ÉVALUATION DE L'ORDINATEUR AMIGA

Gouvernement du Québec
Ministère des Transports
**Direction générale du transport
des personnes et des marchandises**

Gouvernement du Québec
**Ministère
des Transports**

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But de l'étude, recherche et renseignements supplémentaires

Faire l'évaluation des possibilités offertes par le micro-ordinateur Amiga dans l'environnement de la D.G.T.P.M.

Resume du rapport

Ce document résume le contexte de l'infographie et de la micro-informatique à la Direction générale et identifie l'apport de l'ordinateur AMIGA dans son environnement.

L'achat de ce micro-ordinateur, autorisé par la Direction des systèmes de gestion a pour but d'évaluer sa performance au niveau du traitement d'images, d'animation, de production vidéo, et de communication avec l'ordinateur central et les autres ordinateurs de la Direction générale.
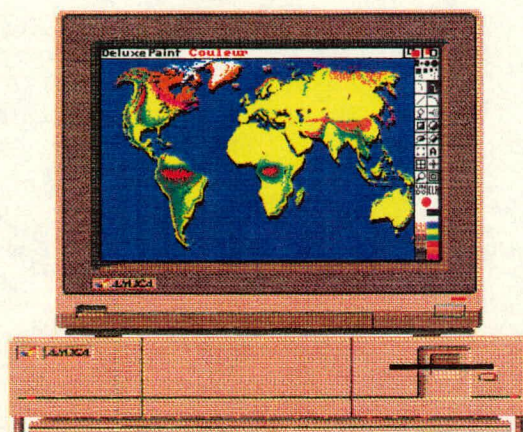
Plusieurs produits commerciaux, disponibles sur cet appareil, y sont testés. Ceux-ci couvrent les domaines suivants: le traitement d'images, l'animation, la production vidéo, la communication avec l'ordinateur central en modes graphique et texte, la gestion de bases de données et de chiffriers électroniques, le traitement de textes et l'éditique. D'autres logiciels commerciaux y sont testés pour vérifier sa compatibilité I.B.M., notamment Autocad, Dbase III plus, Lotus 1-2-3, Volkswriter, etc.

Dans l'ensemble, l'évaluation s'est déroulée sans problème tant au niveau du matériel que des logiciels. Les résultats des tests démontrent l'apport de l'ordinateur AMIGA à la solution globale du traitement infographique.

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ÉVALUATION DE L'ORDINATEUR AMIGA

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1. PROBLÉMATIQUE

Dans le contexte actuel du transport des personnes en milieu urbain où les requêtes du public comme de leurs élus deviennent de plus en plus exigeantes et où finalement les coûts sont toujours à la hausse, les décisions sont de plus en plus difficiles à prendre.

Il devient donc essentiel de posséder des informations précises et à jour en vue de bien connaître l'état des choses et de disposer d'outils permettant d'évaluer l'impact de ces décisions.

La quantité assommante de données produites par les outils traditionnels et leur transposition par le biais de l'atelier à dessin, ont un impact direct sur la productivité et le dynamisme au travail.

C'est pourquoi la Direction générale du transport des personnes et des marchandises (D.G.T.P.M.) s'est dotée d'un environnement informatique qui se caractérise par l'emploi de micro-ordinateurs ayant accès à l'ordinateur central tout en étant reliés entre eux, en plus de leur capacité individuelle de traitement. D'autre part, une place importante est faite aux techniques infographiques qui permettent des représentations efficaces de l'énorme masse de données en jeu dans le contexte de gestion et de planification du Transport.

L'infographie et la micro-informatique se sont complètement intégrés dans l'environnement de la D.G.T.P.M., autant du côté du matériel que du côté du logiciel.

L'infographie a, jusqu'à présent, toujours été réservée à une catégorie d'ordinateurs complexes et dédiés à ce type de traitement. Ces équipements généralement très dispendieux, permettent de réaliser des traitements d'images dont les performances sont limitées par le niveau de programmation de l'utilisateur. C'est pourquoi ils sont pratiquement impossible d'accès pour la plupart des personnes, puisqu'ils nécessitent un effort considérable de formation et de programmation.

La performance de certains ordinateurs de type personnel dans ce domaine a

ouvert les portes à l'utilisation de nouvelles techniques infographiques, plus parti-
culièrement au niveau du traitement d'images et du transfert de celles-ci sur des
équipements de communication comme les magnétoscopes.

La D.G.T.P.M. a donc décidé d'évaluer l'opportunité d'utiliser chez-elle ce type
d'outil flexible, ouvert aux techniques graphiques et de traitements d'images, et
accessible à l'ensemble de son personnel.

C'est dans cette optique que le service des systèmes d'information a entrepris,
avec l'approbation de la Direction des systèmes de gestion, de faire l'évaluation
d'un micro-ordinateur de cette catégorie.

2.   LA SOLUTION ENVISAGÉE

Nous nous sommes entourés, au cours des dernières années, d'un environne-ment informatique très varié tant au niveau des logiciels que des équipements. Néanmoins, un souci constant d'échange d'informations et de données, entre chaque élément de notre environnement, a été de mise dans la prise de décision quant à l'achat de chacun d'eux.

Aujourd'hui encore, la solution envisagée pour pallier aux besoins sans cesse croissants de traitement d'images par informatique à la D.G.T.P.M., tient compte de ce souci d'échange de données et d'information avec l'environnement existant.

Nous avons étudié une solution en tenant compte également du nombre crois-sant d'utilisateurs non-initiés appelés à utiliser l'informatique dans la réalisation de leurs travaux, de façon à ne pas limiter leur productivité et à les faire profiter au maximum des équipements disponibles. Les critères suivants ont été retenus pour la recherche d'une solution.

I-   Choix des périphériques
Les micro-ordinateurs ainsi que les produits utilisés sur ces derniers de-vraient reconnaître et utiliser les différents équipements périphériques que possède déjà la D.G.T.P.M.

II-   Communication avec l'ordinateur central (RAAQ)
La communication, principalement en mode graphique avec l'ordinateur central, est un pré-requis important puisque c'est sur ce dernier que rési-dent la majorité des données utilisées dans les systèmes de transports (enquêtes, réseaux, recensements, etc.).

III-   Compatibilité IBM
La compatibilité IBM est requise pour le transfert de données d'un micro-ordinateur à l'autre, principalement lorsque le support des données est une disquette.

IV-   Convivialité
        L'utilisation du micro-ordinateur et des logiciels doit être simple et at-
        trayante tout en étant pratique et fonctionnelle. Elle doit surtout être la por-
        tée de tous.

Notre choix s'est arrêté sur l'ordinateur personnel Amiga de la firme Commodore.
Il existe actuellement deux modèles sur le marché (Amiga 500 et Amiga 2000).
L'évaluation a été réalisée avec le modèle Amiga 1000 qui à l'époque était le
seul ordinateur Amiga fabriqué par Commodore.

La compatibilité IBM était alors possible par l'ajout d'un CPU compatible IBM in-
clus dans un châssis spécialement conçu pour se brancher sur l'Amiga 1000; ce
module s'appelle SIDECAR. Il a été complètement intégré au châssis (refait) de
l'Amiga 1000 pour ainsi devenir le modèle 2000.

L'évaluation, réalisée à la D.G.T.P.M., a donc été faite avec un Amiga 1000 muni
d'un SIDECAR. Depuis, l'ordinateur Amiga 1000 a été remplacé sur le marché
par l'Amiga 2000; les logiciels sont cependant compatibles de l'un à l'autre.
Aussi, nos recommandations seront-elles faites en fonction du modèle 2000.

3. L'ORDINATEUR AMIGA

L'ordinateur personnel Amiga est un appareil conçu pour un environnement graphique couleur. En plus de son architecture ouverte, il fonctionne en modes multi-écrans, multi-fenêtres et multi-tâches, de façon intrinsèque par icônes et menus et, si désiré, en mode traditionnel DOS. Il possède aussi la capacité de produire du son stéréophonique incluant un dispositif texte-parole (bientôt en français) avec intonation de voix humaine. En plus de son dispositif d'animation graphique remarquable, l'ordinateur Amiga est muni de deux sorties audio et d'une sortie vidéo permettant d'enregistrer sur magnétoscope le son (stéréophonique) et l'image.

3.1 ENVIRONNEMENT GRAPHIQUE COULEUR

En effet, tout ce qui s'affiche sur le moniteur relié à l'Amiga est toujours en mode graphique. Les dessins et même les textes sont générés dans ce mode. De cette façon, le caractère gras, l'italique, le souligné ainsi que d'autres options du genre sont générés à partir du caractère normal et ce, pour toutes polices de caractères assignées au système. Deux modes d'affichages de texte sont standard, un de 80 caractères par 25 lignes et l'autre de 60 caractères par 25 lignes (défini pour les téléviseurs).

L'affichage graphique de cet appareil est extrêmement puissant, car cette tâche est entièrement exécutée par un coprocesseur graphique dédié à cette fonction. Il peut générer une image jusqu'à 640 points horizontalement par 400 points verticalement et ce, jusqu'à concurrence de 4 096 couleurs simultanément à l'écran. D'autres résolutions sont disponibles, soit de 640 points par 200, de 320 points par 400 et de 320 points par 200; il peut même afficher en mode "overscan" pour fins de production vidéo. Il est aussi possible de fonctionner avec l'écran limité à 64, 32, 16, 8, 4 ou 2 couleurs choisies dans une palette de 4 096 couleurs.

3.2 ARCHITECTURE OUVERTE

Le système d'exploitation de l'Amiga a été conçu et bâti de façon très structurée, par niveaux et par modules (voir figure 1), ce qui permet à tout utilisateur dûment qualifié, d'aller intervenir par programmation dans tous les modules et à tous les niveaux de ce système d'exploitation.

Figure 1:

Système d'exploitation modulaire de l'Amiga

L'usager qui n'est pas initié à la programmation, utilise le premier niveau du système, soit l'atelier "Workbench", lequel introduit et gère la convivialité entre l'utilisateur et l'appareil, soit le mode traditionnel CLI (interface de commandes par ligne) aussi appelé AMIGADOS qui est le pendant du DOS sur IBM-PC.

L'environnement d'un ordinateur Amiga peut être très diversifié au niveau des périphériques et des équipements.

On retrouve d'une façon standard sur tous les modèles:

- 256K de mémoire de base pour le modèle 1000 (512K pour le modèle 500 et 1024K pour le modèle 2000);
- processeur central: Motorola MC 68000;
- coprocesseur pour l'affichage graphique;
- coprocesseur pour l'animation graphique;
- coprocesseur pour le son et pour l'accès aux disques;
- sorties vidéo: RGB Analogue
                     RF
                     Composite NTSC
                     (optionnel sur les modèles 500 et 2000);
- sortie audio stéréophonique;
- sortie parallèle;
- sortie série;
- sortie de branchement sur la carte principale;
- lecteur interne de disquettes 3 1/2" formatées à 880K (deux lecteurs internes 3 1/2" ou 5 1/4" au choix et un disque rigide interne optionnel pour le modèle 2000);
- clavier incluant en plus: touches numériques séparées, clés de mouvement du curseur et clés de fonction (F1 à F10);
- souris optomécanique à deux touches;
- moniteur RGB analogue.

En plus de ses équipements standard et de sa capacité de mémoire vive (interne et externe) allant jusqu'à neuf méga-octets, une panoplie d'appareils peuvent s'y rattacher:

- disque rigide externe (interne pour l'Amiga 2000);
- unités de disquettes 3 1/2" ou 5 1/4" (branchées en série);
- interface MIDI (Music Instrument Digital Interface) pour le contrôle d'appareils audio reliés à l'Amiga;
- convertisseur numérique/analogique relié à une caméra vidéo pour la numérisation d'images;
- synchroniseur de signaux vidéo (GENLOCK);
- tablette graphique;
- crayon lumineux;
- modem;
- imprimante...

