

# **EPICS Record Reference Manual**

# Gemini Command/Action Layer EPICS Record Reference Manual

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This document describes the EPICS records developed by the Gemini Project to implement a Command/Action layer.

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## **1.0 Introduction**

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### **1.1 Purpose**

This document describes the EPICS records developed by the Gemini 8M Telescopes Project to implement a Command/Action layer between the Observatory Control System, running on a Unix host, and an IOC and between EPICS subsystems running on different IOC's.

## 2.0 apply - Apply Record

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The apply record executes data links to other records. Its primary purpose is to process CAD records in a fixed order, and return the results of processing those records. There may be up to eight sets of links to other records. The links in each set pass the directive field (DIR to OUTA through OUTH) and client ID field (CLID to OCLA through OCLH), and receive the result value (INPA through INPH to VAL) and error message (INMA through INMH to MESS).

The apply record accepts the same directives as the CAD, namely: MARK, CLEAR, PRESET, START, and STOP. Writing a value to the directive field (DIR) starts the processing of the record and, except for the MARK directive, subsequent processing of all attached records. Writing the START directive forces the PRESET directive to be sent to all links before the START directive is sent. This insures that all CAD records linked to the apply record have valid arguments.

Values returned through the INPx links are inspected by the apply record for negative values. If any link returns a negative value, the associated INMx link is read. The negative value and error message are copied to the VAL and MESS fields, monitors are posted, and the processing halts. No further links are processed once an error has been returned. If the value returned through all INPx fields are zero then the value for the client ID field (CLID) is returned in VAL.

The use of the apply record is required for all principal systems databases, including the TCS, CICS, and all instruments. There must be one, and only one, top level apply record in the database, although there may be cascaded apply records. All principal systems CAD records must be linked to the apply record and must be processed through this record. Links from the apply record outputs may go to records other than CAD records, such as calc, sub, or mosub records.

### 2.1 Field Summary

Field	Type	DCT	Initial	Access	Modify	Rec Proc Monitor	PP
VAL	LONG	No	0	Yes	No	Yes	No
DIR	RECCHOICE	Yes	0	Yes	Yes	No	Yes
CLID	LONG	No	0	Yes	Yes	Yes	No
MESS	STRING	No	Null	Yes	Yes	Yes	No
OMSS	STRING	No	Null	Yes	No	No	No
OUTx	OUTLINK	No	0	No	No	No	No
OCLx	OUTLINK	No	0	No	No	No	No
INPx	INLINK	No	0	No	No	No	No
INMx	INLINK	No	0	No	No	No	No

## 2.2 Field Descriptions

Name	Summary	Description
VAL	Value	This is the return value from the input links. If any link returns a non-zero, processing stops and the last value is returned. If all links return zero, the value of the client ID field (CLID) is returned.
DIR	Directive	The value of this field is passed to all OUTx output links. If the directive is START, the directive PRESET is first passed to all output links. If the directive is MARK, it is not sent to the OUTx fields and processing stops.
CLID	Client ID	This number is incremented every time a directive is loaded. The value is passed to all OCLx output links.
MESS	Message	This is the return message from an INMx input link. If the return value is 0, this field is empty. Otherwise, it reads the error message from the INMx link.
OMSS	Old Message	This is the old message string.
OUTx	Output directive link	There are eight output links OUTA-OUTH which pass the value of the DIR field to a record field.
OCLx	Output client ID link	There are eight output links OUMA-OUMH which pass the value of the CLID field to a record field.
INPx	Input result link	There are eight input links INPA-INPH which read a value from a record field. A non-zero value halts the processing sequence.
INMx	Input message link	There are eight input links INMA-INMH which read a value from a record field. The link is read only for the corresponding INPx link which returned a non-zero value.

## 2.3 Record Support Routines

### 2.3.1 `init_record`

This routine initializes the apply record. All OUTx links are forced to be process passive; all OUMx, INPx, and INMx links are forced to be non-process passive.

### 2.3.2 `process`

See the next section.

### 2.3.3 `get_value`

This routine fills the values of `struct valueDes` so that they refer to VAL.

### 2.3.4 `get_enum_str`

This routine converts the long integer values 0 through 4 into the strings “MARK”, “CLEAR”, PRESET”, “START”, and “STOP”, respectively.

