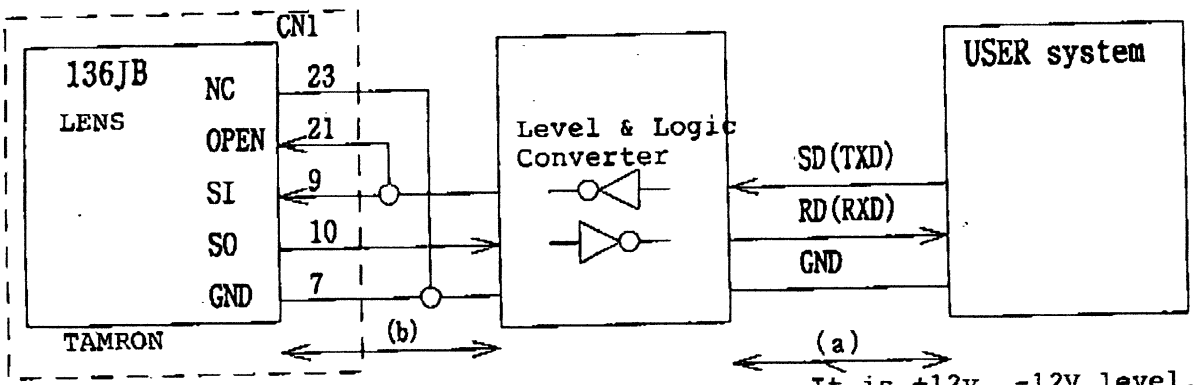
Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

For more details, please refer to the protocol manual which we sent to you before. ? where is this?

3. Asynchronous system using the existing PC board
   1) It becomes as follows with 3 lines of the communication line.

Communication Interface



SI, SO & OPEN lines are TTL Level and it is a positive logic. NC is the port to switch synchronous and asynchronous.

It is +12v, -12V level. And it is negative logic.

(1) As the existing PC board is used, it does not contain Level and Logic Converter. (We will not design these.)
(2) "NC" (No.23 of the CN1) is necessary for switching synchronous to asynchronous (or vice versa) in our production line.
(3) "OPEN" (No.21 of CN1) is necessary to detect start bit from externally, as the current CPU has no UART.

2) In the above chart3-1) the line (b) is TTL level and the speed ~~is~~ 2400bps, ~~data~~ START bit 1, data length 8 bit, stop bit 1 and parity.

TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

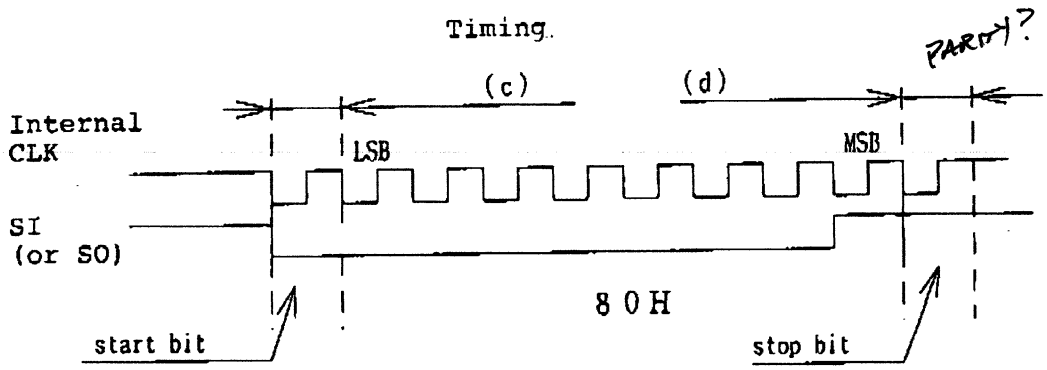
PAGE : 3 of 6

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

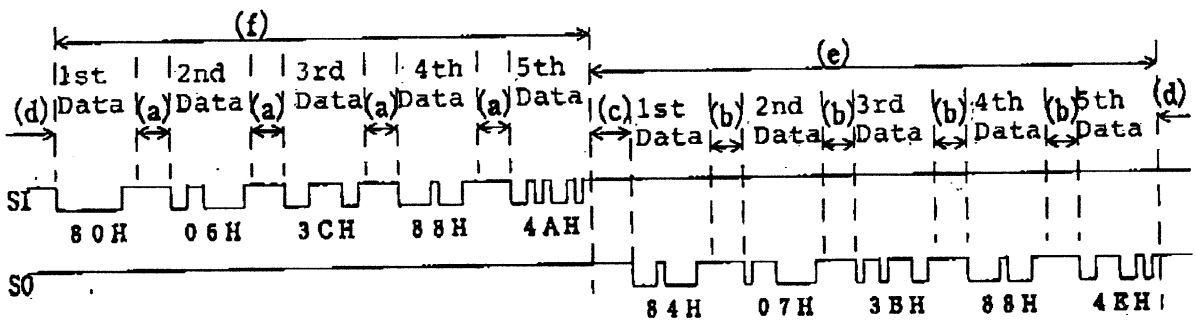
Timing.