3.3   MODE MULTI-ÉCRANS

L'utilisateur peut effectuer plusieurs sessions de travail simultanément grâce au mode multi-écrans de l'Amiga. Pour chaque session, il peut définir un ou plusieurs écrans (cela dépend du logiciel utilisé). Le nombre d'écrans est néanmoins limité par la mémoire disponible dans l'ordinateur. Chaque écran possède sa propre résolution graphique, sa palette de couleurs, et peut occuper en tout ou en partie, l'espace d'affichage du moniteur. Toutes ses caractéristiques peuvent être modifiées aisément par l'utilisateur.
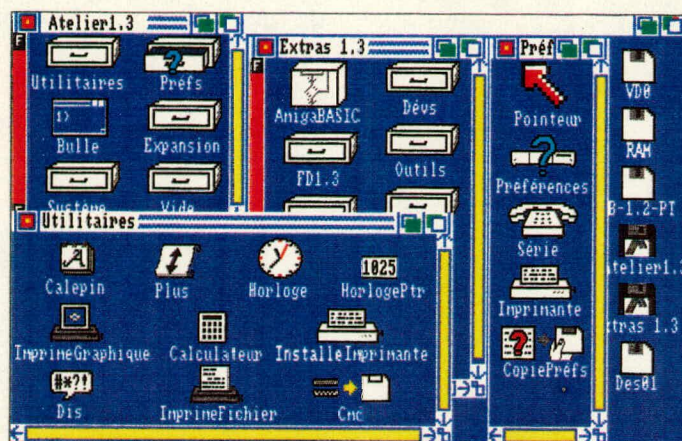
Un écran est un plan de travail sur lequel des fenêtres et des lignes sont placées et manipulées. Les fenêtres et les icônes ne peuvent jamais sortir hors de leur écran, car ils occupent leur propre place en mémoire, et possèdent leurs propres registres et espaces de calcul. C'est comme s'il s'agissait d'un terminal indépendant.

3.4   MODE MULTI-FENÊTRES

Une fenêtre est un espace occupé dans un écran, donnant une "vue" à l'usager sur le déroulement d'une tâche ou d'un programme. Elle est également le médium par lequel l'utilisateur transmet ses informations et ses commandes au programme ou à la tâche en question. Par exemple, une fenêtre peut contenir un panneau de saisie de données.

Le système d'exploitation transmet également ses requêtes par le biais de fenêtres. Elles peuvent être aussi variées que nombreuses. Au besoin, le système d'exploitation ouvre une fenêtre lorsqu'il requiert de l'utilisateur l'insertion d'une disquette particulière (par exemple une disquette de fontes de caractères), la confirmation de la réception d'un message d'erreur ou d'un avertissement sur le déroulement d'une tâche ou encore, la confirmation avant l'exécution d'une tâche définitive sans retour en arrière possible. Dans tous les cas, l'utilisateur a le choix de poursuivre ou d'interrompre la tâche ayant produit la requête.

Un programme peut gérer plusieurs fenêtres. C'est ce qui se produit notamment avec l'atelier "Workbench" où les répertoires et sous-répertoires d'une disquette sont consultés par l'ouverture de fenêtres à l'écran. Dans ce cas, chaque fenêtre laisse voir les fichiers (programmes, données, etc.) et les sous-répertoires d'un répertoire, en les représentant par des icônes (voir section 3.6).

Chaque fenêtre possède les caractéristiques suivantes:

- peut être agrandie ou réduite;
- peut être déplacée dans l'écran;
- peut être mise en dessus ou en dessous d'une autre fenêtre;
- peut être activée et désactivée;
- et peut être fermée.

Toutes ces options sont sélectionnées et fixées par l'utilisateur par simple manipulation de la souris. Ces manipulations de fenêtres peuvent se faire en tout temps, même lorsque l'ordinateur est occupé à effectuer d'autres travaux (par exemple, imprimer ou lire une disquette). En effet, c'est le principe du multi-tâches qui donne cette souplesse (voir section 3.5).

3.5 MODE MULTI-TÂCHES

Dans l'Amiga, chaque programme occupe son propre emplacement en mémoire, possède ses propres registres et génère des tâches qu'il transmet à des exécuteurs. Ces derniers possèdent également leur propre emplacement en mémoire et leurs propres registres (principe du multi-tâches). Chaque exécuteur de tâches contrôle toute l'interaction entre son programme et le matériel (hardware)

en subdivisant chaque action à entreprendre en sous-tâches. Il les transfère à d'autres exécuteurs, lesquels sont dédiés spécifiquement et uniquement aux unités périphériques (soit un lecteur ou un calculateur, etc.). Ces derniers exécutent chaque sous-tâche et retournent l'information demandée à l'exécuteur qui la gère à son tour.

Dans l'Amiga, tout est défini en tâches, même les demandes du système. C'est ce travail d'équipe, entre exécutants et demandeurs, lié au travail en simultané du processeur MC68000 et de ses coprocesseurs (3) qui permet le fonctionnement en mode multi-tâches de façon si souple et si ordonnée. Le nombre de tâches n'est limité que par la capacité de la mémoire.

3.6   ICÔNES ET MENUS

De par sa nature, l'Amiga est un ordinateur convivial fonctionnant avec des icônes et des menus. Les icônes sont de petites images apparaissant dans un écran ou dans une fenêtre servant à représenter une disquette, un disque, un répertoire, un programme ou un fichier. Les icônes peuvent être déplacées, à l'aide de la souris, à l'intérieur d'un écran ou d'une fenêtre et même d'une fenêtre à l'autre. Cette dernière opération a pour effet de copier ou de déplacer, le fichier, le programme ou le répertoire sur l'unité de disque à laquelle se rattache la fenêtre où l'icône est transportée. Cette opération s'applique même dans certains cas, entre deux icônes. Par exemple, on peut copier le contenu d'une disquette, en transportant son icône par dessus celui d'une autre disquette.

Les menus sont des rectangles contenant des choix d'actions. Ils apparaissent lorsque l'on pointe, à l'aide de la souris, le curseur sur la barre du haut d'un écran. Ce sont des menus dits descendants (pull-down menus) car ils descendent de la barre comme s'ils avalent été tirés vers le bas. Ils peuvent donner accès à des sous-menus et ainsi de suite.

Pour choisir une action ou accéder à un sous-menu, on descend le curseur à l'aide de la souris sur ce dernier. L'action ou le sous-menu choisi devient normalement plus éclairé (vidéo inversé ou changement de couleur).

Toutes les opérations de sélection dans les menus et sous-menus se font à l'aide de la souris. L'utilisateur peut donc aisément accéder aux commandes d'un logiciel grâce à ce mode de fonctionnement.

3.7   MODE TRADITIONNEL DOS

À l'instar du DOS d'IBM, l'Amiga permet à l'utilisateur qui le préfère, de taper au clavier ses commandes de système; ce mode se nomme l'AMIGADOS. Il utilise un langage d'interface de commandes par ligne appelé CLI (Command Line Interface) qui est très voisin du DOS d'IBM, et d' UNIX dans le contexte multi-tâches.

4.   MÉTHODOLOGIE DES ESSAIS

A l'aide d'une gamme représentative de produits commerciaux disponibles, nous avons effectué une évaluation de plusieurs domaines d'application pour lesquels il nous apparaît important d'avoir une mesure de qualité et de performance sur l'Amiga.

Les domaines d'application que nous avons retenus sont:

-        la conception, le dessin et le traitement d'images;
-        l'animation et la production vidéo;
-        la communication;
-        la compatibilité IBM;
-        la gestion de bases de données;
-        le traitement de textes;
-        les chiffriers électroniques;
-        l'éditique et la mise en page de documents;
-        et les langages de programmation.

Nous avons identifié d'autres domaines, pour lesquels les produits commerciaux laissent voir beaucoup d'opportunités et offrent beaucoup. On retrouve parmi ces domaines, la production de sons et de musique et les utilitaires permettant d'améliorer et de personnaliser la convivialité des systèmes.

Des critères distincts d'évaluation ont été fixés pour chaque domaine d'application. Nous avons ensuite établi une grille d'évaluation allant du médiocre à l'excellent afin de mesurer la performance des produits sous tous les aspects.

D'autres critères d'ordre général ont été fixés et ont fait l'objet d'une évaluation pour les domaines d'application où des logiciels commerciaux ont été testés. Ces critères sont:

a)   La convivialité des systèmes
        Elle a été mesurée par l'utilisation que fait un produit des éléments
        suivants:

- la souris;
- les icônes et les menus descendants;
- la manipulation des fenêtres;
- le déroulement horizontal et vertical à l'intérieur d'une fenêtre, etc.
- l'obéissance à des conventions de nomenclature des principales actions (ex: charge, sauve, quitte, coupe, copie, colle, etc...)

b)   Les commandes au clavier
Il s'agit de vérifier si les commandes des menus descendants sont également disponibles en mode expert, directement au clavier par la pression de simples touches ou de combinaisons de touches.

c)   Le multi-tâches
Il s'agit de vérifier si le logiciel permet d'accéder à un écran géré par un autre logiciel en cours d'exécution ou à l'écran de l'atelier (Workbench).

d)   Le menu d'aide intégré
Il s'agit de vérifier si le produit possède un menu d'aide intégré, permettant d'obtenir aisément l'information concernant une commande ou une autre particularité du logiciel.

Tous les critères identifiés (d'ordre général ou particulier) par domaine d'application ont été vérifiés. Une analyse des résultats obtenus est présentée à la section suivante de ce document.

De nombreux logiciels ont été essayés afin de sélectionner ceux qui feraient l'objet de tests plus détaillés. Ces produits sont présentés par domaine d'application au tableau de la figure 2.

-------- **Figure 2** --------

Liste des logiciels commerciaux

Domaine d'application	Logiciel	Manufacturier	Prix (dollars US)
conception dessin et traitement d'images	Deluxe Print II Deluxe Paint II AEGIS Images AEGIS Draw Digi-Paint Digi-View Intro CAD Dynamic CAD Pixmate X-CAD Sculpt 3D	Electronic Arts Electronic Arts AEGIS AEGIS Newtek Newtek Progressive Peripherals Micro Illusions Progressive Peripharals Taurus-Impex Byte By Byte	100 130 40 126 60 235 80 500 50 500 100
animation et production vidéo	Deluxe Video kit AEGIS Animator Video Titler Videoscape 3D TV Text TV Show Animate 3D Video Toaster A1300 Genlock ProVideo CG1 RM-2 The Director Super Gen	Electronic Arts AEGIS AEGIS AEGIS Brown-Waugh Brown-Waugh Byte By Byte Newtek Commodore PVS Publishing Glennloc The Right Answer Group Digital Creations	330 140 100 200 100 100 150 800 300 300 2500 70 800
communication	Amiga Talk II BBS PC Online 2.0 Macro Modem 1.2 sketerm Diga 1.0 Middleman II	OXXI Micro Systems Software Micro Systems Software Kent Engineering SKE Software AEGIS Benaiah Computer	100 100 70 70 50 80 150
gestion de bases de données	Acquisition Datamat A-300 Dbman Organize Superbase Professional Microfiche Filer	Taurus-Impex Transtime Versasoft Micro Systems Software Progressive Peripherals Software Vision	300 350 150 100 300 100

-------- Figure 2 --------
(suite)

Liste des logiciels commerciaux

Domaine d'application	Logiciel	Manufacturier	Prix (dollars US)
traitements de textes	Textcraft Plus	Commodore	100
	Design Text	Design Tech	80
	Dynamic Word	Micro Illusions	200
	LPD Writer	Digital Solutions	120
	Prowrite	New Horizons	125
	Scribble	Micro Systems Software	100
	Write & File	Brown Waugh	100
	Word Perfect	Word Perfect Corporation	400
	KindWords	The Disc Company	100
chiffriers électroniques	Analyse	Micro Systems Software	150
	Haicalc	Haitex	60
	Logistic	Progressive Peripherals	150
	Maxiplan Plus	OXXI	200
	VIP Professional	LSD Marketing	150
	Unicalc	Lattice	80
édition et mise en page de documents	PageSetter	Gold Disk	150
	Professional Page	Gold Disk	400
	City Desk	Micro Search	150
	Publisher 1000	Brown Waugh	100
	Shakespeare	Infinity Software	225
langages de programmation	Benchmark Modula-2	OXXI	200
	Amiga Basic	Commodore	000
	Lattice C	Lattice	225
	Modula-2	TDI Software	300
	AssemPro	Abacus	100
	Macro Assembler	Metacomco	100
	Native Assembler	Queld	100
	APL 68000	Spencer Organization	100
	Cambridge Lisp	Metacomco	200
	Iso Pascal	Metacomco	100
	UCSD Pascal	Pecan Softqare	100

5.   SYNTHÈSE DES RÉSULTATS

Les résultats des tests sont synthétisés ici, et exprimés par domaine d'application.

