## ECO POLI CY & PROCE DURE



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#### 1. Purpose:

This Engineering Change Order (ECO) Procedure has been developed by Concept Systems Design to control engineering changes incorporated into our product lines.

The ECO process provides for review of proposed changes requiring business decisions and ensures orderly incorporation of approved design changes. The ECO process begins with the need for change, followed by:

- Development of the change,
- Planning of how the change is to be implemented and,
- Formal approval for the entire change package.

NOTE: This policy deals only with the last aspect (formal approval) of the change process.

#### 2. Scope:

The ECO System and this policy applies to all Concept Systems Design departments whose products are in Pre-production or Production release status.

#### **3. Reference Documents:**

ECO Work Instruction

#### 4. Definitions and Acronyms:

The following terms and acronyms are used in this policy:

CSD Concept Systems Design CCB Change Control Board The term documents includes Documents Engineering drawings Bills of material **Specifications** Wire lists Diagrams Other related engineering data, processed through the ECO System. ECR **Engineering Change Request Engineering Specification Waiver** ESW BOM Bill of Material (computerized) Parts List Engineering document containing a list of parts required listed on the drawing. Retrofit A correction to a performance or safety deficiency for systems in the field. It is provided to the customer at no cost.

PIK Product Improvement Kit - a system enhancement, purchased by the customer for a system in the field. The PIK can be installed by either the customer or field service.

ORIGINATOR

Complete ECO Form,

see ECO Preparation Procedure

CCB Chair

Distribute ECO

package to affected CCB Members

**CCB** Members

Review ECO package for: Content, Application, etc

CCB Meeting

## 5. Policy Revision Procedure:

The Change Control Board (CCB) must approve all maintenance and revisions to this policy, using the ECO process.

## 6. The Change Control Board (CCB):

The CCB authorizes changes to CSD products and their respective engineering documents. The CCB reviews all proposed changes and their effect upon product design, cost, manufacturing and field implementation. The CCB may approve, disapprove and return for further evaluation, any changes submitted for their review.

## 6.1. CCB Chairperson

The CCB Chairperson arbitrates change decisions and, if the CCB Members cannot reach agreement, has final approval or disapproval authority for change decisions. The CCB chairperson also coordinates ECOs that require walk-through approval when the Originator justifies the need.

## 6.2. CCB Members

The CCB is composed of representatives from the following functions of CSD. Following are the required approvals: (See **Figure 2. ECO Approval Form**)

#### 1. Test Engineering

- 2. Quality Assurance
- 3. Technical Publications
- 4. Purchasing
- 5. Design Engineering
- 6. Product Safety
- 7. Master Scheduler
- 8. Final Test
- 9. Marketing



- 11. Manufacturing Engineering
- 12. Materials Spares
- 13. Finance/Cost acct.
- 14. Software Engineering
- 15. Chairperson





				ECO NO.		
Concept Sy	ystems Desi	ign	Proprietary & Confiden	<u>tial</u>	Page	of
ORIGINATION: (please )	print)	******	Comments:			
Originator:						
	Date:	1997				
Resp. Design Eng.:						
	Date:	1997				
Manager:						
	Date:	1997				
Checked by:						
	Date	1997				
CCB APPROVALS: (please	print)					
Engineering:						
(Glenn Pfefferkorn)	Date:					
(Paul Starry)	Date:					
QA / Customer Service:						
(Gary Teachout)	Date:					
(oury routineary	Data					
	Date					
Finance/Cost Accounting:			IMPLEMENTATION:	<del>han 1.1 </del>		
-	Date:		Electronic File Transfer:			
(Terry Wild)						
	Date:			Date:		
Master Scheduling:						
	Date:		Data Entry:			
(Jordan Louie)						
	Date:			Date:		
0						
Operations:						
(Scott Oswald)	Date:		Engineering Final:			
	Date:			Date:		

## Figure 2. ECO Approval Form

## 6.3. CCB Responsibilities

The Change Control Board has the following responsibilities:

- Convene regularly scheduled CCB meetings. CCB Chairperson determines the frequency of meetings based on the ECO backlog.
- Review, discuss, approve, or reject ECOs and ECO process. CCB meetings are not for problem identification.
- Provide justification for rejected or rescheduled ECOs.
- Approve the effectivity of the change (i.e., concur with recommended effectivity or recommend a modification).
- Record all CCB Meetings in the form of minutes or other appropriate documentation.
- Assure accuracy and completeness of the ECO documentation.

## 6.4. CCB Administration

CCB Chairperson will regulate the following events:

- Provide ECO(s) for review to CCB Members, three to five working days before a scheduled CCB meeting.
- Provide CCB Meeting Minutes by the last working day in every week.
- Provide Agenda and Minutes to other interested parties at the discretion of Document Control.
- Complete final distribution of approved ECOs within 10 working days of CCB approval.