(1) The time of (c) or (d) which is for the internal CLK is 1/2400 sec.
In order to make 1 byte communication, it becomes 1/2400 x 10bit = 1/240 = 4.17msec.

(2) The reason for (No Parity) is that the current CPU does not have a UART and we do not want consuming by doing parity check and processing to make a parity bit.

(3) Also in order to utilize current data format and procedure of the communication in the current software, it will be 5 byte communication. That is Check Sum 1 byte plus 4 byte data as shown in the chart No.2-2).
So it becomes partly double communication.



TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

PAGE : 4 of 6

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama, Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

(1) SI is the data being sent from the user and SO is the data being output from the lens.
(2) In the SI line, the following data are to be set from the user:

1st Data... Control Data
2nd Data... Zoom Data
3rd Data... Focus Data
4th Data... Iris Data
5th Data... Check Sum Data

Ex... 80h+06h+3Ch+88h=14Ah ---- 4Ah

In the SO line, the following data are set in the lens side:

Data changes when reflected back? Why?

1st Data... Control Data
2nd Data... Zoom Data
3rd Data... Focus Data
4th Data... Iris Data
5th Data... Cehck Sum Data

TYPO: 142?

Too Long!

what's c?

Ex... 84h+07h+3Bh+88h=14Ah ---- 4Eh

(3) The time for (a) and (b) is within 40mSec.
(4) The period of (d) is the time that the lens wait for the start bit of the 1st data coming from the user.
(5) The period of (e) is the time that the lens outputs five data. It is within 0.1sec. The lens neglect the data if the user send the data during the period of (e).
(6) The period of (f) is the time that the user outputs five data. It is within 0.1sec. If the lens does not receive all the five data within 0.1sec, it goes time out and it wait start bit of 1st data from the user.

As we have not yet tested with the new asynchronous program, we are not 100% sure if we can realize 2400bps. If not, we may ask you 1200bps. We will keep you informing.
If you want to have 9600bps by changing the lens CPU, please note that even if you send commands to the lens with 9600bps continuously, the data which are sent just before are reflected.

4. Please reconfirm the following which both of us agreed in the Tokyo meeting in December :

1) Communication is made by TTL.
2) Your requested communication speed is 9600bps but our possible speed will be 2400bps. (We use 3 lines which is SI, SO and GND.)

TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

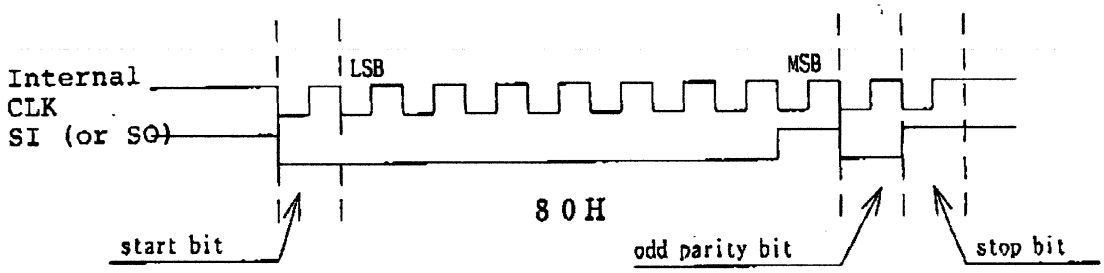
PAGE : 5 of 6

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

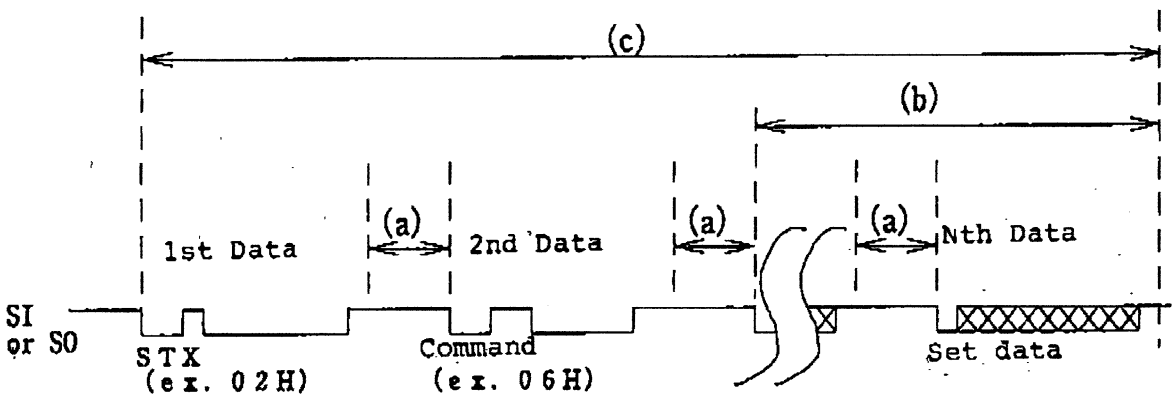
3) Timing



(1) As for the odd parity, if there is HI with odd number, the parity bit becomes "0" and if there are HI with even number, the parity bit becomes "1".
(2) In order to send one data, 11 bits are required.

4) Communication procedure and format
STX and command are used. The values are determined by Tamron. Also number of the data and value to be set are also determined by Tamron.

?



(1) Communication procedure for SI/SO operation will be determined by Tamron.
(2) Spec. for (a), (b) & (c) are also determined by Tamron.

TAMRON

FAX MESSAGE

TO :

FROM :

DATE :

REF :

PAGE : 6 of 6

VARIFOCAL by TAMRON

Vision With Precision

Omiya Head Office
1385, Hasunuma, Omiya, Saitama,Japan
TEL:(048)-684-9129
FAX:(048)-683-8289 :(048)-685-4185

Please let us have your comment as soon as possible and if you have questions, please do not hesitate to contact us.

Thanking you, we remain with best regards,

Tamron Co., Ltd.

Koji Masunari
Special Equipment Div.

Chapter 1: Input/Output

TAMRON Manual 12

1. Power source

   5.0 ±0.25V 120mA
   7.0 ~8.5V Max. 450mA

2. Video Signal
   Either of the followings.

   1) NTSC or PAL Composite signal
      1Vp-p Lens impedance is 10k
   2) Y Signal and VD, HD Signal
      Y Signal: 0.7Vp-p
      VD, HD Signal: TTL level

3. Communication Signal
   Synchronized Serial Signal
   TTL Level

4. Connector

   Parts No.: Molex 52204-2417

Pin #	Connection	Pin #	Connection
1	DGND	13	GND
2	+6V	14	+5V
3	NC	15	GND
4	GND	16	Far
5	+5V	17	Near
6	Video	18	Wide
7	VD	19	Tele
8	HD	20	AI/MI
9	STB	21	Open
10	SO	22	Close
11	SI	23	P15
12	SCK	24	FB

Chapter-3 Flange Back (FB) Adjustment

Process of the adjustment

The following example shows the procedure for the FB adjustment by communication.

① Prepare the lens, camera, monitor and test chart as shown in the chart 7-1.

② Transmit the following data to the lens.
By receiving the data, the lens proceeds to Stage-1 for the manual FB adjustment.

Control Data	Bit 0	Don't care
	Bit 1	Low
	Bit 2	Don't care
	Bit 3	Low
	Bit 4	High
	Bit 5	Don't care
	Bit 6	High (FB Adjustment mode)
	Bit 7	Low

Zoom Data	Don't care
Foocus Data	Don't care
Iris Data	Don't care

Note: When the lens is in the FB adjustment mode, the iris always set at full open, automatically in order to have smaller depth of field for precise adjustment. Therefore, if the test chart is too bright, use ND filter.

③ When the lens is in at stage-1 for the manual FB adjustment, zoom is set at 27H automatically where is the peak point of the zoom tracking curve and the focus is set at 2.53m automatically.

④ Upon receipt of the data mentioned in ②, the lens prepares the data of the adjustment which the lens now has. Therefore, if you do the communication again, it is possible to know the lens data.

⑤ As you can see in the chart No.7-1, set the test chart at 2.53m and do the adjustment watching the TV monitor by changing the transmitting data (focus data) little by little.