5.1   LA CONCEPTION, LE DESSIN ET LE TRAITEMENT D'IMAGES

Ce domaine est l'un des plus concernés dans l'utilisation de la micro-informatique à la D.G.T.P.M. En effet, il fait l'objet d'une demande sans cesse croissante, auprès des usagers de l'informatique de la Direction générale.

Du côté de la conception graphique, notre étude s'est limitée à vérifier l'existence de produits commerciaux appliqués à ce domaine. La raison est que le Ministère approuve et normalise l'utilisation du logiciel AUTOCAD. De plus, ce produit conçu pour un environnement IBM, fonctionne très bien sur le SIDECAR de l'Amiga (voir section 5.4). Ce logiciel est déjà largement utilisé à la D.G.T.P.M. et répond bien aux besoins des usagers.

Le dessin et le traitement d'images par l'ordinateur Amiga, surpassent de beaucoup toute application du genre sur micro-ordinateur conventionnel (XT, AT et compatibles). Cela est principalement dû au fait que l'ordinateur Amiga, ayant une résolution équivalente au système EGA d'IBM (enhanced graphic adaptor), possède deux coprocesseurs qui manipulent constamment la mémoire vidéo, sans l'intervention du processeur central. En fait, en terme de rapidité, seul un ordinateur IBM compatible muni d'un processeur 80386 a réussi à performer aussi rapidement que l'Amiga 1000, au niveau de la manipulation des objets graphiques ne requérant pas l'intervention du processeur central de l'Amiga.
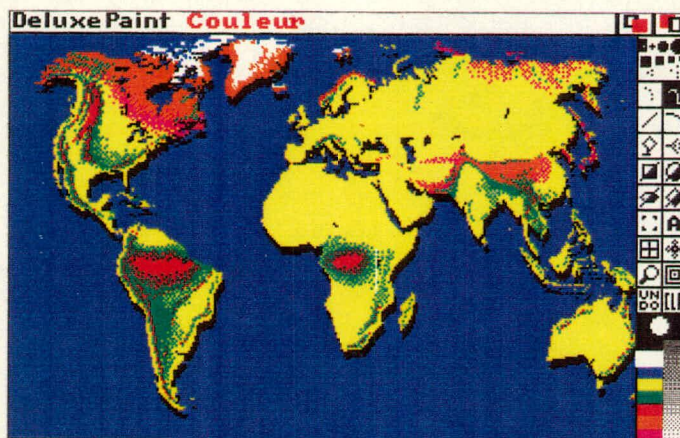
Cette vérification a été faite avec le logiciel DELUXE PAINT II disponible sur ces deux technologies.

Parmi les produits commerciaux, nous avons essayé les suivants:

-    DIGIVIEW (numérisation et édition d'images);

- DELUXE PAINT II (conception et édition d'images);

- Aegis DRAW (dessin assisté par ordinateur).

Plusieurs produits sont spécialisés dans la numérisation d'images utilisant parfois les procédés photographiques, tels les signaux vidéos ou certains périphériques (ex: "scanners"). La qualité des images varie beaucoup. Elle dépend surtout de la qualité des équipements que l'on utilise et du contexte dans lesquels ils servent, plutôt que du logiciel. Par contre, l'édition d'images est très développée sur l'Amiga et il est aisé de corriger les défauts générés lors de la numérisation d'images.

L'Amiga utilise un standard dans la conservation des fichiers sur disque, dont les images. Il s'agit du standard IFF (Interchange File Format). Tous les produits commerciaux utilisent ce standard, ce qui permet de transporter une image d'une application à une autre sans problème.
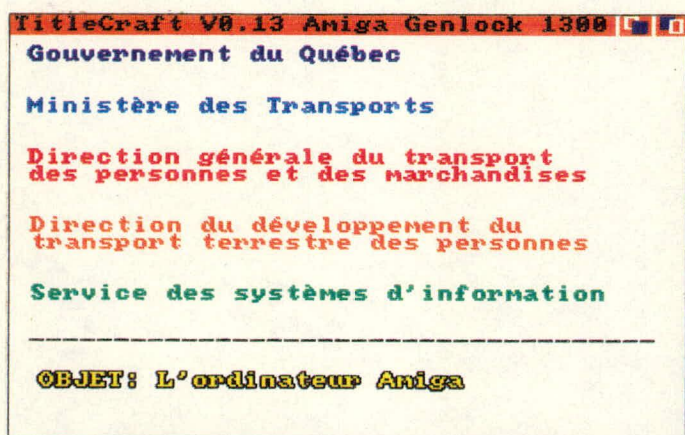
5.2   L'ANIMATION ET LA PRODUCTION VIDÉO

Pour faire distinction avec la section 5.1, l'animation et la production vidéo englobent tous les produits, qui à partir d'images, d'objets graphiques et de textes déjà conçus, permettent de créer des scénarios de production vidéo. De plus, à l'aide d'équipements tel l'Amiga 1300 GENLOCK, ces productions peuvent être synchronisées (image et son) avec une source vidéo externe (exemple: caméra vidéo).

Parmi ces outils de montage vidéo, nous avons testé les logiciels suivants:

- DELUXE VIDEO (montage d'images, d'objets graphiques et de son sur vidéo);
- Aegis Animator (animation d'objets graphiques);
- TVTEXT (montage de textes sur Vidéo, ex.: générique);
- TVSHOW (montage d'images et d'objets graphiques sur vidéc).

Les essais ont été réalisés avec un synchroniseur de signaux audio-vidéo (Amiga 1300 GENLOCK) et un magnétoscope type VHS, pour évaluer la qualité des résultats.

D'une façon générale, ces produits offrent beaucoup de gadgets d'animation et de montage que l'on retrouve au niveau des équipements professionnels. Ils offrent donc beaucoup aux artistes et aux débutants qui oeuvrent dans le domaine de la vidéo.

Cependant, bien que leur performance soit intéressante et que leur utilisation soit simple, de sorte qu'ils sont accessibles à tous, la qualité des résultats produits n'équivaut toutefois pas à celle des équipements professionnels de montage, ceci à cause de la faible performance du Genlock Amiga 1300. Il serait donc nécessaire d'utiliser des périphériques professionnels plus performants avec l'Amiga pour fins de production vidéo dans un contexte de diffusion à grande échelle; ce qui se fait déjà couramment par des firmes spécialisées.

Les besoins en matière de vidéo à la D.G.T.P.M. sont surtout orientés vers les domaines de la communication et de l'échange de procédés et de technologies concernant l'infographie et la simulation de projets d'aménagement et de réalisa-
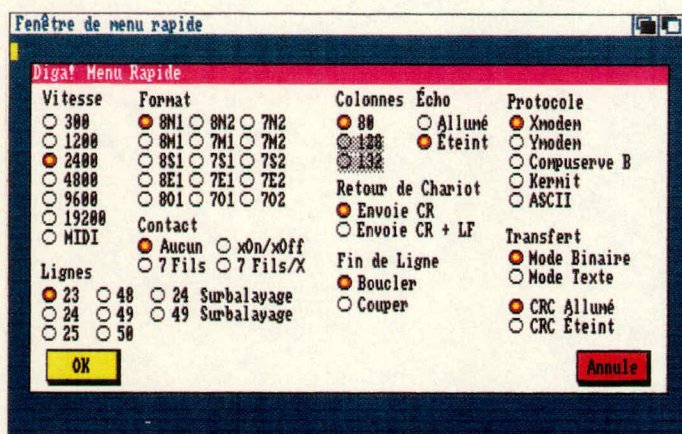
tion d'infrastructure.

Dans ce dernier domaine, un projet a été réalisé en parallèle à l'évaluation de l'Amiga. Ce projet a consisté à réaliser une bande vidéo pour la simulation de l'aménagement des gares et des quais d'embarquement de la ligne de train Deux-Montagnes. Les relevés de cadastre et de chaînage de la ligne ont été jumelés à une bande vidéo montrant le parcours de la ligne. De plus, à l'aide de l'Amiga, il est maintenant envisagé de simuler sur cette bande vidéo, aux endroits appropriés, les propositions d'aménagement des gares et des quais, sous forme de dessins qui seront incorporés à cette bande.

5.3   LA COMMUNICATION

Le domaine de la communication informatique regroupe plusieurs types de logiciels. Parmi ces types, on retrouve les logiciels de communication en émulation de terminaux graphiques et les logiciels de transfert de données. Nous avons concentré nos tests sur ces deux types de produits et dans le premier cas, nous avons testé la communication en émulation TEKTRONIX. Cette dernière est la plus utilisée et la plus supportée par les logiciels graphiques de l'ordinateur central avec lequel nous travaillons.

Le logiciel DIGA, que nous avons testé, s'est avéré très efficace. En plus d'émuler les terminaux Tektronix 4010/14, il émule également les terminaux TTY, ANSI, et DEC VT100/VT52. En mode Tektronix 4010/14, il permet de recevoir et de transmettre des fichiers d'images entre micro-ordinateur et le central. L'émulation Tektronix s'est avérée excellente, et toutes nos applications (EMME/2, SAS/Graph et autres applications utilisant le langage PLOT10 de

Tektronix) ont très bien fonctionné. De plus, plusieurs sessions locales sur Amiga ont pu être ouvertes simultanément grâce à son principe du multi-tâches.

Ce logiciel permet la communication et le transfert de données entre micro-ordinateurs. Il supporte le double dialogue permettant ainsi à deux usagers de dialoguer via des mémos, en effectuant simultanément des transferts de données dans les deux sens.
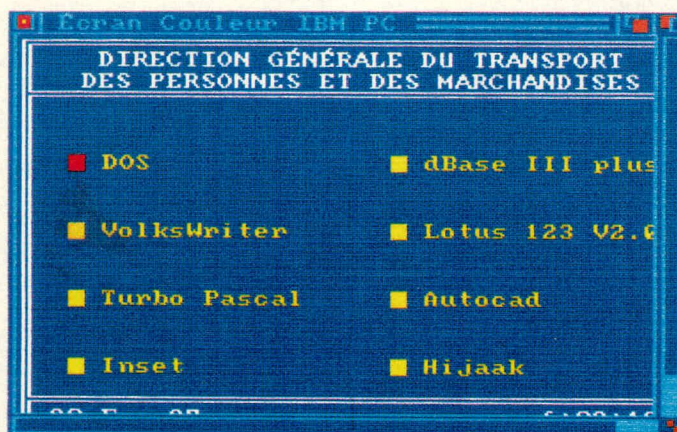
La communication s'est avérée un point fort de l'Amiga surtout au niveau graphique où sont concentrées la plupart de nos applications sur l'ordinateur central.

Les communications en mode réseau sont discutées à la section suivante.

5.4   LA COMPATIBILITE IBM

La compatibilité IBM est disponible sur l'environnement Amiga par l'ajout d'un module d'extension au circuit principal de ce dernier. Ce module présenté dans un chassis comparable à un ordinateur PC d'IBM est un micro-ordinateur en soi, IBM compatible. Ce module s'appelle l'Amiga 1060 SIDECAR.

Le SIDECAR permet la compatibilité IBM au niveau du matériel et du logiciel.

Une session IBM est considérée dans cet environnement comme une tâche gérée par l'Amiga. Cette tâche fait afficher l'image et/ou le texte de la session IBM dans une fenêtre et un écran qui lui sont dédiés (voir sections 3.3 à 3.5). L'AMIGA peut donc exécuter d'autres applications simultanément à celle du SIDECAR (mode multi-tâches).

Le Sidecar permet le partage d'un disque rigide (interne ou externe) entre lui et l'Amiga. Cependant, il n'y a aucune possibilité d'échange direct de données entre eux. Pour ce faire, il faut utiliser des utilitaires permettant de lire et d'écrire sur disque dans les formats Amiga DOS ou MS-DOS, selon le cas. Cette lacune a été corrigée sur l'ordinateur Amiga 2000, où non seulement le SIDECAR fait maintenant partie du châssis de l'Amiga, mais en plus, un pont a été ajouté pour l'échange de données à même la mémoire vive de chacun.

