SNELL & WILCOX

PREFIX CPP200 Compression Pre-Processor

Operator's Manual

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Explanation of Safety Symbols (GB)

This symbol refers the user to important information contained in the accompanying literature. Refer to manual.

This symbol indicates that hazardous voltages are present inside. No user serviceable parts inside. This unit should only be serviced by trained personnel.

Safety Warnings

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT REMOVE COVERS
NO USER SERVICEABLE PARTS
REFER SERVICING TO QUALIFIED PERSONNEL ONLY

Servicing instructions where given, are for use by qualified service personnel only.
To reduce risk of electric shock do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.
Refer all servicing to qualified personnel.

- **To reduce the risk of electric shock, do not expose this appliance to rain or moisture.**
- **Always ensure that the unit is properly earthed and power connections correctly made.**
- **This equipment must be supplied from a power system providing a PROTECTIVE EARTH ⏚ connection and having a neutral connection which can be reliably identified.**
- **The power outlet supplying power to the unit should be close to the unit and easily accessible**

Power connection in countries other than the USA

The equipment is normally shipped with a power cable with a standard IEC moulded free socket on one end and a standard IEC moulded plug on the other. If you are required to remove the moulded mains supply plug, dispose of the plug immediately in a safe manner.

The colour code for the lead is as follows:

GREEN/YELLOW lead connected to E (Protective Earth Conductor)
BLUE lead connected to N (Neutral Conductor)
BROWN lead connected to L (Live Conductor)

Caution If the unit has two mains supply inputs ensure that both power cords are plugged into mains outlets operating from the same phase.

Erklärung der Sicherheitssymbole (D)

Dieses Symbol weist den Benutzer auf wichtige Informationen hin, die in der begleitenden Dokumentation enthalten sind.

Dieses Symbol zeigt an, dass gefährliche Spannung vorhanden ist. Es befinden sich keine vom Benutzer zu wartenden Teile im Geräteinneren. Dieses Gerät sollte nur von geschultem Personal gewartet werden

Sicherheits-Warnhinweise

ACHTUNG
Gefahr von Elektroschocks.
Abdeckungen nicht entfernen
Keine vom Benutzer zu wartende Teile
Wenden Sie sich ausschließlich an qualifiziertes Personal

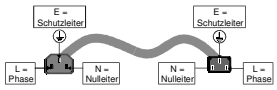
Die angeführten Service-/Reparatur-Anweisungen sind ausschließlich von qualifiziertem Service-Personal auszuführen. Um das Risiko eines lektroschocks zu reduzieren, führen Sie ausschließlich die im Benutzerhandbuch eschriebenen Anweisungen aus, es sei denn, Sie haben die entsprechende Qualifikation. Wenden Sie sich in allen Service-Fragen an qualifiziertes Personal.

- **Um das Risiko eines Elektroschocks zu reduzieren, setzen Sie das Gerät weder Regen noch Feuchtigkeit aus.**
- **Stellen Sie immer sicher, dass das Gerät ordnungsgemäß geerdet und verkabelt ist.**
- **Dieses Equipment muss an eine Netzsteckdose mit ⏚ Schutzleiter angeschlossen werden und einen zuverlässig identifizierbaren Nullleiter haben.**
- **Die Netzsteckdose sollte nahe beim Gerät und einfach zugänglich sein.**

Netzanschluss in anderen Ländern als der USA

Das Equipment wird im Normalfall mit einem Netzkabel mit Standard IEC Anschlussbuchse und einem Standard IEC Anschlussstecker geliefert. Sollten Sie den angeschweißten Stecker auswechseln müssen, entsorgen Sie diesen bitte umgehend. Die farbliche Belegung des Netzkabels ist wie folgt:

GRÜN GELB E = Schutzleiter ⏚
BLAU N = Nulleiter
BRAUN L = P = Phase



Achtung: Wenn das Gerät zwei Anschlussbuchsen hat, stellen Sie bitte sicher, dass beide Netzkabel mit der selben Phase in die Netzsteckdose gesteckt werden.

Légende : (F)

Ce symbole indique qu'il faut prêter attention et se référer au manuel.

Ce symbole indique qu'il peut y avoir des tensions électriques à l'intérieur de l'appareil. Ne pas intervenir sans l'agrément du service qualifié.

Précaution d'emploi :

ATTENTION
RISQUE DE CHOC ELECTRIQUE
NE PAS RETIRER LE COUVERCLE
NE PAS INTERVENIR SANS L'AGREMENT DU SERVICE QUALIFIE

Les procédures de maintenance ne concernent que le service agréé. Afin de réduire le risque de choc électrique, il est recommandé de se limiter aux procédures d'utilisation, à moins d'en être qualifié. Pour toute maintenance, contacter le service compétent.

- **Pour réduire le risque de choc électrique, ne pas exposer l'appareil dans un milieu humide.**
- **Toujours s'assurer que l'unité est correctement alimentée, en particuliers à la liaison à la terre.**
- **La source électrique de cet équipement doit posséder une connexion à la terre ⏚, ainsi qu'une liaison « neutre » identifiable.**
- **La prise électrique qui alimente l'appareil doit être proche de celle-ci et accessible.**

Câble secteur de pays autres que les Etats-Unis

L'équipement est livré avec un câble secteur au standard IEC, moulé mâle/femelle.
Si vous souhaitez changr la prise mâle de votre cordon, voici les codes couleurs des fils :

Le fil VERT/JAUNE est connecté à T (Terre)
Le fil BLEU est connecté à N (Neutre)
Le fil MARRON est connecté à P (Phase)

Attention si l'appareil a 2 alimentations, s'assurer que les cordons soient branchés sur la même phase.

Explicación de los Símbolos de Seguridad (ESP)

Éste símbolo refiere al usuario información importante contenida en la literatura incluida. Referirse al manual.

Éste símbolo indica que voltajes peligrosos están presentes en el interior. No hay elementos accesibles al usuario dentro.
Esta unidad sólo debería ser tratada por personal cualificado.

Advertencias de Seguridad

ADVERTENCIA
RIESGO DE CHOQUE ELECTRICO
NO QUITAR LAS PROTECCIONNES
ELEMENTOS NO ACCESIBLES AL USUARIO.
SERVICIO SOLAMENTE A PERSONAL CUALIFICADO

Las instrucciones de servicio cuando sean dadas, son sólo para uso de personal cualificado. Para reducir el riesgo de choque eléctrico no llevar a cabo ninguna operación de servicio aparte de las contenidas en las instrucciones de operación, a menos que se esté cualificado para realizarlas.
Referir todo el trabajo de servicio a personal cualificado.

- **Para reducir el riesgo de choque eléctrico, no exponer este equipo a la lluvia o humedad.**
- **Siempre asegurarse de que la unidad está propiamente conectada a tierra y que las conexiones de alimentación están hechas correctamente.**
- **Este equipo debe ser alimentado desde un sistema de alimentación con conexión a TIERRA ⏚ y teniendo una conexión neutra fácilmente identificable.**
- **La toma de alimentación para la unidad debe ser cercana y fácilmente accesible.**

Conexión de alimentación en otros países que no sean USA

El equipo es normalmente entregado con un cable de alimentación con un enchufe hembra estándar IEC en un extremo y con una clavija estándar IEC en el otro. Si se requiere eliminar la clavija para sustituirla por otra, disponer dicha clavija de una forma segura.
El código de color a emplear es como sigue:

VERDE/ AMARILLO conectado a E (Conductor de protección a Tierra -Earth en el original-)
AZUL conectado a N (Conductor Neutro -Neutral en el original-)
MARRÓN conectado a L (Conductor Fase -Live en el original-)

Advertencia Si la unidad tuviera dos tomas de alimentación, asegurarse de que ambos cables de alimentación están conectados a la misma fase.

Simboli di sicurezza: (I)

Questo simbolo indica l'informazione importante contenuta nei manuali appartenenti all'apparecchiatura. Consultare il manuale.

Questo simbolo indica che all'interno dell'apparato sono presenti tensioni pericolose. Non cercare di smontare l'unità.
Per qualsiasi tipo di intervento rivolgersi al personale qualificato.

Attenzione:

ATTENZIONE
RISCHIO DI SHOCK ELETTRICO
NON CERCARE DI SMONTARE L'UNITA PER QUALSIASI TIPO DI INTERVENTO RIVOLGERSI AL PERSONALE QUALIFICATO

Le istruzioni relative alla manutenzione sono ad uso esclusivo del personale qualificato. E' proibito all'utente eseguire qualsiasi operazione non esplicitamente consentita nelle istruzioni. Per qualsiasi informazione rivolgersi al personale qualificato.

- **Per prevenire il pericolo di scosse elettriche è necessario non esporre mai l'apparecchiatura alla pioggia o a qualsiasi tipo di umidità.**
- **Assicurarsi sempre, che l'unità sia propriamente messa a terra e che le connessioni elettriche siano eseguite correttamente.**
- **Questo dispositivo deve essere collegato ad un impianto elettrico dotato di un sistema di messa a terra efficace.**
- **La presa di corrente deve essere vicina all'apparecchio e facilmente accessibile.**

Connessione elettrica nei paesi diversi dagli Stati Uniti

L'apparecchiatura normalmente è spedita con cavo pressofuso con la presa e spina standard IEC. Nel caso della rimozione della spina elettrica, gettarla via immediatamente osservando tutte le precauzioni del caso.
La leggenda dei cavi è la seguente:

VERDE/GIALLO cavo connesso ad "E" (terra)
BLU cavo connesso ad "N" (neutro)
MARRONE cavo connesso ad "L" (fase)

Attenzione! Nel caso in cui l'apparecchio abbia due prese di corrente, assicurarsi che i cavi non siano collegati a fasi diverse della rete elettrica.

Forklaring på sikkerhedssymboler (DK)

Dette symbol gør brugeren opmærksom på vigtig information i den medfølgende manual.

Dette symbol indikerer farlig spænding inden i apparatet. Ingen bruger servicerbare dele i apparatet på brugerniveau.
Dette apparat må kun serviceres af faglærte personer..

Sikkerhedsadvarsler

FORSIGTIG
RISIKO FOR ELEKTRISK STØD
DÆKPLADER MÅ IKKE FJERNES
INGEN BRUGER SERVICERBARE DELE SERVICE MÅ KUN UDFØRES AF FAGLÆRTE PERSONER

Serviceinstruktioner er kun til brug for faglærte servicefolk. For at reducere risikoen for elektrisk stød må bruger kun udføre anvisninger i betjeningsmanualen.
Al service skal udføres af faglærte personer.

- **For at reducere risikoen for elektrisk stød må apparatet ikke udsættes for regn eller fugt.**
- **Sørg altid for at apparatet er korrekt tilsluttet og jordet.**
- **Dette apparat skal forbindes til en nettilslutning, der yder BESKYTTENDE JORD ⏚ og 0 forbindelse skal være tydeligt markeret.**
- **Stikkontakten, som forsyner apparatet, skal være tæt på apparatet og let tilgængelig**.

Nettilslutning i andre lande end USA

Udstyret leveres normalt med et strømkabel med et standard IEC støbt løst hunstik i den ene ende og et standard IEC støbt hanstik i den anden ende. Hvis et af de støbte stik på strømkablet er defekt, skal det straks kasseres på forsvarlig vis. Farvekoden for lederen er som følger:

GRØN/GUL leder forbundet til J (Jord)
BLÅ leder forbundet til 0
BRUN leder forbundet til F(Fase)

Forsigtig Hvis enheden har to lysnetindgange, skal der sørges for at begge ledninger tilsluttes lystnetudgange fra den samme fase.

Förklaring av Säkerhetssymboler (S)

Denna symbol hänvisar användaren till viktig information som återfinns i litteraturen som medföljer. Se manualen.

Denna symbol indikerar att livsfarlig spänning finns på insidan.
Det finns inga servicevänliga delar inne i apparaten.
Denna apparat få endast repareras av utbildad personal.

Säkerhetsvarningar

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT REMOVE COVERS
NO USER SERVICEABLE PARTS
REFER SERVICING TO QUALIFIED PERSONNEL ONLY

Serviceinstruktioner som anges avser endast kvalificerad och utbildad servicepersonal. För att minska risken för elektrisk stöt, utför ingen annan service än den som återfinns i medföljande driftinstruktionerna, om du ej är behörig. Överlåt all service till kvalificerad personal.

- **För att reducera risken för elektrisk stöt, utsätt inte apparaten för regn eller fukt.**
- **Se alltid till att apparaten är ordentligt jordad samt att strömtillförseln är korrekt utförd.**
- **Denna apparat måste bli försörjd från ett strömsystem som är försedd med jordadanslutning ⏚ samt ha en neutral anslutning som lätt identifierbar.**
- **Vägguttaget som strömförsörjer apparaten bör finnas i närheten samt vara lätttillgänglig.**

Strömkontakter i länder utanför USA

Apparaten utrustas normalt med en strömkabel med standard IEC gjuten honkontakt på ena änden samt en standard IEC gjuten hankontakt på den andra änden. Om man måste avlägsna den gjutna hankontkaten, avyttra denna kontakt omedelbart på ett säkert sätt. Färgkoden för ledningen är följande:

GRÖN/GUL ledning ansluten till E (Skyddsjordad ledare)

BLÅ ledning ansluten till N (Neutral ledare)
BRUN ledning ansluten till L (Fas ledare)

Varning! Om enheten har två huvudsakliga elförsörjningar, säkerställ att båda strömkablarna som är inkopplade i enheten arbetar från samma fas.

Turvamerkkien selitys (FI)

Tämä merkki tarkoittaa, että laitteen mukana toimitettu kirjallinen materiaali sisältää tärkeitä tietoja. Lue käyttöohje.

Tämä merkki ilmoittaa, että laitteen sisällä on vaarallisen voimakas jännite. Sisäpuolella ei ole mitään osia, joita käyttäjä voisi itse huoltaa.
Huollon saa suorittaa vain alan ammattilainen.

Turvaohjeita

VAROITUS
SÄHKÖISKUN VAARA ÄLÄ AVAA
LAITTEEN KANSIA EI SISÄLLÄ KÄYTTÄJÄLLE HUOLLETTAVIA OSIA HUOLTO AINOASTAAN AMMATTILAISEN SUORITTAMANA

Huolto-ohjeet on tarkoitettu ainoastaan alan ammattilaisille. Älä suorita laitteelle muita toimenpiteitä, kuin mitä käyttöohjeissa on neuvottu, ellet ole asiantuntija. Voit saada sähköiskun. Jätä kaikki huoltotoimet ammattilaiselle.

- **Sähköiskujen välttämiseksi suojaa laite sateelta ja kosteudelta.**
- **Varmistu, että laite on asianmukaisesti maadoitettu ja että sähkökytkennät on tehty oikein.**
- **Laitteelle tehoa syöttävässä järjestelmässä tulee olla SUOJAMAALIITÄNTÄ ⏚ ja nollaliitännän on oltava luotettavasti tunnistettavissa.**
- **Sähköpistorasian tulee olla laitteen lähellä ja helposti tavoitettavissa.**

Sähkökytkentä

Laitteen vakiovarusteena on sähköjohto, jonka toisessa päässä on muottiin valettu, IEC-standardin mukainen liitäntärasia ja toisessa päässä muottiin valettu, IEC-standardin mukainen pistoliitin. Jos pistoliitin tarvitsee poistaa, se tulee hävittää heti turvallisella tavalla. Johtimet kytketään seuraavasti:

KELTA-VIHREÄ suojamaajohdin E-napaan
SININEN nollajohdin N-napaan
RUSKEA vaihejohdin L-napaan

Huom! Jos laitteessa on kaksi verkkojännitteen tuloliitäntää, niiden johdot on liitettävä verkkopistorasioihin, joissa on sama vaiheistus.

Símbolos de Segurança

P

O símbolo triangular adverte para a necessidade de consultar o manual antes de utilizar o equipamento ou efectuar qualquer ajuste.

Este símbolo indica a presença de voltagens perigosas no interior do equipamento. As peças ou partes existentes no interior do equipamento não necessitam de intervenção, manutenção ou manuseamento por parte do utilizador. Reparações ou outras intervenções devem ser efectuadas apenas por técnicos devidamente habilitados.

Avisos de Segurança

PERIGO
RISCO DE CHOQUE ELÉCTRICO!
NÃO RETIRAR AS PROTECÇÕES
PARTES QUE NÃO REQUEREM INTERVENÇÃO DO UTILIZADOR!
CONTACTAR UM TÉCNICO DEVIDAMENTE HABILITADO!

As instruções de manutenção fornecidas são para utilização de técnicos qualificados. Para reduzir o risco de choque eléctrico, não devem ser realizadas intervenções no equipamento não especificadas no manual de instalações a menos que seja efectuadas por técnicos habilitados.

- **Para reduzir o risco de choque eléctrico, não expor este equipamento à chuva ou humidade.**
- **Assegurar que a unidade está sempre devidamente ligada à terra e que as ligações à alimentação estão correctas.**
- **O sistema de alimentação do equipamento deve, por razões de segurança, possuir ligação a terra de protecção ⏚ e ligação ao NEUTRO devidamente identificada.**
- **A tomada de energia à qual a unidade está ligada deve situar-se na sua proximidade e facilmente acessível.**

Ligação da alimentação noutros países que não os EUA

O equipamento é, normalmente, enviado com cabo de alimentação com ficha IEC fêmea standard num extremo e uma ficha IEC macho standard no extremo oposto. Se for necessário substituir ou alterar alguma destas fichas, deverá remove-la e elimina-la imediatamente de maneira segura.
O código de cor para os condutores é o seguinte:

Condutor VERDE/AMARELO ligado a E (Terra)
Condutor AZUL ligado a N (Neutro)
Condutor CASTANHO ligado a L (Vivo).

Atenção: Se a unidade tem duas fontes de alimentação assegurar que os dois cabos de alimentação estão ligados a tomadas pertencentes à mesma fase.

Επεξήγηση των Συμβόλων Ασφαλείας

G

Αυτό το σύμβολο παραπέμπει το χρήστη σε σημαντικές πληροφορίες που συμπεριλαμβάνονται στο συνοδευτικό εγχειρίδιο.

Αυτό το σύμβολο υποδεικνύει ότι στο εσωτερικό υφίστανται επικίνδυνες ηλεκτρικές τάσεις. Στο εσωτερικό δεν υπάρχουν επισκευάσιμα μέρη. Αυτή η μονάδα πρέπει να επισκευάζεται μόνο από ειδικά εκπαιδευμένο προσωπικό.

Προειδοποίηση Ασφαλείας

CAUTION

Οδηγίες επισκευής, όπου παρέχονται, αναφέρονται αποκλειστικά και μόνο σε εξειδικευμένο προσωπικό. Για να μειωθεί ο κίνδυνος ηλεκτροπληξίας, μην εκτελείτε επισκευές πέρα από μόνο τις συμπεριλαμβανόμενες στο εγχειρίδιο των οδηγιών, εκτός και αν έχετε τα απαραίτητα προσόντα για να το κάνετε. Όλες οι επισκευές να εκτελούνται από ειδικά εκπαιδευμένο προσωπικό.

- Για να μειώσετε τον κίνδυνο ηλεκτροπληξίας μην εκθέτετε τη συσκευή σε βροχή ή υγρασία.
- Πάντα να εξασφαλίζετε τη σωστή γείωση της συσκευής και τη σωστή σύνδεση των συνδέσμων τροφοδοσίας.
- Ο εξοπλισμός πρέπει να τροφοδοτείται από ένα σύστημα τροφοδοσίας που να εξασφαλίζει ΠΡΟΣΤΑΤΕΥΤΙΚΗ ΓΕΙΩΣΗ ⏚ και να έχει καθορισμένες θέσεις ουδέτερου και φάσης.
- Ο εξοπλισμός που τροφοδοτεί τη συσκευή θα πρέπει να βρίσκεται κοντά στη συσκευή και να είναι εύκολα προσβάσιμος.

Σύνδεση τροφοδοσίας σε χώρες εκτός των ΗΠΑ

Ο εξοπλισμός συνοδευέται συνήθως από ένα καλώδιο τροφοδοσίας με ένα σταθερό βύσμα τροφοδοσίας ρεύματος τύπου πυραμίδας στη μια άκρη του και μια σταθερή υποδοχή τροφοδοσίας ρεύματος τύπου πυραμίδας στην άλλη άκρη του. Εάν χρειαστεί να αφαιρέσετε το σταθερό βύσμα τροφοδοσίας μην το επαναχρησιμοποιείτε, θεωρείται άχρηστο. Ο χρωματικός οδηγός για το καλώδιο τροφοδοσίας είναι ο παρακάτω :

ΠΡΑΣΙΝΟ/ΚΙΤΡΙΝΟ καλώδιο συνδέεται στο E
(Προστατευτικός Αγωγός Γείωσης)

ΜΠΛΕ καλώδιο συνδέεται στο N
(Ουδέτερο Αγωγό)

ΚΑΦΕ καλώδιο συνδέεται στο L (Αγωγό Φάσης)

ΠΡΟΣΟΧΗ! Αν η μονάδα έχει δύο τροφοδοτικά βεβαιωθείτε ότι και τα δύο καλώδια τροφοδοσίας είναι συνδεδεμένα σε εξόδους τροφοδοσίας που βρίσκονται στην ίδια φάση.

Products employing Lithium batteries

CAUTION
This equipment contains a lithium battery.
There is a danger of explosion if this is replaced incorrectly.
Replace only with the same or equivalent type.
Dispose of used batteries according to the instructions of the manufacturer.
Batteries **shall only** be replaced by trained service technicians.

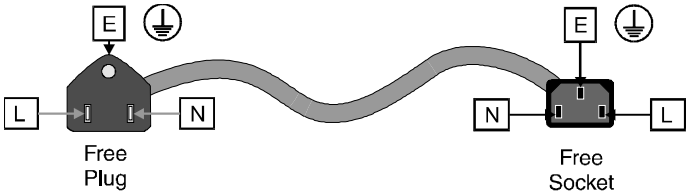
Power cable supplied for the USA

The equipment is shipped with a power cord with a standard IEC molded free socket on one end and a standard 3-pin plug on the other. If you are required to remove the molded mains supply plug, dispose of the plug immediately in a safe manner. The color code for the cord is as follows:

GREEN lead connected to E (Protective Earth Conductor)

BLACK lead connected to L (Live Conductor)

WHITE lead connected to N (Neutral Conductor)



For products with more than one power supply inlet

Caution: To reduce the risk of electric shock plug each power supply cord into separate branch circuits employing separate service grounds.

Rack Mounting the Enclosure

This product must not be rack mounted using only the front rack ears.

When rack-mounting the product, one of the following methods of installation must be used: -

- Place the unit on a suitably specified, and installed rack shelf and secure the product to the rack via the front rack ears or,
- Fit the unit using the rear rack mount kit available from Snell & Wilcox by quoting the order code FGACK RACK-MNT-KIT.

EMC Standards

This unit conforms to the following standards:

Electromagnetic Compatibility-Generic Immunity Standard BS EN 50082-1:1992

The European Standard EN 50082-1:1992 has the status of a British Standard and is related to European Council Directive 89/336/EEC dated 3rd May 1989.

Electromagnetic Compatibility-Generic Emission Standard BS EN 50081-1:1992

The European Standard EN 50081-1:1992 has the status of a British Standard and is related to European Council Directive 89/336/EEC dated 3rd May 1989.

Federal Communications Commission Rules Part 15, Class A :1998

Safety Standards

This unit conforms to EN60065:1992 as amended by amendment A1(May 1993) and amendment A2(March 1994). Specification for safety of technology equipment, including electrical business equipment.

EMC Performance of Cables and Connectors

Snell & Wilcox products are designed to meet or exceed the requirements of the appropriate European EMC standards. In order to achieve this performance in real installations it is essential to use cables and connectors with good EMC characteristics.

All signal connections (including remote control connections) shall be made with screened cables terminated in connectors having a metal shell. The cable screen shall have a large-area contact with the metal shell.

COAXIAL CABLES

Coaxial cables connections (particularly serial digital video connections) shall be made with high-quality double-screened coaxial cables such as Belden 8281 or BBC type PSF1/2M.

D-TYPE CONNECTORS

D-type connectors shall have metal shells making good RF contact with the cable screen. Connectors having "dimples" which improve the contact between the plug and socket shells, are recommended.

About this Manual

This manual covers the following products:

CPP200-1
- CPP200 noise reducer. Digital component input.
- Digital component output.

CPP200-D
- CPP200 noise reducer with digital decoder.
- Digital component input.
- Analogue Composite input.
- Digital component output.

CPP200-G
- CPP100 noise reducer with 'Golden Gate' decoder.
- Digital component input.
- Analogue Composite input.
- Digital Composite input
- Digital Component output.

Packing List

The unit is supplied in a dedicated packing carton provided by the manufacturer and should not be accepted if delivered in inferior or unauthorised materials. Carefully unpack the carton and check for any shipping damage or shortages.

Any shortages or damage should be reported to the supplier immediately.

Enclosures:

- PREFIX CPP200 Unit
- Power cable
- Operator's Manual

Software Version Amendments

Notes about Versions Fitted

Firmware. When shipped this product is fitted with version 1.4.5

Manufacturers Notice

Table of Contents

SECTION

Product Support Procedure

If you experience any technical or operational difficulties with a Snell & Wilcox product please do not hesitate to contact us or utilize our online form to request assistance.

There is a lot of information you can give us that will enable us to diagnose your problem swiftly. Please read the following guidelines, as these suggestions will help us to help you.

Basic Information

For Units ..... Please provide the exact product Model, unit Serial Number and Software Version information.

For Cards or Modules . Please provide the Sub-Assembly Number, card Serial Number and the Software Version information.

Basic Application

Inputs ..... Please provide full details of the Input Signals being used including any references etc. and where they are being generated.

Outputs ..... Please provide full details of the Output Signals required and how they are being monitored.

System ..... Please provide a brief description of the system in which your S&W equipment is currently being used.

Basic Tests

Preset Unit ..... Please use the Preset Unit function to return the settings back to the factory default.

RollCall ..... Is your unit currently connected to a RollCall capable PC? This software is obtainable for free and provides a very user friendly GUI for virtually all S&W equipment - perfect for complex products, large systems or those with passive front panels.

Card Edge Info. ..... What is the status of the card edge LEDs or display? These can often provide information such as power status and input detection conditions.

Internal TPG ..... Many S&W products have an internal test pattern/tone generator. Please activate this to assist you with your problem analysis.

In addition to the above, please do not forget to provide us with all of the necessary contact information:

- Names
- Telephone & Fax numbers
- e-mail addresses
- Business address

A form has been provided for this information and will be found on the next page or an on-line form is available on the Snell & Wilcox website at:

http://www.snellwilcox.com/support/request

Product Support Request Form

Name: *		
Company:		
Address Details: *		
Post/ZIP Code:		
Country: *		
Telephone: *		
Fax:		
Email: *		
Local S&W Center: *		
Product Name: *		
Product Type: *	Switchers (i.e. Magic DaVE, Switchpack, Kahuna)	
	File & Data Transfer Products (i.e. RollCall, Memphis & iCR)	
	Video Products (i.e. Modular, Kudos Plus and Alchemist)	
Unit Serial Number: *		
Fault/Spare Part Information: * (please advise us how many units show this fault and the system layout showing all other manufacturers' products)		
*** Preferred Method of Contact:**	e-mail	
	Phone	

- **Item is required.**

Please mail to:	Snell & Wilcox Ltd., Southleigh Park House, Eastleigh Road, Havant, Hants, PO9 2PE. United Kingdom.	**Service Contact Information:** Tel: +44 (0) 2392 489058 Fax: +44 (0) 2392 489057 http://www.snellwilcox.com/support ftp://ftp.snellwilcox.com/support

Manual Revision Record

Date	Version No.	Issue No.	Change	Comments
	1	1	First Issue	Software Version 1.42b
060598	1	2	Latest software revision	Software Version 1.5
210599	1	3	Includes –G Decoder	Complete manual issued
161100	1	4	New page 0.4 with Firmware version No added. Software data removed from all pages of manual	Complete manual issued
251006	1	5	New logo & support data added	New issue released

Description

Compressors demand extremely high quality inputs if artefacts are to be minimised. A compressor may work well on clean signals from a component digital recorder, but real world signals from analogue, composite or film sources can cause serious problems.

MPEG works by sending the differences between successive pictures. Noise is particularly difficult as it causes random changes from one picture to the next. The compressor tries to encode these changes, using up valuable data capacity. With the powerful noise reduction and pre-processing of PREFIX a compressor can more fully utilise the available bandwidth.

Prefix operates in the component 4:2:2 domain and has a number of distinct filters, each 'tuned' to remove a specific type of noise.

The subsampling nature of MPEG precludes the transmission of some high frequency information. Moreover, high frequency aliasing can occur without adequate pre-filtering. Prefix has a range of 3D de-enhancement filters that allow selective reduction of high frequencies prior to the encoder.

As well as reducing noise, for picture sources that have been band limited Prefix contains a sophisticated detail enhancer. The enhancer works to 'sharpen' detail in the picture without introducing ringing or overshoots normally associated with enhancers. The level of enhancement can be subjectively selected by the user to suit the bandwidth of the material and coring facilities ensure that low level noise is not enhanced.

Residual subcarrier and cross effects can also cause a compressor similar problems; hence PREFIX contains an adaptive field based digital comb filter capable of providing excellent luma/chroma separation. The design utilises techniques derived from work pioneered by the BBC Research department, and ensures exceptional stability, excellent subcarrier rejection and repeatable results.

In today's studio environment, digital audio embedding is becoming more commonplace and offers substantial routing and timing advantages. Prefix offers the option of an audio embedding card that will embed up to 4 channels of audio in the digital component output. Audio ADC conversion, delay, AES formatting and SMPTE-259M-C formatting is included on this card.

PREFIX also has a number of other features including test pattern generation, SMPTE-259M-C digital component inputs, an integral synchroniser, capable of genlocking to either an analogue studio reference or the currently selected input and unique picture splitting facilities.

Behind the hinged front panel is a status display and menu control system. The system's functionality can be controlled from the 4-button and display system present on the upper-most card in the system (if optional decoder is fitted).

Alternatively, the units can be controlled from a RollCall "shoebox" remote control unit.

The processor cards are housed in a 2RU, 19-inch rack that also contains the automatic switched mode power supply, axial cooling fan and connectors.

Features

- Minimum 10 bit processing throughout the system.
- Adaptive Field Comb Filtering and proc. amp facilities (with optional decoder).
- Full frame synchroniser with H&V offset control. The synchroniser is capable of locking to either the analogue studio reference signal or the currently selected input (digital or analogue).
- Seven Filters
  - Recursive filter

    Unique filter biasing and motion adaption algorithms
  - Semi-transversal filter

    Enhances Recursive filter performance.