Control Data	Bit 0	Don't care
	Bit 1	Low
	Bit 2	Don't care
	Bit 3	High (FB data sending/receiving
	Bit 4	High
	Bit 5	Don't care
	Bit 6	High (FB Adjustment mode)
	Bit 7	Low
Zoom Data	Don't care	
Focus Data	$\pm\alpha$ to the FTR data transmitting from the lens	
Iris Data	Don't care	

⑥ When you finish the focusing, set Bit #6 of the control data to Low and transmit the data mentioned in ② again proceed the stage-2.

⑦ In the stage-2, zoom is set at the tele end and the focus is set at 2.53m, automatically.

⑧ Here in this stage, do focusing by changing the transmitting data little by little as follows, like as ⑤.

Control Data	Bit 0	Don't care
	Bit 1	Low
	Bit 2	Don't care
	Bit 3	High (FB data sending/receiving
	Bit 4	High (Remote Focus)
	Bit 5	Don't care
	Bit 6	High (FB Adjustment mode)
	Bit 7	Low

Zoom Data	$\pm\alpha$ to the ZTR data transmitting from the lens
Focus Data	Don't care
Iris Data	Don't care

⑨ When you finish the focusing, set Bit #6 of the control data to Low. After that, send the data mentioned in ② once again to set the Bit #6 at High to go to stage-3.

⑩ In the stage-3, zoom is set at wide end automatically.

⑪ Again watching the TV monitor, send the following data to get just focusing.

Control Data	Bit 0	Don't care
	Bit 1	Low
	Bit 2	Don't care
	Bit 3	High (FB data sending/receiving
	Bit 4	High (Remote Focus)
	Bit 5	Don't care
	Bit 6	High (FB Adjustment mode)
	Bit 7	Low
Zoom Data	Don't care	
Focus Data	Don't care	
Iris Data	$\pm\alpha$ to the WTR data transmitting from the lens	

⑫ When you finished the focusing, set Bit #6 of the control data at Low. And after that, set the same bit at High to finish the adjustment. At that time, focus is set at 2.53m of the Remote mode, zoom is set at the Tele-end and Iris is set at open aperture. Also, the flange Back data (FTR, ZTR and WTR) becomes effective and are written into the E2PROM.

⑬ Transmit normal data with Bit #6 Low in the control data to return to the normal mode.

Chapter-2: Communication

1. Out line
   Zoom, Focus and Iris can be controlled by remote and you are able to select the operation mode as you like.
   Flange back adjustment is also possible.

2. Method of the communication
   It is line-lock 3 lines serial interface with STB for the hand shake. The serial interface is sent from the lens and also it is sent from the camera at the same time. Two way communication is made at the same time.

3. Data for the communication
   The data communicating between the lens and the camera is 1 byte and it is constituted by control data, zoom data, focus data and iris data which is total 4 byte.

   ① Control Data
   In each bit of the data, control signal such as Auto/Remote is allocated. In the data being sent from the camera, a command from the camera is set and in the data being sent back from the lens, current situation of the lens is set.

   ② Zoom Data
   From the camera to the lens, either position where you want to go or direction and speed can be sent. From the lens to the camera, current zoom position is sent.

   ③ Focus Data
   From the camera to the lens, either position where you want to go or direction and speed can be sent. From the lens to the camera, current focus position is sent.

   ④ Iris Data
   From the camera to the lens, either iris position data or constant value for the control can be sent. From the lens to the camera, current iris position is sent.

4. Timing of the communication
   The data being sent from the lens is renovated in the cycle of 60Hz (50Hz in PAL system) synchronizing to the vertical video signal. Communication can be made max. 60 times per 1 sec. (50 times in PAL system)
   Please refer the attached timing chart (Chart No.6-1)

   ① Serial Clock
   The lens always works as a SLAVE and the serial clock is to be supplied from the camera. Frequency of the serial clock is less than 500KHz.

   ② Interval
   After the completion of 1 byte communication, it is necessary to have an interval of minimum 4usec before the next communication starts. During the interval, reading/writing is made between the shift register of the serial interface and the buffer ram.

   ③ Start of the communication
   After the power is on, in 2-3 sec., STB terminal sets at low and the serical interface becomes active. After that, STB terminal becomes low periodically and lens control can be possible.

5. Communication Procedures
The communication can be done by the following procedures.

① When the lens gets ready to communicate, set the STB terminal at low to let the camera know.

② Communication data is to be prepared in the camera side and output the SCK. Synchrinizing it simulataneously, the camera starts to transmit data to the SI terminal of the lens starting from MSB of the control data and also starts to receive data from the SO terminal.