L'ensemble de nos applications développées dans l'environnement IBM fonctionnent sur le SIDECAR. Il est à noter cependant que le SIDECAR via le moniteur 1080 de l'Amiga, n'émule que les standards CGA (Colour Graphic Adaptor) et monochrome d'IBM.
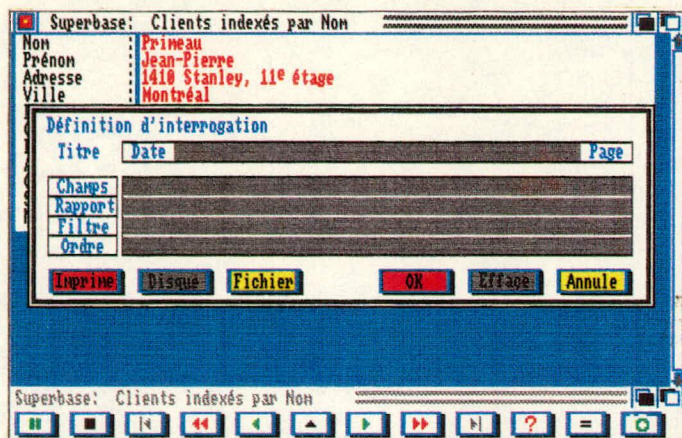
Nous avons expérimenté le branchement du SIDECAR en réseau avec les autres micro-ordinateurs de notre environnement. Le test s'est fait sur un réseau VINES muni d'un serveur BANYAN. La communication en réseau n'a pas fonctionné. Il serait souhaitable d'étudier cette question sur un modèle 2000 où certaines contraintes technologiques ont été éliminées.

D'une façon générale, le SIDECAR offre une piètre performance au point de vue de l'exécution, car il est conçu autour d'un processeur 8088 qui n'est plus utilisé par les compétiteurs d'IBM. Cependant, il est possible d'y ajouter un coprocesseur numérique 8087 pour les fonctions mathématiques complexes.

L'Amiga 2000 peut, à l'instar du SIDECAR, être livré avec un processeur 80186, 80286 ou encore 80386. L'Amiga 2000 offre donc une solution intéressante dans un environnement micro-informatique comme le nôtre.

5.5   GESTION DE BASES DE DONNÉES

Sur l'Amiga, les bases de données sont disponibles sous plusieurs logiciels. Nous avons choisi le logiciel SUPERBASE, base de données relationnelle, qui s'avère la plus performante. Elle est créée à partir de fichiers qui peuvent posséder de multiples index. Les champs de ces fichiers peuvent contenir des données numériques, alphabétiques ou alphanumériques, mais elles peuvent aussi contenir des images et des sons de format IFF sous forme de données externes.

Ce logiciel permet la visualisation des fiches de façon extrêmement souple par simple choix de menus et sous-menus et il ne faut que très peu de temps pour en faire l'apprentissage. Il existe aussi, bien sûr, des bases de données standard pour des besoins plus restreints et qui sont tout aussi faciles à utiliser que SUPERBASE.
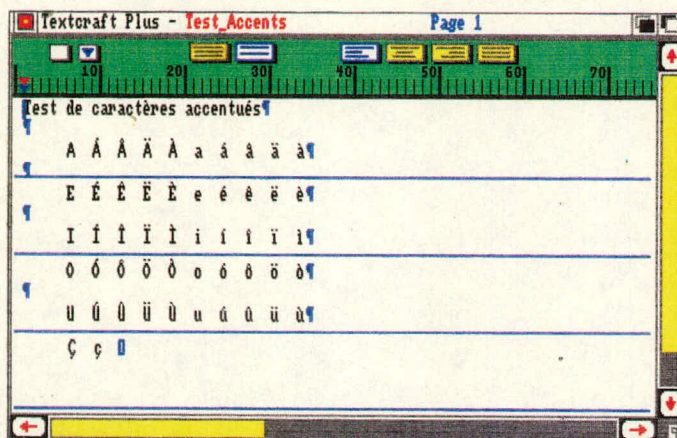
5.6   LE TRAITEMENT DE TEXTES

Ce domaine occupe une place importance à la D.G.T.P.M., et la majorité des utilisateurs de ce type d'application sont concentrés autour de trois produits standardisés au Ministère, soit: le traitement de textes AES et les logiciels SAMNA WORD et WORD PERFECT sur IBM PC et compatibles. Nous avons donc cru bon d'en faire une évaluation.

Les critères d'évaluation proposés à ce type d'application peuvent être aussi exigeants qu'on le désire car les besoins des utilisateurs de traitement de texte varient énormément. Citons ici quelques critères importants qui ont été évalués:

-   Les macro-commandes:
    possibilité de définir et d'emmagasiner une série de commandes pouvant être exécutées sur appel;
-   La gestion de tables de matières, des glossaires et des index:
    (génération et mise à jour automatique);
-   La recherche et le remplacement du texte dans un document;
-   Choix de styles de caractères et les accents français;
-   La mise en page et les tabulateurs;
-   Le dictionnaire intégré et le trait-d'union automatisé;
-   L'espacement proportionnel;
-   Facilités d'import/export des documents;

-      La génération d'en-tête de page, etc.

Nous avons testé trois produits commerciaux répondant aux critères des deux catégories extrêmes d'usagers, soit le personnel spécialisé au traitement de textes et les débutants. Ces logiciels sont: WORD PERFECT, LPD WRITER et TEXTCRAFT+.

Le logiciel WORD PERFECT destiné aux personnes spécialisées en traitement de textes surpasse de loin tous les autres produits disponibles sur l'Amiga dans ce domaine. De plus, existant également sur la technologie IBM, les textes se sont avérés compatibles.

Les logiciels LPD WRITER et TEXTCRAFT+ s'adressent surtout aux utilisateurs qui désirent traiter leurs textes d'une façon beaucoup plus intuitive au prix d'une gamme plus limitée d'options pour améliorer la présentation des écrits.

5.7   LES CHIFFRIERS ÉLECTRONIQUES

Tout le monde connaît le désormais célèbre Lotus 1-2-3 sur IBM-PC, lequel a son pendant dans le monde Amiga, par un logiciel appelé VIP PROFESSIONAL. Ce logiciel utilise les mêmes fonctions et les mêmes clés que 1-2-3 et il travaille de la même manière, mais de façon plus rapide.

Mais le mode convivial de l'Amiga est beaucoup mieux utilisé dans un autre chiffrier appelé MAXIPLAN PLUS. Ce logiciel rend vraiment hommage aux performances de cet ordinateur.

MAXIPLAN PLUS fonctionne par menus et sous-menus et est très aisé à manipuler. Il peut contenir jusqu'à 512 colonnes et 65 530 rangées. Le contenu des cellules (textes ou chiffres) peut être en couleur, de différents styles (gras, italique, etc.), peut être modifié dépendamment d'une condition et peut être récité par le synthétiseur vocal de l'Amiga.

Chaque cellule peut aussi contenir une note explicative ayant jusqu'à 500 caractères de long. Dix sortes de graphiques visant un ensemble de cellules peuvent être simultanément montrés à l'écran et leur image changée de façon interactive en changeant un chiffre dans cet ensemble.

Jusqu'à 64 bases de données peuvent être formées par des ensembles de cellules, avec ou sans critères de sélection et triées dans différents ordres indépendamment du nombre de champs impliqués. Il possède aussi un langage macro semblable au MICROSOFT EXCEL et qui permet de ne décrire qu'une fois de longues suites de commandes.

Il possède un mode zoom unique servant à visualiser rapidement le contenu des cellules. Les chiffriers ou parties de chiffriers peuvent être protégés par des mots de passe. MAXIPLAN PLUS peut aussi lire les données de Lotus 1-2-3; il peut exporter le contenu de ses cellules en tout ou en partie et ses graphiques vers des fichiers externes.

Sa performance est excellente, tout autant que son rapport qualité/prix.

5.8   LA MISE EN PAGE DE DOCUMENTS

Dans ce secteur, il n'est pas aisé de déterminer si un logiciel est un traitement de texte intégrant des images graphiques ou si c'est un programme d'éditique intégrant un module de traitement de texte. La marge entre les deux est dans certains cas très mince.

Il existe plusieurs logiciels d'éditique dans le monde Amiga et le choix fut difficile, pas tant au point de vue utilisation desdits logiciels mais bien dans leur finalité qui est à toute fin pratique l'impression sur papier du document tel que vu à l'écran.

La plupart de ces logiciels proposent une sortie sur imprimante selon la norme "Postscript" et ne donnent une juste mesure de leur qualité d'impression que sur des appareils possédant cette norme.
Certains permettent l'utilisation de la couleur alors que d'autres n'utilisent que le noir et le blanc en permettant toutefois le transfert d'images couleur en images aux teintes de gris.

Nous avons sélectionné les logiciels PAGESETTER et PROFESSIONAL PAGE. Ceux-ci permettent d'éditer du texte sous différents jeux de caractères, de même que l'édition d'images. Celles-ci peuvent être crées ou importées, agrandies ou réduites, retouchées et déplacées dans le document; donc, ils laissent beaucoup de latitude et de créativité aux "designers" et sont d'une grande facilité d'utilisation. par ailleurs, PROFESSIONAL PAGE permet la séparation des couleurs et la préparation directe de fichiers pour impression sur des appareils de linotypie.

5.9   LES LANGAGES DE PROGRAMMATION

La plupart des langages de programmation sont autorisés sur l'Amiga.

Un Basic Microsoft très puissant, possédant certaines fonctions Pascal et Fortran, est inclus à l'achat de l'Amiga. Il est de style libre, sans numéro de ligne et structuré; il permet l'appel à de véritables sous-programmes et il peut utiliser la plupart des fonctions conviviales de l'ordinateur: menus, souris, sons, animations, etc.

L'on peut utiliser un Assembler 68000 si l'on veut aller au coeur de la machine et le langage "C" qui fonctionne de façon naturelle sur l'Amiga (95% des routines à tous les niveaux du système d'opération de l'Amiga furent écrites en C).

D'autres langages tels le LISP, l'APL, le Pascal, le Fortran et le Modula-2 existent sur l'Amiga, mais nous ne les avons pas essayés au cours de notre évaluation.

6.0   COMPLÉMENTARITÉ DE L'AMIGA DANS L'ENVIRONNE-MENT INFOGRAPHIQUE DE LA D.G.T.P.M.

La D.G.T.P.M. a perçu depuis longtemps le potentiel des micro-ordinateurs en planification du transport. Elle a mis à la disposition de ses professionnels des appareils graphiques convenablement équipés de logiciels (AUTOCAD, VENTURA, PAGEMAKER, la série GEM, etc.) et de périphériques de toutes sortes (traceurs de courbes, imprimantes couleur, tables numérisantes, lecteur optique, etc.), Dès leur installation, ces outils se sont rapidement intégrés à l'environnement des gens et leur sont vite devenus indispensables.

La D.G.T.P.M. s'est dotée de trois environnements graphiques au niveau de la micro-informatique:

.   un micro-ordinateur Tektronix 4116-B;
.   un micro-ordinateur PC-AT, modèle GX,
.   des micro-ordinateurs PS/2 modèles 80, 60 et 30, PC-AT/XT et compatibles, munis de logiciels graphiques.

Le Tektronix 4116-B est un appareil à haute résolution (4096 x 4096) très puissant au niveau de l'affichage graphique. Il sert exclusivement de terminal relié à l'ordinateur central, pour l'utilisation du logiciel EMME/2 (outil de planification du transport). Ses capacités de traitement graphique au niveau local, ont été inexploitées car n'étant pas compatible avec les standards IBM, très peu de logiciels sont disponibles sur ce dernier. La difficulté de pouvoir se procurer des produits commerciaux à prix raisonnables, fonctionnant sur cet appareil, a contraint la D.G.T.P.M. à y développer ses propres outils graphiques. Cependant, la complexité de développement des algorithmes de traitement dans le domaine de l'infographie a rendue cette tâche onéreuse.

Le micro-ordinateur PC-AT/GX d'IBM permet la communication avec l'ordinateur central, en mode graphique. Cependant, le protocole utilisé pour le transfert d'image (GDDM) est encore très peu supporté par les produits commerciaux. En fait, parmi tous les produits graphiques exploités sur l'ordinateur central de la RAAQ (EMME/2, SAS, SPSS, etc.), seul SAS supporte ce protocole. Il existe néanmoins quelques logiciels fonctionnant sur les PC-IBM type 3270 permettant

de faire certains traitements d'images localement (le GRAPHICS EDITOR, par exemple).

Les micro-ordinateurs IBM et compatibles sont déjà sur-utilisés du côté du développement des systèmes et du traitement des données. Plusieurs produits commerciaux permettent la production de graphiques (AUTOCAD, GEM, etc.).Il existe même des outils très puissants dans le domaine de l'éditique. Malgré la panoplie de logiciels commerciaux, il y a encore très peu de produits permettant d'effectuer du traitement d'images. En effet, cette réalité est probablement dûe aux difficultés techniques reliées à l'architecture même de ces micro-ordinateurs (pas de coprocesseur graphique à l'exception des nouveau PS/2 d'IBM, modèles 50 et plus).