    Increases Overall noise reduction.
  - Median filter

    Selective median filtering only filters suspect pixels.
  - Spatial Filter

    Spatial median filter for improved noise reduction
  - Linear filters

    A suite of linear filters : Brickwall & Gaussian Low-pass/High-pass.
  - Scratch Filter

    Vertical scratch filter
  - Enhancer

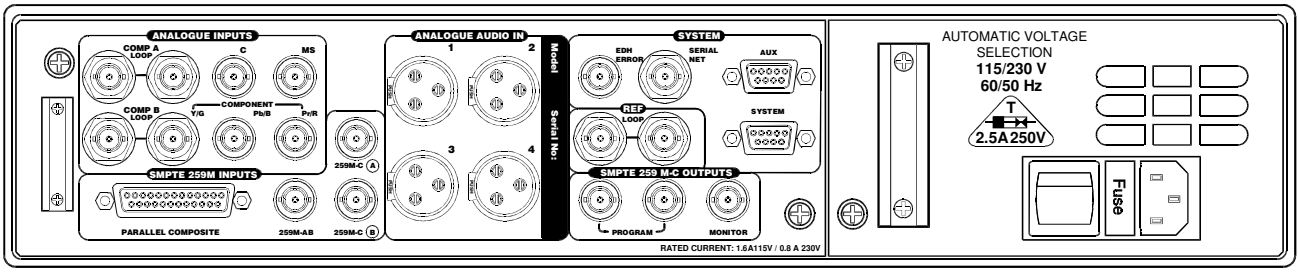
    Sophisticated spatial detail enhancer utilising non-linear and linear processing

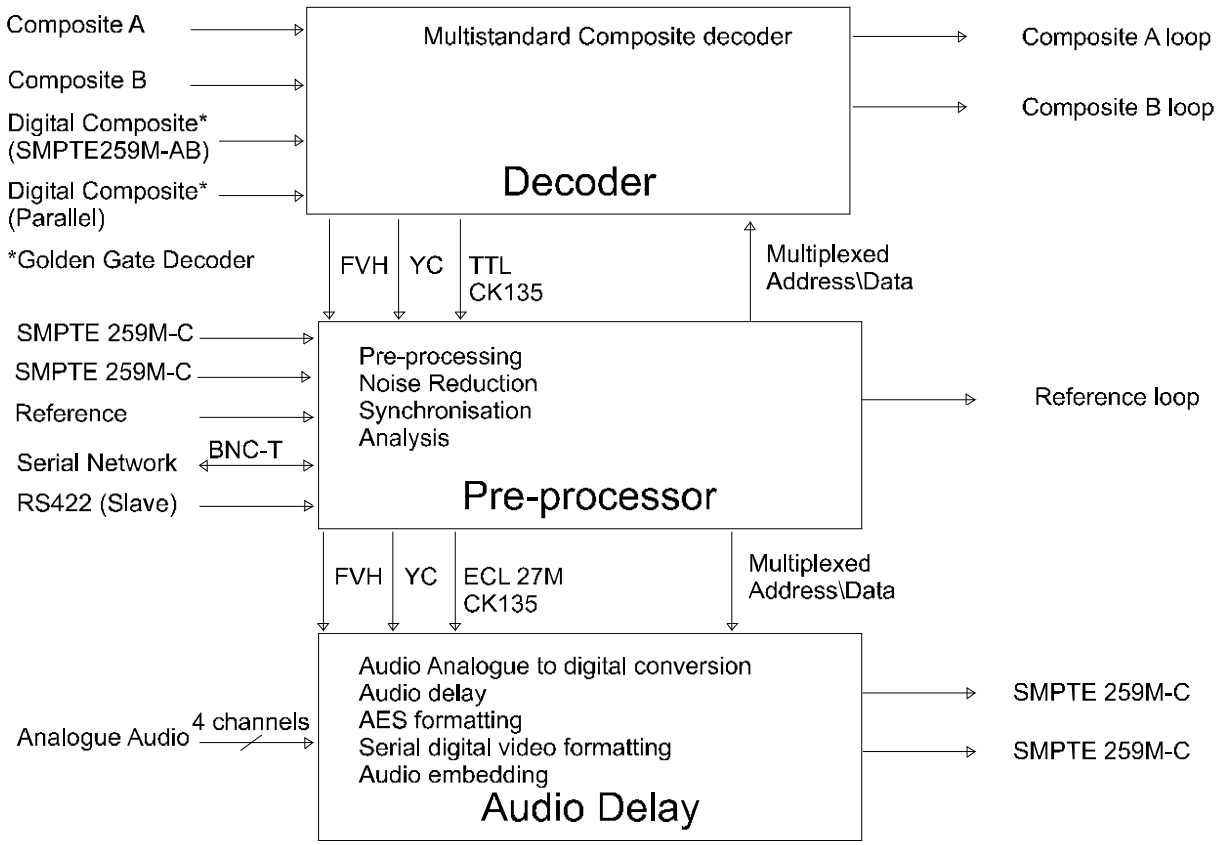
    Unique decoder matching and video filters

    MPEG De-Enhancement filters

- EDH extraction and status check
- Full remote control facility using Snell & Wilcox proprietary serial BNC system 'RollCall'
- Internal test pattern generation
- Audio processing and embedding. Conditioning and conversion of analogue audio channels into Digital format. The digital audio is inserted into the CCIR 656 stream in channel positions 1-4 respectively.

I/O & Interconnection





Composite inputs are decoded using an adaptive field-based comb-decoder and passed down the backplane to the pre-processor card as separated luminance and multiplexed U\V. Up to two composite loop-through inputs can be applied simultaneously to the unit with switch selection between them on the decoder.

In addition to composite inputs, up to two serial digital component (SMPTE259M-C) inputs can be applied directly to the pre-processor. Source switching between digital inputs is accomplished on the pre-processor card.

An analogue loop-through reference may also be applied to the pre-processor card if the output is required to be synchronised to a station reference. External communication is via a serial network (described more fully later) connection to the pre-processor card. Internal communication is facilitated by a conventional CPU bus link (address/data, ALE, WR, RD) between the three cards.

Filtered data is sent from the pre-processor card down the backplane to the audio delay card using the same luminance and multiplexed U/V format. Up to 4 channels of analogue audio are digitised and formatted to AES specification. A phase-locked PLL circuit on the audio delay locks the 48kHz audio rate to the video output from the pre-processor. Video and formatted audio is then serialised into a 270Mbit/sec output as per SMPTE 259M-C.

Pre Processor Overview

Recursive Filter

Recursive filters reduce noise by temporally averaging successive pictures. Utilising delays of exactly one picture or frame, noise can be reduced in stationary areas without loss of spatial (horizontal and vertical) resolution. Although temporal recursive filters offer considerable levels of noise reduction, sophisticated control logic is required to ensure that picture detail is preserved at higher noise settings.

In particular, analysis of the noise floor level is necessary to set movement thresholds at levels that are just above the noise floor. At optimum settings this allows maximum noise reduction and simultaneously maximum sensitivity to movement.

Auto Threshold Bias

In auto threshold mode the noise detection algorithm may be given a subjective bias to give more or less noise reduction. Modification of the bias should not be necessary under normal circumstances.

Y And C Recursive levels

These settings change the amount of noise reduction for luminance (Y) and chrominance (C) by limiting the maximum level of noise reduction. The actual level of noise setting is dynamically adjusted on a pixel-by-pixel basis with regard to the noise setting for the same pixel in the previous frame. Other factors such as movement contribute to the current pixel setting. This mechanism ensures that the optimum level of noise reduction is applied to each pixel.

Threshold

This sets the threshold for the motion detector. The lowest level of 0 gives the greatest sensitivity to motion, but allows more noise to break through, while 15 gives the greatest noise reduction but can lead to excessive filtering of low-level textures. When this is set to auto the threshold is dynamically set to an appropriate value for the current input noise level.

Semi Transversal

The semi-transversal filter is a uniquely patented design that operates in conjunction with the recursive filter to increase its effectiveness. Quite unlike traditional transversal filters it operates by selecting the most appropriate outputs from a chain of picture stores at the output of the recursive filter.

An algorithm is used to determine which of the stores contains the highest level of noise-reduced picture. The overall effect is to increase the amount of noise reduction in a typical picture. For example, moving objects cause the recursive filter to turn off at the edge of the moving object. This leads to a recurrence of noise that takes a number of frames to reduce to the defined user level. The semi-transversal filter is able to monitor the recurrence of noise and delay the output of the recursive filter up to a maximum of three frames. Operating on a pixel-by-pixel basis, the overall level of noise reduction in a typical picture is maintained at a more uniform level and is less dependent on movement.

As the semi-transversal filter complements the recursive filter, it cannot be utilised without the recursive filter. Effective at all recursive filter settings its operation can be seen as a reduction in the level of revealed noise trail following moving objects.

The semi-transversal filter operates in a fully automatic mode - there are no user adjustments required.

Median Filter

Median filters can be effective at removing impulse noise. They operate by rank filtering pixels from an odd number of aperture points yielding the median value. The aperture set may utilise the surrounding pixels from the same field or more usually some combination of pixels from current and adjacent fields or frames.

When a pixel is judged to be in error it is replaced by the median value of the aperture set. Pixels judged not to be in error remain unaltered. The algorithm is therefore quite specific about the areas of the picture which are filtered.

An algorithm utilises both spatial and temporal gradient information to determine if the suspect pixel has impulse noise characteristics.

Median level

Six settings are provided for the median filter level control. The low setting provides modest filtering and has high rejection of false alarms caused by picture movement and texture etc. The medium and high settings are biased increasingly towards removal of larger dropouts and dirt but consequently may have a higher false alarm rate resulting in a general softening of the picture.

Spatial Filter

Spatial filtering typically involves filtering using an aperture that comprises adjacent pixels from the same field period. Spatial median filters can be effective at suppressing impulse noise originating from film dust or small dropouts. However they are also effective as Gaussian noise reduction filters.

Y And C Spatial Levels

The spatial filter operates by median filtering a small kernel of adjacent pixels and then comparing the median filtered pixel level with the current pixel. The spatial filter has three level settings that are used to vary the comparison threshold and effectively set the balance between the level of noise suppression and detail preservation. Typically used in conjunction with other temporal based filters such as the recursive and transversal filters, spatial noise reduction can increase the overall noise reduction level.

Linear Filters

A suite of linear filters allows fine control of the horizontal bandwidth of the luminance signal.

Brickwall low-pass filters ranging from 2.5MHz to 4.2MHz provide good band-limiting facilities for MPEG encoders that use half resolution processing. These filters also provide variable peaking or boosting at each of the selected cut-off frequencies. Boosting prior to brickwall filtering can raise the overall perception of picture sharpness. In addition to the above filters there is a set of extra low pass filters where greater band limiting is required. These filters have a cut-off ranging from 2.4MHz to 0.9MHz.

The ten sets of Gaussian low-pass filters gently attenuate high frequencies and can be used to correct material which has previously been boosted or enhanced as well as reducing high frequency noise.

Similarly, five sets of Gaussian high-pass filters provide variable correction of high-frequency luminance that may have been attenuated from faulty distribution links or analogue VTR processes.

Scratch Filter

This filter has been designed to detect and repair vertical scratches, of variable contrast, and length, be they black, white or both, while maintaining picture quality where there are no scratches. To maximise the benefit obtained from this filter, a suite of filter strengths has been provided.

Enhancer

The enhancer menu contains four different types of filters: Enhance, MPEG De-enhance, Decoder matching and Video mode. These filters are exclusive and cannot be applied at the same time.

For example, it would be inappropriate to simultaneously enhance and de-enhance the picture and this option is excluded. Similarly, video modes (which utilise the same adjacent fields and lines as the de-enhancement filters) cannot be selected at the same time as any of the other three filters.

The enhancer uses a combination of linear and non-linear processes to generate edge correction and peaking correction signals. The use of non-linear processing ensures that high levels of correction are possible without introducing edge distortion such as overshoots and ringing normally associated with traditional frequency boosting techniques.

Three settings of enhancement are provided for both luminance and chrominance. Coring controls can be used for noisy inputs to prevent enhancement of low level noise. Three settings are provided for both luminance and chrominance coring.

De-enhancement filtering can be used to suppress high vertical/temporal frequencies that the MPEG encoder may not be able to efficiently encode.

Material that originated on video with 60Hz or 50Hz temporal sampling will encode less efficiently than 24Hz film originated material. For fixed or multiplexed bit rate systems suppression of high diagonal frequencies can reduce the peak bit rate requirements.

A three dimensional vertical temporal filter is used to provide suppression of moving and static diagonal frequencies.

Three filter settings are provided for both luminance and chrominance. They can be used to adjust the degree of filtering from partial suppression of diagonal frequencies at the low setting to full suppression of diagonal frequencies over a wide horizontal band at the high setting. Purely horizontal frequencies remain unfiltered.

Three decoder matching settings are provided: Line Comb, Field Comb and Other.. The purpose of each of these filters is to provide complementary filtering from a composite source which has been decoded using a comb decoder such as NTSC/PAL line or field comb.

A composite comb decoder will use a spatial or a vertical/temporal aperture to separate luminance from chrominance. With knowledge of the comb structure the decoder matching filters in Prefix filter areas of the spectrum which the composite decoder has not previously filtered.

Cross-effects such as cross-colour (high frequency luminance in chrominance) and cross luminance (residual chrominance in luminance) are reduced in amplitude.

The Line Comb setting is used for decoders which utilise a line comb structure (vertical filter using adjacent lines) for Y/C separation. The Field Comb setting is used for decoder which utilise a field comb structure based on 312H (PAL) or 263H (NTSC) diagonal vertical/temporal filters such as the Prefix internal field comb decoder.

For simple or notch decoders which do not utilise a comb decoder strategy for Y/C separation or where the Y/C separation strategy is unknown, the *Other* setting provides good suppression of high frequency diagonal components which may have originated from cross-effects.

For video based inputs two modes of video filtering can be used to reduce the temporal bandwidth of the video source to 30/25Hz from an original 60/50Hz. These operate by filtering and subsampling the video inputs so that the output rate has been temporally reduced.

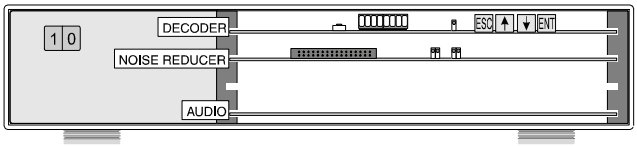
An MPEG encoder operating in video mode will be able to encode the filtered output more efficiently by utilising the high level of correlation between adjacent fields.

The two video modes are filtered differently prior to temporal subsampling. *Mode 1* provides a sharper picture with a stronger 25Hz inter-frame component than *Mode 2* which has no inter-frame component but has less overall vertical/temporal bandwidth. The choice will be dependent on the available MPEG bit rate and subjective picture tests.

Installation

PREFIX is supplied in a dedicated carton provided by the manufacturer and should not be accepted if delivered in inferior or unauthorised material. Carefully unpack the unit and check for any shipping damage or shortages. If you encounter any problems please report them to the supplier immediately.

IMPORTANT NOTE : In case of complaint the packing material should be retained for inspection by the carrier.



(Decoder –D version shown fitted)

The unit is designed for mounting in a 2RU slot in a 19" racking system.

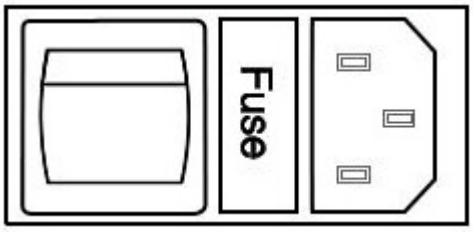
The chassis is equipped with a pair of mounting ears attached to the side plates. Suitable screws should be inserted through the holes in these flanges to secure the chassis to the racking system. Ensure that the rack is correctly configured to accept the 2U unit with chassis runners positioned to support the unit.

Under no circumstances should the unit be hung from its rack ears alone as this will result in irreparable damage to the case.

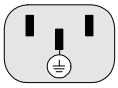
Whilst mounting the unit please try to ensure that there is adequate air flow to the rear of the unit.
If a PREFIX is to be mounted in a rack together with convection cooled equipment, e.g. Analogue distribution amplifiers ensure that it is not located above or interspersed with these units. The equipment should be operated in an environment having a temperature between 0°C and +40°C and a relative humidity of less than non-condensing.

The front panel is opened by pulling the two catches forwards. We have found that the easiest way of doing this is with your thumbs! The internal hinge mechanism has been designed so that the panel can hinge forwards and to the left to leave unrestricted access to the boards.

Electrical Connection



The power supply accepts AC mains in the range 90 to 250 Volts AC @ 50Hz to 60Hz and will auto switch to these standards. The main power connection, located at the rear of the unit, is made via a fused IEC320 inlet socket (fuse 2.5 AT, Max Current 1.8A) with the middle pin as earth conductor. This electrical connection should be located as close to the unit as possible to facilitate easy isolation.



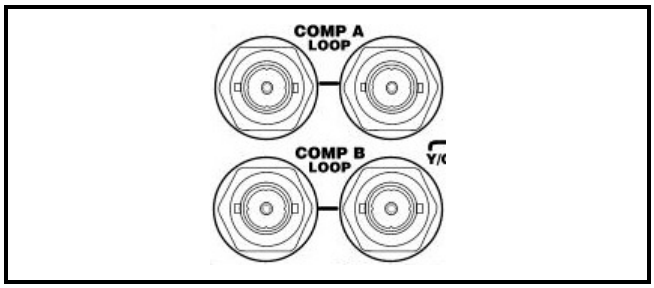
Earth Connection

Power Switch

The unit has two ON / OFF switches. One is located behind the front panel, the other on the rear of the unit. Both need to be in the ON position for the unit to function.

Signal Connections

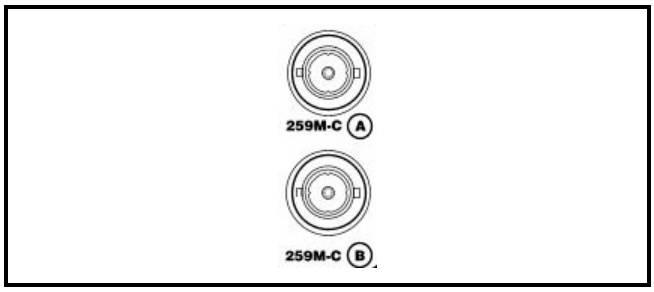
All external signal connections are made via the rear panel.



Composite Analogue Inputs

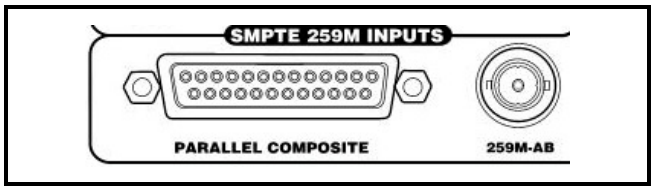
The rear panel supports these inputs which are labelled as COMP A and COMP B with loop through indication. Nominal input level for analogue video is 1V peak to peak and a 75-Ohm termination must be fitted if the loop through facility is not used.

Digital Inputs



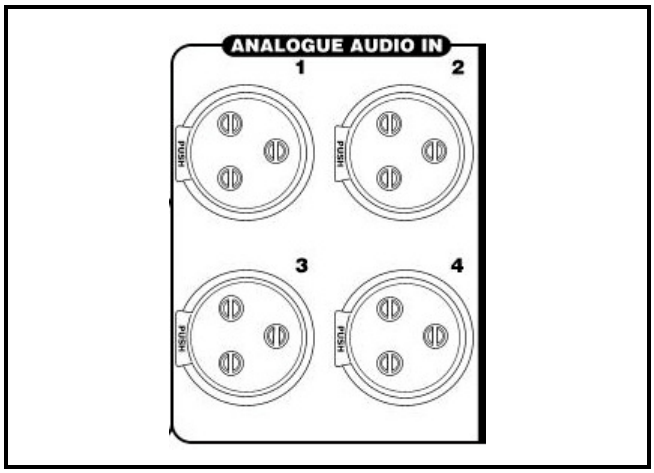
The BNC connectors labelled 259M-C A and B accept digital signals.

Golden Gate' Option

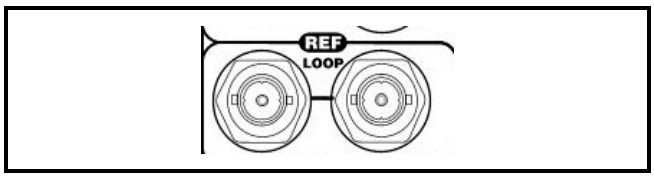


The 'Golden gate' option has two digital inputs. One input is for serial digital video (in accordance with SMPTE 259M-AB). The other input is for parallel composite digital video via DB25 connector (terminated in 110 Ohms ± 10 Ohms). 10m maximum cable length using shielded multi-core cable.

Analogue Audio Inputs



These inputs require locking XLR connectors. To remove the connector the release tab must be pushed in.

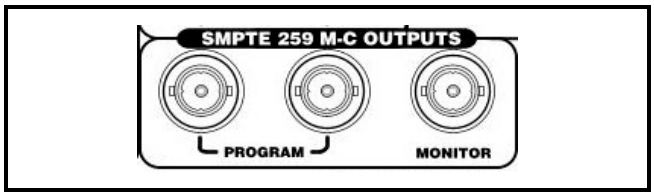


Reference Input

The reference accepts analogue video with a nominal input level of 1V peak to peak. A 75-Ohm termination must be fitted if the loop through facility is not used.

Digital Outputs

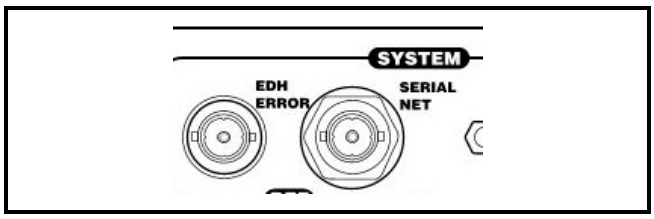
These are the SMPTE 259M-C outputs from the unit via BNC connectors. They are component digital outputs, both of which can be used simultaneously.



Note
To aid compliance with EMC/RFI regulations, we recommend the use of high quality co-axial cable type BBCPSF1/2 or equivalent.

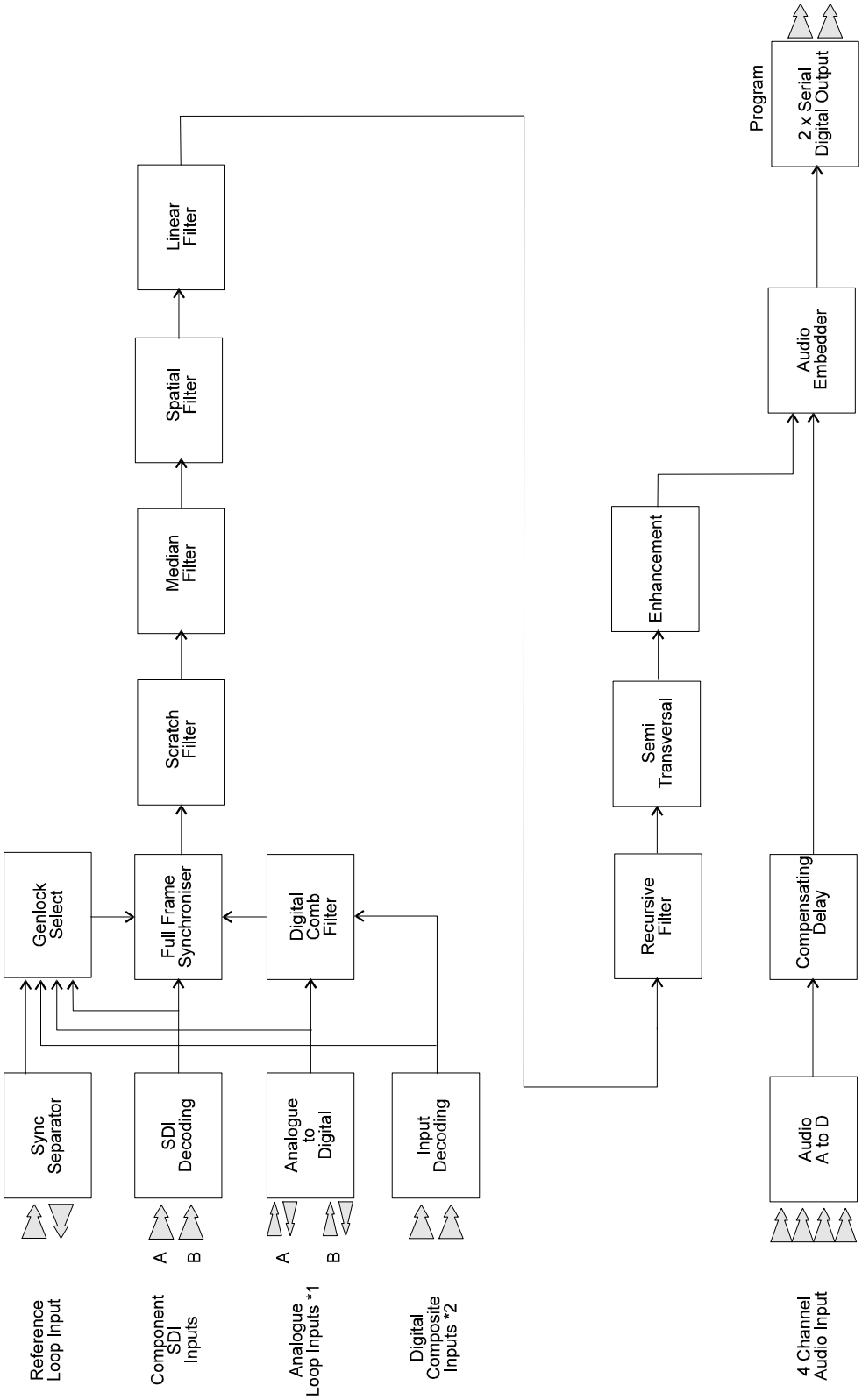
Remote Control

Interface to the "RollCall" communications network is via the single BNC connector labelled Serial Net. Connections should be made by means of a `T' piece (Zo=75 Ohms) to a 75 Ohm cable system with both extremities terminated in 75 Ohms.



Under no circumstances should the "RollCall" network be directly connected to any other communications network such as a computer "Ethernet" system.

Block Diagram

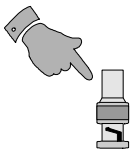


*1 - Only available with decoder options

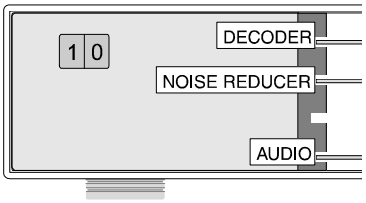
*2 - Only available with Golden Gate decoder option

Getting Started

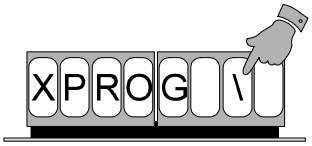
Connect up the unit so that there is a Analogue Composite video signal applied to the composite input or a Serial Digital video signal applied to the SMPTE259M-C serial input. For Composite inputs REMEMBER to fit a termination if the video loop through is not used. Either one of the 2 serial outputs can be used. A reference signal may be connected if required.



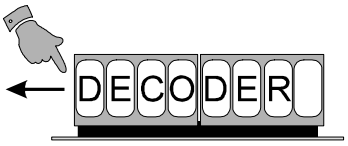
The front panel is opened by using the two black catches at either end of the panel. We have found the best way of opening the panel is to use your thumbs to release the catches and then ease the panel sufficiently forward to take hold of it. Carefully hinge the assembly forward.



Turn the unit on. If the unit does not power up check the switch on the rear panel, and the fan should be audible.



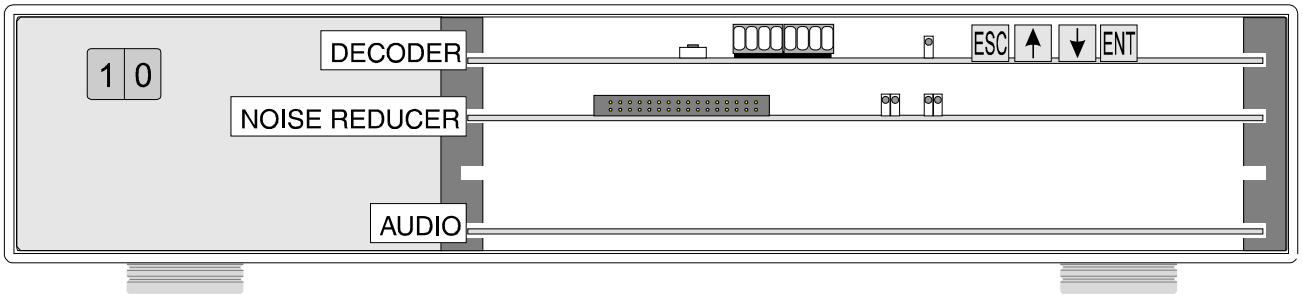
The display will indicate that the Xilinx devices are being configured. The bar at the end of the message will rotate during this process.



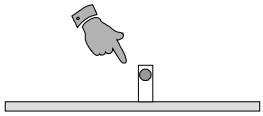
A scrolling message will then display the unit's name and the configuration status.

The initialisation sequence is now complete and the output should be the decoded input.

Card Edge Functions

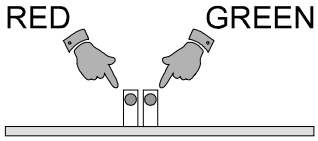


Decoder Card (Option D)

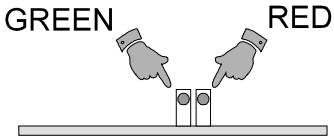


The upper card is the decoder. The LED will illuminate if there is a loss of syncs on the analogue input

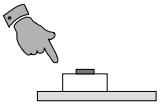
Noise Reducer



The right hand pair of LEDs indicate the condition of CPU A. The GREEN LED flashes when the CPU is in normal operation. The RED LED illuminates on power-up and if an internal error occurs.



Similarly the left hand pair of LEDs indicate the condition of CPU B.

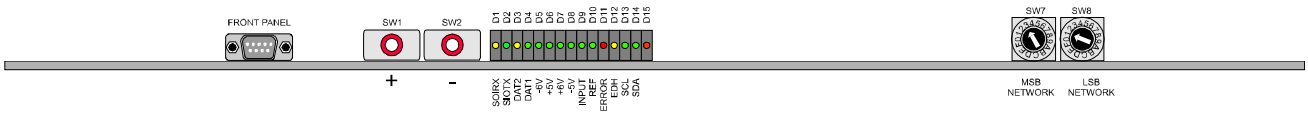


If for any reason the menu system should hang the CPU can be restarted with the CPU RESET switch.

Audio

There are no indicators or switches on this card.

Decoder Card – 'Golden Gate Option



Adjustment of the settings for the CPP200 is available via the RollCall remote control system.

LED INDICATORS

D1 (SOIRX)

This indicator will flash when RS422 data is being received from the remote control port.

D2 (SIOTX)

This indicator will flash when RS422 data is being transmitted to the remote control port.

D3 (DAT2)

This indicator will flash when network data is being received from the RollCall remote control port.

D4 (DAT1)

This indicator will flash when network data is being transmitted to the RollCall remote control port.

D5, D6, D7 & D8

These indicate that the -6 V, +5 V, +6 V and -5 V power supplies are present.

D9 (INPUT)

This indicates the presence of a decoder composite input.

D10 (REF)

This indicator is non-operational

D11 (DECODER ERROR)

This indicates a decoder error

D12 (EDH)

This indicator will flash when EDH errors are detected

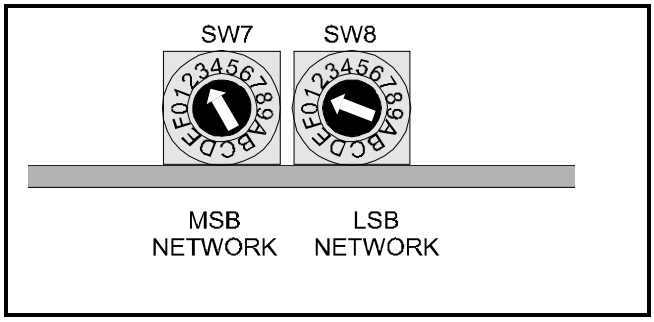
D13 (SCL) and D14 (SDA)

These are internal status indicators

D15 (ILF)

This indicator will flash if an internal load fault is detected; continuous illumination indicates a faulty unit.