#### 6.5. CCB Member Responsibilities

Each CCB Member shall have the following additional responsibilities:

- Review each ECO and develop relevant change impact information considering Member's organization.
- Maintain current charter which includes identification of Member, two Alternate Members and Manager's approval.
- Provide ECO review feedback to Originator prior to scheduled CCB meeting.
- Attend each CCB meeting or, if unable to attend, appoint an Alternate Member.

## 7. ECO Originator's Responsibilities

- Obtain Safety, Master Scheduler, Marketing, and/or Retrofit approvals prior to submitting ECO to Document Control.
- Update all procedures effected by the ECO within the ECO.
- Verify that ECO is complete and correct.
- Attend CCB meetings when Originator's ECOs are scheduled for approval.

• If ECO requires emergency processing, justify the need for walk-through approvals to the CCB Chairperson.

#### 8. Manufacturing Engineers Responsibilities

- Coordinate change(s) with design engineers and obtain their consent.
- Approve ECO prior to Originator submitting to Document Control.
- Approve all final drawings prior to final distribution.

#### 9. Change Consolidation

To avoid problems with effectivity and document revision numbers, engineering changes should be consolidated in the following manner:

- Combine all concurrent changes to a part or assembly into a single ECO.
- Group all parts and assemblies affected by a change into a single ECO.
- Comply with the rules of interchangeability.

## **10. Documentation Control and Type**

The Ask ManMan (MM3000) software uses a 2-character revision number. Therefore the following rules apply to the indicated types of documentation:

#### **10.1. Prototype Documentation**

Designs whose documentation status is "Engineering Release" (not released to manufacturing) are <u>not</u> controlled by the ECO System.

Engineering must use "X-REV," alpha-numeric revision identifiers (ex: "X1") to control revisions to Engineering Release documentation.

Revision and control of changes to Engineering Release documentation shall comply with CSD Drafting Standards for maintaining changes to Engineering Release documentation.

## 10.2. Pre-Production (Preliminary) Documentation

Designs whose documentation status is "Pre-Production" <u>are</u> controlled by the ECO System. However, Pre-Production ECOs <u>may</u> be excluded from CCB review, at the discretion of the Program Manager, with the <u>unanimous</u> approval by Engineering, Manufacturing and Quality Management.

Alpha-numeric revision identifiers always start with the letter "P," followed by sequential numbers (Pl, P2, P3 through P9). If revisions exceed P9, drop the "P" and continue the numerical sequence (10, 11, 12, etc.).

When inactivating a part and drawing, append an "I" to the <u>current</u> revision number to indicate the revision level of the inactivated drawing ("1I"). If the drawing is inactivated at revision "10" or higher, drop the first numeric digit ("0I" representing "10" inactive), ("1I", representing "11" inactive), etc. Use the MM 3000 database to review the part's history.

Use the same rules when obsoleting parts, appending "O" instead of "I" to the current revision level.

### **10.3.** Production Documentation

Designs whose documentation status is "Production Released" are controlled by the ECO System. Proposed changes are subject to CCB review. Maintenance of Production Released documentation shall comply with CSD Drafting Standards and in this policy.

#### 11. Effectivity

## 11.1. Definition

Effectivity is the point of introduction of a change. It must be specified as applied upon:

- A specific date, and,
- A specific project (system serial number) in the manufacturing cycle; or, upon field units.

## **11.2. Effectivity Guidelines**

The following factors determine effectivity:

- Material availability
- Labor availability
- Scrap costs
- Pending ECOs
- Drafting backlog

- Test fixtures
- Procedures
- Facilities changes
- Urgency of the change

When effectivity is specified as a date, it is the date when the change will be incorporated on (or into) the highest level assemblies, kits or parts, indicated within the body of the ECO.

Lower level changes or activities to support the ECO (ordering/stocking of parts or reworking subassemblies) may have earlier effectivity dates determined by Inventory/Production Control Planning.

When possible, effectivity should reference a System Number where the change goes into effect. System Number is mandatory for reliability, retrofit, and rework ECOs.

## 11.3. Responsibility

Originator can recommend effectivity based upon an assessment of the basis for change and its expected effect upon Manufacturing, Field Engineering, Materials, Spares, etc. Materials sets the effectivity date at CCB, and follows up with the first System Number affected, at least one week before effectivity date.

Document Control will redistribute ECO cover sheet when starting System Number is added.

## 12. Change Categories

## 12.1. Change Category Definition

The following ECO change categories define the nature of the problem and identify the basic reasons for recommending a change. They are the only categories for change considered acceptable. If an ECO has two categories, the higher indicated approval class prevails. The ECO Form shows these categories.