On retrouve donc à la D.G.T.P.M. plusieurs logiciels et équipements permettant de générer une variété impressionnante de graphiques couleurs et d'images-écran. Cependant, il n'y a encore rien en place qui permette de manipuler ces graphiques et images d'une façon fonctionnelle et professionnelle.

L'ordinateur Amiga 2000 répond très bien à cette lacune. En effet, sa compatibilité IBM permet le transfert des données et des programmes utilisés lors de la réalisation des graphiques et supporte l'exécution de ceux-ci pour reproduire les graphiques désirés. Son pouvoir d'opérer simultanément en mode Amiga, permet de récupérer tout graphique produit sur l'écran et de stocker celui-ci pour manipulations ultérieures.

De plus, supportant la communication en mode Tektronix couleur, il crée ainsi le lien avec tous les outils graphiques exploités sur l'ordinateur central. Il peut également recevoir sur disquettes des fichiers d'images produits sur un ordinateur IBM, lesquels sont ensuite transposés sous format Amiga, et vice versa, à l'aide du programme HIJAAK qui permet les conversions d'images de différents types: IBM, MAC, AMIGA, ETC.

La Direction générale, dotée de ce nouvel équipement, possède maintenant un outil de communication puissant créant une unification dans la production de graphiques de tous les équipements et logiciels déjà en place dans son environnement.

7.   CONCLUSION

Tel que stipulé à l'origine dans l'autorisation, par la Direction des systèmes de gestion, de procéder à cette évaluation et dans l'esprit qui a prévalu à sa réalisation, il nous est donc permis de constater que l'ordinateur AMIGA s'intègre très bien dans l'environnement informatique de la Direction générale du transport des personnes et des marchandises, en tant que complément au monde IBM pour sa capacité de manipulation et d'animation d'images et de production vidéo et ce, à un coût très bas.

Même si tous nos tests ont été effectués sur un ordinateur AMIGA 1000, tel que mentionné à la section 2 du présent document, nos recommandations porteront sur l'AMIGA modèle 2000 qui est la version améliorée de l'AMIGA 1000.

De plus, le modèle 1000 est actuellement discontinué du marché et la performance du SIDECAR 1060 qui s'y rattache n'est pas suffisante, en plus d'être dans un boîtier annexe occupant un large espace sur une aire de travail. Cependant au niveau de la fiabilité, nous n'avons eu à faire face à aucune déficience de l'appareil et de tous ses périphériques en aucun moment depuis leur acquisition (environ 2 ans) et ce, dans un contexte d'utilisation intensive.

Le 2000, quant à lui, s'approprie toutes les qualités du 1000, mais en mieux. Son boîtier semblable à celui d'un IBM-PC intègre des emplacements pour cartes AMIGA et/ou IBM-PC XT et AT. Il peut posséder des lecteurs de disquettes 3 1/2" ou 5 1/4", des normes AMIGA ou IBM-PC. Tout disque rigide compatible au PC d'IBM peut y être intégré et divisé en partitions AMIGA et IBM-PC.
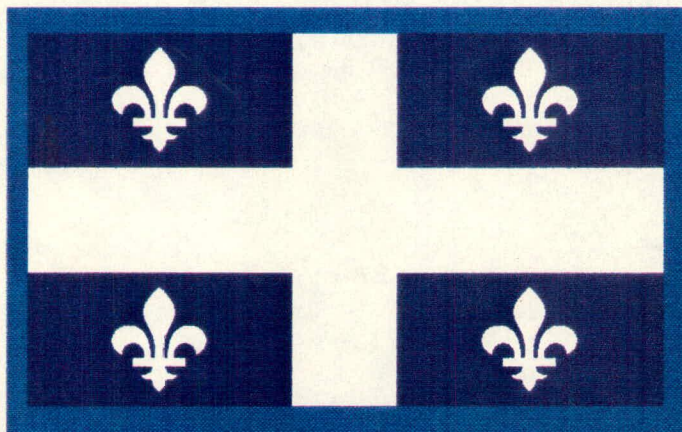
En utilisant l'option "couper et coller", une partie de la mémoire peut être partagée, et un programme IBM peut ainsi donner accès à ses données à un programme AMIGA et vice-versa.

L'AMIGA 2000, même acheté aujourd'hui est un acquis pour l'avenir, car il pourra, lorsque viendra le temps, être augmenté en AMIGA 2500-AT ou 2500-UX (sous UNIX).

Déjà à l'heure actuelle, il existe un AMIGA 2500 intégrant un processeur 68020, un coprocesseur mathématique 68881, un gestionnaire de mémoire (MMU), un disque rigide de 40 méga-octets à 19 mili-secondes d'accès, et deux méga-octets de mémoire "32 bits" additionnelle.

Ces technologies sont garantes de l'avenir tant du côté AMIGA que du côté IBM.

Dès aujourd'hui, l'AMIGA 2000, grâce à toutes ses qualités exceptionnelles dé-crites dans ce document, peut accomplir le travail dévolu à des ordinateurs plu-sieurs fois plus coûteux. Nous voyons donc que du côté prix et du côté perfor-mance l'AMIGA 2000 se démarque facilement de ses compétiteurs et qu'il peut s''intégrer de façon naturelle à notre parc d'ordinateurs.

Annexe A

Commodore® AMIGA® 2000 HD

AMIGA 2000 HD

Le Commodore Amiga 2000HD est un ordinateur de bureau remarquable, qui combine tout à la fois la vitesse, l'agilité et une mémorisation rapide sur disque à grande capacité. L'ordinateur A2000HD standard comprend une unité de disque rigide de 40 Mo à amorçage automatique. L'Amiga 2000HD, équipé d'un système d'exploitation puissant, est entièrement configuré pour toute une série d'applications de productivité, créativité et gestion.

Avec l'ajout d'une carte d'interconnexion optionnelle pour compatibilité XT® (A2088) ou AT® (A2286), vous pouvez utiliser des centaines de programmes Amiga et tous les programmes populaires MS-DOS® simultanément sur le même ordinateur. Ce qui signifie que vous pouvez faire d'une pierre deux coups. Et tous les ordinateurs Commodore Amiga sont à logiciels compatibles.

L'ordinateur Amiga 2000HD vous permet de choisir un moniteur monochrome ou couleur dans l'environnement MS-DOS.® En fait, la totalité de la palette de couleurs Amiga est disponible pour les applications MS-DOS.® Ceci est possible parce que l'Amiga Commodore 2000HD a une vision du monde en plus de 4000 couleurs, avec des possibilités d'animation et un réalisme presque photographique.

Vous pouvez transférer une image vidéo à partir d'une caméra ou d'un magnétoscope, modifier les couleurs ou en ajouter, créer des animations ou des effets spéciaux, ou même faire du mixage de son en stéréo pour obtenir des productions répondant aux normes professionnelles les plus sévères.

Le Commodore Amiga 2000HD est un véritable ordinateur multitâche dont la technologie à 16/32 bits vous offre une puissance vous permettant de réaliser simultanément plusieurs tâches avec deux systèmes d'exploitation différents.

Le clavier du Commodore Amiga 2000 est équipé d'un bloc de touches à pleine fonction, et de touches de curseur disposées en T inversé.

L'AMIGA 2000HD
Caractéristiques du produit

UCT
• Motorola 68000, 16/32 bits

FREQUENCE DE BASE
• 7,14 MHz

COPROCESSEURS
• Système coprocesseur à 3 puces pour ADM, vidéo, graphiques et son

MEMOIRE
• Mémoire vive standard de 1 méga-octet, possibilité d'expansion interne jusqu'à 8 méga-octets (avec AUTOCONFIG^{MC}), total maximum de 9 méga-octets

ROM
• 256 K

INTERFACES
• Clavier
• Souris/manette de jeu (2), aussi utilisable pour photostyle ou bloc électronique ou autre
• Série (RS232, compatible IBM-PC®)
• Parallèle (Centronics, compatible IBM-PC®)
• Vidéo (RGB analogique, RGBI)
• Canaux audio droit et gauche
• Unités de disque externes

FENTES DU SYSTÈME
• Bus UCT Amiga : 1 fente (86 broches) pour extensions UCT, par exemple MC68020/68881
• Bus système Amiga : 5 fentes (100 broches) avec AUTOCONFIG^{MC}
• Système bus secondaire : 2 fentes compatibles IBM® PC/AT (format normal), 2 fentes compatibles IBM-PC® (format normal, branchements AT pouvant être posés plus tard)
• Nombre total de fentes : 7 (2 fentes combinant les positions Amiga-IBM® PC/AT)

FENTE VIDÉO
• 1 fente vidéo pour codeur interne NTSC/PAL pour vidéo composite, Genlock interne etc.

ALIMENTATION
• 200 watts (machine de base plus extensions)

CLAVIER
• Détachable, 94 touches (version internationale, 96 touches) avec 10 touches de fontion, touches de curseur séparées (configuration en T renversé), touche d'aide

SOURIS
• Optomécanique, système à deux touches

UNITES DE DISQUES
• Unité de disque 3,5'' intégrée (formatée 880 Ko)
• Unité intégrée de disque rigide 40 Mo, 3,5'' 28 milli-secondes préformatée et préchargée avec logiciel de système et logiciels utilitaires (comprend le contrôleur de disque rigide à amorçage automatique)
• Emplacement pour unité en option: unité 5,25'' à demi-hauteur pour utilisation avec A2088 ou A2286

UNITES DE DISQUE EXTERNES
• 2 unités de disque souple Amiga (A1010-3,5''; A1020-5,25'')
• 3 unités de disque (formatées MS-DOS®) si une carte de connexion Bridgeboard Amiga est installée.

AFFICHAGE VIDEO
• 525 lignes, fréquence verticale 60 Hz (version internationale : 625 lignes, fréquence verticale 50 Hz)
• Coprocesseur graphique avec Beam Synced, modes dessin, remplissage et déplacement (Blitter)
• Mémoire vidéo maximale de 512 K (sur puce), palette de 4096 couleurs, maximum 6 plans binaires
• 8 objets par ligne de balayage

MODE TEXTE
• Modes standard :
80 caractères/25 lignes
60 caractères/25 lignes
• International : 80 caractères/32 lignes
60 caractères/32 lignes
• Commutable; choix de couleurs d'écran définies par l'usager

MODES GRAPHIQUES
• 320 x 200 points, palette de 32 couleurs sur 4096, palette commutable sur la ligne de balayage, pas d'interligne (International: 320 x 256 points)
• 640 x 200 points, palette de 16 couleurs sur 4096, palette commutable sur la ligne de balayage, pas d'interligne (International: 640 x 256 points)
• 320 x 400 points, palette de 32 couleurs sur 4096, palette commutable sur ligne de balayage, interligne (International: 320 x 512 points)
• 640 x 400 points, palette de 16 couleurs sur 4096, palette commutable sur la ligne de balayage, interligne (International: 640 x 512 points)

SON
• 4 canaux indépendants configurés comme audio gauche et droit
• Reproduction de formes d'onde de complexité illimitée
• Tampon de son pouvant atteindre 400 K nominal, 512 K maximum
• Filtre passe-bas (7,5 KHz, 12 dB/oct)

CALENDRIER/HORLOGE
• Intégré avec pile de secours

PAROLE
• Dispositif texte-parole en anglais intégré
• Contrôle de la vitesse, de l'espacement, du volume, de l'intonation et du sexe de la voix

LOGICIELS DE SYSTEME
• Offre le traitement multitâche; comprend AmigaDOS, interface d'utilisateur à fenêtre (Workbench), et interpréteur de ligne de commande (CLI)
• AmigaBASIC de Microsoft® Corporation (soutient les fonctions de graphique, son et fenêtre de la machine)
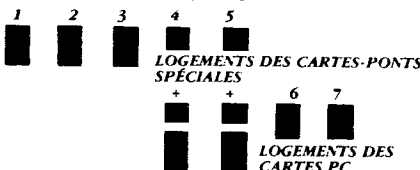• Système Reinstall Disk permettant à l'utilisateur de reconstituer la structure du disque rigide

ALIMENTATION
• 110 volts/60 Hz (international: 220-240 volts/50 Hz) (approbation ACNOR)

CONFIGURATION STANDARD
• La machine est livrée avec clavier, souris, disque rigide, bloc d'alimentation, manuel d'introduction, manuel AmigaBASIC, logiciels de système Workbench, AmigaBASIC et utilitaires, et système Reinstall Disk (pour reconstitution de structure de disque rigide), sur trois disques de 3,5''

LOGEMENTS DES CARTES AMIGA
1 2 3 4 5

LOGEMENTS DES CARTES-PONTS SPÉCIALES
+ + 6 7

LOGEMENTS DES CARTES PC

Organisation des logements
Si une carte de compatibilité PC est insérée dans le logement 4, alors le logement 5 est réservé aux cartes de PC, et les possibilités d'expansion par cartes sont les suivantes : 3 cartes Amiga, et 3 cartes PC. Si la carte de compatibilité est insérée dans le logement 5, alors le logement 4 est réservé aux cartes Amiga, et les possibilités d'expansion sont les suivantes : 4 cartes Amiga, et 2 cartes PC.

commodore business machines limited
3470 Pharmacy Avenue, Agincourt, Ontario M1W 3G3

Commodore® AMIGA® 2500

AMIGA 2500

Le Commodore Amiga 2500 est un simple ordinateur de bureau équipé d'un processeur à grande vitesse, qui offre une mémorisation rapide sur disque rigide à grande capacité, de même qu'un système d'exploitation souple et très puissant. Avec une unité centrale à 32 bits Motorola 68020 et un coprocesseur à virgule flottante 68881, l'Amiga 2500 est bien adapté aux applications qui exigent vitesse et puissance, telles que la conception assistée par ordinateur, le lancer de rayons, les simulations, les modèles mathématiques, l'édition de bureau et les vidéos de bureau.