SW7 and SW8



These two switches enable the RollCall network address to be set. SW7 sets the MSB (most significant bit) and SW8 sets the LSB (least significant bit)

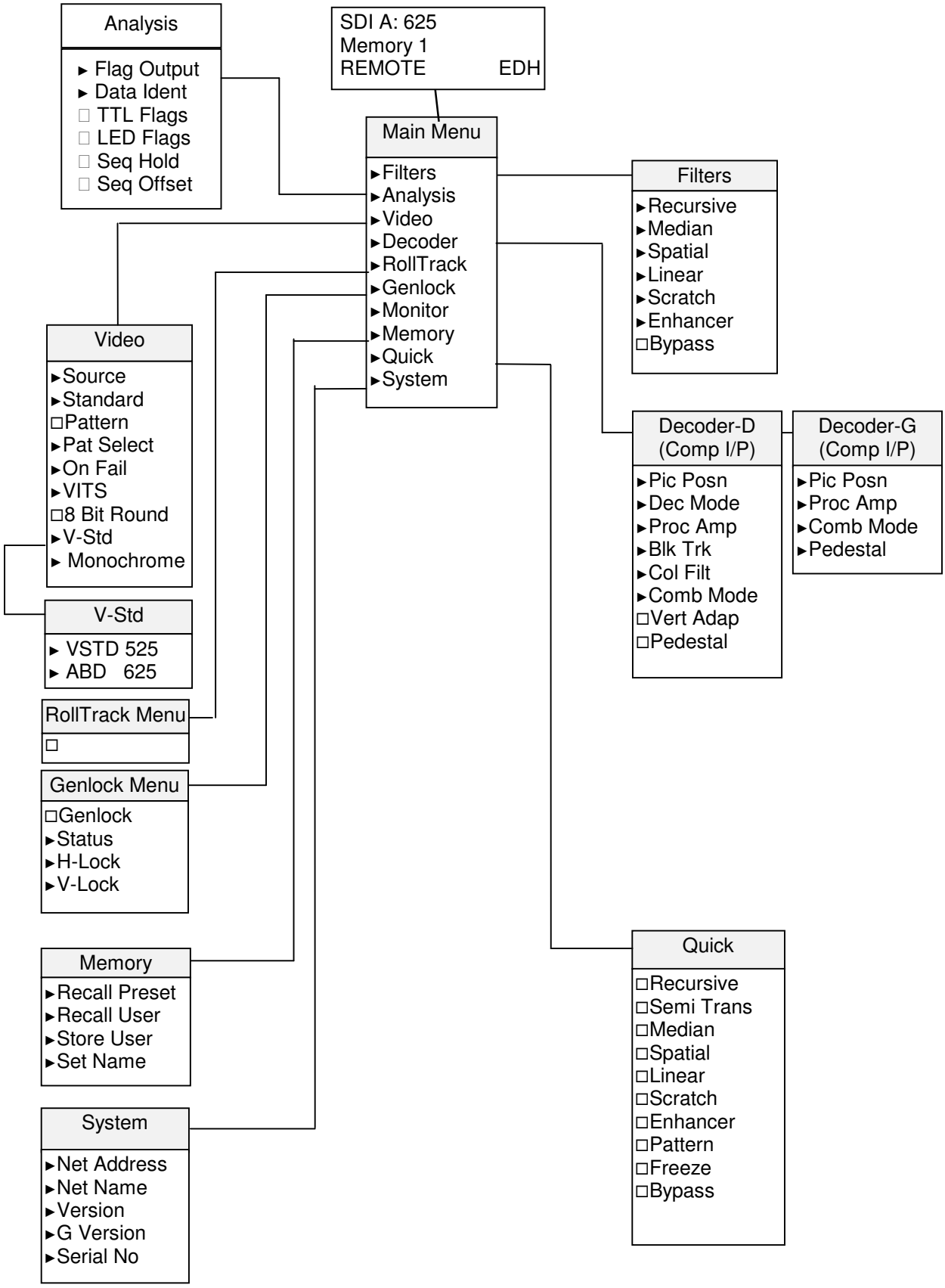
SW7 is factory set to position 3 and SW8 is factory set to position 1.

SW1 and SW2

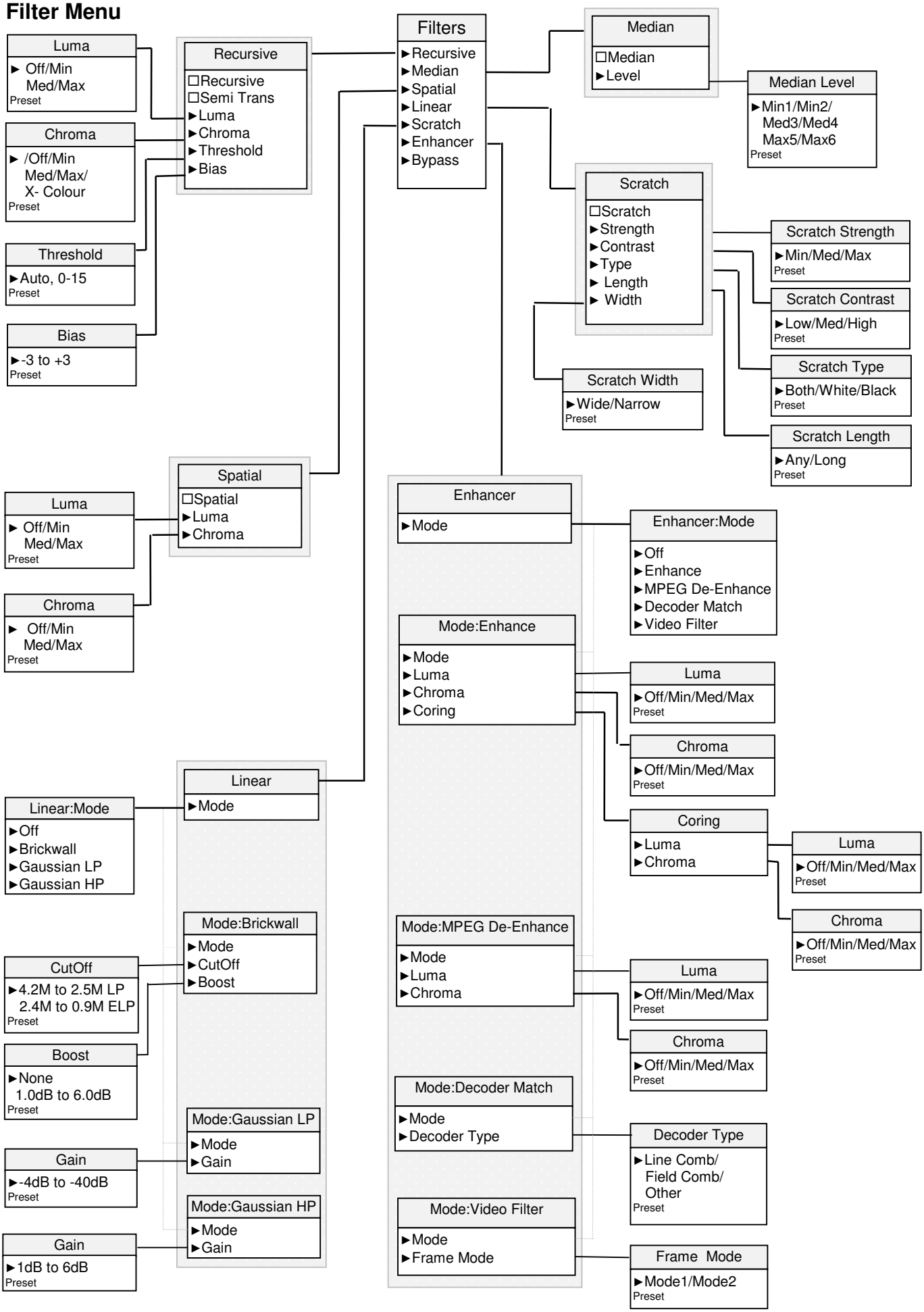
These switches have no function on this card.

Menu System

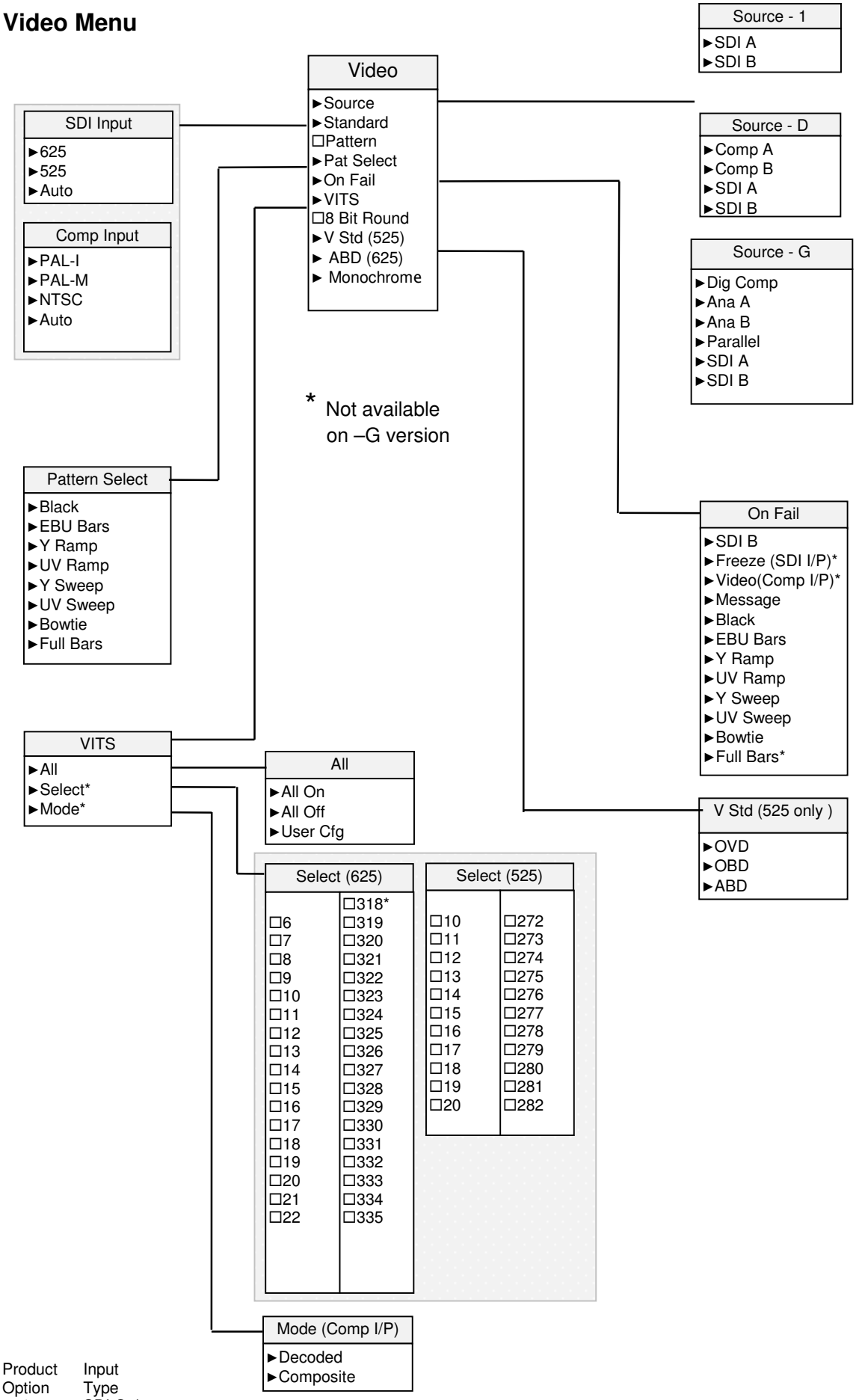
Normal Panel Display and Top Level Menu Structure



Filter Menu

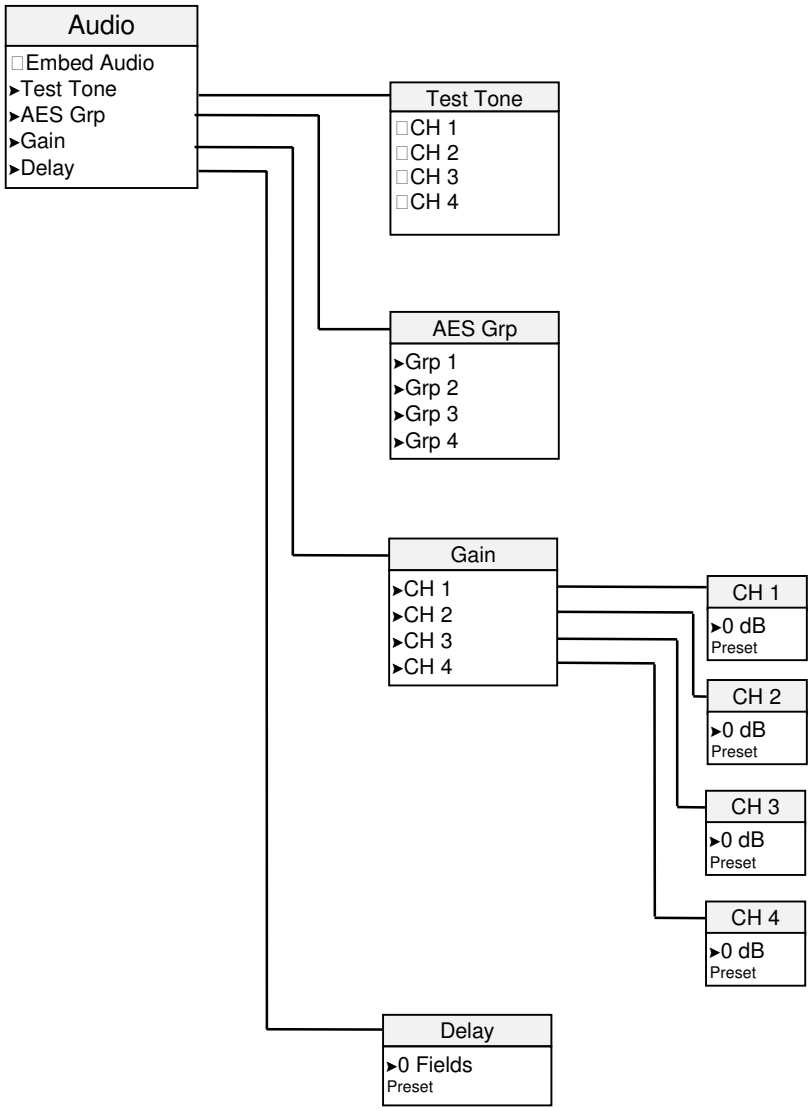

Filters
►Recursive
►Median
►Spatial
►Linear
►Scratch
►Enhancer
►Bypass
Recursive
☐Recursive
☐Semi Trans
►Luma
►Chroma
►Threshold
►Bias
Luma
► Off/Min Med/Max
Preset
Chroma
► /Off/Min Med/Max/ X- Colour
Preset
Threshold
►Auto, 0-15
Preset
Bias
►-3 to +3
Preset
Median
☐Median
►Level
Median Level
►Min1/Min2/ Med3/Med4 Max5/Max6
Preset
Scratch
☐Scratch
►Strength
►Contrast
►Type
► Length
► Width
Scratch Strength
►Min/Med/Max
Preset
Scratch Contrast
►Low/Med/High
Preset
Scratch Type
►Both/White/Black
Preset
Scratch Length
►Any/Long
Preset
Scratch Width
►Wide/Narrow
Preset
Spatial
☐Spatial
►Luma
►Chroma
Luma
► Off/Min Med/Max
Preset
Chroma
► Off/Min Med/Max
Preset
Enhancer
►Mode
Enhancer:Mode
►Off
►Enhance
►MPEG De-Enhance
►Decoder Match
►Video Filter
Mode:Enhance
►Mode
►Luma
►Chroma
►Coring
Luma
►Off/Min/Med/Max
Preset
Chroma
►Off/Min/Med/Max
Preset
Coring
►Luma
►Chroma
Luma
►Off/Min/Med/Max
Preset
Chroma
►Off/Min/Med/Max
Preset
Linear
►Mode
Linear:Mode
►Off
►Brickwall
►Gaussian LP
►Gaussian HP
Mode:Brickwall
►Mode
►CutOff
►Boost
CutOff
►4.2M to 2.5M LP
2.4M to 0.9M ELP
Preset
Boost
►None
1.0dB to 6.0dB
Preset
Mode:Gaussian LP
►Mode
►Gain
Gain
►-4dB to -40dB
Preset
Mode:Gaussian HP
►Mode
►Gain
Gain
►1dB to 6dB
Preset
Mode:MPEG De-Enhance
►Mode
►Luma
►Chroma
Luma
►Off/Min/Med/Max
Preset
Chroma
►Off/Min/Med/Max
Preset
Mode:Decoder Match
►Mode
►Decoder Type
Decoder Type
►Line Comb/ Field Comb/ Other
Preset
Mode:Video Filter
►Mode
►Frame Mode
Frame Mode
►Mode1/Mode2
Preset

Video Menu

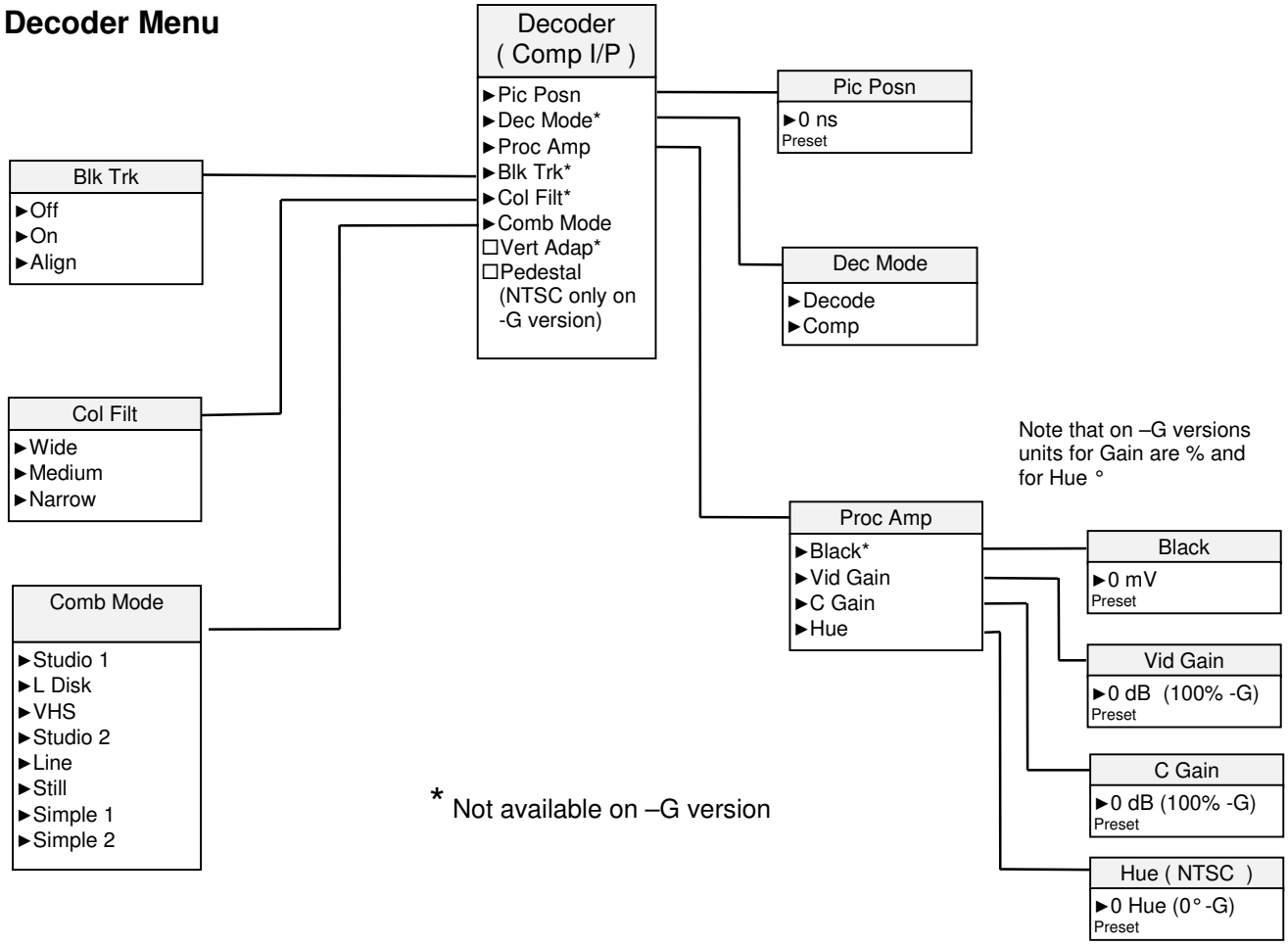


Product Option	Input Type
-1	SDI Only
-D	SDI and Composite
-G	SDI and Parallel

Audio Menu

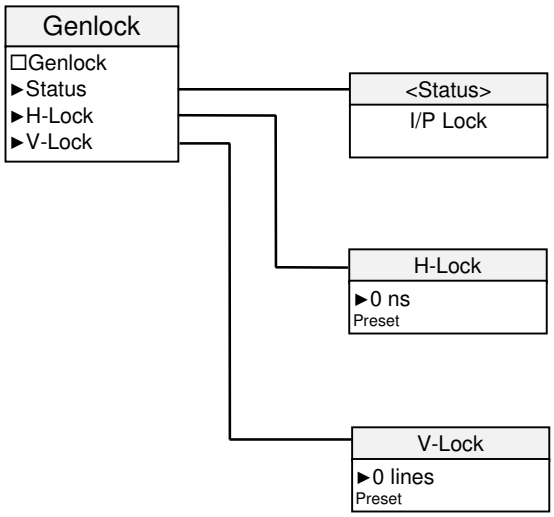

Audio
Embed Audio
Test Tone
AES Grp
Gain
Delay
Test Tone
CH 1
CH 2
CH 3
CH 4
AES Grp
Grp 1
Grp 2
Grp 3
Grp 4
Gain
CH 1
CH 2
CH 3
CH 4
CH 1
0 dB
Preset
CH 2
0 dB
Preset
CH 3
0 dB
Preset
CH 4
0 dB
Preset
Delay
0 Fields
Preset

Decoder Menu

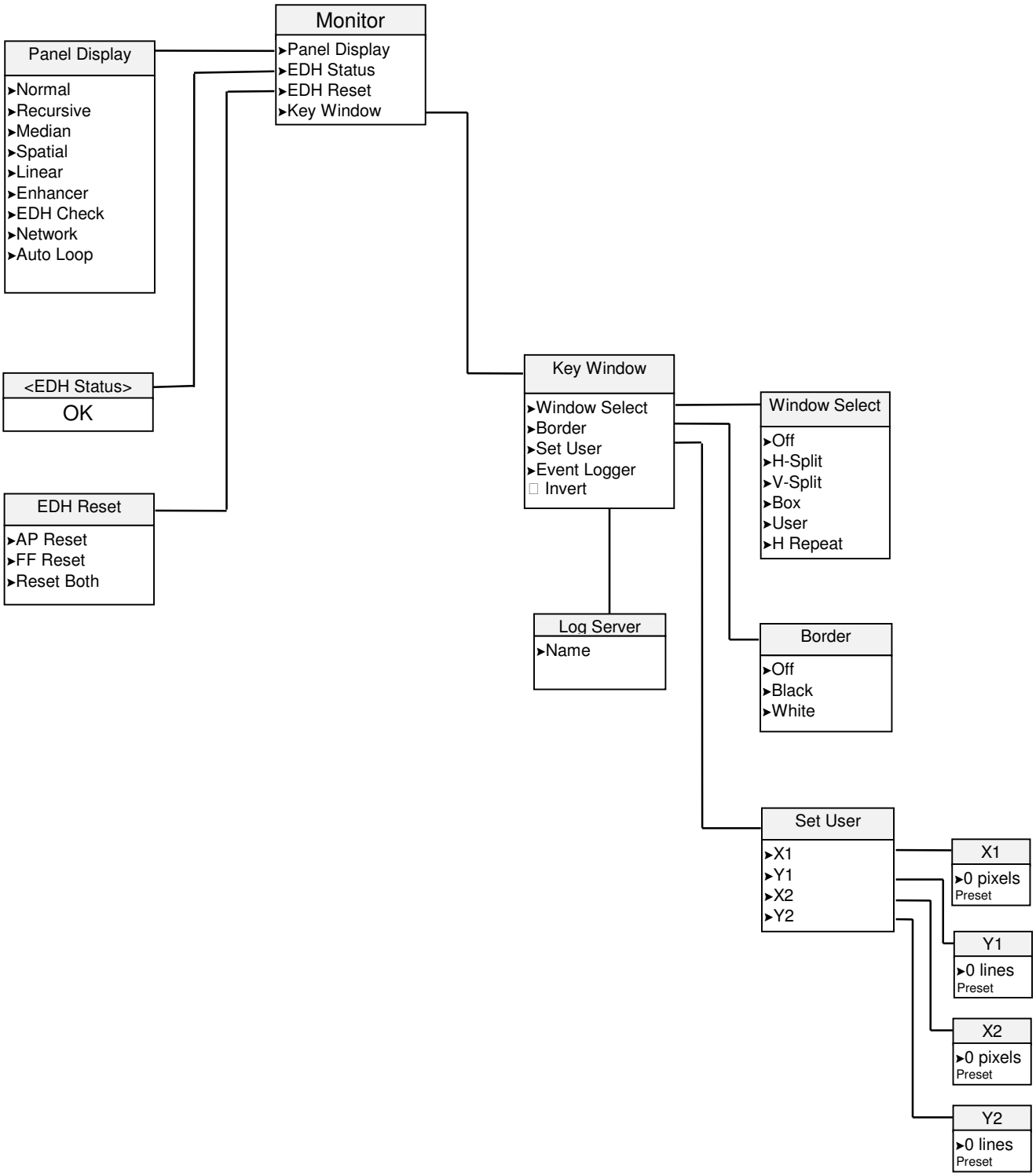


Note: The decoder sub-menu is only available if the optional decoder card is fitted and a composite video input is selected.

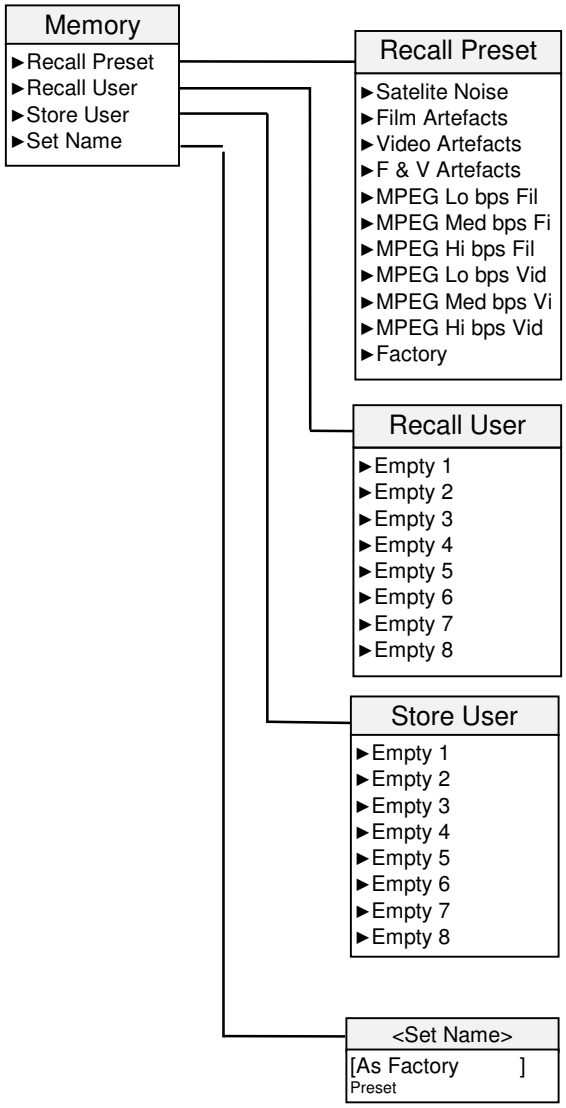
Genlock Menu



Monitor Menu

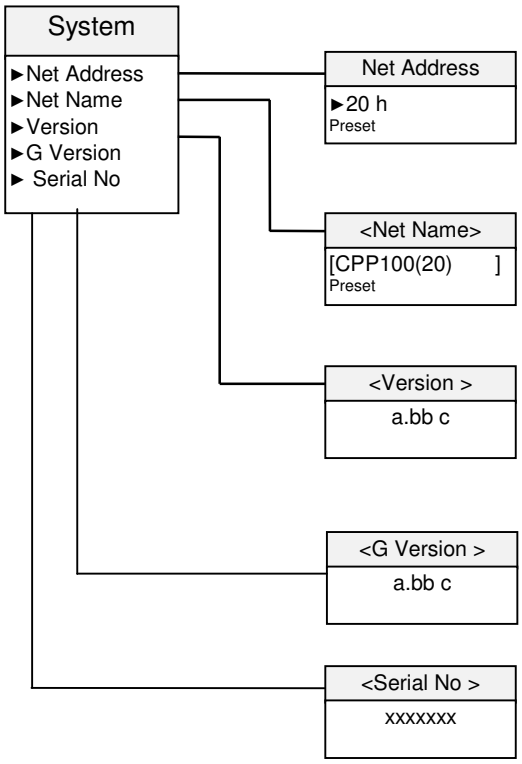


Memory Menu



Quick Menu

System Menu



Character set for < Net Name > and < Memory Name >

	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[	\		]	^
_	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~

Operation

All operational parameters and selections are made using a system of menus as shown in the previous section. A guide to controlling the PREFIX and what the operational parameters and selections do can be found in this section.

The PREFIX may be controlled by a number of different means:-

- Remote “Shoe Box”
- Computer Interface
- Card Edge Control (Not available on –G versions)

When using a Remote “Shoe Box” or the computer interface, communication is via a wired network system called RollCall™. Several units may be controlled using this system. Further details can be found in section 7 and the “Shoe Box” operation manual.

If the PREFIX is fitted with a decoder (-D version only) card (top slot) the unit may be controlled by using the interface fitted to this card. This interactive user interface consists of a high contrast 8 character display and a bank of four push button switches, both of which are accessed by opening the front panel. Further details of this method of control can be found at the end of this section.

Filter Menu

Filters
- ▸Recursive
- ▸Median
- ▸Spatial
- ▸Scratch
- ▸Linear
- ▸Enhancer

This section provides a brief overview of the filter controls. For a more detailed and in depth explanation please see Appendix 1.

Recursive

Recursive
- Recursive
- Semi Trans
- ▸Luma
- ▸Chroma
- ▸Threshold
- ▸Bias

This is the top level Recursive Filter menu.

Note : The Semi Transversal filter can only be turned ON/OFF if the Recursive filter is ON

Semi-Transversal

Default Off

Recursive Luma Level

Range Off/Min/Med/Max
Preset Min

Recursive Chroma Level

Range Off/Min/Med/Max/X-Color
Preset Min

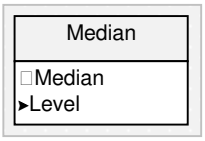
Recursive Threshold

Range Auto, 0-15
Preset Auto

Recursive Bias

Range -3 ... 0 ... +3
Preset 0

Median

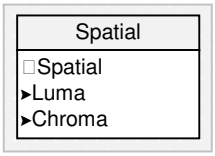


This is the top level Median Filter menu.

Median Level

Range Min /Min2/Med3/Med4/Max5/Max6
Preset Min1

Spatial



This is the top level Spatial Filter menu.

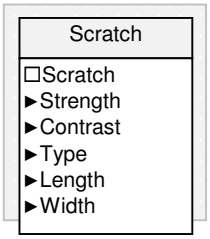
Spatial Luma Level

Range Off / Min / Med / Max
Preset Min

Spatial Chroma Level

Range Off / Min / Med / Max
Preset Min

Scratch



This is the top level Scratch Filter menu.

Scratch Strength

Range Min / Med / Max
Preset Min

Scratch Contrast

Range Low / Med / High
Preset High

Scratch Type

Range Both / White / Black
Preset Both

Scratch Length

Range Any / Long
Preset Long

Scratch Width

Range Wide/Narrow
Preset Wide

Linear

Linear
▸Mode

This is the top level Linear Filter menu when the filter is turned OFF.

Mode:Brickwall
▸Mode ▸CutOff ▸Boost

Mode:Gaussian LP
▸Mode ▸Gain

Mode:Gaussian HP
▸Mode ▸Gain

If the Linear filter is turned on in one of the three operating modes the top level Linear Filter menu will show the different options available for that operating mode.