③ When serial clock starts to be input, the lens starts to transmit data from the SO terminal and starts to receive data from the SI terminal, beginning from control data of MSB.

④ Transmission signal from the SO terminal of the lens is changed by SCK-low and Signal of the SI terminal is received by SCK-high.

⑤ When 1-byte communication is completed, the lens stores the data which has been transmitted from the camera, in the buffer memory and sets the next data in the shit register to output.

⑥ The transmitting/receiving procedures continue until 4-byte communication is completed. After the 4-byte communication is over, the lens gets STB terminal at high to let the camera know about the end of the communication.

Note:
① The communication is made automatically by CPU in the lens. The CPU is driven in the cycle of 16.7msec (20msec in PAL system) synchronizing with the video signal. In this cycle, it is possible to communicate in the most of the time except the moment for 2~3msec for data renovation. However, once communication is made, STB can not be high untill next cycle.

② To avoid that data is renovated during communication, it is desirable to close the communication within 14msec (17msec in PAL system) after STB gets low. However, even if you fail the communication, you do not have a serious ruin (You only lose the data).

6. Control Data
Among the 4 byte data, the control data which is communicated at the beginning has the following format.

Bit	Function
Bit 0	Macro Mode
Bit 1	Used in the factry (Should be always low)
Bit 2	DS (Direction/Speed) Mode
Bit 3	Flange back data transmitting/receiving Mode
Bit 4	Remote focus
Bit 5	Remote iris/Auto iris
Bit 6	Flange back adjustment
Bit 7	Invalid receiving data (Only sending data is effective.)

① Macro Mode
Bit #0 is used as the highest bit for the focus data.
When the bit is high, 34H of the focus data menas 134H.
if you want to focus closer than 0.8m at wide angle range, you are able to focus down to 1cm by using the bit.

② DS Mode (Mode to select direction and speed)
Usually, zoom data, focus data and iris data show the position of the each but if you select high in the Bit #3, data of the zoom/focus/iris being sent from the camera mean as follows:

Lower nibble..... Driving speed
Higher nibble..... Driving direction

③ Flange back data transmitting/receiving Mode
If the Bit #3 is selected high, the remaing 3 byte data mean the data for flange back adjustment.
Please refer details in the chapter 7.

④ Remote focus
The lens will focus on the position
instructed in the 3rd-byte of the focus data.

Low..... N/A
High..... Remote Focus

⑤ Remote iris/Auto iris
It is possible to select Auto iris or Remte iris by Bit #5.

Low..... Auto Iris
High..... Remote Iris

⑥ Flange back adjustment Mode
When Bit #6 becomes high, flange back adjustment mode is selected.

Low..... Normal mode
High..... Flange back adjustment Mode

⑦ Invalid receiving data
In case only receipt of data from the lens is needed, set bit #7 at high.
In this case, as receiving data is neglected, it is possible to know the lens situation without giving any influence to the control.

Note: Previous data memorized is revived when just after power is on.

7. Zoom Data
Zoom data is transmitted in the 2nd Byte and it usually shows the zoom position.
Please refer the chart No. 6-2 showing the relation between the data and the focal length.

Tele..... 04H
Wide..... A2H

① Preset for Zoom
By memorizing the zoom data obtained from the lens in the memory of the camera and by sending the data through serial interface, it is possible to make preset control.

② Control by DS Mode
DS mode can be selected by getting High in the Bit #2 of the control data. In the DS mode, the Higher Nibble is used for the direction and the Lower Nibble is used for the speed and it can be controlled as follows:

Driving direction

To tele photo.....	8 □H
To wide angle.....	4 □H
Stop.....	0 □H

Driving speed

Low Speed.....	□1H	(21.1±0.2sec)
High Speed.....	□FH	(1.7±0.2sec)
Stop.....	□0H	

Note: When you will control the lens by push botton in the camera by sending the zoom position, please be careful in over shooting. In this case, during the WIDE switch is pressed, FFH should be sent and during the TELE switch is pressed, "0" should be sent. And in order to stop moving smoothly, correction data is necessary to send because of the time lag for the data transmittance. It is recommended 2H~4H which is moved in 1/60 sec.

8. Focus data
The data of 3rd byte is the focus data and has the follwoing specification. The focus data does not show the physical distance to the object and shows the relative distance to the object.
Please refer the chart No.6-3 showing the relation between the data and the actual distance.