Avec l'ajout d'une carte d'interconnexion optionnelle pour compatibilité XT® (A2088) ou AT® (A2286), vous pouvez utiliser des centaines de programmes Amiga et tous les programmes populaires MS-DOS simultanément sur le même ordinateur. Ce qui signifie que vous pouvez faire d'une pierre deux coups. Et tous les ordinateurs Commodore Amiga sont à logiciels compatibles.

L'ordinateur Amiga 2500 vous permet de choisir un moniteur monochrome ou couleur dans l'environnement MS-DOS.® En fait, la totalité de la palette de couleurs Amiga est disponible pour les applications MS-DOS.® Ceci est possible parce que l'Amiga Commodore 2500 a une vision du monde en plus de 4000 couleurs, avec des possibilités d'animation et un réalisme presque photographique.

Vous pouvez transférer une image vidéo à partir d'une caméra ou d'un magnétoscope, modifier les couleurs ou en ajouter, créer des animations ou des effets spéciaux, ou même faire du mixage de son en stéréo pour obtenir des productions répondant aux normes professionnelles les plus sévères.

Le Commodore Amiga 2500 est un véritable ordinateur multitâche dont la technologie à 32 bits vous offre une puissance vous permettant de réaliser simultanément plusieurs tâches avec deux systèmes d'exploitation différents.

Le clavier du Commodore Amiga 2500 est équipé d'un bloc de touches à pleine fonction, et de touches de curseur disposées en T inversé.

L'AMIGA 2500
Caractéristiques du produit

UCT
- Motorola 68280, 32 bits

FREQUENCE DE BASE
- 14,3 MHz

COPROCESSEURS
- Système coprocesseur à 3 puces pour ADM, vidéo, graphiques et son

MEMOIRE
- Mémoire vive standard de 3Mo à expansion interne (avec dispositif AUTOCONFIG^MC)
- 2 Mo à accès à 32 bits (extensible jusqu'à 4 Mo sur carte)
- Maximum 9 Mo

INTERFACES
- Clavier
- Souris/manette de jeu (2), aussi utilisable pour photostyle ou bloc électronique ou autre
- Série (RS232, compatible IBM-PC®)
- Parallèle (Centronics, compatible IBM PC®)
- Vidéo (RGB analogique, RGBI)
- Canaux audio droit et gauche
- Unités de disque externes

FENTES DU SYSTÈME
- Installé dans l'UC Amiga Bus (fente à 86 broches): MC68020 avec coprocesseur mathématique 68881 et MMU 68851
- Bus de système Amiga: 5 fentes (100 broches), (4 disponibles) avec dispositif AUTOCONFIG^MC
- Système de bus secondaire: 2 fentes compatibles IBM PC/AT (pleine dimension), 2 fentes compatibles IBM PC (pleine dimension, peut recevoir plus tard des connecteurs AT)
- Nombre total de fentes : 7 (2 fentes représentent des positions combinées Amiga IBM® PC/AT)

FENTE VIDÉO
- 1 fente vidéo pour codeur interne NTSC/PAL pour vidéo composite, Genlock interne etc.

ALIMENTATION
- 200 watts (machine de base plus extensions)

CLAVIER
- Détachable, 94 touches (version internationale, 96 touches) avec 10 touches de fonction, touches de curseur séparées (configuration en T renversé), touche d'aide

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- Reproduction de formes d'onde de complexité illimitée
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PAROLE
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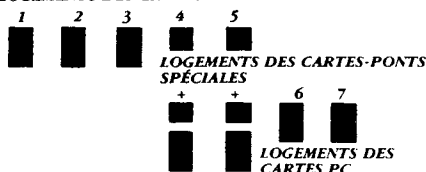- Système Reinstall Disk permettant à l'utilisateur de reconstituer la structure du disque rigide

ALIMENTATION
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Annexe B

How to Succeed in Business Presentations

(WITHOUT REALLY SPENDING A FORTUNE)

Knowing what tools you'll need—and how to use them—

can give you the winning edge in using your Amiga to make a successful,

and cost-effective, business presentation.

By Bob Eller

F YOU'RE IN business then you know what an eye-catching presentation can do—create more business! What you may not know, however, is that you don't have to hire an expensive agency to create that professional-quality presentation—if you own an Amiga. With its multitasking operating environment and impressive graphics, sound, and video capabilities, your Amiga has the power and versatility to produce effective, smart-looking business presentations. The key is knowing what hardware and software tools you need to harness that power.

We'll begin by looking at what you will need to prepare an effective *printed presentation* and then focus on how to use the materials you have created in a *live presentation* for your client. Finally, we will show you how to combine the Amiga's graphic and video capabilities into a recorded *video presentation* that your client can view anytime. The accompanying sidebar outlines a presentation scenario when aspiring company meets hard-boiled client.

Keep in mind that because the Amiga allows you to prepare your presentation for several different presentation media, the first thing you need to do is to determine which media will best help you reach your "target audience." While a slick, MTV-style video may be desirable for less conventional business concerns or for reaching a young audience, a professionally printed brochure or single-page advertisement might work better in a more traditional business arena or with a more mature clientele. ►

Before looking at the tools of the trade, however, let's examine some basic system hardware requirements. Many of the things we will be looking at with an eye to producing presentations will involve creating graphics for pages and artwork. Graphics, and the programs you use to create them, require a great deal of memory. I would recommend you have a minimum of one megabyte of memory (more if you can afford it) and two disk drives. Ideally, if you can manage it, a hard drive will make your work both faster (programs run from a hard disk execute more quickly) and easier (the greater storage capacity and more efficient organization of a hard disk will better handle the large number of files you will be combining to create your finished presentation).

Other hardware you may need—particularly photographic and video equipment—will depend on the types of presentations you create. Service bureaus are widely available to take your Amiga work and produce a high-quality printed page or slide. Depending on the frequency and the extent of your presentations, you may often find it more cost effective to send your work to a service bureau rather than invest in an expensive piece of equipment. We will look at some of this special hardware a little later on. Information about all products—hardware and software—and services mentioned in the article is contained in the accompanying "Product Information" box, which is presented alphabetically by name of product, service, or reference title.

Word and Image: The Printed Presentation

YOUR PRINTED PRESENTATION begins in the planning stage with an eye to its graphic design—the careful blending of typography (type fonts, sizes, styles) and graphics (photos, illustrations, and so forth) into an overall page layout. Take a close look at some of your favorite publications and you will notice that many of them have a distinctive style of graphic design. The purpose of graphic design is to make it easy and pleasurable for the reader to understand your message, while making you—the source of that message—memorable in the reader's mind. Think about it: Are you more likely to read and remember the information if it is a black mass of text rather than a balanced presentation of text and illustration in an attractive page layout?

With the sophisticated capabilities of many word-processing and desktop-publishing programs, it is no longer necessary to hire an artist to design your presentation and a printing firm to produce it. Apart from design hints and techniques contained in the documentation of these programs, there are numerous books about the subject. One particularly good general source for type design is *How To Spec Type* (Watson-Guptill Publications) by Alexander White. Also, an excellent source for learning about desktop-publishing design and layout is *The Aldus Guide to Basic Design* (Aldus Corporation). Although Aldus

manufactures PageMaker software for the Macintosh and IBM PC, the book is not system-specific and provides valuable information to beginners starting out on their first Amiga publishing venture. Once you get past the basics of design, several Amiga software tools can help you start creating documents that will grab your audience and sell your product or service.

To create text you will need a word processor. Most Amiga word-processing software—including excellence! (Micro-Systems), KindWords (The Disc Co.), ProWrite (New Horizons), Scribble! (Micro-Systems), Textcraft Plus (Commodore), and WordPerfect (WordPerfect Corp.)—will do a fine job in helping you create text for your presentation. Each, however, differs in its features, capabilities, and price. If you plan to later use the text you create in a desktop-publishing program, almost any Amiga word processor will produce text files that can be imported into such programs. If your documents are long and full of complex formatting, you will want a word processor with fairly sophisticated features and extensive formatting control—such as WordPerfect or excellence!—but be prepared to pay a more substantial price. And, in all cases, if you want to use the various style and font changes you have made in your text files later on in the document you create with your desktop-publishing program, make sure that program recognizes the appropriate formatting commands as part of its support of your particular word processor. (For a discussion of the relative merits of Amiga word processors, see "The *AW* Word Procesing Roundup" in the October '88 issue of *AmigaWorld*, p. 48.)

MANIPULATING TEXT AND GRAPHICS

Some Amiga word processors—notably ProWrite and to a lesser extent excellence! and KindWords—allow you to combine text and graphics. If your presentation needs are modest, these programs may suffice—without your having to use desktop-publishing software and highly expensive printers. You can manipulate text and graphics—all three can import IFF (Interchange File Format) images, and ProWrite also accommodates HAM (Hold-and-Modify) images. You can also choose from a limited variety of fonts, and print in color or black and white.

If, however, you have extensive and sophisticated business presentations in mind, you will probably need the more advanced page-creation features, graphics-handling abilities, and high-quality laser-printer support of a desktop-publishing program. (See Figure 1 for an example of how Professional Page, a top-notch Amiga desktop-publishing program, handles page-creation requirements for a one-page business prospectus.) In its early stages, Amiga desktop publishing ran far behind its competitors in the Apple and IBM PC market, but the situation has changed dramatically over the last year. The original Amiga desktop programs—such as PageSetter, City Desk, and Publisher 1000—have all been updated to offer

more sophisticated features and printer support.

In addition, Gold Disk (maker of PageSetter, the first Amiga desktop-publishing program) now offers Professional Page, a program that rivals any of its Apple or IBM competitors. (See "The Desktop Heavyweight" in the May '88 issue of *AmigaWorld*, p. 32, for a feature review of Professional Page.) And Shakespeare: The Page Integrator, from Infinity Software, is a unique program that allows you to produce professional-quality pages of color text and graphics. (See the July '88 issue of *AmigaWorld*, p. 16, for a review of Shakespeare.) What distinguishes these two programs—and to some extent several of the updates of older programs—is their support of PostScript printing.

Postscript is a page-definition language for laser printers developed by Adobe Systems. By using PostScript the printer can print text free of the "jagged" look common to most computer output. Professional quality is not without its price. PostScript support will add between $1500 to $2500 to the cost of your laser printer. Fortunately for us, service bureaus are widely available to print PostScript-formatted documents on imagesetters and color printers. Adobe maintains a listing of service bureaus on the CompuServe computer network. Most larger cities have a local service bureau to handle your work. Many of the bureaus, unfortunately, do not directly support the Amiga. You may need to copy your PostScript-formatted file to an IBM-formatted disk, using a file-conversion utility such as Central Coast Software's Dos-2-Dos program, which will allow the bureau to print your file from its IBM computer. Many bureaus, however, have a modem available to receive your work, thus eliminating the need to transfer your file to another disk format. Before beginning any job, contact the service bureau you wish to use and request information about service charges and the kind of PostScript-compatible equipment used. It is a good idea to send the bureau some test files to get an idea of its work before beginning an important presentation.