Linear : Mode

Linear:Mode
▸Off ▸Brickwall ▸Gaussian LP ▸Gaussian HP

The default operating mode is Brickwall

Linear : Brickwall CutOff

The Brickwall filter has two sets of low pass filters. The first set of Low Pass (LP) has a variable boost available. The second set of Extra Low Pass (ELP) filters has a fixed level of boost.

Low Pass (LP)

Range 4.2 MHz to 2.5 MHz
Step 0.1 MHz
Boost Variable, 1dB to 6dB

Extra Low Pass (ELP)

Range 2.4 MHz to 0.9 MHz
Step 0.3 MHz
Boost Fixed

Preset Low Pass 4.2 Mhz

Linear : Brickwall Boost

Range 1dB , 2dB , 3dB , 4.5dB , 6dB
Preset None

Variable Boost is only available with the Low Pass Brickwall filters.

Linear : Gaussian LP Gain

Range -4dB to -40dB
Step -4dB
Preset -4dB

Linear : Gaussian HP Gain

Range 1dB , 2dB , 3dB , 4.5dB , 6dB
Preset 1dB

Enhancer

Enhancer
▸Mode

This is the top level Enhancer Filter menu when the filter is turned OFF.

Mode:Enhance
▸Mode ▸Luma ▸Chroma ▸Coring

Mode:MPEG De-Enhance
▸Mode ▸Luma ▸Chroma

Mode:Decoder Match
▸Mode ▸Decoder Type

Mode:Video Filter
▸Mode ▸Frame Mode

If the Enhancer is turned on in one of the four different operating modes the top level Enhancer menu will show the different options available for that operating mode.

Enhancer : Mode

Enhancer:Mode
▸Off ▸Enhance ▸MPEG De-Enhance ▸Decoder Match ▸Video Filter

This selects the Enhancer operating mode. The default mode is Enhance.

Enhancer : Enhance

Luma Level

Range Off / Min / Med / Max
Preset Min

Chroma Level

Range Off / Min / Med / Max
Preset Min

Luma Coring

Range Off / Min / Med / Max
Preset Off

Chroma Coring

Range Off / Min / Med / Max
Preset Off

Enhancer : MPEG De-Enhance

Luma Level

Range Off / Min / Med / Max
Preset Min

Chroma Level

Range Off / Min / Med / Max
Preset Min

Enhancer : Decoder Match

Decoder Type

Range Line Comb / Field Comb / Other
Preset Other

Enhancer : Video Filter

Frame Mode

Range Mode1 / Mode 2
Preset Mode 1

Video Analysis Flags

Background

The ‘Prefix’ Compression Pre-Processor range has been designed with the following primary goals:

- To provide ‘clean’ decoding and high quality interfacing to a wide variety of input sources such as PAL or NTSC composite and 625/525 component signals.
- To remove or reduce picture impairments caused by electronic processing or satellite transmission failures.
- To limit the bandwidth of the picture to a level commensurate with the MPEG encoder bit rate.
- To generate video analysis information which a downstream MPEG encoder can use.

Video Analysis Information

Prefix has been designed to provide the following analysis information:

- Shot change detection
- Advanced Shot Change detection
- Film 3:2 sequence detection for 525 film originated material
- Explicit 3:2 sequence data for 525 film originated material
- Sequence change detection
- Single Field Flag
- Film/Video Identification
- Film frame pairing for 625 originated film
- Input Noise floor level
- Filter Status

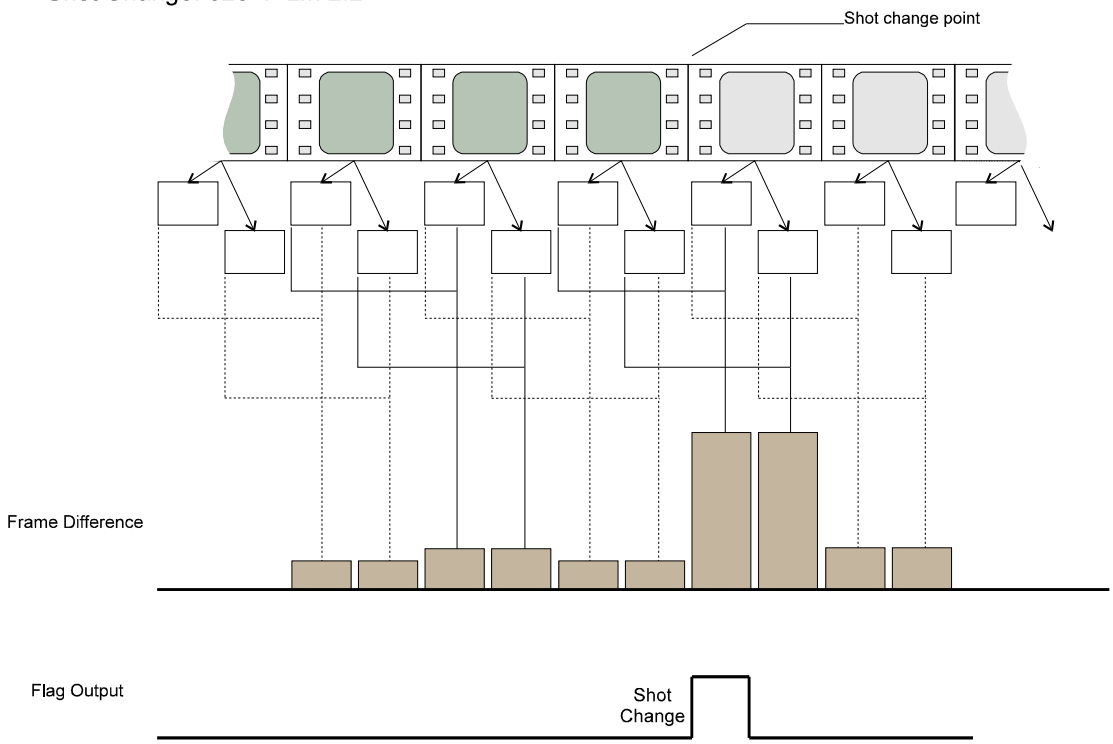
Shot Change detection

The presence of a shot change is detected by the analysis of picture difference between frames and fields.

Film material which is frame based will generate a strong intra frame correlation i.e. there will be no motion differences between fields which originate from the same film frame.

On the other hand, video originated material which has individual fields representing different points in time has no frame correlation. Nevertheless, at the presence of a shot change the integrated field and frame difference outputs will show a distinctive pattern which can be correlated to identify the exact field where the shot change occurs.

Shot Change: 625 FILM 2:2

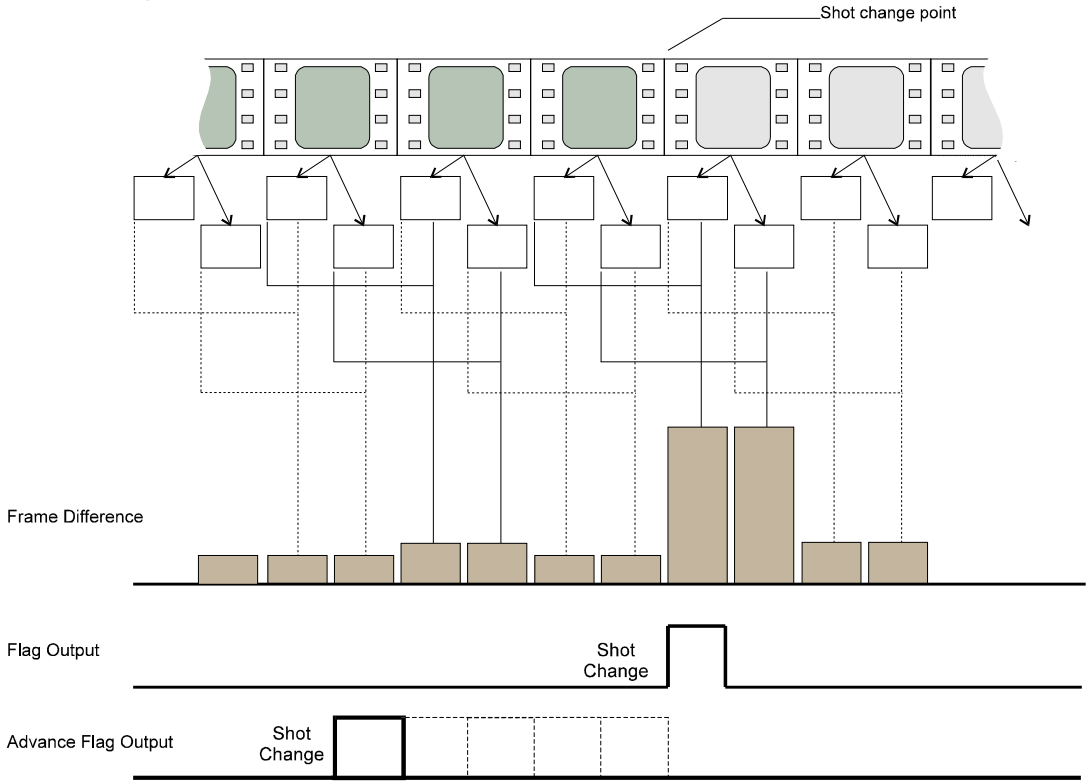


The shot change flag is a single line active high immediately after the shot change and is cleared at the end of the following field.

Advanced Shot Change

The shot change flag can be advanced by up to 5 fields in 1 field increments to allow downstream equipment to prepare for the occurrence of a shot change.

Shot Change : 625 FILM 2:2



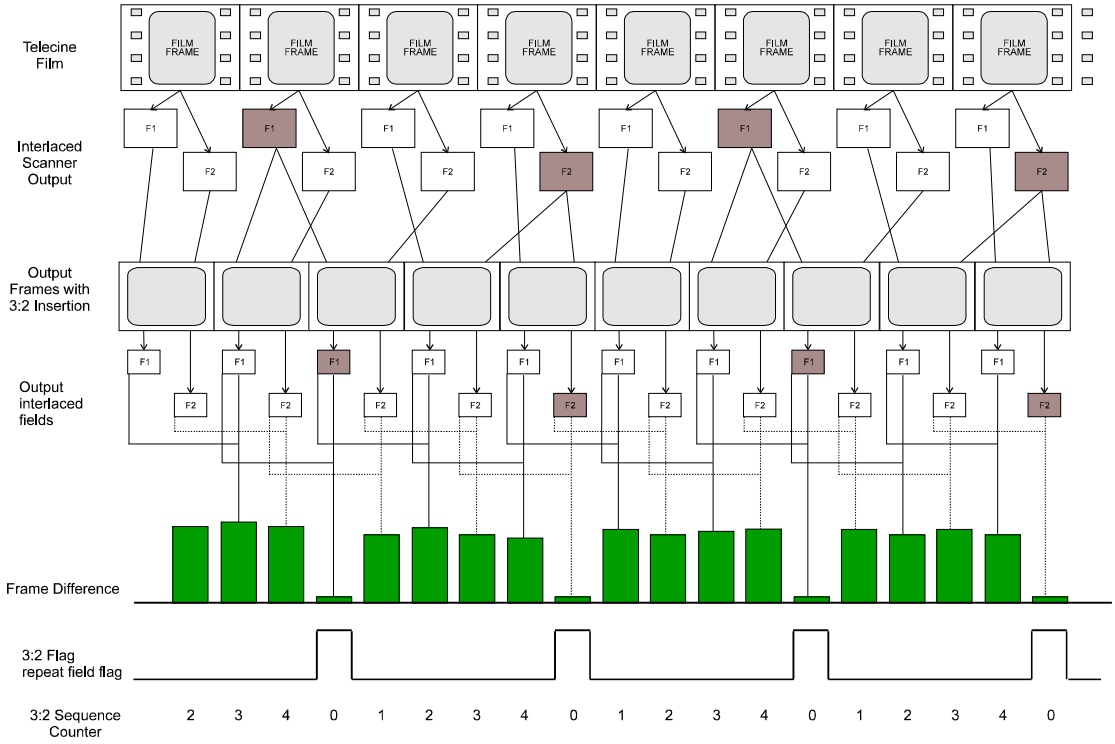
Repeat Field Flag for 525 film originated material

Film material which is scanned by telecine to produce a 525 line output uses the well known 3:2 pulldown technique to insert an additional field for each pair of film frames. This has the effect of increasing the output field rate to 60Hz required for 525 distribution.

The output video signal has a distinctive pattern of 2 fields followed by 3 fields followed by 2 fields etc... The five field sequence can be identified by indicating the position of the repeat field as shown below.

Sequence count for 525 film originated material

The five field sequence can be further identified by a specific code for each field in the sequence. In the example shown below a 3 bit code running from 0 to 4 is used to explicitly identify each field in the 3:2 sequence.



Post produced electronic editing

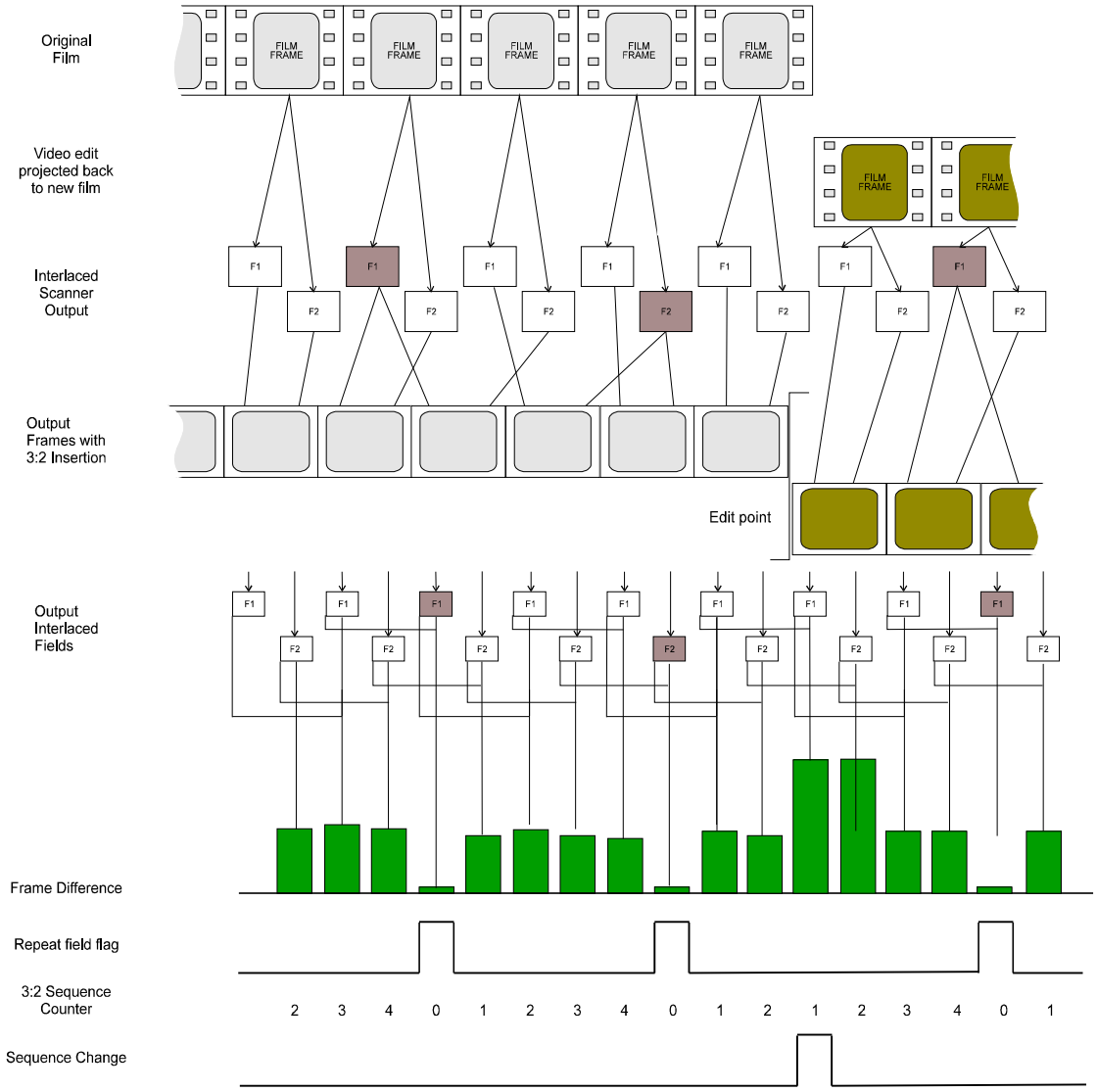
Although the process of detecting the 3:2 sequence is relatively straight forward, complications arise whenever material is electronically edited. This causes temporary discontinuities in the 3:2 sequence at the edit point. Downstream equipment which relies on the accuracy of this flag could be affected if the sequence counter does not correspond exactly to the video at the edit point. Prefix uses a correlation algorithm to:

- detect the edit
- analyse the 3:2 sequence following the edit
- provide accurate cotimed sequence count at Prefix output

Sequence change

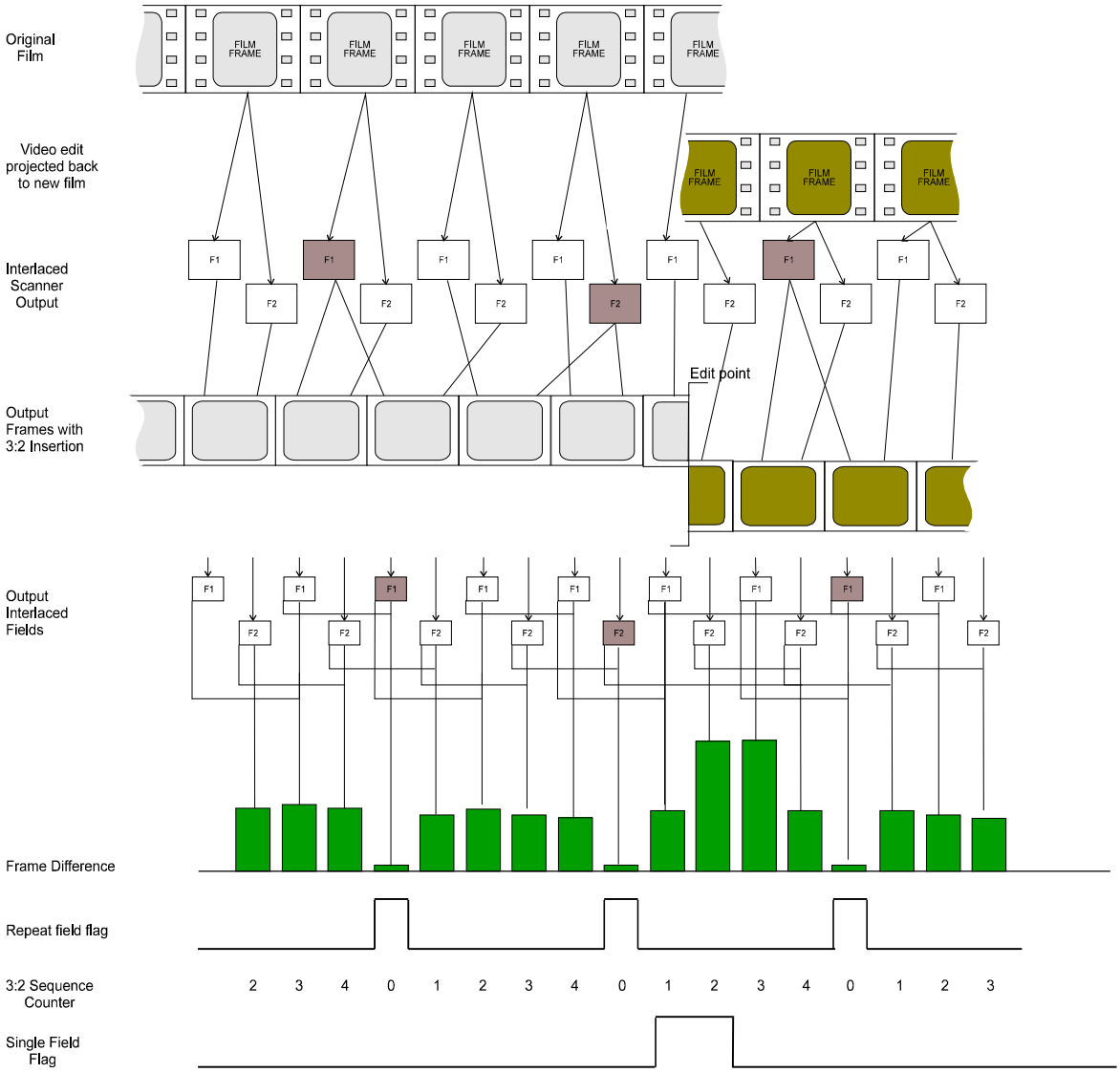
An example of an electronic edit to a film originated master is shown below.

In this case, the edit has caused a discontinuity in the sequence count resulting in the counter value changing from a 2 back to a 1 at the edit point. Prefix will accurately detect the edit and adjust the sequence count value until it is cotimed with the video output.



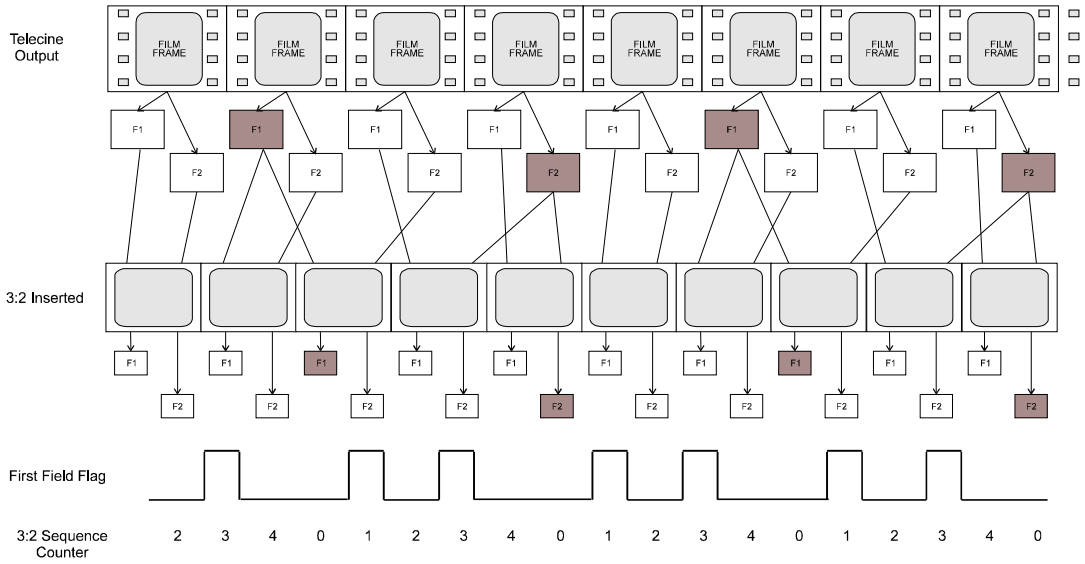
Single Field Flag

In the following example, an electronic edit has occurred but in this instance there is no disturbance to the 3:2 sequence count. Nevertheless, downstream equipment which performs some form of interpolation would generate a mixed output if fields corresponding to sequence counts 1 and 2 were treated as though there were from the same film frame. To prevent this, a single field flag is generated which indicates to downstream equipment that this field should be treated as a single field. In the instance shown, the single field flag is active for two consecutive fields to indicate that an edit has occurred such that two single fields have been generated from two original film frames containing different picture material.



First Field Flag

The first field flag indicates the first field of a film frame as shown in the example below for 525 film originated material. In this case, the first field flag will always correspond to a sequence count value of 1 or 3.

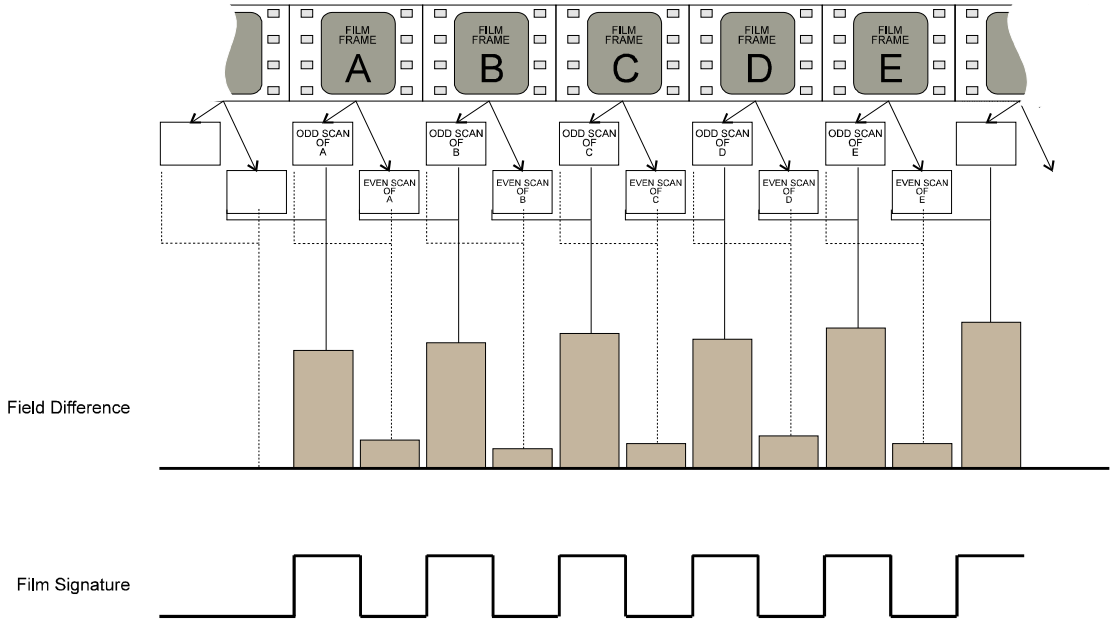


Film / Video Identification

Film is scanned directly to produce a 625 line 50Hz output by running the telecine at 25/24 normal speed. The resulting output has pairs of fields corresponding to each original film frame. No additional fields are required as the resulting frame rate of 25Hz is exactly correct for the 625 line standard. The frame pairs are identified by analysis of field differences.

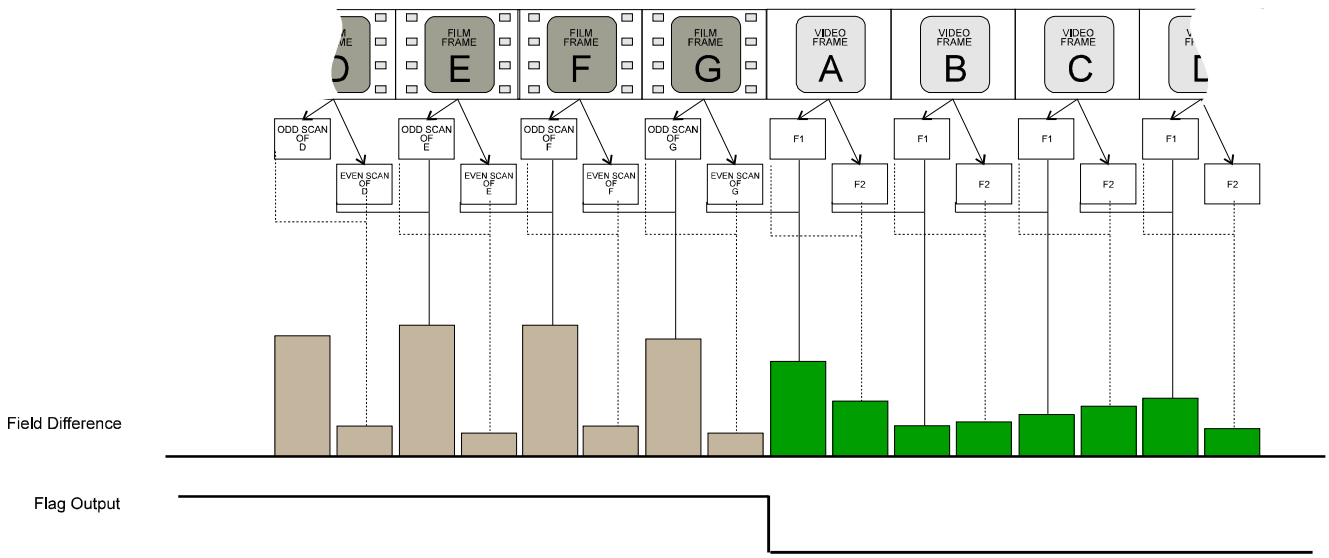
Film originated material has a high level of picture correlation on fields which are extracted from the same film frame. Processed picture differences will produce a characteristic frame rate output signal as shown below. Correlation algorithms within 'Prefix ' are used to extract the film sequence and identify the soure as film originated.

Frame / Field Ident : FILM



A video originated source however, has no such frame correlation. A single line is used to indicate film\video origination and is provided at the start of each field. If the material contains mixed film and video originated material then the flag changes state immediately prior to the start of the first field of the film\video edit.

Frame / Field Ident : Sequence Identification



Noise floor measurements

A proprietary algorithm is used to measure input noise floor level. This is used internally to control operation of the median, recursive and de-enhancement filters and can be passed out along with the other video analysis information.

Filter Status

Filter status (active or inactive) is reported through this register.

Embedded Video Flags (in the ancillary data space)

Introduction

Provision exists to embedd ancillary data within the SMPTE259 serial digital output. The flag information is embedded in the Horizontal Ancillary (HANC) data space on one line per field.

Ancillary Data Packets are divided into Type 1 and Type 2, where Type 1 uses a single word for data identification and Type 2 uses two words for this purpose.

Prefix has been designed to embedd ancillary data as type 1 utilising a single data ID for identification of the ancillary data packet.

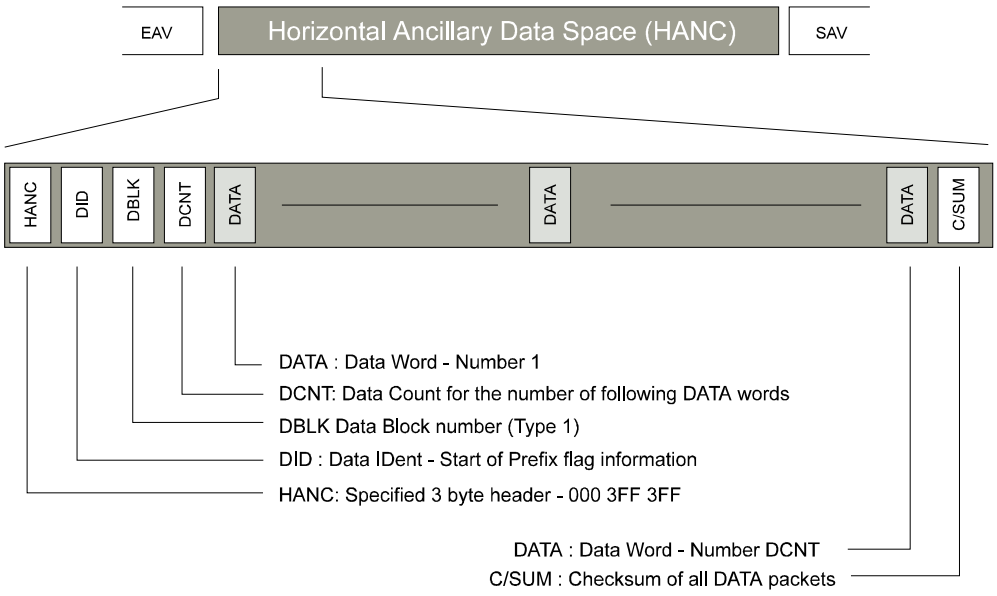
Packet Structure

The structure of the packet data follows the convention laid down by the reference documents for ancillary data of type 1.

For simplicity of hardware, Prefix utilises a module which is common to both EDH and ancillary data generation. Both packets have identical structure although the ancillary data packet is located immediately following the EAV group whereas the EDH packet occurs immediately prior to the SAV group.

Only the top 8 MSB's of the output data stream are used to ensure no losses through 8 bit equipment.

The structure is shown below.