### 2.3.5 `get_enum_strs`

This routine returns all five of the above strings.

### 2.3.6 put\_enum\_str

This routine converts the above strings into the long integer values 0 through 4.

## 2.4 Record Processing

This routine processes the record whenever requested. Processing will occur whenever a value is written to the DIR field.

- All MARK directives are ignored and processing exits.
- The return message field is cleared.
- If the directive is START:
  - increment the client ID,
  - recursively call this procedure with PRESET,
  - exit if an error occurred during PRESET.
- for each existing set of links A-H:
  - send CLID and DIR to OCLx and OUTx links,
  - get VAL from INPx link,
  - if VAL is negative, get MESS from OUMx link and stop looping
- if VAL is zero, set VAL equal to CLID
- post monitor on VAL field.
- if VAL is negative and MESS is different than OMSS:
  - post monitor on MESS field.

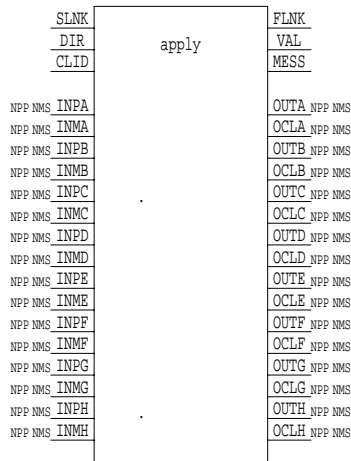
## 2.5 Device Support

There is no device support available.

## 2.6 CapFast

There is one CapFast symbol for the Apply record.

FIGURE 1. CapFast *eapply* symbol



### 3.0 CAD - Command Action Directive Record

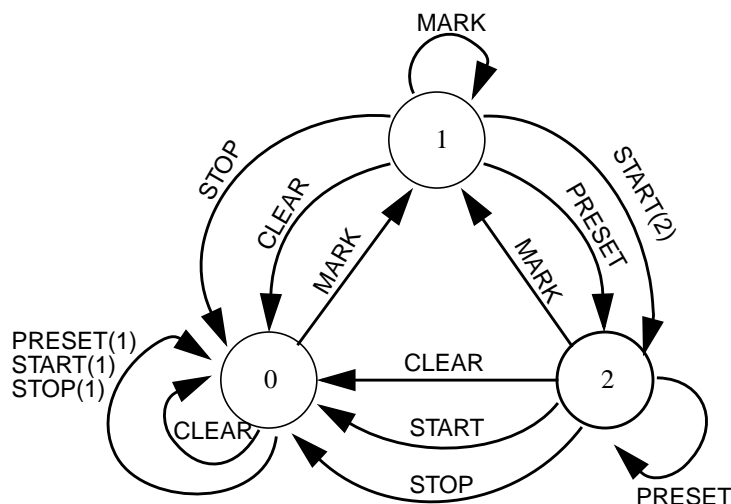
The CAD record initiates processing of Gemini commands. Attributes of the command are either loaded into fields A through T, or read from input links INPA through INPT. Processing begins when a directive is received in the DIR field. Subroutine calls may be made during initialization and processing. Each directive also has an associated link which is processed when the directive is received. A return value from the processing subroutine is returned in the VAL field.

There are five valid directives: MARK, CLEAR, PRESET, START, and STOP. The MARK directive forces the CAD state machine into state 1. This directive is also executed through special processing if any of fields A through T are modified. The CLEAR directive forces the state machine into state 0, clearing any prior mark or preset. The PRESET directive moves the state machine from state 1 to state 2. The START directive either moves the state machine from state 2 to state 0, or executes a PRESET directive then moves from state 2 to state 0. In all cases except PRESET, START, and STOP in state 0 the processing subroutine SNAM is called and the corresponding directive link is processed.

The CAD record can be in one of three states, given by the value of the MARK field. In state 0, the CAD record is considered to be cleared. In state 1, it is considered to be marked as ready to preset. In state 2, it is considered to be preset and ready to activate. Figure 1 shows the state diagram for the CAD record, with the edges identified as possible directive commands.

FIGURE 2.

CAD Record state transition diagram



- (1) No call to SNAM, no links processed.  
 (2) PRESET call and link processed first.