GRAPHICS GALORE

While text may contain your message, the effective use of graphics might be the key to making your presentation grab the attention of your clients. And no personal computer can match the Amiga's capabilities when it comes to graphics.

If you have an artistic bent, then create your own images with any one of several fine Amiga paint programs, including DeluxePaint II (Electronic Arts) and Photon Paint (MicroIllusions). Electronic Arts also offers a neat three-in-one package, Deluxe PhotoLab, which combines a paint program (Paint) with an image processor (Colors) and a print program (Posters) that prints any picture file in any size from one-inch square to ten feet on a side.

Those whose artistic talents are still at the stick-figure stage can make use of the "canned-art" ap-

proach by availing themselves of the many clip-art programs on the market. Often containing hundreds of ready-to-import IFF images, these programs are quite inexpensive, usually falling in the $20 to $40 range. A small sample of clip-art disks available might

include Art Companion (MicroSearch), Art Parts (Electronic Arts), Art PAK 1 (Aegis), and Express Clip Art (PAR Software).

Similar to clip-art disks and useful for dressing up text and titling are font packages, which offer a wide and varied range of type fonts, sizes, and styles. There are literally dozens of these packages available, including the Borders and the Business Font Sets from C Ltd. and the Calligra Fonts Series from InterActive Softworks.

In a related vein, a brand new product from Gold Disk, Design-3D, may also be helpful. While we have excluded from discussion such 3-D modeling programs as Byte By Byte's Sculpt 3D and Aegis' Video- ►

Scape 3D on the grounds that their complexity limits them to professional graphics artists, or at least very advanced users, this object-creation program is much less ambitious in its scope and much easier to use for the beginner/intermediate. More importantly, its 3-D text support (fonts included and built-in font editor) makes it quite simple for users to add three-dimensional titling to a variety of presentation graphics.

Some say the ultimate clip art is digitizing. With a camera and digitizing equipment, you can create digitized images of almost anything to incorporate into your presentation. Digi-View (NewTek) is the most widely known Amiga digitizer, and the latest version of its software component (3.0) can be used not only for color, but also for creating black-and-white line art for importing into your desktop-pub-

Figure 2. Digitized images (plus captions) of staff members, a company office, or whatever can be easily added to your presentation.

lishing program. While Digi-View can only digitize still images, real-time digitizers—such as Live! (A-Squared) and Perfect Vision (SunRize)—offer digitizing possibilities for moving objects.

Let's take an example of how to use the digitizing process to enhance a business presentation. Suppose you would like to introduce the development team of your new company (one of whose members appears in Figure 2) in a smart-looking presentation with some added special effects. You would start by using a digitizer to put their pictures on the Amiga screen. With Live! or Perfect Vision, simply place the subjects in front of the camera, with a nice neutral background behind them, and capture each of their faces as IFF files. Digi-View would require an extra step—taking a good photograph first. Once developed, place the photo on the digitizer's copy stand (or, in the case of a slide, on a wall and aim the camera at that). You then plug the video camera's cable into the video plug on the back of the monitor, and switch the monitor's display to composite so you can preview the image and line it up just right.

Once you have captured the image and saved it in the format you have chosen (B&W, 32-color, or HAM), you can then move the image over to the paint program to do a little fine-tuning. This could include anything from putting a simple border around the image and adding a name and appropriate caption, to doing a major reworking of the picture—combining it with other images and color correcting it with an image-processing program. With the right combination of digitized image and paint program, you can achieve a wide range of very effective presentation graphics. (For a useful collection of digitizing tips and techniques, see "Digital Reprise" in the October '88 issue of AmigaWorld, p. 39.)
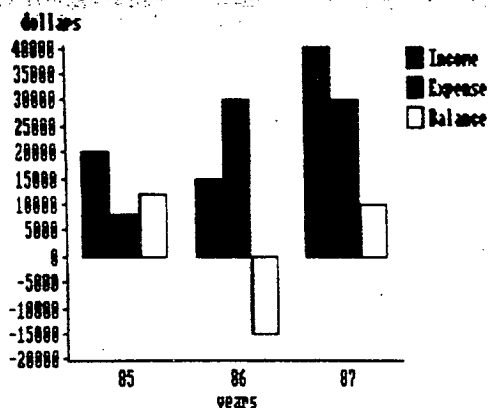
Projecting Your Pitch: The Live Presentation

YOUR PRINTED PRESENTATION knocked the clients dead and now they would like you to give a presentation to the company. This is usually the point where beads of sweat start trickling down your forehead, but the Amiga is ready to bail you out. The written presentation you prepared has the information that got you this far. Now you have the opportunity to highlight your assets. By using the text and graphics you have already prepared, you are ready to produce a live presentation that will close the deal.

Some people may find it daunting to walk into a meeting to do an oral presentation and have to set up and run their Amiga systems at the same time. For such people, here is another place where a service bureau can help you out. You may find it easier to operate a slide projector during a presentation than to keep a computer under control. If so, service bureaus are available to turn your IFF or HAM images into 35mm color slides. You will probably have to mail or modem your images to the bureau, as companies handling Amiga graphics are harder to locate than those who print PostScript work. Philadelphia Video Lab in Philadelphia, PA, provides excellent service in this regard. In addition, AmigaWorld's monthly "Pull-Down Menu" section often contains ads for such services, such as Hammond Photographic Service of Culver City, CA. The AmiEmporium on American PeopleLink also offers a slide, print, and poster service on line.

If you regularly need to convert your work to 35mm slides, you might want to consider investing in the Poloroid Palette Film Recorder (plus Liquid Light's Imprint software), which allows a 35mm camera to capture slides directly from your Amiga. (See the November '87 issue of AmigaWorld, p. 76, for a review of the Palette and Imprint.)

If you would rather use an overhead projector during your presentation, you may want to look at the Xerox 4020 color printer. The 4020 prints full-color IFF images onto a transparency that will produce an excellent image for your overheads. Your local service bureau may also be able to help you out here, too. ►

The price tags, however, of the Polaroid/Imprint system for making slides (nearly $2500) and the Xerox 4020 for making transparencies ($1500) are very steep. Remember, you can generate slides or transparencies from hardcopy (a decent laser printout); see your local camera store, print shop, or copy

service to find out what they require. You can also try your hand at taking your own screen shots if you own a good camera. Mount your camera on a tripod, masking out all external light with a hood, and shoot directly at the screen. You will need to experiment quite a bit at first—taking fairly long exposures and continually adjusting the f-stops (through about five full stops). Be prepared to use a lot of film.

WHY NOT TAKE YOUR AMIGA ALONG?

Also, keep in mind that more hearty souls need not abandon their Amigas at presentation time. Your Amiga can be as helpful in performing your presentation as it is in creating the displays. Many programs

have slide show capabilities that let you input graphics files and step through them one frame at a time by clicking the mouse. You can use Mindware's PAGEflipper Plus F/X, for example, as a controller for displaying digitized and IFF images. A multitude of other programs can also help you out in this vein, including Hash Enterprises' Animation:Flipper and Lights! Camera! Action! by Aegis.

Some Amiga utility programs can also help you out if you are making the live presentation with your Amiga in tow. Under live conditions, one ill-placed mouse click could ruin an otherwise persuasive presentation. To take the worry out of running a long sequence of operations (manipulating an image or entering a string of changes in a spreadsheet and reviewing the results at each step, for example), you can use a macro-creation program such as Encore (Elipsys) or The Demonstrator (Meridian). Both of these programs let you record a series of mouse clicks and keystrokes, then play back the sequence by clicking on an icon or pressing a key. To automate your presentation completely, you can add speech and scrolling text.

If you need charts and tables to help emphasize important points of your talk, consider the graphics capabilities of some Amiga spreadsheet programs. MaxiPlan Plus and MaxiPlan 500 (Oxxi) are Amiga naturals that can produce IFF images from your data for conversion to slides and overheads. Analyze! (Micro-Systems) and Haicalc (Haitex) also offer somewhat comparable graphics functions. Creating an IFF graphic of your MaxiPlan spreadsheet is easy. Just type the data you would like to represent into MaxiPlan. Use MaxiPlan's graph functions to design the title, text, and data points, and then have Maxi Plan draw your finished chart. Extend the window of your chart to cover the entire Amiga screen and use the MaxiPlan capture function to capture your Amiga's screen to an IFF picture file. You can then load the IFF picture into DeluxePaint II or any other Amiga IFF paint program and customize your chart's colors, change the text, and delete any unwanted remnants of your Amiga screen that may have been captured with your chart. (Figure 3 shows the "before-and-after" effect of this procedure.)

MaxiPlan and other Amiga spreadsheets are not the only programs that help you create graphic representations of data. Math-Amation from Progressive Peripherals includes a business-graphics module that allows you to create two- and three-dimensional color bar graphs, cumulative line and bar graphs, and pie charts. Other program features perform statistical analysis on columns of data (including groups of data), and plot them in attractive displays.

If you need to include maps in your presentation to display distribution patterns, Bassett Geographic's program Choromap can help. With this package, you can trace a map from a transparency onto your screen, input data corresponding to sections of the map, and assign shades or colors to value ranges. ►

They Laughed When I Sat Down to Play the Amiga

THE CONFERENCE ROOM door swings wide, and in walks the CEO with his Marketing Director and an attitude that screams, "Okay, show me!"

Just 48 hours ago, nothing tangible existed, and now you, as Account Executive, are making your pitch for a sizable piece of advertising business. Your palms begin to sweat as the marketing toady asks, "Where are the storyboards, flip charts, slide, and overhead projectors?"

The conference room is empty except for the presence of a VCR, large-screen monitor, and an Amiga.

FLASHBACK

Two days earlier your media director finally got all her numbers, charts, and demographics together. Before, her part of the pitch was relegated to overhead transparencies knocked out on the Xerox machine. Now, however, she loads up DeluxeVideo (Electronic Arts) and begins generating animated pie and bar charts. Labels are applied just as fast as she can type.

Using Live! (A-Squared), she digitizes the title sequences from TV shows she recommends buying. She adds special visual effects with Invision (Elan Design) and lays in the demographic breakouts with TV*Text (Zuma Group/Brown-Wagh). She scripts out the timings and strings the animated sequences together using DeluxeProductions (Electronic Arts) or MovieSetter (Gold Disk), dumps to videotape through a genlock (just to keep all the colors bright and right), and she is ready to write her narration.

CREATIVE SOLUTIONS

Storyboards have always been a staple of any presentation of TV commercials—anything from 10 to 40, 4 x 6-inch cartoon panels that try to give the client some idea of what the commercial is going to look like. They are crude at best, totally ineffective at worst. Now, however, your company can generate video storyboards, and do it in hours, rather than days. Beginning with a rough sound track, the art director pulls existing photos and art from magazines and books, feeds those images into the Amiga through a Digi-View (NewTek) digitizer, then animates them with a package such as MovieSetter. The client's new logo is even animated through digitized artwork and Animate 3D (Byte by Byte).

She dumps the resulting animations through the genlock to a VCR, adds the sound track via the machine's audio dub function, and the commercials (now called animatics) are ready for the presentation. The method is fast and efficient, one quarter of the old costs, and probably 50 times more effective.

BRING IN THE SUITS

You and your agency president still have parts to play. For you, Deluxe Productions goes to work illuminating the marketing strategies behind the plan. Animated maps (using clip art) pinpoint target markets, introduction dates, and a breakout of estimated costs. Digi-View again makes things simple. In this case, the presentation is saved to disk so that the visuals can be synchronized to your live presentation, using the package's slide show function.

Finally, it's time for the finish. As your agency president begins his summation, the video accompanies him with images of the agency, its facilities, and the people who will be working on the account. These appear with a full range of wipes, dissolves, and animation effects, all produced with the software and hardware already mentioned. As he concludes, the agency logo, gloriously three-dimensional, spins onto the screen, shimmers in the imaginary light, and fades to black as the music reaches its climax.

As the lights come up, you hand the CEO your agency presentation book that covers everything you have just shown, complete with 300 dot-per-inch illustrations (generated through Gold Disk's Professional Page). He thumbs through the impressive document and mutters, "Ah, a Macintosh...just like in the commercials."