HANC : Horizontal Ancillary Header

The HANC header is as specified in REC656 as a 3 byte header in the form 000 3FF 3FF.

DID : Data Ident

The DID consists of 10 bits, of which 8-bits carry the identification value and the remaining bits carry even parity and its inverse as shown:

bits b7 (MSB) - b0 (LSB) form the identification value (00h - FFh)
bit b8 is even parity for b7 - b0
bit b9 = not b8

DID words

Some DID words such as EDH are “Internationally Registered” and are unavailable for selection.

Words in the range C0h to DFh are available for user application and may be assigned for use in Prefix as shown in the table below.

DID 10-bit	DID 8-bit
C0	✔
C1-C3	✘
C4	✔
C5-C7	✘
C8	✔
C9-CB	✘
CC	✔
CD-CF	✘
D0	✔
D1-D3	✘
D4	✔
D5-D7	✘
D8	✔
D9-DB	✘
DC	✔
DD-DF	✘

To retain 8-bit compatibility the range of allowed values is restricted to the entries marked with a tick.

DBLK: Data Block Number

The data block number is incremented by 1 for each consecutive data packet sharing a common DID and requiring continuity indication. This is always set to zero in Prefix.

DCNT : Data Count

This byte represents the number of user data words to follow, and in this case it is always set to 16.

C/SUM: Check Sum

The checksum word is used to determine the validity of the Ancillary Data Packet from the DID through the user defined words (UDWs). The checksum value is equal to the nine least significant bits of the sum of the DID, the DBLK the DCNT and all UDWs in the packet.

In 8-bit applications, where the two LSBs of every 10-bit word in the packet are set to zeros, the C/SUM word is calculated in the same way as for 10-bit applications. (The LSBs produce a zero sum themselves and produce no carry bit).

User data words: (UDW)

All user defined words can be described as bitwise utilising bits 2 through 7 with bit 8 defined as parity and bit9 set to “NOT bit 8”.

To ensure that no data is lost through 8 bit equipment, bits 1 & 0 are not used

Positioning

The flag information is inserted on the following lines :-

HANC	625 line Standard	525 line Standard
Field 1	6	10
Field 2	319	273

NOTE - although it is recommended that Ancillary Data Packets are not transmitted within the ancillary space on line 10/273 or line 6/319 (as switching may occur during these lines), receiving equipment should process ancillary data located in any ancillary data space.

Synchronous switching of picture sources will invalidate the analysis information in any case, therefore it is convenient to locate the data on the switching lines for the configuration where Prefix analysis data is used with a compression encoder.

Additionally, these lines have been chosen because they are guaranteed to be free from embedded audio packets which are not permitted on the switching lines.

Groups

The flag information is arranged into individual Groups as shown below

Word Number	Group	Word Count
1	Film I	1
2	Film II	1
3	Noise Floor	1
4-8	Status	5

Film Group I

Group	Word	Bit	Flag
Film I	1	9	~b8
		8	parity
		7	single field flag
		6	sequence change
		5	shot change
		4	sequence count bit 2
		3	sequence count bit 1
		2	sequence count bit 0

Film Group II

Group	Word	Bit	Flag
Film II	1	9	~b8
		8	parity
		7	0
		6	0
		5	repeat field flag
		4	~ film
		3	advance shot change
		2	first field flag

Noise Floor Group

Group	Word	Bit	Flag
Noise Floor	1	9	~b8
		8	parity
		7	Noise floor bit 5
		6	Noise floor bit 4
		5	Noise floor bit 3
		4	Noise floor bit 2
		3	Noise floor bit 1
		2	Noise floor bit 0

Status Group

Group	Word	Bit	Flag
Status	1	9	~b8
		8	parity
		7	Recursive Y level high
		6	Recursive Y level med
		5	Recursive Y level low
		4	Recursive C level high
		3	Recursive C level med
		2	Recursive C level low
	2	9	~b8
		8	parity
		7	Spatial Y level high
		6	Spatial Y level med
		5	Spatial Y level low
		4	Spatial C level high
		3	Spatial C level med
		2	Spatial C level low
	3	9	~b8
		8	parity
		7	Linear Mode Brickwall
		6	Linear Mode Gaussian LP
		5	Linear Mode Gaussian HP
		4	Linear Filter set bit 5
		3	Linear Filter set bit 4
		2	Linear Filter set bit 3
	4	9	~b8
		8	parity
		7	Linear Filter set bit 2
		6	Linear Filter set bit 1
		5	Linear Filter set bit 0
		4	Semi-Transversal ON
		3	Scratch Filter ON
		2	Median Filter level bit 2
	5	9	~b8
		8	parity
		7	Median Filter level bit 1
		6	Median Filter level bit 0
		5	Enhancement Mode: enhance
		4	Enhancement Mode: de-enhance
		3	Enhancement Mode: Decoder Match
		2	Enhancement Mode: Video Filter

Overall Packet structure

Data Item	b9 msb	b8	b7	b6	b5	b4	b3	b2	b1	b0 lsb
Ancillary Header Word 1	0	0	0	0	0	0	0	0	0	0
Ancillary Header Word 2	1	1	1	1	1	1	1	1	1	1
Ancillary Header Word 3	1	1	1	1	1	1	1	1	1	1
Data ID	~b8	parity	C0h	to	DF					
Block Number	1	0	0	0	0	0	0	0	0	0
Data Count	0	1	0	0	0	1	0	0	0	0
UDW 1	~b8	parity				Film	group	1	0	0
UDW 2	~b8	parity				Film	group	2	0	0
UDW 3	~b8	parity				Noise	Floor		0	0
UDW 4	~b8	parity				Status			0	0
UDW 5	~b8	parity							0	0
UDW 6	~b8	parity							0	0
UDW 7	~b8	parity							0	0
UDW 8	~b8	parity							0	0
UDW 9	1	0	0	0	0	0	0	0	0	0
Reserved	1	0	0	0	0	0	0	0	0	0
Reserved	1	0	0	0	0	0	0	0	0	0
Reserved	1	0	0	0	0	0	0	0	0	0
Reserved	1	0	0	0	0	0	0	0	0	0
Reserved	1	0	0	0	0	0	0	0	0	0
Reserved	1	0	0	0	0	0	0	0	0	0
Reserved	1	0	0	0	0	0	0	0	0	0
Checksum	~S8	S8	S7	S6	S5	S4	S3	S2	S1	S0

Note. In 8-bit applications which have restricted DID values, C/SUM bits S0 and S1 will be zero.

Direct TTL output

Analysis Flags

Some of the analysis data can be accessed through an external TTL interface at the rear of the unit. A nine-pin D-type is used to provide 4 control outputs which can be mapped to each of the following flag signals:

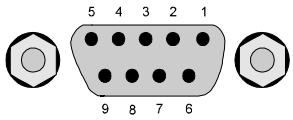
Analysis Flags
Shot Change
Advance Shot change
Repeat Field Flag
3:2 Sequence bit 2
3:2 Sequence bit 1
3:2 Sequence bit 0
Sequence Change
Single Field Flag
~ Film Flag

Note: Each flag can also be inverted

Physical Interface

Flags	D-Type pin number
Flag 3	8
Flag 2	3
Flag 1	2
Flag 0	7

Viewed From Rear Panel



DEFT (Digital Electronic Film Transfer)

Background

DEFT is a specialised standards converter which is used to convert 525 (59.94) film originated material to 625 (50). Utilising a two field aperture, and taking the film sequence data into account, the standards converter attempts to preserve frame integrity by utilising the field pairs from original film frames. On electronically edited material, the characteristic film sequence is typically disturbed and a new sequence must be re-established.

DEFT requires explicit identification of the 3:2 sequence to ensure correct pairing of input fields. This is achieved through a 3-bit code as described in earlier sections of this document. In situations where electronic editing has reduced an original film pair to a single field, an additional single-field-flag is required to indicate that the current field should be processed using a single field aperture.

DEFT Flags

To ensure backwards compatibility with existing DEFT equipment the flags are embedded in the two words immediately following the EAV code on every line. The code is updated on the line during which the V flag has falls (at the end of the digital vertical blanking period).

The flag information is updated on the following lines :-

HANC	625 line Standard	525 line Standard
Field 1	23	10
Field 2	336	273

The word contains the following flags:

Bit	Analysis Flags
9	3:2 Sequence bit 2
8	3:2 Sequence bit 1
7	3:2 Sequence bit 0
6	Single Field Flag
5	Repeat Field Flag
4	Shot change
3	Sequence change
2	NOT film

Bits 0 and 1 are always zero

TRS Errors

The DEFT output format is not a recognised method of embedding ancillary data and hence should only be used with DEFT equipment. Moreover, as there is no explicit method of avoiding illegal TRS codes, downstream equipment may indicate continuous TRS errors or even fail to operate correctly.

Configuring for DEFT output

The DEFT output is not provided in normal shipment configuration but can be accessed by configuring the unit in debug mode using SW4-2 and enabling this option through the configuration menu.

In this case, the CPUB LED's D18 and D19 are remapped to provide some basic debug output as shown below:

LED	Colour	Status
D18	Red	Shot change Indication
D19	Green	Sequence Change Indication

Video Menu

Video
►Source
►Standard
Pattern
►Pat Select
►On Fail
►VITS
8 Bit Round
►V Std

The video menu allows configuartion and control of the Input, Video Standard, Test Patterns, On Fail and VITS processing.

Source

This selects the video input, and the menu displays the available sources. If the optional decoder card is fitted (option D or G) then four options are available:-

D Option
- Comp A
- Comp B
- SDI A
- SDI B

Default Comp A

G Option (as D plus :-)
- Dig Comp
- Parallel

If the optional decoder card is not fitted then only two options are available:-

- SDI A
- SDI B

Default SDI A

Standard

PREFIX has the ability to automatically detect the video standard of the selected source. In most cases this will prove to be a satisfactory method. However the standard can be manually selected if required. The available options are:-

Decoder Card not fitted (-1)
PAL-I / PAL-N / PAL-M / NTSC / Auto

Decoder Card fitted (-D)
625 / 525 / Auto
Default Auto

Decoder Card fitted (-G)
PAL-I / PAL-M / NTSC / Auto
Default Auto
Note that PAL-M is not Auto detected)

V-Std

When a 525 serial digital component input is selected it is possible to select three different modes of operation.

Note: Lines 10-20/273-282 are collectively treated as VITS lines and as such can be individually blanked or passed. Although the following description assumes that all VITS lines have been selected to be passed through the unit, individual VITS lines may be blanked or passed as required. The following V-Std setting determines which of the VITS lines may be filtered.

SMPT125M permits the optional use of lines 10-19 and 273-282 as video. This is reflected in the data stream by changing the width of the embedded vertical blanking period. If the optional lines are used to carry video information then the vertical blanking period is reduced as shown below:

OVD Optional Video Data
Lines 1-9/264-272

Lines 1-9/264-272 are digitally blanked within the unit and lines 10-19/273-282 are treated as video and *will* be affected by any of the filters, which are active within the unit.

If the optional lines are *not* used to carry video information then the vertical blanking period is increased as shown below:

OBD Optional Blanking Data
Lines 1-19/264-282

In this case, lines 1-19/264-283 will not be filtered within the unit and any VITS or embedded information will be passed.

In order to preserve closed caption information, which may be transmitted on lines 20 to 22 an additional setting has been provided which affects these lines only:

ABD Additional Blanking Data
Lines 1-22/264-282
ABD in 625 = Line (not on –G version)

This setting behaves in the same way as OBD with the exception that lines 20 to 22 will *not* be filtered by any of the filters within the unit.

The embedded vertical flag conforms to the SMPTE125 OBD standard (lines 10-19/273-282).

Default OVD

Pattern

The internal test patterns can be enabled by selecting this option.

Pat Select

The test pattern displayed can be selected in the *Pat Select* menu.

The available test patterns are:-

Black / EBU Bars / Y Ramp / UV Ramp / Y Sweep / UV Sweep / Bowtie / Full Bars

Default EBU Bars

On Fail

When an input loss occurs it is possible to configure the PREFIX to operate in a predetermined mode dependent on which input is selected.

Composite Input Selected

SDI B / Video (Freeze on –G version) / Message / Black / EBU Bars / Y Ramp / UV Ramp / Y Sweep / UV Sweep / Bowtie / Full Bars (not on –G version)
Default Message

SDI Input Selected

SDI B / Freeze / Message / Black / EBU Bars / Y Ramp / UV Ramp / Y Sweep / UV Sweep / Bowtie / Full Bars (not on –G version)
Default Message

As soon as a valid input is detected the On Fail condition is released and the source is passed through the unit again.

On Fail : SDI B

When an input loss is detected this option displays a frozen image of the signal on SDI B. This option could be used to display a station logo or other static message. If SDI B is selected as the source this option performs an On Fail Freeze.

On Fail : Freeze (SDI inputs only)

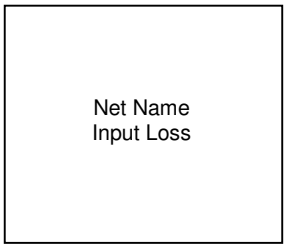
When an input loss is detected the picture is frozen.

On Fail: Video (Comp inputs only and not on –G version)

When an input loss is detected the ‘failed’ source is fed to the ouput.

On Fail : Message

When an input loss is detected, a black test pattern is generated. This is sent to the PROGRAM output. A message is displayed on the MONITOR output as shown below.



On Fail : Test Pattern

Any of the available test patterns can be selected should an input loss occur.

When PREFIX detects that the input has recovered the On-Fail condition reverts back to the selected video source.

Vertical Interval Test Signal Processing (VITS)

PREFIX provides for comprehensive VITS processing. The following options are available:-

All On	Pass all VITS lines
All Off	Blank All VITS lines
User Cfg	Selectively Blank VITS lines
Default	All On

When the *User Cfg* option is chosen the VITS lines to be blanked are picked in the *Select* sub-menu. The appropriate VITS lines for 525 line and 625 line standards are displayed. Individual lines can then be selected. For example if only line 10 is to be blanked the simplest method is to select the *All On* mode and then select line 10 in the *Select* sub-menu.

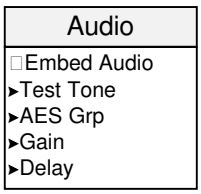
If the source is composite then a further option is available (not on –G version). The VITS lines may be processed as decoded or composite.

Decoded	Pass as decoded luma
Composite	Pass sampled composite as luma, chroma blanked
Default	Composite

8 Bit Rounding

A facility exists to round the processed video to 8 bits. This is only done at the ouput stage of the PREFIX, so signal processing is maintained at 10 bits or higher until the output stage. Use of this facility may be preferable as some systems truncate the video to 8 bits. Rounding to 8 bits upstream of such systems may improve the quality of the picture. The default status is 8 bit rounding OFF.

Audio Menu



The *Audio* menu allows the parameters of the audio card to be controlled.

The audio processing card of the PREFIX accepts 4 differential analogue inputs for digitisation. These are then delayed to co-time them with the video before being embedded into the output data stream.

Embed Audio

If the unit is being used with serial digital inputs, audio insertion may be bypassed allowing any previously embedded audio to be preserved.

Alternatively Prefix may be used to embed audio with digital inputs. Note that in this case any other ancillary data will be removed prior to audio embedding.

Test Tone

This inserts a test tone into the desired audio channel. The tone for each channel can be turned ON/OFF.

AES Grp

This selects the AES group for the four mono audio input channels.

Range Grp1/Grp2/Grp3/Grp4
Default Grp 1

Gain

The gain of each of the four channels can be individually controlled.

Range Mute,-95.5dB to 31.5dB
Step 0.5dB
Preset 0dB

Delay

The audio can be varied in steps of 0.25 fields. The default setting is for picture and audio to be co-timed at the output, assuming they are co-timed at the input

Range -1 to 10 Fields
Step 0.25 Fields
Preset 0 Fields

Audio alignment using the internal tone generator

There are two predominant audio standards which specify the amount of available headroom in the analogue domain. The SMPTE\SONY specification requires 20dB headrooom and the BBC specification requires 18dB headroom.

With this in mind, the internal tone generator can be used to provide a calibrated output level and used to set the amount of headroom required.

The analogue input stage was designed to have +24dB headroom at 0dB gain setting. The on-board analogue gain control has a range between +31.5dB and -96.5dB\mute to accommodate a wide range of audio standards and level variations.

Hence to calibrate the input stage, the procedure would be to apply an analogue reference tone to the unit and monitor the output level whilst adjusting the gain control until it matches level of the internal tone generator.

The internal tone generator has been set such that when the two levels are identical the available headroom will be 20dB as per SMPTE specification.

Typically this will correspond to a gain setting of +4dB.

Similarly if the headroom required is 18dB as per BBC specification, the gain control should be adjusted until it measure 2dB greater than the tone generator output.

Calculations are based on 0dBm = 0.775V\600R

Decoder Menu

Decoder
►Pic Posn
►Dec Mode*
►Proc Amp
►Blk Trk*
►Col Filt*
►Comb
☐Vert Adap
☐Pedestal

*not on –G version

This menu is only available if the optional decoder is fitted.

Pic Posn

This allows delay adjustment of output video in relation to the TRS codes

	Standard	*-G version*
Range	± 1835.2 nsec	600 nsec
Step	7.4 nsec steps	4.4 nsec
Preset	0 nsec	0 nsec

Dec Mode

This specifies whether the input is colour or mono

Decode	Colour input will be decoded
Comp	Output is non-decoded digitised composite to preserve quality
Default	Decode

Decode

This mode decodes the video using the selected comb mode.

Comp

In this mode the video is *not* decoded and the output is digitised composite. This mode is particularly useful for preserving the quality of monochrome inputs.

Proc Amp

Vid Gain - this sets the sensitivity of the ADC. ie. Gain

	Standard	*-G version*
Range	±3.00 dB	0-117%
Step	0.2 dB steps	1%
Preset	0 dB	100%

C Gain - this sets the chroma gain

Range	±6.00 dB	0-200%
Step	0.05 dB	1%
Preset	0 dB	100%

Black (not on –G version) - this sets the offset of the ADC ie. Black level

Range	-20 mV to +20 mV
Step	0.2 mV
Preset	0 mV

Hue - this allows adjustment of the NTSC hue control

	Standard	*-G version*
Range	-180° to +180°	179°
Step	0.5°	1°
Preset	0 o	1°

Black Track (not on –G version)

This disables or enables the Automatic Black stabilisation

Off	No stabilisation
Align	Used for card alignment
On	Auto black stabilised
Default	On

Colour Filter (not on –G version)

This selects the type of filter used to filter the chrominance prior to it being re-modulated for subtraction from the composite.

Wide	Filtering with a wide bandwidth
Medium	Filtering with a medium bandwidth
Narrow	Filtering with a narrow bandwidth
Default	Medium

By altering the response of the chrominance filter, prior to remodulation and subtraction from the composite input, the effective area of the spectrum that is combed can be controlled.

On static scenes luminance and chrominance will be separated by the comb structure. However, with movement the comb will fail and the luminance resolution will be degraded. Therefore a wider chrominance bandwidth will produce slightly lower luminance resolution with moving scenes. In general the filter choice will depend upon the type of material that is being decoded.

This is shown in the table below.

Filter	***Movement***
WIDE	Little
MEDIUM	Medium (default)
NARROW	Fast moving

Comb

This selects the style of Combing and adaptive algorithms

Adaptive	Adaptive Field comb
Normal	Non-Adaptive Field comb
Default	Adaptive

There are two modes of YC separation using different combing architectures. Each mode has been optimised for different applications.

Adaptive mode

This mode uses a field comb to separate Y & C. Traditional comb failure artefacts are suppressed by a tailored algorithm. This mode should be used if failure artefacts become obtrusive or if minimum chrominance smear on shot changes is required.

Normal mode

This mode uses a non-adaptive field comb to separate Y & C. This mode gives the best possible YC separation giving a high luminance bandwidth and significantly reduced cross colour. However, some comb failure artefacts will be noticed on saturated vertical transitions.

'Golden Gate' Option

The 'Golden gate' option allows one of nine types of comb filtering systems to be applied to the signal.

Studio 1 This mode should be used for 'real life' type pictures (sports etc). This mode should be used as a starting point.

L Disk In this mode the timebase correction and decoding are optimised to give maximum performance from LaserDisk sources

VHS In this mode the timebase correction and decoding modes are optimised to give maximum performance from VHS and other non-mathematical signal sources.

Studio 2 This mode should be used for 'non-sport' type materials.

Mindel (not on –G version)
This mode produces the minimum input/output delay (approx. 3 lines) and may be used where audio delay problems may exist and cannot be compensated for.

Still This mode gives the best results with sources that contain no motion. e.g. Rostrum cameras and still graphics.

Simple 1 This simple decode mode incorporates a wide bandwidth subcarrier notch filter.

Simple 2 This simple decode mode incorporates a narrow bandwidth subcarrier notch filter.

Line This is a classical line comb with no adaption.

Vert Adap (not on –G version)

This disables or enables the Adaptive algorithm for the vertical filter.

On	Adaptive filtering
Off	Vertical filtering, ie. No Adaption
Default	Off

Hannover bars and small chroma phase errors are suppressed by averaging across adjacent lines. An adaptive vertical filter has been included which cancels out small chrominance phase errors thus suppressing Hannover bars.

The operation will generally depend upon the type of material being decoded. Some guidelines as to which settings should be used are given below.

On

The filter will adapt to vertical transitions. This is optimised for the sharpest pictures. Normal chroma transistions are unaffected in this mode. This has the maximum vertical resolution.

Off

In this mode some reduction of cross colour can be achived in addition to suppression of Hannover bars. However this will be at the expense of softening all vertical colour transitions.

This mode should be used where the picture content has a lot of high frequency diagonal luminance. e.g. Small graphics, captions, scrolling titles, chequered patterning etc.

Pedestal

This determines whether the input pedestal is removed or passed

Ped On	The input has a pedestal
Ped Off	The input has no pedestal
Default	Ped On

Genlock Menu

Genlock
Genlock
▸Status
▸H-Lock
▸V-Lock

Incorporated onto the noise reduction card is a full frame synchroniser which allows the selected input to be referenced to a signal of the same line standard.

The menu system allows the synchroniser to be switched such that the genlock mode is on or off.

Genlock Off

When the genlock is forced into the off state the output video will *not be locked* to the input or the reference video signal.

This is sometimes referred to as “free-running”. If the input and output were to be viewed on an oscilloscope the two traces would be seen to be moving one past the other.

Genlock On (Default)

This mode forces the output to be locked to another video signal of the same line standard.

Usually Genlock On will force the output to be locked to the signal that is connected to the reference input.

However, if the reference signal is invalid, or of a different line standard than that of the input, the synchroniser will lock the output to the input. This mode of operation needs to be used if the source video signal has embedded audio in the ancilliary data space.

The status display will always indicate the mode of operation for the synchroniser.

In the event of an input loss (with the unit Genlocked to the input), the output will be momentarily disrupted when the input is returned. This effect can be minimised by ensuring the system is Reference Locked.

Reference Format

The reference signal should be a normal composite video signal of either PAL I or NTSC formats. The burst information has no effect on the operation of the synchroniser.

The nominal input level is 1 volt peak to peak.

If the loop-through facility is not required the signal should be terminated here by using a 75 Ohm BNC terminator.

Genlock Offsets

Provision has been made to allow the horizontal and vertical timing of the output to be varied in relation to the “referenced” signal, whether it is the input or the reference. This facility is useful when the output needs to be in sync with other units such as in a studio system. This will allow clean switching between multiple sources which may have different phase relationships.

H-Lock

This changes the Horizontal Genlock Offset

525 line standards
- Range 0 to 63455 ns
- Step 37 ns
- Preset 0 ns

625 line standards
- Range 0 to 63899 ns
- Step 37 ns
- Preset 0 ns

V-Lock

This changes the Vertical Genlock Offset

525 line standards
- Range 0 to 524 lines
- Step 1 line steps
- Preset 0 lines

625 line standards
- Range 0 to 624 lines
- Step 1 line
- Preset 0 lines

Genlock Status

This displays the current Genlock status

---	Unable to Genlock. Check the reference signal is valid or that the input is valid.
Off	Genlock Off
Input	Genlocked to input if a valid reference input is not present.
Ref	Genlocked to reference input

Status information about Genlock is also indicated by the status LED on the Genlock button and on the front panel LED display.

Using the Synchroniser

Prefix contains a frame-synchroniser, which is essentially just a variable delay, which has a little in excess of 1 frame capacity. The purpose of the variable delay is to allow each unit to provide an output picture, which is cotimed with other units in a studio system. Normally this is achieved by applying a studio reference signal to each unit in the studio and the variable delay automatically adjusts the output so it is horizontally and vertically phased-up with the studio reference.

The purpose is to allow clean switching between multiple sources which may have different phase relationships.

Another advantage of a synchroniser is that the stability of the output clock is directly related to the quality of the reference signal. This is fundamental, as the output video rate must be phase locked to the reference video signal. In some cases this is also important as it guarantees output clock stability even if the input disappears or is noisy.

The penalty of using a synchroniser is that the input and output sides of the synchroniser are running at different clock rates and sooner or later the synchroniser will be forced to repeat or drop a video frame. A complete frame must be dropped to avoid interlace errors. This is fundamental and will almost certainly be undetectable.

If no reference is applied then the unit will automatically phase lock to the input as long as Genlock ON is selected. In this case there will be no necessity to repeat or drop a video frame and the output of each unit will be a fixed delay relative to the input.

With Genlock OFF the frame synchroniser will once again be running with different clock rates on each side and therefore will either repeat or drop a frame as necessary. The output clock stability will be very

high because the read side XTAL will be set to the nominally correct frequency but will not be phase locked.

Genlock Warnings

If there is a Genlock error the GREEN status LED in the Genlock button will flash.

REF	Reference is wrong standard. Check that the input standard is set correctly, and that the reference is the correct standard.

This is displayed on the bottom line of the front panel display at the right hand side.

Summary of Genlock Operating Modes

Input	Reference	Genlock Mode	Output (locked to)
PAL	not connected	On	Input
PAL	PAL	On	Reference
PAL	NTSC	On	Input
NTSC	not connected	On	Input
NTSC	PAL	On	Input
NTSC	NTSC	On	Reference
625 SDI	not connected	On	Input
625 SDI	PAL	On	Reference
625 SDI	NTSC	On	Input
525 SDI	not connected	On	Input
525 SDI	PAL	On	Input
525 SDI	NTSC	On	Reference

Note: Whenever the Genlock mode is OFF the output is always free running.

Monitor Menu

Monitor
▸Panel Display ▸EDH Status ▸EDH Reset ▸Key Window ▸Border

Panel Display

Normal / Recursive / Median / Spatial / Linear / Scratch / Enhancer / EDH Check / Network / Auto Loop

Default Normal

The *Panel Display* sub-menu provides a facility to display the PREFIX settings and configuration on the LED display on the front panel. Filter configuration information or unit status information can be displayed; optionally the display can be set to automatically scroll through all the status and configuration information.

When the front panel LED is showing the status display the menu control buttons can also be used to select which status information is displayed. Use the PRESET or PREV buttons to scroll through the different status and configuration information. To set the panel display into automatic scroll mode simply press PREV and PRESET together. To turn off the automatic scroll simply press PREV and PRESET together again.

EDH Status

PREFIX performs automatic checking of the SDI bitstream. The *EDH Status* menu indicates the current status of the EDH checking. The messages displayed are: -

None	EDH not present
OK	EDH present no errors
Errors	EDH is present with errors
Off	EDH checking turned off

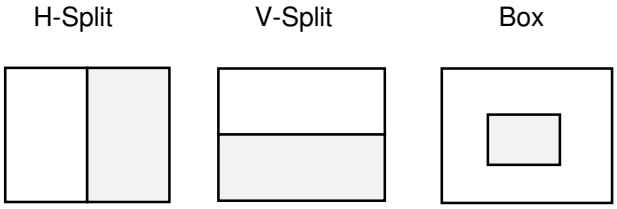
This display is constantly updated, and reflects the current EDH status. To view the Active Picture and Full Field error second counts use the *Panel Display* or *Status Display*. The EDH error second count can be reset in the *EDH Reset* sub-menu. When the H-Split key window is selected EDH checking is turned off.

EDH Reset

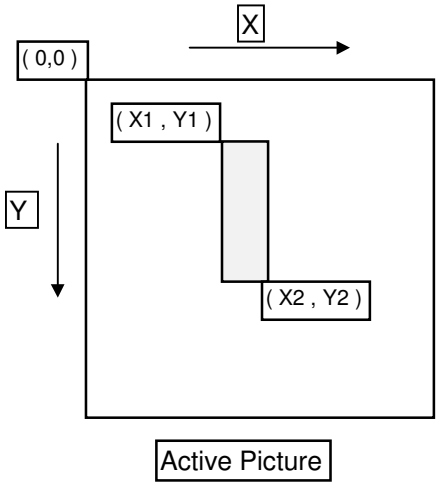
AP Reset	Reset Active Picture Error Seconds
FF Reset	Reset Full Field Error Seconds
Reset Both	Reset AP and FF Error Seconds

Key Window

A powerful facility exists in PREFIX to control which areas of the picture are processed. This can be found in the *Key Window* sub-menu. The key window can be set up as a basic split or a user definable area. The options available are: -

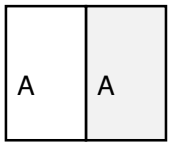


User



The user defined key window could be used to apply processing to a specific area of the picture. The co-ordinates are set in the *Set User* sub-menu. The co-ordinate pairs are specified as top-left and bottom right, (X1, Y1) and (X2, Y2). The range of values for X is 0 to 719 pixels. The range of values for Y is 0 to 285 lines in 625 line standards and 0 to 242 lines in 525 line standards.

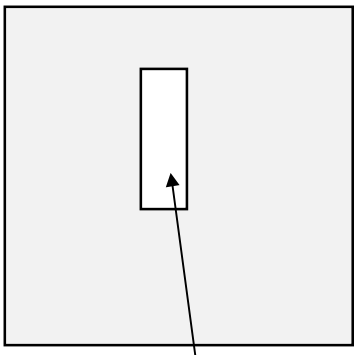
H-Repeat



H-Repeat performs a horizontal repeat so that the left half of the picture is repeated on the right half of the picture.

When key window is selected the signal processing is applied to the shaded area. It is possible to invert the sense of the key window so that processing is applied to the other part of the picture instead.

With the user definable key window a particular area of the picture could be excluded as shown below.



Area to be excluded from processing selected by user defined key window and Key window invert

Selecting a Border to be displayed around the key window can highlight the Key Window.

Please note that when the key window is chosen it is applied to both the PROGRAM and MONITOR outputs. Hence the processing is applied to the PROGRAM and MONITOR outputs. The Border is only visible on the MONITOR output.

The facility exists to log systems events using the RollCall PC log viewer application software (refer to Appendix 4 – Section 12 for field information).

Memory Menu

Memory
- ▸Recall Preset
- ▸Recall User
- ▸Store User
- ▸Set Name

This menu allows unit configuration and settings to be stored and recalled.

In the *Store User* sub-menu there are eight initially empty memory slots. To recall one of the user defined memories use the Recall *User* sub-menu. *Set Name* allows the name of the user memories to be selected by the user.

There are a set of pre-defined memory settings for specific applications and these can be found in the *Recall Preset* sub-menu.

Current Operating Conditions

When the panel display shows the 'normal' status page the current memory name is displayed on the second line. If any setting is different to that memory either "(Modified)" or "(Mod)" will be added to the end of the name to show that the current configuration is a modified version of that store.

The current settings, including the network name and address, are maintained in a special store that is recalled when the Prefix is powered on. Ten seconds after any setting is changed it is written to this store so that if the unit is subsequently powered off then on again its configuration will not be lost.

Store User

The eight user defined memories store all the PREFIX configuration settings such as filters, decoder parameters and video configuration. The only exceptions to this are the Network Address and Name; these are only changed and stored under the *System* menu.

Using the memory.