Reliability	Changes required to overcome a failure to meet minimum requirements of the product design specification, or failing to meet accepted industry standards.
Safety	Changes required to correct actual or potential personnel safety problems, damage to equipment or environment.
New Product	Release of new products and options.
Product Improvement	Changes to improve product life, performance, maintainability, or capabilities which exceed the requirements of the existing product design specification.
Producibility Problems	Changes required to overcome manufacturing difficulties BOM errors, etc.
Procurement Problem	Changes required to overcome inventory shortages, supplier problems, or part availability.
PMF Changes	Changes required to correct Part Master Form (PMF) or add second sources.
BOM Change	Change or add item numbers, reference designators or quantity on the BOM only, doesn't affect drawing other than revision change.
Preliminary ECO	(See Section 10.2) Unreleased piece parts for production use. All new parts are structured to Engineering Project numbers. The numbering system is to be determined. The system parts into the Engineering Project number. Materials will procure all new prereleased parts, and buy the released part conservatively. The Master Scheduler will insure demand is added to MM3000 to drive the appropriate requirement. This does not allow shipment, an ECO is required (Follow Section 10.3).

#### **13. ECO Preparation Guidelines**

The ECO is an approval and implementation vehicle. The person assigned responsibility for planning change must:

- Undertake the front-end analysis and,
- Interface personally with all functional groups necessary to assure complete integration before the ECO is processed.

#### 13.1. Preparation

Appropriate departments must prepare the ECO Form shown in **Figure 3. ECO Form**, **page 12**. If more space is needed, use the continuation form shown in **Figure 4. ECO Continuation Form**, **page 13**.

Instructions for completing these and other ECO Forms are found in the **ECO Work Instruction**.

E

Concept Systems Design	Models Affected:
Fremont, CA 94538-6520	□ 2400 □ G2 □ G3
Effectivity: 1 Date: 1 System:	Approval Granp. Change Category I Category II Product Improvement III PMF Changes I Safety 5 II Productibility III BOM Changes I Once Wroduby II Procurement III Preliminary
Effect Upon: Procedures On Order Mfg. 7 Inventory Field Field	Areas Affected:       Drafting       QA/Receiving       ITest Fixtures       Safety         Materials       QA/Final Test       IManufacturing       Master Scheduler         Spares       VPurchasing       Imaterials       Retroffic
As-Built Condition?	□No Parts Supplied By Engineering? □Yes 10 □No
7	
Problem(State clearly the "cause	and the effect" on the system operation):
$\left( 12 \right)$	
Solution/Action:	Unit Total
Solution/Action:	UnitTotalDate: / /
Solution/Action: 13 Costs: 14 Init Total Material Rework: \$0.00 Material Scrapt \$0.00	Unit Total Field Retrofit: \$\$ApprovalDate: / /
Solution/Action: 13 Costs: 14 Jnit Total Material Rework: \$0.00 Material Scrapt \$0.00 Released: 15	Unit     Total       Field Retrofit:     \$\$ ApprovalDate: / /       Impact Category     17
Solution/Action: 13 Costs: 14 Init Total Material Rework: \$0.00 \$0.00 Material Scrapt \$0.00 \$0.00 Released: 15 Date: //	Unit Total   Field Retrofit: \$\$ApprovalDate: / /   / / Impact Category   / / Unit   PER YSTEM
Solution/Action:         13         Costs:       14         Material Rework:       \$0.00         Material Scrapt       \$0.00         Solution       \$0.00         Released:       \$15         Distributed:       \$16	Unit Total   Field Retrofit: \$
Solution/Action:         13         Image: Costs:       14         Image:	Unit Total   Field Retrofit: \$
Solution/Action: 13 Costs: 14 Jnit Total Material Rework: \$0.00 Material Scape Solution Material Scape Solution Released: (Print) 15 Date: //	Unit Total   Field Retrofit: \$ ApprovalDate: / /   Impact Category 1-PER YSTEM   PRIORITY PRIORITY   PRIORITY FR CHAMBER   Walk Through?:   Yes   No   Authorized By:   Date

Figure 3. ECO Form

Concept Systems Design 2800 Bayview Drive Fremont, CA 94538-6520	ENGINEERING CHANGE ORDER Continuation Sheet	Page of	ECO Number:
	· · · · · · · · · · · · · · · · · · ·	- • · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·
Objective/Problem:			
Action/Solution:			
		ne tiken	

# Figure 4. ECO Continuation Form

### 14. Change Approvals (Preliminary)

All approval signatures must be present for the ECO to be processed, regardless of the urgency or change category. (See **Figure 2. ECO Approval Form, page 6**).

### 14.1. Safety

Safety signature is required on any safety related items and a *Safety Impact Analysis* must be part of the ECO prior to submitting for CCB review. (*Safety Impact Analysis* is a system designed by CSD's safety organization for determining the company's degree of liability on safety issues.)

## **15.** Flowcharts

The following four pages show detailed flow charts of the ECO Procedure, from Originator, through CCB approval, to Master Planning. (Flowcharts do not include the implementation phase.)

The first three flowcharts can be laid side-to-side to connect the lines. The fourth flowchart shows the revision level number procedure.

The boxes connected by solid lines show process; the "scrolls" connected by dotted lines, show ECO paperflow from one department or group of people to another.



Figure 5. ECO Flowchart (Page 1)







Figure 7. ECO Flowchart (Page 3)



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