### 3.1 Field Summary

Field	Type	DCT	Initial	Access	Modify	Rec Proc Monitor	PP
VAL	LONG	No	0	Yes	No	Yes	No
SNAM	STRING	Yes	Null	Yes	No	No	No
SADR	LONG	No	0	No	No	No	No
STYP	SHORT	No	0	Yes	No	No	No
INAM	STRING	Yes	Null	Yes	No	No	No
DIR	RECCHOICE	Yes	1	Yes	Yes	No	Yes
ICID	LONG	No	0	Yes	Yes	No	No
MESS	STRING	No	Null	Yes	Yes	Yes	No
OMSS	STRING	No	Null	Yes	Yes	No	No
CTYP	SHORT	Yes	2	Yes	No	No	No
PREC	SHORT	Yes	0	Yes	Yes	No	No
MLNK	FWDLINK	Yes	0	No	No	No	No
CLNK	FWDLINK	Yes	0	No	No	No	No
PLNK	FWDLINK	Yes	0	No	No	No	No
STLK	FWDLINK	Yes	0	No	No	No	No
SPLK	FWDLINK	Yes	0	No	No	No	No
OCID	LONG	No	0	Yes	Yes	Yes	No
OSIM	RECCHOICE	No	None	Yes	Yes	Yes	No
NARG	SHORT	Yes	0	Yes	Yes	No	No
MARK	SHORT	No	0	Yes	Yes	Yes	No
ERSV	GBLCHOICE	Yes	0	Yes	Yes	No	Yes
SIOL	INLINK	Yes	0	No	No	No	No
SVAL	LONG	No	0	Yes	Yes	No	No
SIML	INLINK	Yes	0	No	No	No	No
SIMM	RECCHOICE	No	None	Yes	Yes	No	No
SIMS	GBLCHOICE	No	0	Yes	Yes	No	No
INPx	INLINK	Yes	0	No	No	No	No
OUTx	OUTLINK	Yes	0	No	No	No	No
A - T	STRING	No	0	Yes	Yes	No	Spec
VALx	NOACCESS	Yes	0	Yes	Yes	No	No
FTVx	GBLCHOICE	No	String	Yes	No	No	No

### 3.2 Field Descriptions

Name	Summary	Description
VAL	Return Error Code	The return value is set within the user-supplied processing subroutine. Conventionally, a return value of zero indicates success, while a non-zero value shows an error has occurred.
SNAM	Subroutine Name	The name of a VxWorks subroutine to execute during processing.
SADR	Subroutine Address	The internal representation of the subroutine address.
STYP	Subroutine symbol type	Not used.
INAM	Init Routine Name	The name of a VxWorks subroutine to execute during initialization.
DIR	CAD Directive	The directive to execute. This may be one of the following enumerated list values: MARK, CLEAR, PRESET, START, or STOP.
ICID	Client ID (In)	An integer value to be associated with the current command.
MESS	Message	A return message from the CAD. This string will be empty if the return value is zero.
OMSS	Old Message	The previous message.
CTYP	Number of CAD Args	This value should be set to the maximum number of arguments a CAD record will use. The value is usually set by the selected CapFast symbol.
PREC	Display Precision	This value is used for the precision of double-precision outputs.
MLNK	Mark Link	If the directive is MARK, this forward link is processed.
CLNK	Clear Link	If the directive is CLEAR, this forward link is processed.
PLNK	Preset Link	If the directive is PRESET, this forward link is processed.
STLK	Start Link	If the directive is START, this forward link is processed.
SPLK	Stop Link	If the directive is STOP, this forward link is processed.
OCID	Client ID (Out)	The input client ID is sent out this field.
OSIM	Simulation Mode (Out)	The simulation mode is sent out this field.
NARG	No. Inputs used	The actual number of arguments used is set in this field.
MARK	Is Record Preset?	This field shows the current state of the CAD. It can be zero, indicating no MARK has been done; one, showing a MARK; or two, showing a PRESET has been done.
ERSV	Error Alarm Severity	The severity of an alarm.
SIOL	Simulation Error Link	Simulation mode variables. Refer to reference [1], chapter 3.
SVAL	Simulation Error	



Name	Summary	Description
SIML	Simulation Mode Link	
SIMM	Simulation Mode	
SIMS	Simulation Mode Alarm Severity	The value for the simulated alarm.
INPx	Input Link A-T	The 20 input links for the arguments to the record.
OUTx	Output Link A-T	The 20 outputs are sent across these links.
A - T	Value of Input A-T	The 20 string input arguments.
VALx	Value of Output A-T	The 20 output values.
FTVx	Type of Value A-T	The types for the 20 output values. The type may be one of STRING, LONG, or DOUBLE.