1. Set up PREFIX with the desired settings such as
   SDI A, VITS All On
   Recursive On
   Median On
2. Use the *Set Name* sub-menu, and select the name for the memory. You could adopt a simple numbering system, use a channel name or a generic setting such as film or sports.
3. Store the memory. To do this enter the *Store User* sub-menu and choose which memory slot is to be used. Press SELECT when the desired slot has been chosen.

Recall User

The eight user defined memories can be recalled by using the *Recall* sub-menu, simply choose the desired memory and press the SELECT button. When a user defined memory is recalled, ALL parameters and configuration information including the source are set as per the memory.

Recall Preset

This sub-menu contains a set of pre-defined memory settings for specific applications. These settings provide a guide for the filters, which are appropriate for particular types of noise. The actual settings for each filter should be evaluated depending on the material being processed. When these memories are recalled only the Filter configuration and control parameters are recalled. So if the source is composite A, recalling the Film Artefact preset memory will not change the decoder or video set up, only the filters will be changed.

The Preset memories are: -

Satellite Noise
Film Artefacts
Video Artefacts
F & V Artefacts
MPEG Lo bps Fil
MPEG Med bps Fil
MPEG Hi bps Fil
MPEG Lo bps Vil
MPEG Med bps Vi
MPEG Hi bps Vil
Factory

The final entry in the *Recall Preset* sub-menu is a Factory setting. This can be used to return all configuration and control parameters to the Default State when the unit was shipped. Note that the Net address and Net Name are reset when you do a Recall Factory.

Set Name

To change the characters in the memory name, the SELECT button is used to move the cursor along one character to the right. The SPINWHEEL is used to change the character. The available characters are shown in the menu structure.
When the desired memory name has been entered press the SELECT button until the cursor is at the end of the text entry field. Pressing the SELECT button once more will return to the Memory menu.

PRE-DEFINED MEMORIES - General Settings

	Application	Recursive	Semi Transversal	Median	Spatial	Linear	Scratch	Enhancer
1	Satellite Noise	Y - Med C - Med Threshold - Auto Bias - 0	On	Level - Med 3	Off	Mode : Off	Off	Mode : Decoder Match Field Comb
2	Film Artefacts	Y - Min C - Med Threshold - Auto Bias - 0	On	Level - Med 4	Y - Min C - Med	Mode : Off	Strength - Med Contrast - Low+Med Length - Long Type - Both	Mode : Enhance Y - Min C - Min Y Core - Min C Core - Min
3	Video Artefact	Y - Med C - X colour Threshold - Auto Bias - 0	On	Level - Med 3	Y - Min C - Max	Mode : Off	Off	Mode : Decoder Match Field Comb
4	Film & Video Artefacts	Y - Med C - X Colour Threshold - Auto Bias - 0	On	Level - Max 5	Y - Med C - Max	Mode : Brickwall Cutoff - 3.2MHz Boost - 0dB	Strength - Med Contrast - Low+Med Length - Long Type - Both	Mode : Decoder Match Field Comb

Note: If an external composite decoder is used, the Line or Other may be a more appropriate setting for the Decoder Match filter.

PRE-DEFINED MEMORIES - MPEG Settings

	Application	Recursive	Semi Transversal	Median	Spatial	Linear	Scratch	Enhancer
5	MPEG low bit rate Film	Y - High C - High Threshold - Auto Bias - 0	On	Level - Max 5	Y - Med C - Max	Mode : Brickwall Cutoff - 3.2MHz Boost - 0dB	Off	Mode : MPEG De-enhance Y - Max C - Max
6	MPEG med bit rate Film	Y - Med C - Med Threshold - Auto Bias - 0	On	Level - Med 4	Y - Min C - Med	Mode : Brickwall Cutoff - 3.5MHz Boost - 0dB	Off	Mode : MPEG De-enhance Y - Min C - Med
7	MPEG high bit rate Film	Y - Min C - Min Threshold - Auto Bias - 0	On	Level - Min 2	Y - Min C - Min	Mode : Brickwall Cutoff - 4.2MHz Boost - 0dB	Off	Mode : MPEG De-enhance Y - Off C - Min
8	MPEG low bit rate Video	Y - High C - X Colour Threshold - Auto Bias - 0	On	Level - Max 5	Y - Med C - Max	Mode : Brickwall Cutoff - 3.2MHz Boost - 0dB	Off	Mode : MPEG De-enhance Y - Max C - Max
9	MPEG med bit rate Video	Y - Med C - High Threshold - Auto Bias	On	Level - Min 2	Y - Min C - Med	Mode : Brickwall Cutoff - 3.2MHz Boost - 0dB	Off	Mode : MPEG De-enhance Y - Min C - Med
10	MPEG high bit rate Video	Y - Min C - Min Threshold - Auto Bias - 0	On	Level - Min 1	Y - Min C - Min	Mode : Brickwall Cutoff - 4.2MHz Boost - 0dB	Off	Mode : MPEG De-enhance Y - Off C - Min

PRE-DEFINED MEMORIES - Factory Settings

	Application	Recursive	Semi Transversal	Median	Spatial	Linear	Scratch	Enhancer
11	Factory	Off	Off	Off	Off	Off	Off	Off

Note : This also resets all other control and configuration parameters to their default setting.

Quick Menu

Quick
Recursive Semi Trans Median Spatial Linear Scratch Enhancer Pattern Freeze Bypass

The *Quick* menu provides a fast way to turn key features of the unit On and Off. This facility will probably be of more benefit when using the 'Shoe Box' interface.

System Menu

System
►Net Address ►Net Name ►Version ►G Version ►Serial No

The system menu allows configuration of the RollCall network address and name. The address can be changed in the *Net Address* sub-menu. The default is 20h, the network address is displayed in hexadecimal format. The *Net Name* could be changed to something meaningful such as a channel name or rack unit and location. The Net Name is set in the same way that the memory name is set.

If the On-fail condition is selected as Message, the Net Name is displayed on the output.

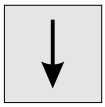
The software *version* number can also be recalled in this menu.

Operation from Decoder Card Edge
(Option –D only)

Long messages are scrolled across the display so that more information can be displayed.

Cancels the current action and reverts to the previous level.

Steps to the next menu level or causes a relevant value to increase.



Steps to the previous menu level or causes a relevant value to decrease.

Branches to a sub-menu or causes a parameter to be accepted with a transition to the previous menu level.

The PREFIX configuration can be programmed via the control buttons adjacent to the display. These buttons give access to a number of menus which have been arranged so that progressively selecting the relevant item on any given menu will eventually lead to the parameter requiring modification.

Some of the parameter modifications take effect immediately allowing the change to be previewed before accepting it by pressing the [ENT] button. Pressing the [ESC] Button will cancel the change and move the menu up one level.

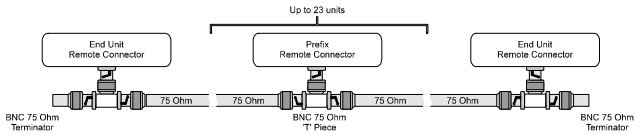
Pressing [↑] and [↓] simultaneously recalls the preset option for a menu entry.

Once the PREFIX has been configured the menu should be returned to the top level by pressing [ESC] as required. In this way any status or error messages can be scrolled across the display.

Remote Control

PREFIX has provision to be remotely controlled via the serial BNC network - S&W RollCall.

Interface to the "RollCall" communications network is via the single BNC connector. Connections should be made by means of a `T' piece (Zo=75 Ohms) to a 75 Ohm cable system as shown below. It should be noted that both extremities of the cable system must be terminated in 75 Ohms and the maximum number of units limited to 25 on one single cable run.



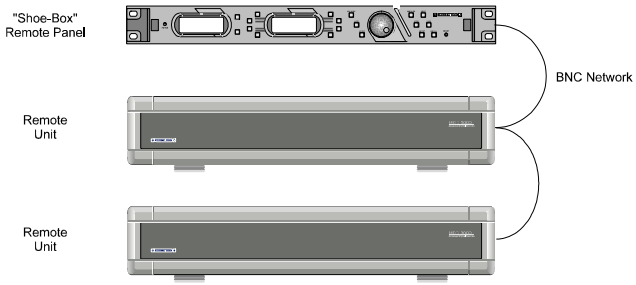
The communications network is a specially designed remote control network system and many more units can be accommodated by using a "Network Bridge". Remote control can come from either a dedicated front panel or "shoe-box" or a standard IBM compatible PC. Full protocol documentation and more detailed information is available on request from the supplier.

An RS 422 interface is available via the 9-pin female D type connector. Further information about this port is available on request.

Basic RollCall Operation

All the features from the menu system are available remotely with the same options structure. This maintains compatibility and facilitates easy operation for users familiar with the unit.

The most common PREFIX remote configuration is shown below where several compression pre-processors are connected to the network for remote control by one remote panel or "shoe-box".



Typical Set-up

The network address for each unit is set via the menu system option "NETWORK". The default address is 20hex. When installing a network it is recommended that a table similar to the one at the end of the manual be kept up-to-date to allow fast and accurate allocation of new unit addresses.

Parameter changes are reflected both locally and remotely. For example, if the output is changed to a test pattern by a remote unit then any further access from the card edge to the PATTERNS option will indicate this change. Similarly, if the card edge changes a parameter then this will be reflected on the display panel of the remote unit.

For more detailed information about the operation of the remote panel or PC software please consult their relevant manuals.

Network Configuration

If a number of Snell & Wilcox products are to be connected to a RollCall™ network each needs to be assigned a unique identification number. This *Network Address* is a number between 1 and 255 (usually shown in hex as 0x01 to 0xff). Addresses in the range 0x01 to 0x1f are reserved for network bridging and gateways so each Prefix must have a unique address between 0x20 and 0xff.

The best way to configure a network is to draw up a table of units and allocate an address and name to each. Each unit should then be set up before connecting to the network or while the other devices on the network are powered off.

Alternatively advantage can be taken of the automatic network address selection facility of the Prefix. Whenever a Prefix is powered on it checks that its network address is not already being used by another device. If the address is being used it will search for the next available value and will configure itself to use this new address.

When a new Prefix is delivered to a customer it will have the factory default network address of 0x20 and network name “PREFIX (20)”. If this unit is added to a network that already contains a device with address 0x20 the new unit will pick the next free address, say for example 0x34. In this case the unit’s network name will also be updated to “PREFIX (34)”. The name can now be changed to something more meaningful.

If a large number of new Prefixes are to be formed into a network they will all start with address 0x20, but the second unit to be powered on will find that 0x20 is in use by the first and so will set its address to 0x21. The third unit powered on will find both 0x20 and 0x21 in use so will select 0x22 and so on until all units have configured themselves. A remote control device on the network will show units named “PREFIX (20)”, “PREFIX (21)”, “PREFIX (22)” etc. Knowing the order power was applied will allow each unit to be identified and more meaningful name, such as “OB Feed 1” or “Rack 1, Unit 3” to be set. Once a unit’s address is correctly configured it will not change unless it is powered off and then attached to a new network that already has a unit with the same address.

If you wish to configure a network automatically it is important to realise that each time a Prefix checks a prospective network address it takes a second. This means that when configuring a network of 20 devices, each Prefix should be allowed at least 20 seconds to pick a network address before another unit is powered on. A more accurate method is to wait for each new Prefix to be shown on a remote control device such as a *Shoebox* or a PC before powering on the next one.

***Note** : It is not recommended to connect more than 25 Prefixes or other RollCall™ devices on a single section of coax network. If a larger system is required sections of up to 25 units should be built with at least one Shoebox each. The sections can then be linked with 9-way ribbon cable linking the Shoeboxes’ “Network” connectors. The sections will all be regarded as one network so any of the units can be controlled by any of the Shoeboxes. The total number of units that can be connected in this way is limited, by the number of unique addresses, that is, up to about 200.*

RollTrack

RollTrack is a feature of RollCall™ (Snell & Wilcox's proprietary remote control system).

It enables Snell & Wilcox RollCall compatible audio delay products to track delay introduced by RollCall compatible video processing products.

The simplest configuration is a single video unit and a single audio delay in a RollCall system. The audio delay will have the same delay as through the video path. If the delay changes the audio delay will track.

The next level of configuration is where there are multiple Frame Synchronizers (for example) each connected through RollCall to their own tracking Audio Delay. (It is worth stating that the synchronizers and audio delays do not have to be in the same enclosure; the addressing scheme, discussed later, allows for the units to be positioned anywhere in the RollCall domain.)

The maximum number of video units and audio delays in a RollCall system is set by the maximum limit of the number of modules in a RollCall network and is currently 3840.

The next level of complexity is *a vertical delay cluster* where a video unit can have up to eight audio delays tracking - of the same or different types.

From one to eight audio delay products can be connected via RollCall to a single frame synchronizer, for example. If the synchronizer delay changes, then however many audio delays are connected will track the delay. The audio delays can also have a manual delay which will be added to the RollTrack delay.

The next level of complexity is *a horizontal delay cluster* where an audio delay can track up to four video units.

The total delay time through the audio delay is then the sum of the individual delays introduced by the video units plus the manual delay of the audio unit. The manual delay can be set to compensate for any fixed propagation delay in the video path or may be set to zero.

The next level of complexity is a *matrix delay cluster* where each audio delay (up to eight) can track up to four video units. This configuration is in effect a four by eight matrix of video units and audio delay units.

The total delay time through the audio delay units is then the sum of the individual delays introduced by the video units plus the manual delay of the audio unit.

As any of the delay times change in the video path so will the audio delay time track this delay.
A virtual connection is by:

selecting the *Setup...* Menu
then selecting the *Audio_Delay...* Menu
then choosing from *Unit_1* to *Unit_8*
then entering the unique network address in the form *nnnn:xx:yy*z*

where *nnnn* = network address and in most cases will be 0000;
xx = Enclosure address;
yy = slot address
z = the connection (or channel) number - see table below.

then selecting *Delay...* Menu
then selecting *Auto*

Example of Network Addresses with Channel Numbers

	D1FSY 1	D1FSY 2
Audio delay 1	0000:10:01*14	0000:10:01*15
Audio delay 2	0000:10:03*14	0000:10:03*15
Audio delay 3	0000:10:05*14	0000:10:05*15
Audio delay 4	0000:10:07*14	0000:10:07*15
Audio delay 5	0000:10:09*14	0000:10:09*15
Audio delay 6	0000:10:0B*14	0000:10:0B*15
Audio delay 7	0000:10:0D*14	0000:10:0D*1 5
Audio delay 8	0000:10:0F*14	0000:10:0F*15

	D1FSY 3	D1FSY 4
Audio delay 1	0000:10:01*16	0000:10:01*17
Audio delay 2	0000:10:03*16	0000:10:03*17
Audio delay 3	0000:10:05*16	0000:10:05*17
Audio delay 4	0000:10:07*16	0000:10:07*17
Audio delay 5	0000:10:09*16	0000:10:09*17
Audio delay 6	0000:10:0B*16	0000:10:0B*17
Audio delay 7	0000:10:0D*16	0000:10:0D*1 7
Audio delay 8	0000:10:0F*16	0000:10:0F*17

Specifications

Features

Signal Inputs

Analog Composite	2 loop-through via BNC connectors
Digital Serial SMPTE 259M	2 via BNC connectors
Reference	1 loop-through via BNC connectors
Analog Audio	4 channels analog via XLR connectors

Signal Outputs

SMPTE 259M-C	2 Program with embedded AES audio in channel positions 1, 2, 3, 4.
	2 Program
	Note: AMD = Advanced Multi-Phase Decoder

Control Ranges

BLO operating range	±100 Hz
Video gain	±3 dB, 0.1 dB steps
Chroma gain	±6 dB, 0.05 dB steps
Black level	±20 mV, 2 mV steps Manual or Automatic tracking
Color filters	Wide/medium/narrow
NTSC/ PAL-M pedestal	On - Input has a pedestal
	Off - Input does not have a pedestal
NTSC hue	±180°, 1° step
Picture Position	±600 ns
Decode Mode	Enable or disable Y/C separation
Comb Mode	Standard Version:
	Non adaptive/Adaptive (default)
	AMD Version:
	Studio 1, 2, 3.
	Min Delay
	LDisk
	VHS
	Still
	Simple 1 & 2
	Line
Vertical Adaption	Chrominance Hanover bars suppression
	On - Adaptive vertical filter (default)
	Off - Non adaptive vertical filter

Features

VITS	Individual line controls or Group control for blanking/passing of VITS lines.
	AMD Version:
	625 composite standard: 6 to 22 & 319 to 335
	525 composite standard: 10 to 20 & 272 to 282
	Standard Version:
	625 composite standard: 6 to 22 & 318 to 335
	525 composite standard: 9 to 22 & 272 to 282
Recursive Filter	Motion Adaptive asymmetric temporal (frame) recursive filter.
	Three set levels with maximum noise reduction of up to 12dB.
	Bias adjustment ±3 allows fine control in approximately 1dB steps.
	Filter On/Off Y: AUTO, Off, Min, Med, Max
	C: AUTO, Off, Min, Med, Max Bias: -3 - +3
	Threshold (Noise floor): AUTO, 1 - 15
Semi-Transversal Filter	Operates on recursive filter output.
	Reduces absolute levels of noise trails in static revealed/concealed areas e.g. after scene changes up to 4.7dB. Can only be switched on when recursive filter is selected.
	Filter On/Off
Median Filter	Adaptive spatial/temporal median filter.
	Filter On/Off
	Level: Min 1, Min 2, Med 3, Med 4, Max 5, Max 6
Spatial Filter	Spatial 2D median filter.
	Filter On/Off
	Y: Off, Min, Med, Max
	C: Off, Min, Med, Max
Linear Filter	18 sets of linear 15 tap low pass brickwall digital filters.
	6 sets of linear 15 tap extra low pass brickwall digital filters.
	6 sets of peaking value for each cut-off frequency.
	10 sets of Gaussian low pass filters (no peaking).
	5 sets of Gaussian high pass filters.

Features

Brickwall Low Pass Cut Off:	Full Bandwidth, 4.2 - 2.5 MHz (-6 dB) in 0.1 MHz steps
Brickwall Extra Low Pass Cut Off	2.4 - 0.9 MHz (-6 dB) in 0.3 MHz steps (no boost)
Boost:	None, 1 dB, 2 dB, 3 dB, 4.5 dB, 6 dB
Gaussian Low Pass:	-4 dB to -40 dB in 4 dB steps
Gaussian High Pass:	1 dB, 2 dB, 3dB, 4.5 dB, 6 dB
Scratch Filter	Filters, of different strengths, for Vertical scratches, of variable contrast, type and length.
	Filter On/Off
	Strength: Min, Med, Max
	Contrast: Low, Med, High
	Length: Any, Long
	Type: Both, Black, White
Enhancer Modes	Off, Enhance, MPEG De-enhance,
	Decoder Match, Video Mode
Enhance:	Spatial 2D enhancer utilising separately derived non-linear and linear edge detection and compression.
	Luma: Off, Min, Med, Max
	Chroma: Off, Min, Med, Max
	Luma Coring: Off, Min, Med, Max
	Chroma Coring: Off, Min, Med, Max
MPEG De-Enhance:	Non adaptive symmetric vertical temporal filter utilising ±1 field contributions
	Luma: Off, Min, Med, Max
	Chroma: Off, Min, Med, Max
Decoder Match:	Non adaptive symmetric vertical temporal filters utilising ±1 field contributions
	Aperture adjusted to complementary match decoder comb structure
	MDD500, Line Comb (e.g.MDD1000), Field Comb.
Video Mode:	Reduces temporal bandwidth of interlaced video (non-film) inputs prior to MPEG 2 encoding. Modes: 1,2.
Synchronizer	Genlock: Input/Reference/Off
	Status: I/P lock, Ref. Lock
	Horizontal offset::
	0 - 1H (in 37 ns steps)
	Vertical offset:
	0 - 624H (625 standards)
	0 - 524H (525 standards)

Features

VITS	All On, All Off, Select individual lines
	Individual line controls or Group control for blanking/passing of VBIS lines
	AMD Version:
	625 Standard: 6 to 22 & 319 to 335
	525 Standard: 10 to 20 & 272 to 282
	Standard Version:
	625 Standard 6 to 22 & 318 to 335
	525 Standard 9 to 22 & 272 to 282
Embedded V flag Style (525 line only)	OVD Optional Video Data (1-9/264-272)
	OBD Optional Blanking Data (1-19/264-282)
	ABD Additional Blanking Data (1-22/264-282) not filtered (V flag as OBD)
8-bit Rounding	10-bit to 8-bit rounding using truncation error feedback.
EDH	Input error detection and handling
	Status: None, OK, Errors
	AP/FF Individual or linked reset
Key Window	Allows split screen facilities to monitor effect of digital filtering applied to the key area only.
Select:	Off, H-Split, V-Split, Box, User, H-Repeat
User:	User Defined Key window co-ordinates
	X1, Y1, X2, Y2
Invert:	Inversion of selected key window.
Border	Selects the border shade around the key window. Off, Black, White
Event Logging	Enables the user to monitor events using RollCall PC Log Viewer
Pattern	Internal Test Patterns.
	Black/ EBU Bars/ Y Ramp/ UV Ramp/ Y Sweep/ UV Sweep/
	Bowtie/ Full Bars

Features

On Fail	This sets the default mode for the unit when the input signal fails.
	SDI B/ Video (Comp I/P)/ Freeze (SDI I/P)/ Message/
	Black/ EBU Bars/ Y Ramp/ UV Ramp/ Y Sweep/
	UV Sweep/ Bowtie/ Full Bars
Panel Display	RollCall™ shoebox panel display information: Normal, Recursive, Median, Spatial, Linear, Enhancer, EDH Check, Network, Auto Loop
Panel Display	RollCall™ shoebox panel display information: Normal, Recursive, Median, Spatial, Linear, Enhancer, EDH Check, Network, Auto Loop
Memory Store:	User defined memory Slots 1-8
Memory Recall User:	User defined memories 1-8
Memory Recall Preset:	Recall preset memories:
	Satellite Noise
	Film Artifacts
	Video Artifacts
	F & V Artifacts
	MPEG Lo bps Fil
	MPEG Med bps Fi
	MPEG Hi bps Fil
	MPEG Lo bps Vid
	MPEG Med bps Vi
	MPEG Hi bps Vid
	Factory
Memory Set name:	Set Memory Name (user defined) 1-8,
	10 characters ASCII character set.

Specifications

Reference Input	625 and 525 Black Burst or Composite Video
Return Loss: Analog Inputs	better than -35 dB to 5.5 MHz
Return Loss: Digital Inputs	better than -17 dB at 270 MHz
Analog Audio Input	10k ohm impedance electronically balanced
	Nominal input level +4 dBu
Return Loss: Digital Outputs	better than -17 dB at 270 MHz
Serial Net RollCall™ BNC	Proprietary Snell & Wilcox interface multi-drop via BNC-T network
System Communication	9 pin D-Type RS422 Slave
AUX Communication	9 pin D-Type RS422 Master
Digital Processing	Minimum 10-bit processing throughout.
ADC Conversion	Analog composite input is sampled using 10-bit ADC twice oversampled and digitally filtered/decimated
Luminance/Chrominance	Symmetric multi-standard adaptive field comb.
Separation	Dual 312H PAL-I, PAL-N
	Dual 263H NTSC, PAL-M
Composite Formats	AUTO, PAL-I, PAL-N, PAL-M, NTSC

Audio Processor

ADC Conversion	18-bit resolution.
	64 times oversampled
Input Headroom	Adjustable, nominally 18 dB
Frequency range	20 Hz-20 kHz ± 1dB
Total Harmonic Distortion	Less than 0.015% @ 1 kHz
Signal to Noise Ratio	Better than 100 dB 20 Hz-20 kHz
Input Dynamic Range	106 dB
Phase difference between channels	Less than 1 degree @ 1 kHz
Cross Talk	Less than 75 dB @ 15 kHz
Channel Level Differences	Less than 0.5 dB
Digital Audio AES sample rate	48 k samples/second
Serial Digital format	A pair of dual 32 bit synchronous serial channels
Delay Adjustment	-1 to 10 fields in 0.25 field steps
Audio Level Adjustment	Mute, -95.5 dB to +31.5 dB in 0.5 dB steps
Test Tone	Individually selectable on CH1-CH4
	Digitally generated +4 dBu level
AES Group	Selectable GRP0/ GRP1/ GRP2/ GRP3

Specifications

Power

Input Voltage Range	90 V to 250 V 50/60 Hz
Consumption	100 VA maximum
Mains Fuse Rating	2.5 A(T)

Mechanical

Specifications

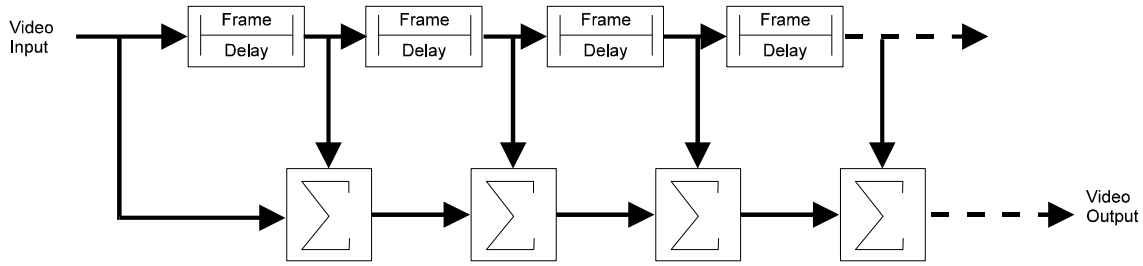
Temperature Range	0 to 40° C operating
Cooling	Filtered Axial fan. Front to rear air flow
Case Type	2U Rack Mounting
Dimensions	483 mm x 495 mm x 88.6 mm (w,d,h)
Weight	12 kg

Appendix 1-Using the Filters

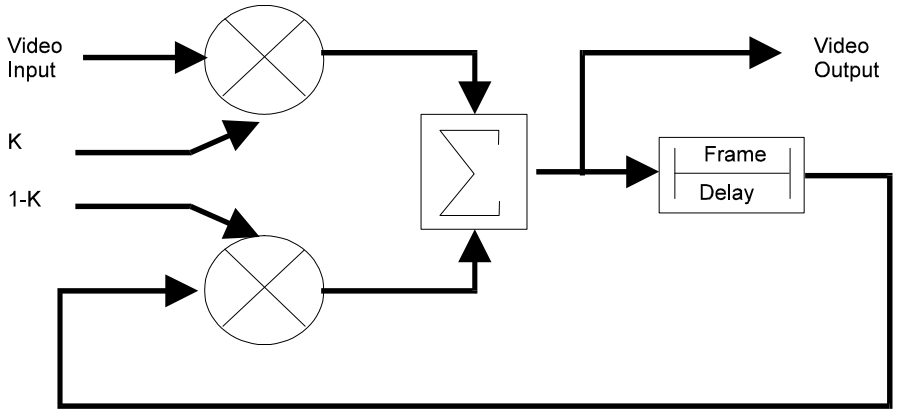
Recursive Filtering

Noise can be reduced in video signals without impairing spatial (horizontal and vertical) resolution by using the fact that in stationary pictures the only difference between successive frames is caused by the noise itself. Thus temporal averaging of successive video frames will produce a degree of noise reduction of the picture since the noise contribution is random with zero mean. The overall effect of this is a temporal low pass filter.

There are two ways of implementing such a low pass filter. Firstly the signal may be passed through a series of delay elements, each of length one picture period, and the output signals summed together as shown below:



This type of noise reducer is typically known as a transversal noise reducer. The level of noise reduction that can be obtained from this type of arrangement is directly determined by the number of temporal or picture contributions. Unfortunately, a large number of picture contributions are required to achieve a useful level of noise reduction. Another consequence of this arrangement is that it introduces a substantial processing delay. An alternative filter arrangement is shown below:



The structure of this filter is basically a two input cross-fader between the video input and previous output delayed by one frame. The cross-fade value, K is determined by factors such as the degree of noise reduction required and the level of picture difference detected between current input and frame delayed output. Hence if the K value is very small then the contribution to the output will predominantly be from the previous output and not from the current input. On a static scene following a shot change the picture output will be formed entirely from the input (K=1) since there will be a large picture difference between scenes. On the next frame however, K will be reduced to the optimum value of 1/2 and some noise reduction will be accrued from the combination of current input and previous output. On the following frame the value of K will be further adjusted to the optimum value of 1/3 and so forth for additional frames until K reaches the lowest corresponding to the ultimate level of noise reduction required.

Recursive Filtering cont.

If current input is denoted as input (n) , subsequent input frames are described as input (n+1), input (n+2) etc..

OP1 (scene change) = input (n)

OP2 (scene change + 1 frame) = 1/2 * input (n+1) + 1/2 * OP1

Which can be rewritten as:

OP2 (scene change + 1 frame) = 1/2 * input (n+1) + 1/2 * input (n)

OP3 (scene change + 2 frames) = 1/3 * input (n+2) + 2/3 * OP2

Which can be rewritten as:

OP3 (scene change + 2 frames) = 1/3 * input (n+2) + 2/3 * (1/2 * input (n+1) + 1/2 * input (n))

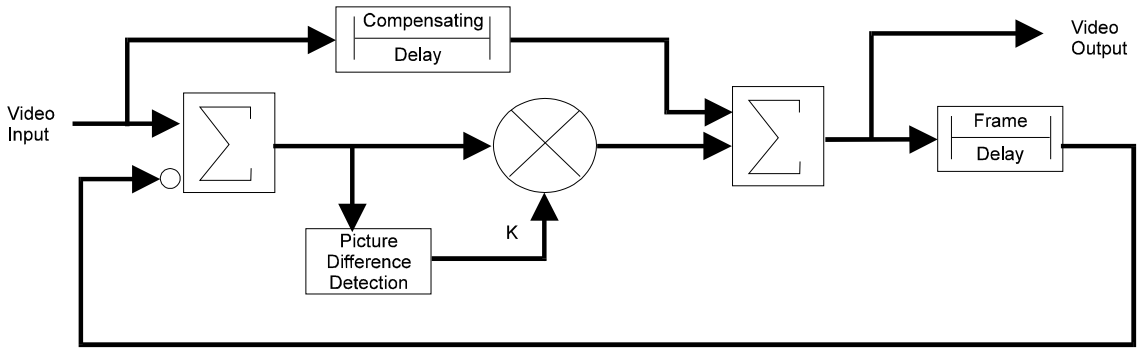
Which can be rewritten as:

OP3 (scene change + 2 frames) = 1/3 * input (n+2) + 1/3 * input (n+1) + 1/3 * input (n)

and so on for further inputs..

Each output is built up from contributions of previous inputs in a controlled manner to provide optimum noise reduction as quickly as possible. The advantages of such an arrangement are that much higher levels of noise reduction can be obtained than the transversal arrangement with virtually no delay. In the limiting case an infinite amount of noise reduction can be applied to a stationary picture with picture contributions backwards into infinity. In reality the level of noise reduction will be continuously modulated by picture differences such as shot changes or motion. Sophisticated control of K is vital to the correct operation of a recursive noise reducer.