0V-INF.....	00H
INF.....	20H
NEAR.....	C0H ~180H (MOD varies by the focal length)
TELE.....	C0H (Approx. 0.8m)
WIDE.....	180H (0.01m)

① Prest for focus
By memorizing focus data obtained from the lens in the camera and by sending it trough serial interface, it is possible to make preset control.

② Control by DS Mode
DS mode can be selected by getting High in the bit #2 of the control data. In the DS mode, the Higher Nibble is used for the direction and the Lower Nibble is used for the speed and it can be controlled as follows:

Driving direction

To INF.....	8 □H
To NEAR.....	4 □H
Stop.....	0 □H

Drivins speed

Low Speed.....	□1H
High Speed.....	□FH
Stop.....	□0H

③ MOD (Minimum Object Distance)
Minimum object distance varies by the zoom position.

Note: ① The focus data show distance to the object and please note that the same value shows different physical distance according to the zoom position you have.

② The focus data which is transmitted from the lens, always shows the focus position regardless of the mode of the lens (Auto Focus Mode, Remoto Focus Mode, DS Mode).

③ When you will control the lens with push botton in the camera, the control method is the same as zoom control.

9. Iris data

When Auto-iris is selected, iris data of the 4th byte indicate LEVEL and ALC.
When Remote-iris is selected, it indicates the iris position.
When it is in DS mode, it indicates the driving direction and the driving speed.

① In the Auto-iris setting, it is possible to control LEVEL by the Higher Nibble of the iris data.

Under Exposure.....	0□H
Normal Exposure.....	8□H
Over Expoure.....	F□H

It is possible to control ALC by the Lower Nibble of the iris data.

Peak.....	□0H
Normal.....	□8H
Average.....	□FH

② In the remote iris setting, the iris data which is transmitted from the camera will be treated as the instruction of the iris position and the current iris position data will be sent back from the lens.

Close.....	33H±4H
Open.....	CDH±4H
Accuracy	±2H

③ DS Mode

DS Mode can be selected by getting High in the bit #2 of the control data.
And this mode can be active in the Remote-iris mode only.
In this mode, the Higher Nibble is used for the dirrection and the Lower Nibble is used for the speed and it can be controlled as follows:

Driving direction

To Close.....	4□H
To Open.....	8□H
Stop.....	0□H

Drivins speed

Low Speed.....	□1H
High Speed.....	□FH
Stop.....	□0H

Note: Please note that the data which is sent from the lens is the one which was set one field before.
Especially when the mode is changed from Auto iris to Remote iris, the

fast data which camera received just after the change, is the data of auto iris. By this communication, the lens is set at Remote iris mode and then, from the next communication, remote iris data starts to output.

Molex

ピンコネクション　モレックス　52271-1490

番号	名称	機能
1	HALL	測定用
2	IRIS	(必要に応じて)
3	HD	(必要に応じて)
4	VD	(必要に応じて)
5	VIDEO	AF用同期付き標準コンポジット信号
6	+5v	制御回路用電源入力
7	GND	制御回路用電源GND
8	SCK	シリアルクロックイン
9	SI	シリアルデータイン
10	SO	シリアルデータアウト
11	STB	ストローブ
12	+6v	ドライバー電源入力
13	D. GND	ドライバー電源GND
14	D. GND	done

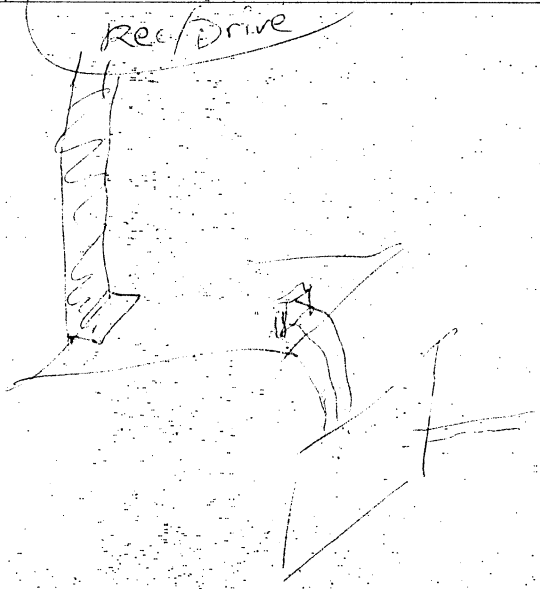
Factory

cam w/ Ext Sync 3, 4 removed

Rec/Drive

100-450mA

7-8.5V



TAMRON