### 3.3 Record Support Routines

#### 3.3.1 init\_record

During the first initialization pass, the output types are determined from the FTVx fields and appropriate space is created for the VALx fields. During the second pass, input and output links are initialized, the initialization routine is called, and the processing subroutine is readied. The directive field is set to CLEAR, and the mark field is set to zero.

#### 3.3.2 process

See the next section.

#### 3.3.3 special

The special processing is called when a value is put to one of the twenty fields A through T. The mark flag is set to one.

#### 3.3.4 get\_value

This routine fills the values of `struct valueDes` so that they refer to VAL.

#### 3.3.5 get\_precision

This routine retrieves PREC.

#### 3.3.6 get\_enum\_str

This routine converts the long integer values 0 through 4 into the strings "MARK", "CLEAR", "PRESET", "START", and "STOP", respectively.

#### 3.3.7 get\_enum\_strs

This routine returns all five of the above strings.

### **3.3.8 put\_enum\_str**

This routine converts the above strings into the long integer values 0 through 4.

## **3.4 Record Processing**

Record processing is very dependent upon the directive given to process and the value of the mark field in the state machine. The algorithm is:

- If PRESET, START, or STOP with MARK==0, then return
- If simulation, process simulation links.
- Process all input links.
- Process requested directive (see next sections for details).
- Enforce rule that MESS is empty if VAL is 0.
- Put the values on the output links.
- Raise monitors on fields VAL, MESS, OSIM, OCID, MARK.
- Process directive link (MLNK, CLNK, PLNK, STLK, SPLK).
- Process forward link.

### **3.4.1 Mark Directive Processing**

- Call user subroutine, return value in VAL.
- Copy ICID to OCID.
- Set mark field to 1.

### **3.4.2 Clear Directive Processing**

- Call user subroutine, return value in VAL.
- Copy ICID to OCID.
- Set mark field to 0.

### **3.4.3 Preset Directive Processing**

- Call user subroutine, return value in VAL.
- Copy ICID to OCID.
- Set mark field to 2.

### **3.4.4 Start Directive Processing**

- If mark field is 1:
  - set directive to PRESET.
  - Call user subroutine, return value in VAL.
  - Copy ICID to OCID.
  - Process PLNK link.
  - Set mark field to 2.
  - Put the values on the output links.
  - Raise monitors.

- Call user subroutine, return value in VAL.
- Copy ICID to OCID.
- Set mark field to 0.

### 3.4.5 Stop Directive Processing

- If mark field is not 0:
  - Call user subroutine, return value in VAL.
  - Copy ICID to OCID.
  - Set mark field to 0.

### 3.5 Device Support

There is no device support available.

### 3.6 CapFast

There are four CapFast symbols for the CAD record.

**FIGURE 3.**

CapFast *ecad2*, *ecad4*, *ecad8*, and *ecad20* symbols

[illegible]

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## **4.0 CAR - Command Action Response Record**

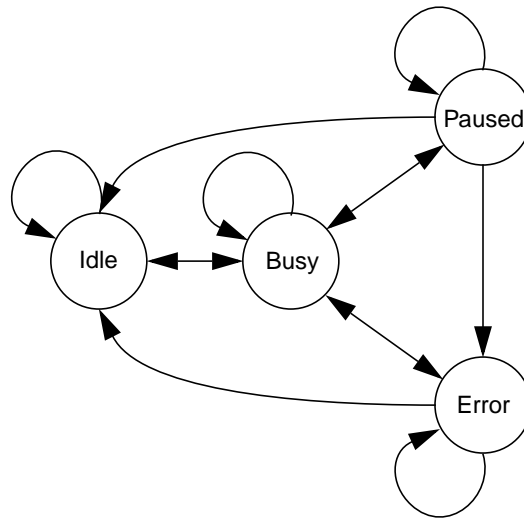
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The CAR record provides information about the state of a particular action occurring within a database. Possible states of the CAR record are UNAVAILABLE, IDLE, BUSY, PAUSED, and ERR. The allowable transitions between the states are illustrated in Figure 4.