Without some form of motion detection, the impulse response of the recursive filter would be that of a decaying exponential sampled at the picture frequency, and the effect on moving pictures is very like that of a long persistence display tube with a time constant of 1/K picture periods. Its effect on motion would be to cause unacceptable smearing of the current picture with contributions of previous pictures. Therefore a sophisticated movement detector is used to disable contributions from previous pictures when there is a difference between the previous output and the current input. The structure of the recursive filter can be re-arranged as shown below:



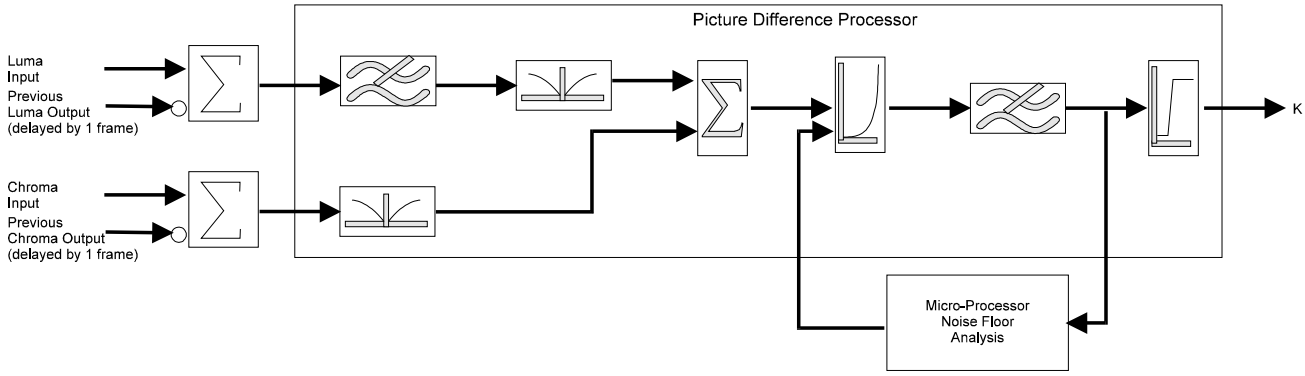
This arrangement removes one of the multipliers at the expense of a second adder and has the added benefit of providing a picture difference signal which is used in the picture difference processor to generate the cross-fade value K.

Recursive Filtering cont.

Noise Floor Measurement

Accurate noise floor measurement is required to set the threshold above which picture differences are perceived as motion. Luminance and chrominance picture differences are processed using a combination of full-wave rectifiers, linear filters and non-linear mapping tables to generate the control value K which determines the amount of noise reduction which can be applied on a pixel-by-pixel basis. Luminance differences are low pass filtered before being rectified and summed with the rectified chrominance difference signal. Subsequent non-linear mapping tables are used to amplify the combined picture differences. Finally a 2D spatial filter is used which has contributions from adjacent pixels and lines. The overall effect of the rectifier and spatial filter is to form the mean modulus of the picture difference signal. This is similar to measuring the r.m.s. value of the difference signal but is computationally easier and in the absence of motion is a good representation of the r.m.s. value of the noise (which forms the only contribution to the picture differences).

A side chain is used to integrate the processed differences and a software algorithm evaluates the noise floor based on a large history of previous picture difference measurements. Integrated picture differences will have a minimum value when there is no motion. The noise floor measurement produces a control value which determines the sensitivity of the motion detector (shown as a non-linear transfer function below).



The control parameter for this function can be configured manually through the THRESHOLD adjustment or normally it can be left in the AUTO setting in which case the microprocessor will automatically control the sensitivity.

Semi-Transversal

The semi-transversal filter operates in conjunction with the recursive filter to increase its effectiveness. Quite unlike the traditional transversal filters described in the preceding section it operates by selecting the most appropriate output from a chain of picture stores at the output of the recursive filter.

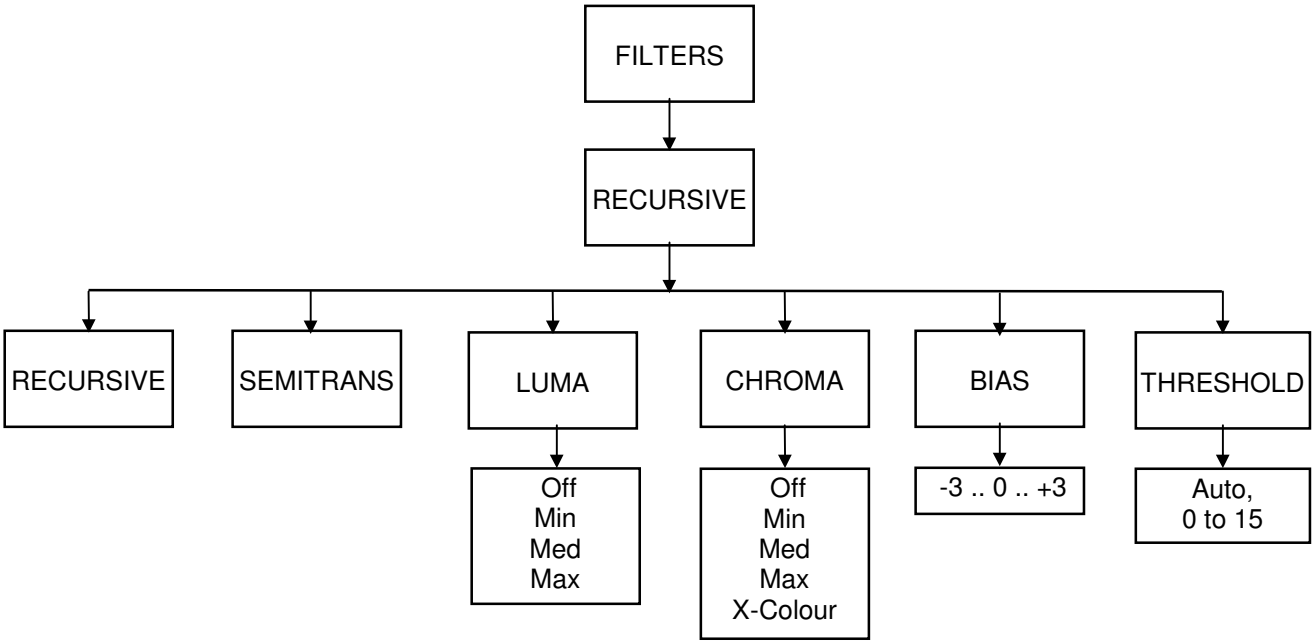
An algorithm is used to determine which of the stores contains the highest level of noise reduced picture. The overal effect is to increase the amount of noise reduction in a typical picture. For example, moving objects cause the recursive filter to turn off at the edge of the moving object. This leads to a recurrence of noise which takes a number of frames to reduce to the defined user level. The semi-transversal filter is able to monitor the recurrence of noise and delay the output of the recursive filter up to a maximum of three frames. Operating on a pixel-by-pixel basis, the overall level of noise reduction in a typical picture is maintained at a more uniform level and is less dependent on movement. As the semi-transversal filter complements the recursive filter, it cannot be used without the recursive filter. Effective at all recursive filter settings its operation can be seen as a reduction in the level of revealed noise trail following moving objects.

The semi-transversal filter operates in a fully automatic mode - there are no user adjustments required.

Recursive Filtering cont.

Operation

Control parameters for the recursive filter can be found under the RECURSIVE menu as shown below:



The recursive filter has separate controls for luminance and chrominance noise reduction levels. The levels represent the maximum noise reduction that can be obtained and can be roughly equated to 4dB, 8dB and 12dB for the min, med and max settings respectively. The default AUTO setting sets the noise reduction level to the MED position.

X-COLOUR

The cross-colour setting in the chroma level menu allows greater attenuation of cross-colour by defeating the chrominance motion adaption control. Whilst this is capable of considerably attenuating cross-colour the sensitivity of the motion detector to moving chrominance will be reduced with the consequent possibility of chrominance smearing.

Threshold setting

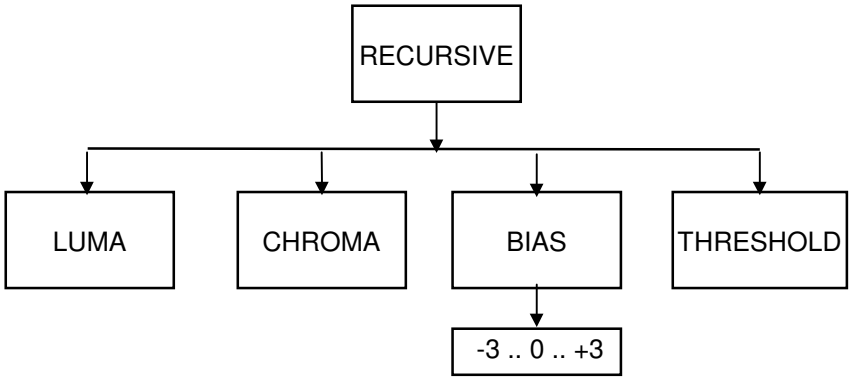
The recursive noise reducer has a threshold setting which determines the sensitivity of the noise reducer to picture differences. In the AUTO position (default) the sensitivity of the picture difference detector is set at a level which is appropriate for the amount of measured noise. The overall effect is that the closed loop system will attempt to provide the desired level of noise reduction whilst maintaining maximum sensitivity to picture differences caused by motion. Traditionally, noise reducers have offered manual configuration of the threshold setting to allow adjustment over a range around the correct operating point and the same facility has been provided in this design for that purpose.

Recursive Filtering cont.

Bias setting

An alternative mechanism for modifying the level of noise reduction is to use the bias function to introduce a small offset value to the threshold calculations of the noise floor detector. The THRESHOLD setting can then be left in AUTO position and the bias control can still be used to increase or decrease the amount of noise reduction applied to the picture. The behaviour of the bias function is as follows:

-3	Less Noise Reduction
0	Default setting
+3	More noise reduction



Examples for use

Recursive noise reduction is a powerful method of reducing electronically generated or white noise in video or film sources. Additionally it can be effective in reducing the level of film grain and to some extent film weave.

A typical range of settings may be described by the following table:

Noise Reduction Setting	Luminance Level	Chrominance Level	Bias	Threshold Setting
Low	Min	Min	0 (Default)	AUTO
Low-Medium	Min	Min	+3	AUTO
Medium	Min	Med	0 (Default)	AUTO
Medium-High	Med	Med	+3	AUTO
High	Med	Max	0 (Default)	AUTO
High-Maximum	Med	Max	+3	AUTO
Maximum	Max	X-Colour	Not relevant	15

Note the bias setting is an offset to the AUTOmatic noise floor measurement and is only effective when the microprocessor is controlling the closed loop system. Setting the threshold manually effectively opens the loop; therefore the bias adjustment setting no longer has any effect.

Median Filtering

Introduction

Median filters operate by rank ordering a set of points selected from an aperture. The outer points end up at the extremes of the list with the median value in the middle. Hence median filters always sort from an odd number of points. The median filter used in Prefix operates on the five most appropriate points selected from a 9-point aperture.

Median filters are effective at suppressing impulse noise which tends to end up at the extremes of the sorted list. Moving textures would also be distorted by the median filter if the filter were applied universally. Hence an alogrithm is used to evaluate spatial and temporal gradients in the vicinity of the suspect pixel to determine if it has the caracteristics of impulse noise. This serves the dual purpose of rejecting false alarms caused by moving textures and noisy sources.

The median filter has six settings which control both the strength and aperture set.

Min 1. This setting is used to conceal small drop-outs and sparkle which have a high contrast. It utilises information from adjacent lines only and is very selective.

Min 2. This setting is also used for small drop-outs and sparke but is also effective for film dust and lower contrast drop-outs. It utilises information from adjacent lines only and is quite selective.

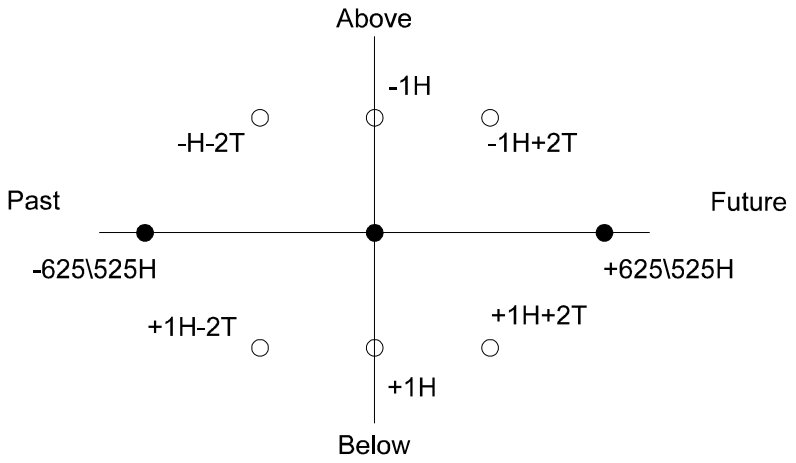
Med 3. This setting should be used for low contrast drop-outs and dust\small dirt. It utilises information from adjacent lines only and is quite selective.

Med 4. This setting is more effective at concealing small\medium dirt. It utilises information from both the current frame and adjacent frames.

Med 5. This setting is used to conceal medium dirt. It utilises information from both the current frame and adjacent frames.

Med 6. This setting provides the highest level of concealment for medium\large dirt. It utilises information from both the current frame and adjacent frames.

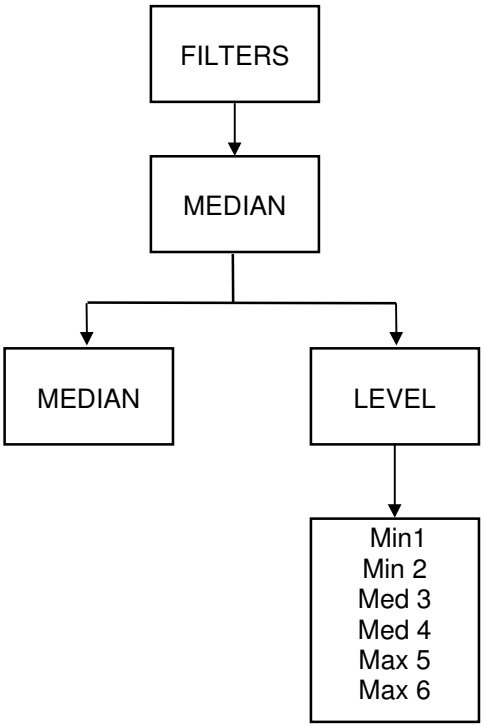
Median Filter Aperture



A subset of the points shown in the above aperture may be used in the median filter depending on the strength selected. In addition to the points shown in the aperture drawing above, horizontally adjacent pixels are used in the gradient analysis. The result of the gradient analysis determines whether or not the suspect pixel is replaced by the result of the median.

Operation

Control parameters for the median filter can be found under the MEDIAN menu as shown below.



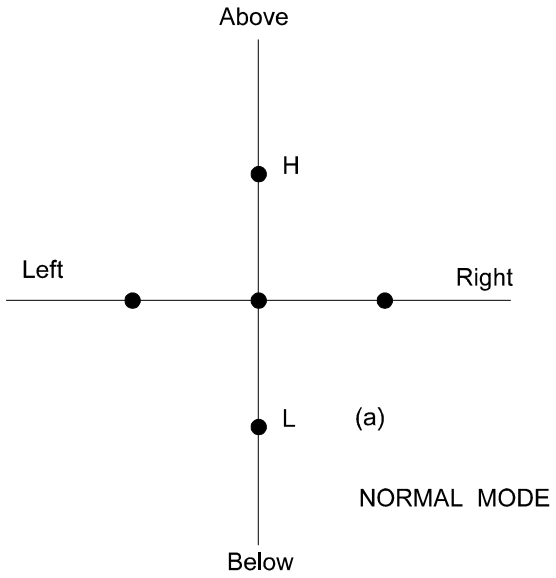
Spatial Filtering

Spatial filtering typically involves using an aperture which comprises adjacent pixels from the same field period. Typically linear filters have been used for noise reduction formed from a weighted average of adjacent pixels. Usually non-adaptive in nature they reduce noise by averaging contributions across several pixels. In plain areas, the degree of noise reduction is proportional to the sum of the square of the weighted contributions. In general a larger aperture will allow a higher level of noise reduction.

Typical levels of noise reduction for equally weighted contributions are shown in the table below:

Aperture Size	Noise power dB
3	-4.7
5	-6.9
7	-8.4

A major disadvantage of this approach is that high frequency picture detail is also filtered and this leads to a softening of the picture on edges and on textures.



Spatial Aperture comprising adjacent points on the same line and on adjacent lines above and below the central pixel.

The spatial filter in PREFIX uses a median filter based on an aperture of 5 pixels shown above.

Median filters operate by rank ordering a set of points selected from a median aperture. The outer points end up at the extremes of the list with the median value in the middle.

Although median filters can be effective at suppressing impulse they are also effective as gaussian noise reduction filters.

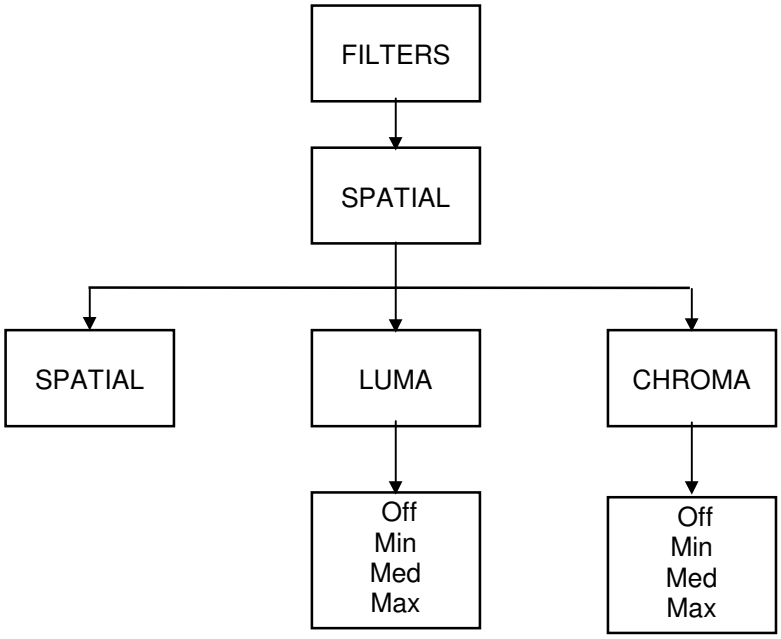
The spatial filter operates by resolving the spatial median and then verifying if this is of similar value to the current pixel. By varying the comparison threshold, the spatial filter can be tuned to reject noise but still preserve picture transitions and textures.

The spatial filter is controlled by two settings which vary the comparison threshold and effectively set the balance between the level of noise suppression and detail preservation.

Spatial Filtering cont.

Operation

Control parameters for the spatial filter can be found under the SPATIAL menu as shown below:



The SPATIAL filter has separate controls for luminance and chrominance noise reduction levels.

Examples for use

The spatial filter is complementary to the temporal noise filters (such as recursive, de-enhancement and decoder matching) and should be used in conjunction to achieve greater levels of noise suppression.

Linear Filters

Introduction

There are three types of linear filter which are available:

1. Brickwall Low Pass Filter with optional Boost
2. Gaussian Low Pass Filter.
3. Gaussian High Pass Filter.

The function of these filters is to perform various levels of noise reduction or compensation on the luminance component of the video signal.
The requirement to filter the luminance component can be desirable since its high bandwidth means that it is susceptible to high frequency noise. Also as the human eye is more susceptible to the luminance signal (as it is this signal which controls picture contrast) filtering of the signal can be extremely important.

Brickwall Filter

This filter is employed to reduce noise resident in the high frequency region of the luminance spectrum.

The filter has two ranges : Low pass and Extra Low Pass

Low Pass.

There are 18 user selectable cut-off frequencies (specified at -6dB) ranging from 4.2 MHz down to 2.5 MHz in 0.1 MHz steps. The stopband performance is -34 dB or better with no boost.

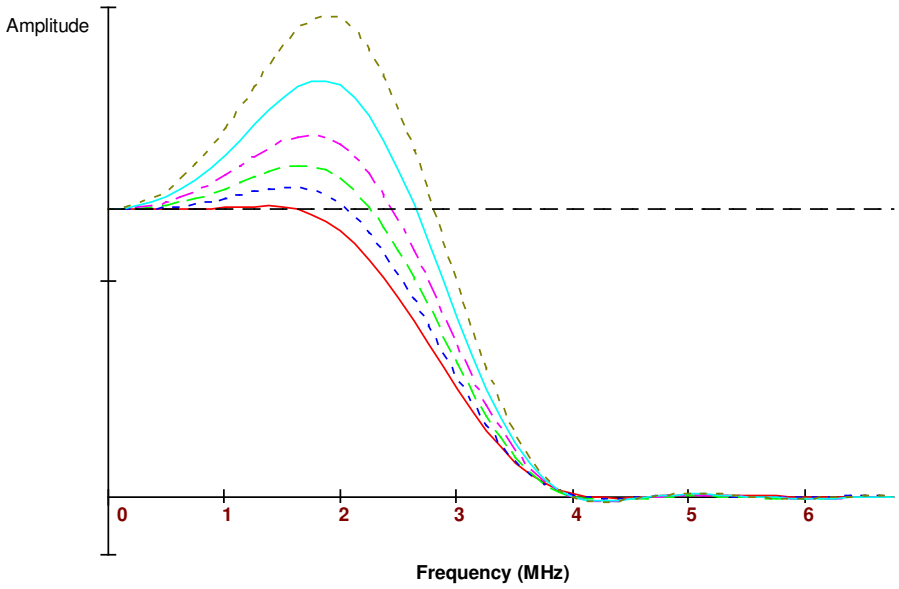
In addition to the selectable cut-off frequencies the user can also select a given boost at each cut-off:
0dB (no boost), 1dB, 2dB, 3dB, 4.5dB, 6dB.

The boost value selected is the amount of gain applied to the filter response at the chosen cut-off frequency.
The selectable boost facility is incorporated to allow the user to increase the perception of sharpness in the picture by boosting the contrast. The sharpness of a picture can sometimes be significantly reduced by filtering the high luminance frequencies so the inclusion of the extra boost helps to restore some of the sharpness to the picture. A boost of 6dB will result in the cut-off frequency being increased by up to 0.4 MHz.
The actual amount of boost selected will be a trade-off between cut-off and picture sharpness.

Extra Low Pass.

There are 6 user selectable cut-off frequencies (specified at -6dB) ranging from 2.4 MHz down to 0.9 MHz in 0.3 MHz steps. These filters can be used where the luminance component of the video signal needs to be significantly reduced in bandwidth. This set of filters would only normally be used in exceptional circumstances.

Linear Filters - cont.



2.8 MHz Brickwall Filter with available boosts

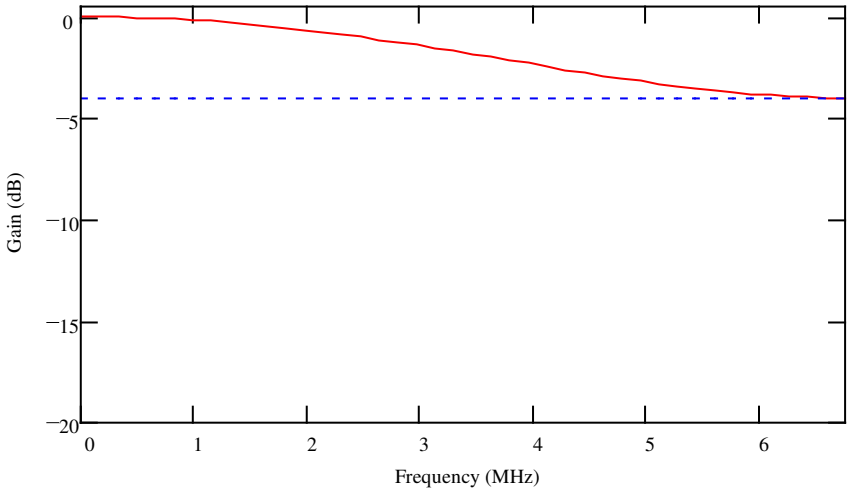
Linear Filters - cont.

Gaussian Filter

This filter is employed for both noise reduction and compensation purposes. The filter has two user selectable modes both of which are mutually exclusive: *low-pass* and *high-pass*.

Gaussian Low Pass

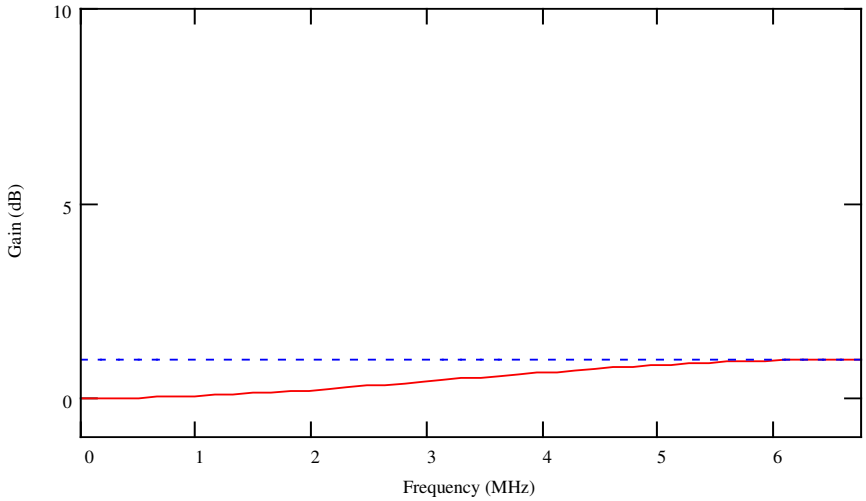
The *low-pass* filter mode is employed to noise reduce with less severity than the brickwall filter and/or to compensate for any irregularities in the luminance signal such as inherent high frequency gain.
This mode has 10 user selectable levels at 6.75 MHz ranging from -4dB to -40dB in -4dB steps.



Gaussian Low Pass Filter with -4dB Gain

Gaussian High Pass

The *high-pass* filter mode is employed to compensate for high frequency attenuation in the luminance spectrum. This high frequency attenuation may be mainly caused by stray capacitance's inherent throughout the cables of an installation. This mode has 5 user selectable levels at 6.75 MHz: 1dB, 2dB, 3dB, 4.5dB, 6dB.



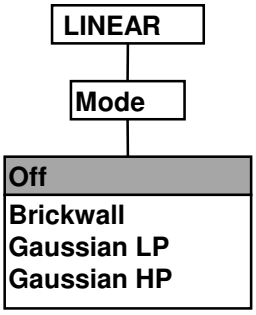
Gaussian High Pass Filter with 1 dB Gain

Linear Filters - cont.

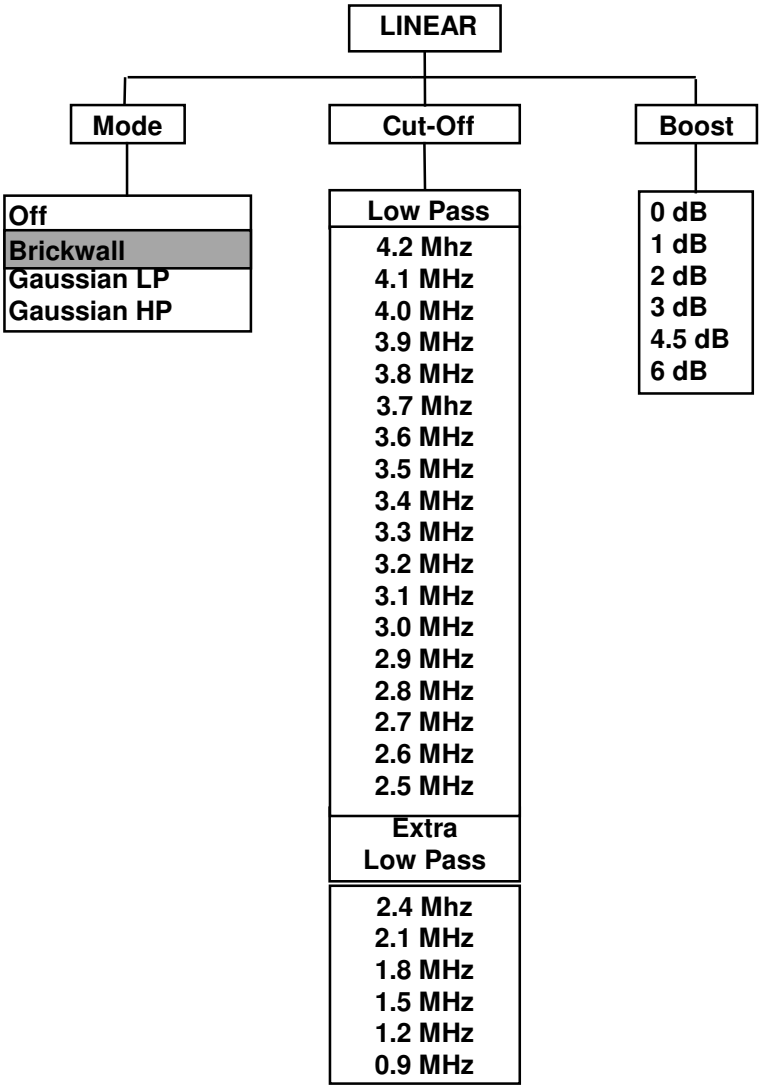
Operation

The linear filter control parameters can be found in the **FILTERS** menu under **LINEAR**.
The control features available to the user depend on the filter mode selected.
The options available for each mode are as follows:

Mode - Off (Full Bandwith)

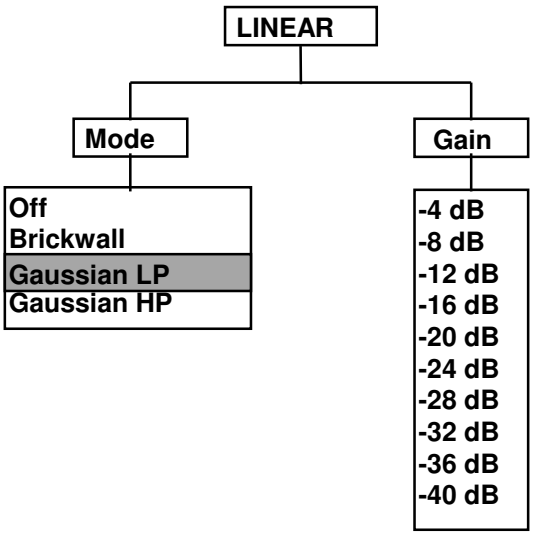


Mode - Brickwall

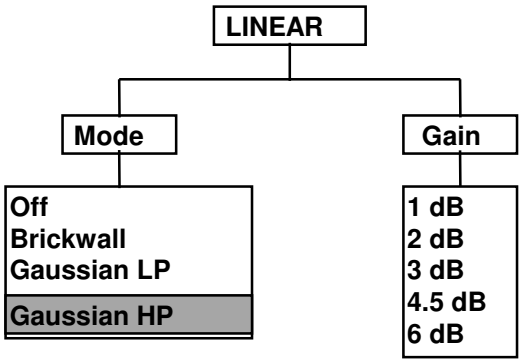


Linear Filters - cont.

Mode - Gaussian Low Pass



Mode - Gaussian High Pass



The factory default setting for the linear filter is **Off (Full Bandwidth).**

The factory default settings for each filter type are as follows:

Brickwall	**4.2 MHz** (**0 dB Boost**)
Gaussian LP	**-4 dB**
Gaussian HP	**1 dB**

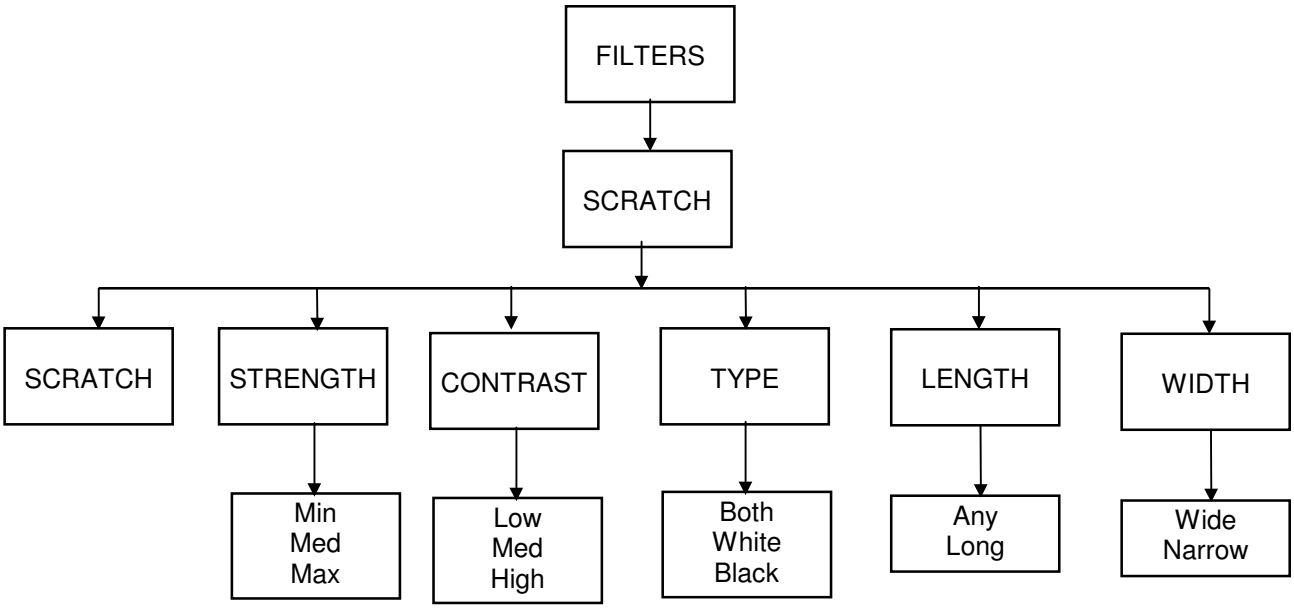
Scratch Filter

Introduction

This filter has been designed to detect and repair vertical scratches, of variable contrast and length, be they black, white or both, while maintaining picture quality where there are no scratches. To maximise the benefit obtained from this filter, a suite of filter strengths has been provided.