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**FIGURE 4.**

CAR transitions



#### 4.1 Field Summary

Field	Type	DCT	Initial	Access	Modify	Rec Proc Monitor	PP
VAL	RECCHOICE	Yes	Idle	Yes	No	Yes	No
CLID	LONG	No	0	Yes	No	Yes	No
OMSS	STRING	No	Null	Yes	Yes	Yes	No
OERR	LONG	No	0	Yes	Yes	Yes	No
IVAL	LONG	No	0	Yes	Yes	No	Yes
ICID	INLINK	Yes	0	No	No	No	No
IMSS	STRING	No	Null	Yes	Yes	No	No
IERR	LONG	No	0	Yes	Yes	No	No
AVAL	LONG	No	0	Yes	Yes	No	No
MVAL	LONG	No	0	Yes	Yes	No	No
ACID	LONG	No	0	Yes	Yes	No	No
MCID	LONG	No	0	Yes	Yes	No	No
AMSS	STRING	No	Null	Yes	Yes	No	No
MMSS	STRING	No	Null	Yes	Yes	No	No
AERR	LONG	No	0	Yes	Yes	No	No
MERR	LONG	No	0	Yes	Yes	No	No
ERSV	GBLCHOICE	Yes	0	Yes	Yes	No	Yes
SIOL	INLINK	Yes	0	No	No	No	No
SVAL	LONG	No	0	Yes	Yes	No	No
SIML	INLINK	Yes	0	No	No	No	No
SIMM	RECCHOICE	No	0	Yes	Yes	No	No
SIMS	GBLCHOICE	Yes	0	Yes	Yes	No	No

#### 4.2 Field Descriptions

Name	Summary	Description
VAL	State	Current state
CLID	Client ID	Value of the latest client ID
OMSS	Message (out)	Output message
OERR	Error Code (out)	Output error code
IVAL	State (in)	Input state transition
ICID	Client ID (in)	Link to client ID
IMSS	Message (in)	Input message
IERR	Error Code (in)	Input error code
AVAL	Last State Archived	The last state value which was archived

Name	Summary	Description
MVAL	Last State Monitored	The last state value which generated a monitor event
ACID	Last Client ID Archived	The last Client ID which generated an archive event
MCID	Last Client ID Monitored	The last Client ID which generated a monitor event
AMSS	Last Message Archived	The last message which generated an archive event
MMSS	Last Message Monitored	The last message which generated a monitor event
AERR	Last Error Code Archived	The last error code which generated an archive event
MERR	Last Error Code Monitored	The last error code which generated a monitor event
ERSV	Error Alarm Severity	The severity code of the error alarm
SIOL	Simulation Error Link	Simulation mode variables. Refer to reference [1], chapter 3.
SVAL	Simulation Error	
SIML	Simulation Mode Link	
SIMM	Simulation Mode	
SIMS	Simulation Mode Alarm Severity	

### 4.3 Record Support Routines

#### 4.3.1 `init_record`

This routine sets the current state to IDLE and clears the input message and error code. Any simulation modes or links are also initialized.

#### 4.3.2 `process`

See the next section.

#### 4.3.3 `get_value`

This routine fills the values of `struct valueDes` so that they refer to VAL.

#### 4.3.4 `get_enum_str`

This routine converts the long integer values 0 through 5 into the strings “UNAVAILABLE”, “IDLE”, “PAUSED”, “ERR”, “BUSY”, and “UNKNOWN” respectively.

#### 4.3.5 `get_enum_strs`

This routine returns all of the above strings.

4.3.6 put\_enum\_str

This routine converts the state strings into values 0 through 5.

4.4 Record Processing

Record processing begins when a value is written into the IVAL field. The client ID is read from the ICID link and put into CLID. The input value is used to transition the CAR state machine and the input message and input error code are placed into the output message and output error code fields. If the state machine transitions to the ERROR state an alarm is generated.

Monitors are posted if the output value is different than the last output value or the client ID is different than the old client ID. Monitors are posted on the VAL, CLID, OMSS, and OERR fields.

4.5 Device Support

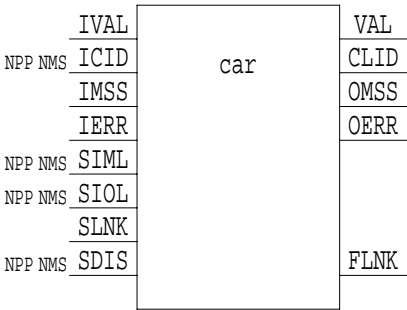
There is no device support available.

4.6 CapFast

There is one CapFast symbol for the CAR record.

FIGURE 5.

CapFast *ecars* symbol



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## **5.0 SIR - Status Information Record**

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The Status Information Record provides a standard information-passing mechanism between Gemini principle systems. The SIR records for any Gemini system are expected to be combined into a separate database called the Status Alarm Database (SAD) and loaded into the SAD IOC.

SIR records combine three important parts of Gemini EPICS status reporting: a status value, status message, and alarms. The status value is read through the INP link, the status message is placed into the IMSS link. Alarms are propagated to the SIR record by the input link.

There are three valid output data types: long integer, double precision, and string. A subroutine supplied by the user can be attached to the SNAM field and called during record processing. This subroutine can convert the input, raise additional alarms, or enhance the output message string.

A full description of the SIR record's function is expected in the FDSC field. This field can hold a 40 character string which is used by the OCS when displaying the SIR value.



## 5.1 Field Summary

Field	Type	DCT	Initial	Access	Modify	Rec Proc Monitor	PP
INP	INLINK	Yes	0	No	No	No	No
IMSS	STRING	No	Null	Yes	Yes	No	No
FDSC	STRING	Yes	Null	Yes	Yes	No	No
FTVL	GBLCHOICE	Yes	0	Yes	No	No	No
EGU	STRING	Yes	units	Yes	Yes	No	No
VAL	VOID *	No	Null	Yes	Yes	Yes	Yes
OMSS	STRING	No	Null	Yes	Yes	Yes	No
SNAM	STRING	Yes	Null	Yes	No	No	No
SADR	LONG	No	0	No	No	No	No
STYP	SHORT	No	0	Yes	No	No	No
PREC	SHORT	Yes	0	Yes	Yes	No	No
AVAL	VOID *	No	0	Yes	Yes	No	No
MVAL	VOID *	No	0	Yes	Yes	No	No
AMSS	STRING	No	Null	Yes	Yes	No	No
MMSS	STRING	No	Null	Yes	Yes	No	No
LALM	DOUBLE	No	0	XXX	No	No	No
HIHI	FLOAT	Yes	0	Yes	Yes	No	Yes
LOLO	FLOAT	Yes	0	Yes	Yes	No	Yes
HIGH	FLOAT	Yes	0	Yes	Yes	No	Yes
LOW	FLOAT	Yes	0	Yes	Yes	No	Yes
BRSV	GBLCHOICE	Yes	0	Yes	Yes	No	Yes
HHSV	GBLCHOICE	Yes	0	Yes	Yes	No	Yes
LLSV	GBLCHOICE	Yes	0	Yes	Yes	No	Yes
HSV	GBLCHOICE	Yes	0	Yes	Yes	No	Yes
LSV	GBLCHOICE	Yes	0	Yes	Yes	No	Yes
HYST	DOUBLE	Yes	0	XXX	Yes	No	No
ADEL	DOUBLE	Yes	0	XXX	Yes	No	No
MDEL	DOUBLE	Yes	0	XXX	Yes	No	No
SIOL	INLINK	Yes	0	No	No	No	No
SVAL	STRING	No	Null	Yes	Yes	No	Yes
SIML	INLINK	Yes	0	No	No	No	No
SIMM	RECCHOICE	No	0	Yes	Yes	No	No
SIMS	GBLCHOICE	Yes	0	Yes	Yes	No	No