Operation

Control parameters for the scratch filter can be found under the SCRATCH menu as shown below:



Scratch Filter - On/Off

For unscratched material, it makes sense to turn the scratch filter off.

In order to remove scratches, it is necessary to enable the scratch filter.

Strength

There are three *Filter Strengths* available, and they are denoted as *Min*, *Med* and *Max*.

By increasing the strength of the filter, the potential for detecting and removing more scratches is improved. While the probability of false alarms is small, increasing the filter strength increases the probability of false alarms. Thus, when choosing the filter strength for a certain piece of footage, the smallest filter strength that is sufficient to cope with its scratches should be chosen, thus minimising the number of unrepaired scratches as well as false alarms, while maintaining maximum picture quality.

Contrast

There are three settings for *Scratch Contrast* available, and they are denoted as *Low*, *Med* and *High*.

Depending on the footage in question, the scratches may be low, medium or high contrast. Selecting the most appropriate *Scratch Contrast* option results in the maximum number of detected scratches, the minimum number of undetected scratches and the minimum number of false alarms, while keeping picture quality to its maximum.

Type

With most pieces of footage, the scratches appear to be white or black. With footage that has been processed both as positives and negatives, there may be both white and black scratches present.

Where there is only one type of scratch (i.e. white or black), the *Type* option should be set to W*hite* or *Black*, as appropriate. This will aid in reducing the number of false alarms, and thus result in improved picture quality.

Where there are white and black scratches, the *Type* option should be set to *Both*.

Length

As well as being of different strength, type and contrast, scratches will also be of different lengths.

Where one is only concerned with repairing long scratches (whose length is the majority of the height of the screen), the *Length* option should be set to *Long*. This will result in the minimum number of false alarms, while keeping picture quality to its maximum.

When concerned with short scratches, or scratches of any length, the *Length* option should be set to *Any.*

Width

Depending on the levels of the scratches present, correction can be set to either *Wide* or *Narrow*.
Default is to *Wide*.

Enhancer

Introduction

The enhancer has four distinct modes of operation which can be used individually to improve picture quality in four unique ways. These are: Enhance, MPEG De-enhance, Decoder Matching & Video mode.

Mode - Enhancement

During the process of video recording or transmission, pictures can lose sharpness as high frequency components of the picture are lost or reduced, resulting in soft or blurred edges.
The aim of the enhancer is to restore the perceived sharpness of an image by adding a correction signal derived from information from the incoming signal to sharpen edges and boost peaks but in a way that does not produce unnaturally sharp pictures or excessive unwanted artefacts.

The enhancer correction signal uses a combination of linear and non-linear methods. The linear and non-linear enhancement signals are calculated separately and combined to provide the final correction signal which is then summed with the incoming signal.

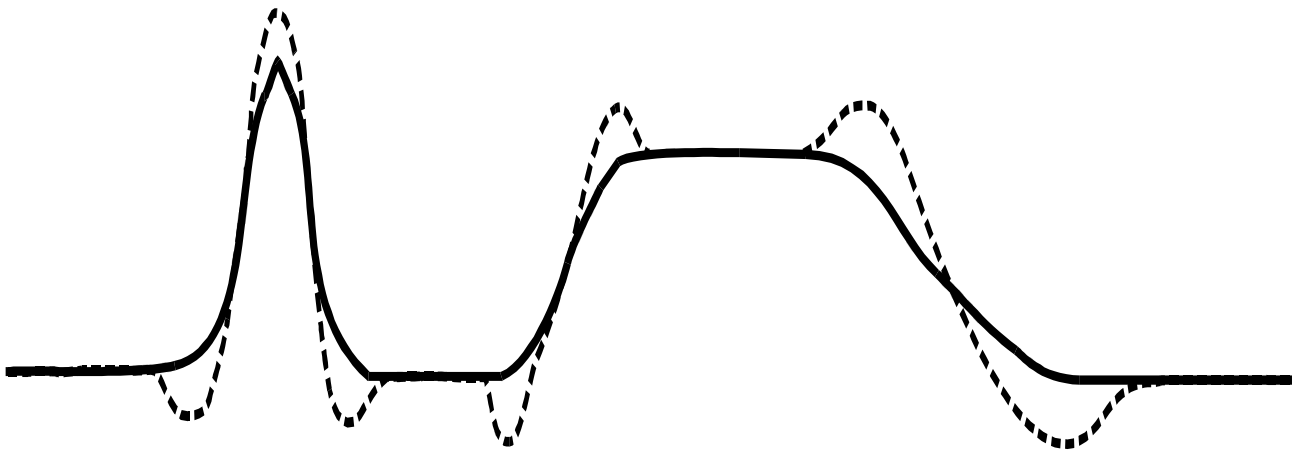
Non-linear enhancement is able to enhance images without the large increase in overshoots and ringing that are associated with linear enhancement methods.
The non-linear correction signal consists of a peak enhancement signal and an edge enhancement signal. The type of non-linear enhancement is determined by analysis of the incoming signal and has a pixel by pixel response to provide the optimum blend of peaking and edge correction.

Although the benefits of linear enhancement methods are limited, linear enhancement is more successful at dealing with low amplitude detail and texture in pictures.

The enhancer uses a combination of both methods to provide an optimum correction signal which produces minimal ringing and overshoots.
The control of enhancement levels together with the adjustable coring make the enhancer a very powerful tool for improving picture quality.

As mentioned previously the aim of the enhancer is to sharpen edges and boost peaks with minimal ringing and overshoots. An example of this is shown below. This shows the output of a conventional enhancer showing large undershoots and overshoots. The dotted line represents the enhanced signal and the solid line shows the input signal.

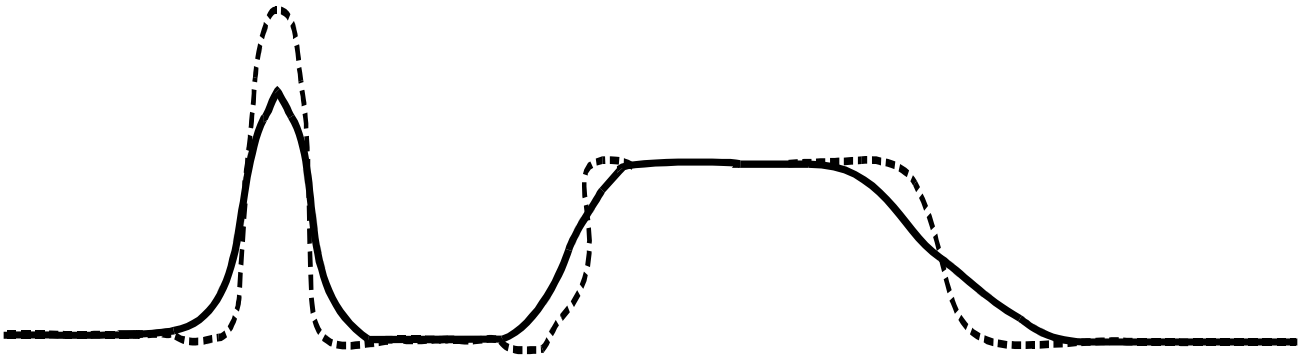
Conventional enhancement



Enhancer cont.

The figure below shows the output of the enhancer. The dotted line shows the enhanced signal and the solid line shows the input signal. The rise and fall time of the edges has been reduced i.e. the edges are sharper without changing the position of the edge. The peak has been boosted which will also add to the appearance of a sharper picture.

Enhancer output



The enhancer uses two different types of filtering in order to optimise the type and level of enhancement. The two filters used are a broad bandpass filter and an adaptive filter.

The broad bandpass filter produces the highest enhancement levels at
3.375 MHz for luminance whereas the adaptive filter has the highest levels of enhancement over a broader range of frequencies.

The table below shows the filter settings used for the various levels of luminance enhancement:

Enhance Level	Filter Type
minimum	broad bandpass
medium	broad bandpass
maximum	adaptive

Coring

The aim of coring is to reduce or prevent the enhancement of noise in the picture using information from the incoming signal. The coring function uses an adjustable threshold window which can be adjusted for different levels of noise in the incoming signal. The enhancer has adjustable coring levels which can be altered depending on the quality of input pictures. The higher the coring level the less noise is enhanced.

Enhancer cont.

Mode - De-Enhancement

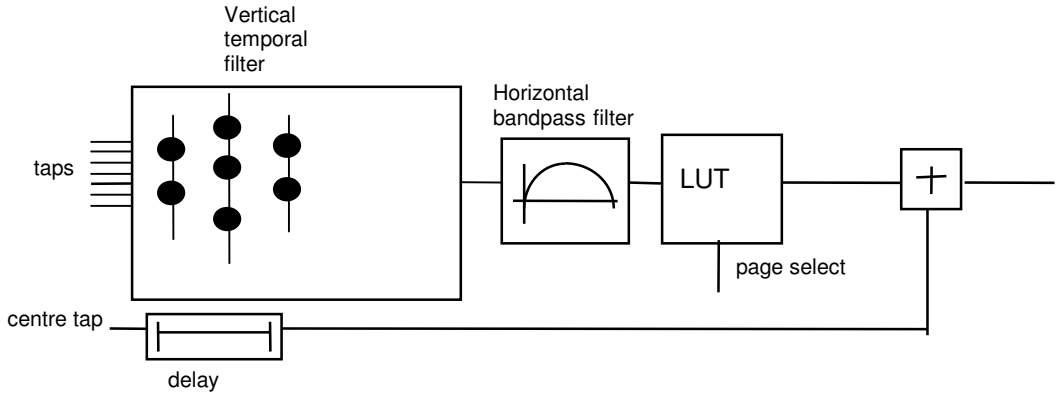
As well as enhancing picture sharpness the enhancer also incorporates de-enhancement settings for luminance and chrominance which reduce the sharpness of an image by softening picture detail that MPEG might otherwise have difficulty in encoding, notably high frequency moving diagonals.

The de-enhancement feature is able to reduce moving diagonals in luminance and chrominance whilst maintaining full resolution for horizontal frequencies.

The de-enhancement filter has three de-enhancement settings : minimum, medium and maximum
The maximum setting provides greatest attenuation of diagonal frequencies.

Luminance De-enhancement

A diagram of the luminance de-enhancer is shown below.



The first stage of the luminance de-enhancer is a seven point vertical temporal filter. The vertical temporal filter is followed by a horizontal bandpass filter. The effect of these two cascaded filters is to select the diagonals which are then reduced or eliminated by de-enhancement gains from the LUT.

The seven point filter has the added benefit of reducing noise by averaging.

Attenuating luminance high frequency moving diagonals is particularly useful when trying to reduce the bit rate for MPEG encoding.

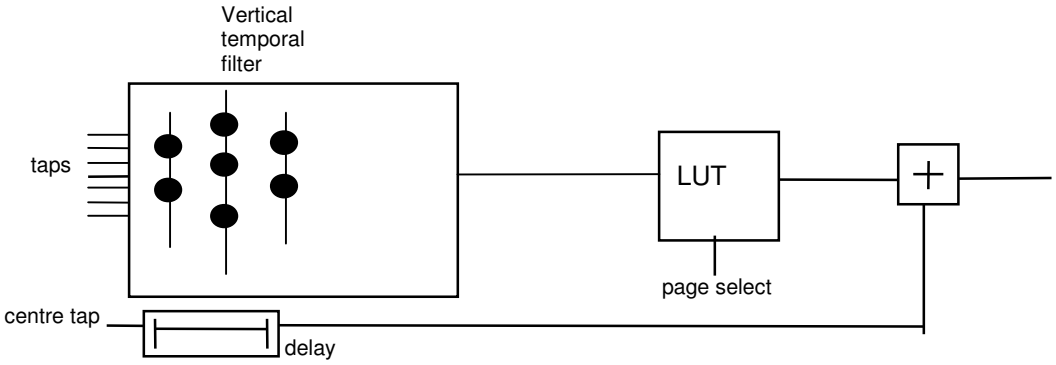
The de-enhance levels use different filters to optimise the type and level of de-enhancement. The adaptive filter allows more de-enhancement of all textures
The table below shows the filter settings for the various levels of luminance de-enhancement.

De-enhance Level	Filter Type
minimum	broad bandpass filter 1
medium	broad bandpass filter 2
maximum	adaptive bandpass between filters 1 & 2

Enhancer cont.

Chrominance De-enhancement

A diagram of the chrominance de-enhancer is shown below



The first stage is a seven point vertical temporal filter. As well as attenuating high frequency diagonals the multi-tap filter also suppresses cross-colour (originating from composite luminance and chrominance separation) and other non-correlated temporal noise.

Chrominance de-enhancement is applied at all horizontal frequencies.

Enhancer cont.

Mode - Decoder Matching

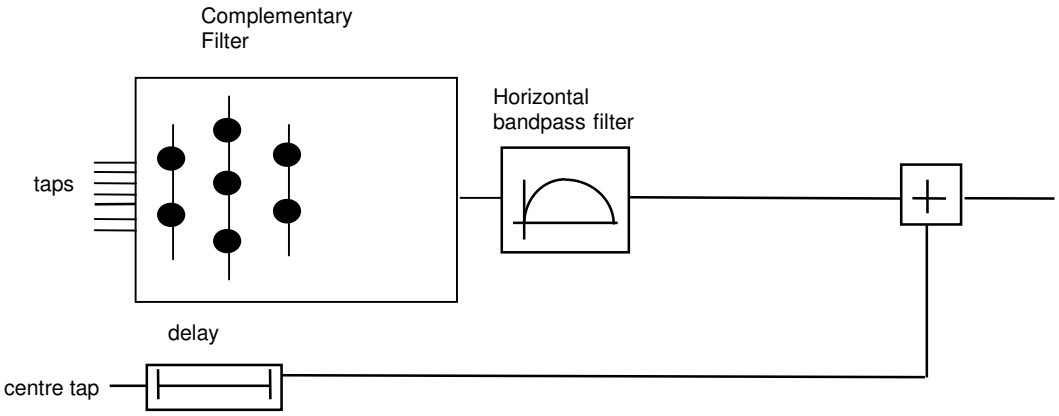
The aim of decoder matching is to reduce the artefacts produced by composite decoding. This is done by applying filters which complement the comb filters in the decoder to produce a larger overall aperture.

A composite comb decoder will use a spatial or a vertical/temporal aperture to separate luminance from chrominance. With knowledge of the comb structure the decoder matching filters in Prefix filter areas of the spectrum which have not been previously filtered by the composite decoder. Cross effects such as cross-colour (high frequency luminance in chrominance) and cross luminance (residual chrominance in luminance) are reduced in amplitude.

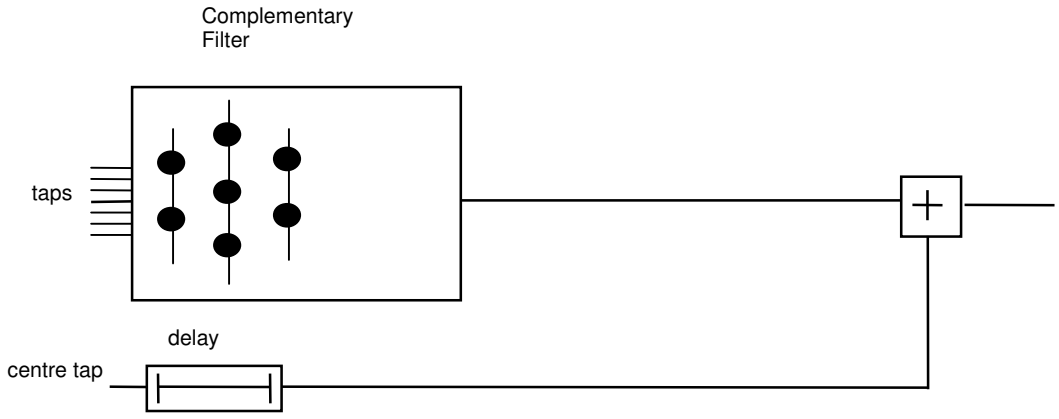
The line comb setting is used for decoders which utilise a line comb structure for Y/C separation. The Field Comb setting is used for decoder which utilise a field comb structure based on 312H (PAL) or 263H (NTSC) diagonal vertical/temporal filters such as the Prefix internal field comb decoder.

For simple or notch decoders which do not utilise a comb decoder strategy for Y/C separation or where the Y/C separation strategy is unknown, the *Other* setting provides good suppression of high frequency diagonal components which may have originated from cross-effects.

Luminance Decoder Matching



Chrominance decoder matching



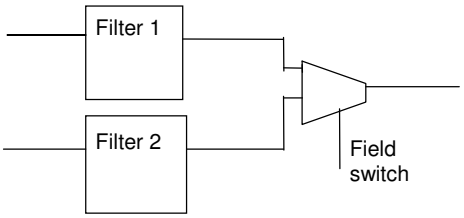
Enhancer cont.

Mode - Video Mode

The aim of the video mode is to reduce the temporal bandwidth of video source material by pre-filtering and temporal sub-sampling. Temporal sub-sampling reduces the number of fields which contain picture differences which in turn increases the encoding efficiency.

Mode 1

In Mode 1, a single input field is filtered to produce two output fields. Two different apertures are used for the input field (skewed by one field) and the output is generated by switching between the two filters at field rate.



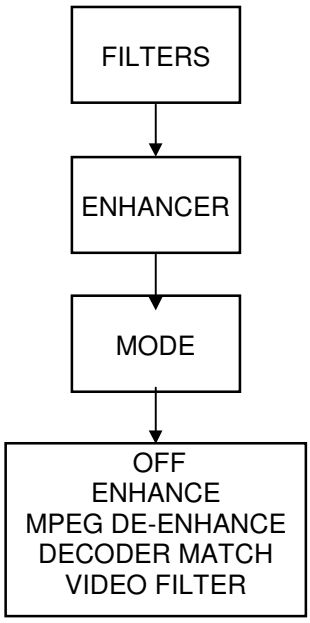
Mode 2

In Mode 2, two input fields are combined using a vertical temporal filter to produce two output fields.
Although mode 2 attenuates high frequency diagonals more than mode 1, it has no 25Hz temporal flicker component as both input fields are identically filtered.

Enhancer cont.

Using The Enhancer

The enhancer control parameters can be found under the ENHANCER menu as shown below:



The enhancer mode menu allows the user to select between the four different filter options:

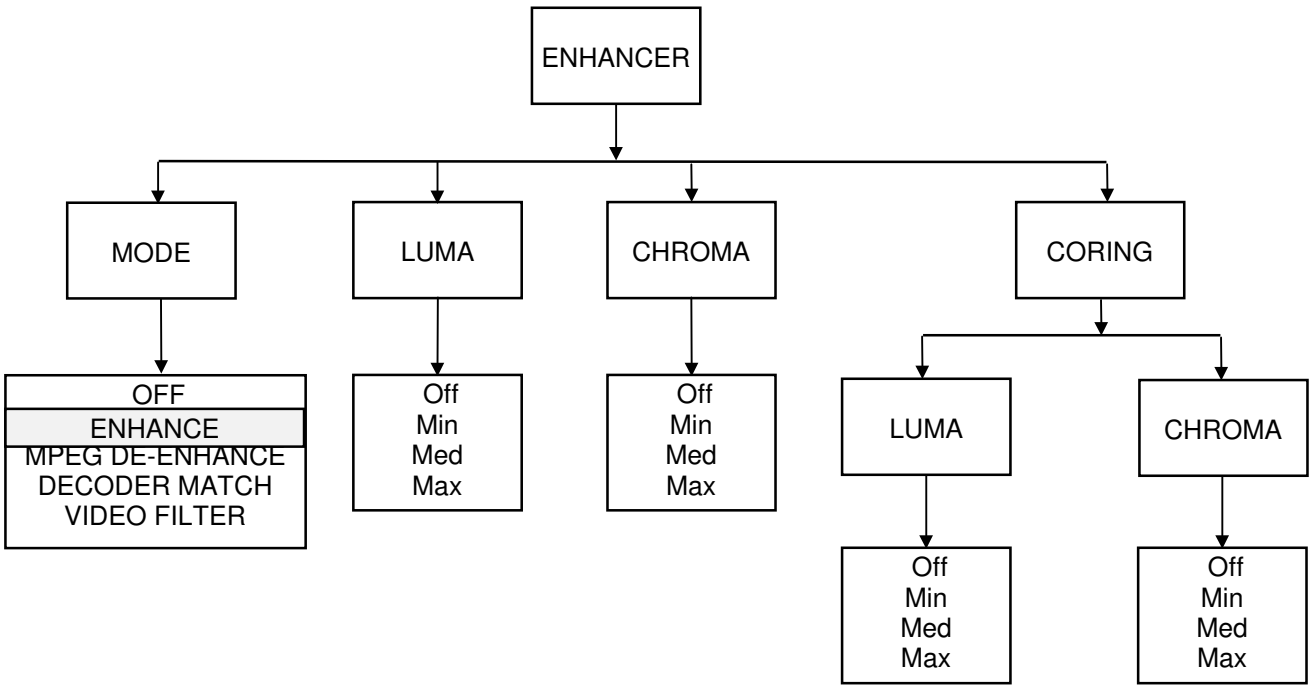
- Enhance
- MPEG De-enhance
- Decoder match
- Video Filter

Selecting one of these options automatically turns the other three off and displays the next level of options for that particular choice.

The enhancer can be switched off by using the OFF setting under the Enhancer Mode menu as shown above.

Enhancer cont.

Adjusting The Enhancement Settings



Adjusting Enhancement Settings

The enhancer filter has separate controls for luminance and chrominance enhancement. The luminance and chrominance enhancement controls are shown in the above diagram.

The enhance settings range from maximum softness to maximum enhancement. It is possible to enhance just luminance or just chrominance by selecting the OFF option on either. Setting both Luminance and Chrominance to OFF has the same effect as switching the Enhancer off.

Adjusting The Coring Level

The enhancer has separate coring controls for luminance and chrominance. The coring controls are shown in the above diagram.

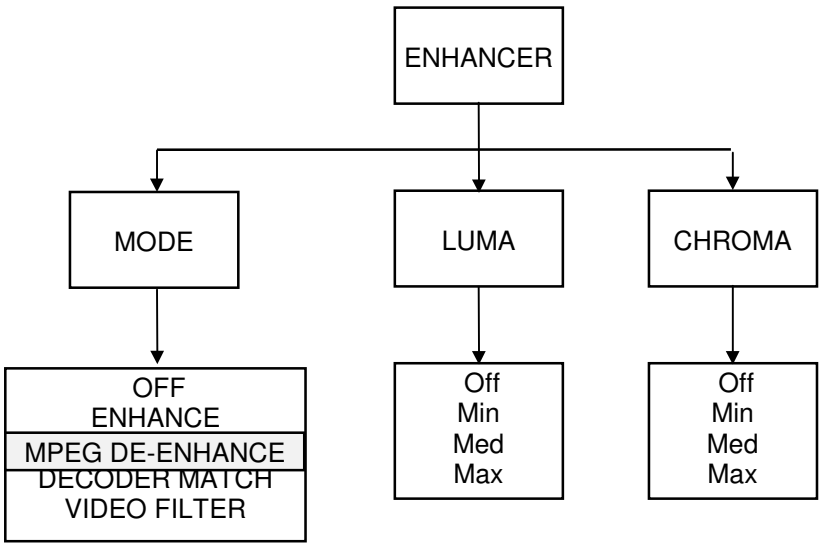
Coring can be used to control the effects of noise for the enhance settings for luminance and chrominance.
In the OFF position, which is also the default, no coring is applied. For very noisy input pictures a high level of coring is recommended.

Enhancer cont.

Adjusting De-Enhancement Settings

The de-enhance settings can be found by selecting the de-enhance option under the enhance mode menu.

The controls for the de-enhancement option are shown below:-



The de-enhancement setting has separate luminance and chrominance de-enhancement controls. It is possible to de-enhance just luminance or just chrominance by selecting the OFF option on either. Setting both Luminance and Chominance to OFF has the same effect as switching the de-enhance option (and therefore the enhancer) off.

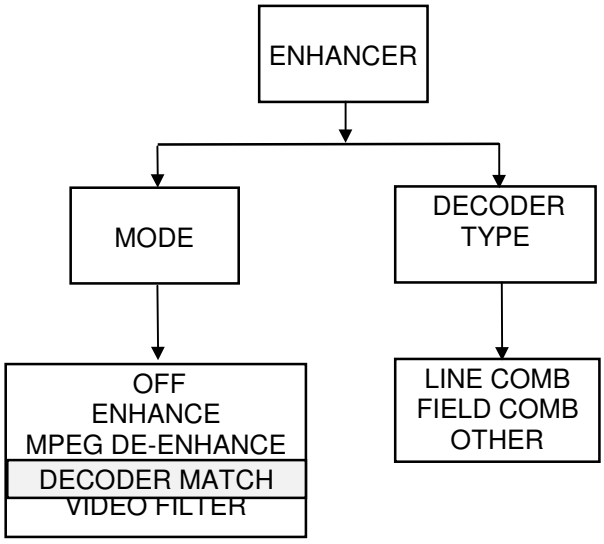
The auto settings for luminance and chrominance de-enhancement selects the automatic de-enhancement control. If this option is not installed then this option corresponds to medium de-enhancement.

Enhancer cont.

Adjusting Decoder Match Settings

The decoder match settings can be found by selecting the decoder match option under the enhance mode menu.

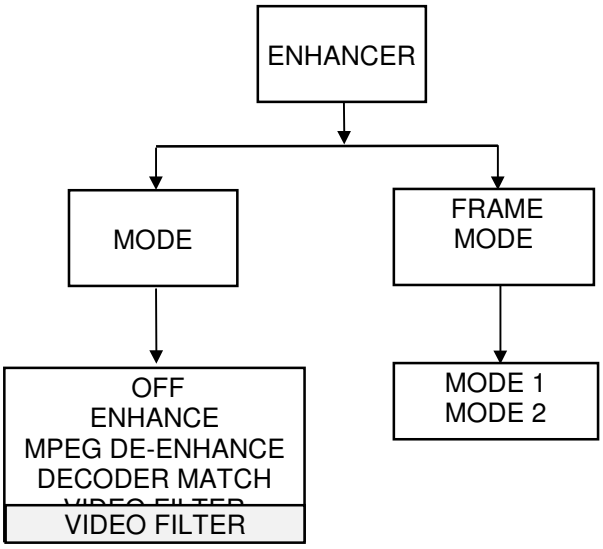
The controls for the decoder match option are as shown below:-



Adjusting Video Filter Setting

The video filter settings can be found by selecting the video filter option under the enhance mode menu.

The controls for the video filter option are as shown below:-



Enhancer cont.

Examples For Use

De-enhancement	-	ideal for graphics and extremely sharp pictures.
Decoder match	-	designed for digital inputs when the type of external decoder is known or for composite inputs.
Video	-	for 2:1 reduction in bandwidth.
Minimum enhance	-	designed for pictures that are fairly soft for example film originated pictures.
Medium enhance	-	the recommended setting for the majority of pictures.
Maximum enhance	-	ideal for extremely soft archived material, multi-generation film copies and semi-professional sources.

Other Information

It is important that enhancement levels used match the type of pictures being enhanced for the best results. Pictures will suffer from artefacts such as overshoots if the enhancement level is set too high.
The main indication that the enhancement level is set too high is the effect of noticeable outlining around objects.

With the coring switched off very small detail is enhanced which with some sharp pictures can lead to unnatural effects on certain textures. This can be solved by reducing the enhancement level.
The easiest way to check the level of enhancement is with coring switched off.

If the input pictures contain a high level of noise, coring may be necessary, otherwise the noise will be enhanced and the result will be poor.

Enhancing noise is an unfortunate consequence of the enhancement process and coring allows this problem to be dealt with but at the expense of low amplitude detail and texture. As a result coring should not be used unless necessary. Setting the coring level too high can result in ‘cartoon-like’ results as small amplitude detail and texture is lost.

Appendix 2

Status and Warning Messages Summary

A number of different messages are displayed on the front panel NORMAL display or on the 'ShoeBox' status display. In addition status information can be found in different parts of the menu structure and from the front panel buttons.

Source Status

The top line of the NORMAL panel display is used to identify the source selected and the status.

The source is identified as follows

SDI A	Serial Digital Interface Input A
SDI B	Serial Digital Interface Input B
Comp A	Composite Input A
Comp B	Composite Input B

The status messages are

No I/P	A valid video input has not been detected at the selected source. Please check that the correct source has been selected and that a valid source has been connected to the unit.
Wrong Std	The video standard of the selected source does not match the selected source standard for the unit. Check that the selected standard is correct. Check that the source is valid. This error should not occur if the standard is set to Auto.
525	525 line SDI source signal
625	625 line SDI source signal
PAL-I	PAL-I composite video signal
PAL-N	PAL-N composite video signal
PAL-M	PAL-M composite video signal
NTSC	NTSC composite video signal

If there is an input error the RED status LED in the INPUT button will flash.

Genlock Status Menu

---	Unable to Genlock. Check the reference signal is valid or that the input is valid.
Off	Genlock Off
Input	Genlocked to input if a valid reference input is not present.
Ref	Genlocked to reference input

If there is a Genlock error the GREEN status LED in the Genlock button will flash.

EDH Status Menu

None	EDH not present
OK	EDH present no errors
Errors	EDH is present with errors
Off	EDH Turned Off

Status Messages

These are displayed on the bottom line of the display at the left hand side.

Message	Meaning
PATTERN	Test pattern is turned ON
REMOTE	The unit is being accessed from a remote RollCall™ unit
FREEZE	Picture Freeze is turned ON
PANEL LOCKED	Front panel lock is ON
BYPASS MODE	Filters are turned OFF

If more than one of these messages is valid then the display automatically loops round.

Warning Messages

These are displayed on the bottom line of the display at the right hand side.

REF	Reference is wrong standard. Check that the input standard is set correctly, and that the reference is the correct standard.
NET	Network error. Check that the RollCall™ network is properly connected and terminated. This may occur briefly when a new unit is added to the network.
EDH	EDH errors on SDI input. Check upstream SDI equipment and cabling for errors or damage.

The above messages relate to causes which may indicate a problem with a connection to the unit such as the input, reference or the network.

XIL	Hardware error
XLB	Hardware error
VID	Video error
SYS	Internal network error
BUF	Internal comms error

The above messages relate to unit warnings that may occur briefly in normal operations, for example when the unit is reconfigured. If these messages persistently occur please contact Snell & Wilcox for assistance.

Appendix 3

Network Address Table

It is recommended that the following table be kept up-to-date with the units and their addresses.

Example entries:

Network Address	Product Name	Network Name Card / Slot	Rack Position	Notes
16	MDD500	Main	R3 / 20	Main feed
20	MDD500	Upper	R3 / 20	Aux feed

Network Address	Product Name	Network Name Card / Slot	Rack Position	Notes