## 5.2 Field Descriptions

Name	Summary	Description
INP	Input Link	A CA link to the value to be reported. This value must match the type declared in FTVL.
IMSS	Message In	The input message.
FDSC	Full Description	A 40 character description of the SIR record
FTVL	Type of value	The data type of the input link. May be either LONG, DOUBLE, or STRING.
EGU	Engineering Units	The units of the value.
VAL	Value Out	The input value converted to a string.
OMSS	Message Out	The output message.
SNAM	Subroutine Name	The VxWorks name of a subroutine to perform additional conversion between the input and output values.
SADR	Subroutine Address	The internal representation of the subroutine address.
STYP	Subroutine symbol type	Not used.
PREC	Display Precision	This value is used for the precision of double-precision output.
AVAL	Last Value Archived	This value is used to determine if the new value needs to generate an archive monitor.
MVAL	Last Value Monitored	This value is used to determine if the new value needs to generate a monitor.
AMSS	Last Message Archived	This string used to determine if the new message string needs to generate an archive monitor
MMSS	Last Message Monitored	This string used to determine if the new message string needs to generate a monitor.
LALM	Last Value Alarmed	This value saves the last value that caused an alarm.
HIHI	Hihi Alarm Limit	This sets the HI-HI alarm limit.
LOLO	Lolo Alarm Limit	This sets the LOW-LOW alarm limit.
HIGH	High Alarm Limit	This sets the HIGH alarm limit.
LOW	Low Alarm Limit	This sets the low alarm limit.
BRSV	Bad Sub Return Severity	This alarm is set if the user subroutine returns a non-zero value.
HHSV	Hihi Severity	This alarm is set if the HIGH-HIGH value is reached.
LLSV	Lolo Severity	This alarm is set if the LOW-LOW value is reached.
HSV	High Severity	This alarm is set if the HIGH value is reached.
LSV	Low Severity	This alarm is set if the LOW value is reached.

Name	Summary	Description
HYST	Alarm Deadband	This sets the hysteresis range for alarm reporting.
ADEL	Archive Deadband	This set the archive hysteresis range.
MDEL	Monitor Deadband	This sets the monitor hysteresis range.
SIOL	Simulation Value Link	In simulation mode this link value is read and returned in VAL.
SVAL	Simulation Value	The simulation value is stored here.
SIML	Simulation Mode Link	This link determines if the record is in simulation mode or not.
SIMM	Simulation Mode	The simulation mode is stored here.
SIMS	Simulation Mode Alarm Severity	This is the value of the simulation mode alarm severity.

### 5.3 Record Support Routines

#### 5.3.1 `init_record`

On the first pass, space is allocated for the VAL, SVAL, MVAL, AVAL fields, based upon the type of FTVL field (DBF\_STRING, DBF\_DOUBLE, or DBF\_LONG). On the second pass, the simulation mode is checked and if true, the simulation mode and input link are set. The address of the process subroutine (SNAM) is found.

#### 5.3.2 `process`

See the next section.

#### 5.3.3 `get_value`

This routine fills the values of `struct valueDes` so that they refer to VAL.

#### 5.3.4 `get_precision`

This routine retrieves PREC.

#### 5.3.5 `get_units`

This routine returns EGU.

#### 5.3.6 `cvt_dbaddr`

This routine converts the VAL field to either string, double precision, or long integer based upon the value of FTVL.

#### 5.3.7 `get_alarm_double`

This routine sets the following values:

```
upper_alarm_limit = HIHI
upper_warning_limit = HIGH
```

lower\_warning\_limit = LOW  
lower\_alarm\_limit = LOLO

#### 5.4 Record Processing

In simulation mode, the simulation value is fetched from the link. Otherwise the values is fetched from the INP link. The user subroutine (SNAM) is executed and the return value is checked. For return values of zero, the input message IMSS is copied to the output message OMSS, the record is time stamped, alarms and monitors are checked, and the forward link is processed.

An alarm is set if the value is outside the preset range limits (HIHI, HIGH, LOW, LOLO) and outside of the hysteresis range (HYST).

Logging and archive monitors are raised on VAL and OMSS if their value changes. For double precision and long integer values of VAL the change must be greater than the hysteresis ranges (MDEL and ADEL).

#### 5.5 Device Support

No device support is available.

#### 5.6 CapFast

There is one CapFast symbol for the SIR record.

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**FIGURE 6.**

CapFast *esirs* symbol