You smile and reply, "Apple only wishes!"

"Well, what else could produce a presentation like this?" he asks.

"Hire us and we'll tell you."

YOU CAN TOO

Fantasy? No. With an Amiga, two megabytes or so of memory and less than $2000 worth of hardware and software, the presentation outlined above is routine reality. You can orchestrate live, taped, or any combination of presentations at incredible savings in both time and money.

While IBM's greatest achievement is the ability to make very expensive slides, and Macs rely on their monochromatic desktop-publishing prowess, the Amiga successfully encompasses those attributes while adding high-resolution, full-color graphics, video, music, and stereo capabilities. It's the ideal desktop-presentation machine. ☐

—Gary Ludwick

Gary Ludwick is the president of The Creative Department, a Charlotte, NC-based advertising agency. The Amiga has been an essential part of his company's presentation, graphics, and video capabilities for the past two years.

From this, the program will produce a map showing distribution by color.

Lasting Impressions: The Video Presentation

SUPPOSE YOUR CLIENTS are too far away for you to make a live presentation at their offices, or perhaps the people to whom you delivered your presenation need to have further meetings with others in their organization. This is where recording a video presentation can spark that edge of immediacy that could be lost if you are forced to rely on printed materials or word of mouth.

You need only record much of your previously created images, with appropriate sound and video titling added, to splice together a video presentation. You can edit your written presentation into a script and use recorded live images mixed with the graphics you have already created. Combining the pictures from your video camera or recorder with graphics from the Amiga will require a device known as a genlock.

A genlock allows you to overlay your Amiga's graphics directly onto external video and then send the combined picture to another video recorder. More specifically, a genlock synchronizes the video signals between a VCR or camera and the Amiga, permitting video created on the Amiga to be overlaid on top of video coming from the VCR or camera. ►

This allows you to create titles and logos over video of your products or services. Amiga genlocks are available in a range of prices, and in most cases cost is directly related to quality of video produced. At the high end of the market is the SuperGen ($750) from Digital Creations, which produces a high-quality signal good enough for many local TV stations. In the mid-range of the market is Progressive Peripherals' ProGen ($450), and at the low end is the AmiGen ($200) from Mimetics. (For a good hands-on guide to setting up a home-based Amiga video system, see "The Amiga Home Video Companion," in the September '88 issue of *AmigaWorld*, p. 40.)

Once you have your hardware set up, there is a wide variety of software available to help get your video production under way. Character generators create text you can place in the form of titling and other information onto video. JDK Images' Pro Video CG1 and Pro Video Plus are excellent character-generating programs (with the latter allowing IFF pictures to be used as backgrounds so that text can be overlaid). Aegis' Video Titler will also produce titles and effects, as will the combination of TV*Text and TV*Show (Zuma Group/Brown-Wagh). All of these programs can use IFF images from your paint program or digitizer.

For simple animation using IFF images, look into DeluxeVideo 1.2 from Electronic Arts. Both it and MovieSetter (Gold Disk) combine graphics and sound to produce animated sequences playable on the Amiga and recordable by your VCR. Also consider Antic Software's Zoetrope, which uses either 3-D objects, IFF images, or animation captured using A-Squared's Live! digitizer to create animation. With Zoetrope however, you cannot include sound with your animation. A similar problem exists with another Electronic Arts animated-video production tool—Deluxe Productions—which offers high-quality animation capabilities but no integrated sound.

Various companies also offer video clip art that may prove helpful in producing video sequences. Everything from video fonts to backdrops are currently available. A sampling of these disks might include Pro Video CG1 and Pro Video Plus Fonts Libraries (JDK Images), the Video Visions series (Charles Voner Designs), and the Zuma Fonts series (Zuma Group/Brown-Wagh).

For a descriptive guide to Amiga video software and hardware products, see "Videot's Delight," in the the March '88 issue of *AmigaWorld*, p. 22. Also, for information on additional Amiga products in all sections of this article, check *AmigaWorld*'s annual Buyer's Guides (Software: December '88, pp. 19–72; Hardware: March '89, pp. 32–46). ∎

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THE AMIGA HOME

VIDEO

COMPANION

A step-by-step, how-to guide for using your Amiga to spice up your home

movies with snappy titling and some simple, yet impressive video effects.

WHEN WAS THE last time you viewed your home movies and wondered which relatives these were in the footage or what the name of the place you visited was on that vacation you took four years ago? Wouldn't it be nice to be able to go back and put that information on the videotape permanently? Learning some basic video-titling procedures can solve your problem and, in the future, allow you to create titles as you complete your home video productions.

In addition, mastering some equally basic video-graphics techniques can open up a host of creative home movie-making opportunities. Adding special effects—such as "transporting" people in and out of scenes, setting up "force fields" to separate things from their environments, or even landing spaceships in otherwise ordinary scenes—will give you the kind of cinematographical options you thought only people like Steven Spielberg could enjoy.

All that is required are a video camera, a VCR, your Amiga (with a genlock), and the appropriate software.

VIDEO TITLING

A first step in spicing up your home movies is to provide titling by means of a character generator (CG)—a device that creates text and places it in the form of titling (and other information) onto video. You can transform your Amiga into a character generator with a number of excellent programs, such as

Pro Video CG1 and Pro Video Plus (PVS Publishing), Video Titler (Aegis Development), TV*Text and TV*Show (Brown-Wagh Publishing), and, for sophisticated 3-D titling, VideoScape 3-D (Aegis). These represent only a small selection of what's available. (For a more complete listing, see "Videot's Delight," p. 23, in the March '88 issue of *AmigaWorld*.)

CASTING YOUR CHARACTERS

Here are some tips on using a character generator for the first time:

■Watch your home-produced videotape all of the way through and make notes on what you want your titling to "say" and where on the screen it should be placed with respect to spacing and readability.

■Do not choose a font that is difficult to read.

■Do not choose a font color that clashes with videotaped subjects and/or material.

■Do not clutter the screen with CG information.

■When you display your information, do not leave it on screen longer than it takes for you to read it twice.

Because videotape, unlike film, does not permit multiple exposures, you cannot simply reexpose the film in the camera to produce titles. You must add the titles while you are copying from one VCR to another. To achieve this, you must connect the composite video output of the first VCR to the composite ►

By Wayland W. Strickland

video input of a genlock, and then connect the composite video output of the genlock to the composite video input of the second VCR. Finally, connect your monitor, or television, to the second VCR's composite video output (if using a monitor) or RF output (if using a television). (This may seem complicated, but if you consult Figure 1, you will see that this scheme of connecting the components is not as difficult as it sounds.)

Before we move on, a brief discussion of the genlock component mentioned above is in order. In addition, we will try to explain the differences in capabilities and features among genlocks, as well as the specialized "video loop-through" feature found only in select models of genlocks.

A genlock synchronizes the video signals between a VCR or camera and the Amiga, permitting video created on the Amiga to be overlaid on top of video coming from the VCR or camera. Thus, the background video (color 0 in the Amiga palette) always originates from your external source (the VCR or camera), while your Amiga always generates the foreground video.

Genlocks come in two basic configurations. The less expensive units, such as Mimetics' AmiGen and Commodore's A1300, do not allow the Amiga's graphics to be "faded in" or "faded out." The graphics are simply "full up" or "full on" all the time. More expensive genlocks, such as Digital Creations' SuperGen and GlennLoc's RM-2, do allow you to "dissolve" computer-generated graphics over external video. SciTech's GenKey, although priced comparably with SuperGen, also does not allow for fade-ins and fade-outs.

Both GenKey and SuperGen do, however, have what is known as a "video loop-through." This permits another monitor or TV display to use the same video source as the genlock. Thus, you can observe your source video on one display while watching, on another monitor (connected to VCR #2), your source
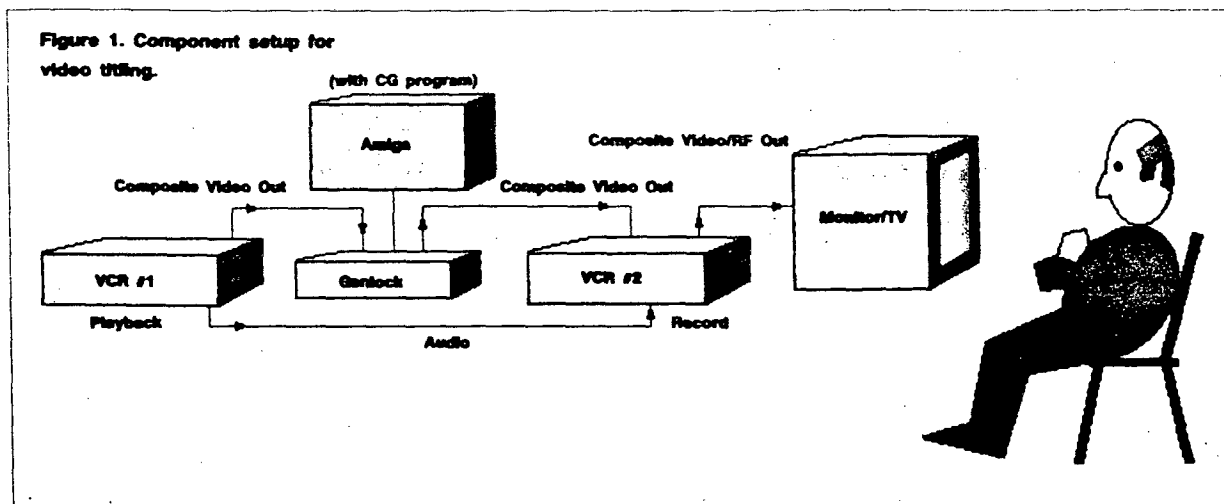
video with graphics overlaid. In this way you can separate the two images in your mind, stopping to adjust and fine tune your productions as you go.

If you do not have another monitor to attach to this video loop-through connector, then your video may look too "hot" (contrast and brightness are too high, resulting in a "bright" picture). To solve this problem, first check your genlock manual to see if the genlock has a built-in switch that will correct for this brightness problem. If not, visit your local electronics store and purchase a 75-ohm video terminating resistor and connect it to the video loop-through connector.

ROLL THOSE CREDITS

The next step is to power up your computer and load the CG program of your choice. Select a font, font size, and color, and size and direction of the drop shadow. Then compose your pages in the order in which you are going to record them onto your videotape. Many of the character-generator programs permit fancy ways of displaying the information on the screen, such as slides, wipes, checkerboard patterns, and so forth. Select any special screen transitions desired and, depending on the program, save the information for use when you copy the "home movie."

Insert the master videotape (the one you want to add titling to) into VCR #1 and insert a blank videotape into VCR #2. You should note that when copying a videotape, there will always be a slight loss in picture and sound quality. This loss, however, can be minimized by recording the original and the duplicate in the fastest speed on your VCR (SP for VHS, BII for BETA). A good habit to get into with your initial productions is to make a test recording before dubbing the entire videotape. Place VCR #1 (source machine) into play mode while simultaneously placing VCR #2 (record machine) into record mode. Clear the computer screen in your CG program or go to a

Figure 1. Component setup for video titling.

blank page and try your test recording. If the test recording turned out favorably, you are ready to begin dubbing. If it did not record properly, check to see that the cables are firmly connected, the genlock is plugged in, and your computer is on.

Using the notes you made from an earlier screening, watch the monitor (or television) as the part of the videotape you wish to add titling over is shown. Depending on your CG program, initiate the proper command sequence to display the titling information. Repeat this operation until you finish adding all of the titling you wish to your videotape.

ADVANCED VIDEO EFFECTS

With the same set of components used for titling, you can put your Amiga to work creating a repertoire of special effects for your home video productions. For instance, you can transport yourself and a friend to faraway places or planets, create a force field (to keep away monsters, in-laws, or presidential aspirants), or land a spaceship in your backyard. No longer are these well-known special effects limited to professionals. How, you say, can all these be simulated? We'll try to provide some explanations, and advice, concerning the creation of a few of your favorite effects.

GETTING AWAY FROM IT ALL: THE TRANSPORTER EFFECT

The transporter effect has been used in a number of television programs over the years. Its original method of creation involved dropping aluminum dust through the beam of a high-intensity light as the subject was being photographed. An optical printer was then used to matte the effect on top of the person or object to be "transported." You can accomplish this effect more simply by using almost any paint program with the ability to cycle colors (such as DeluxePaint II), a video camera, a VCR, and a monitor.
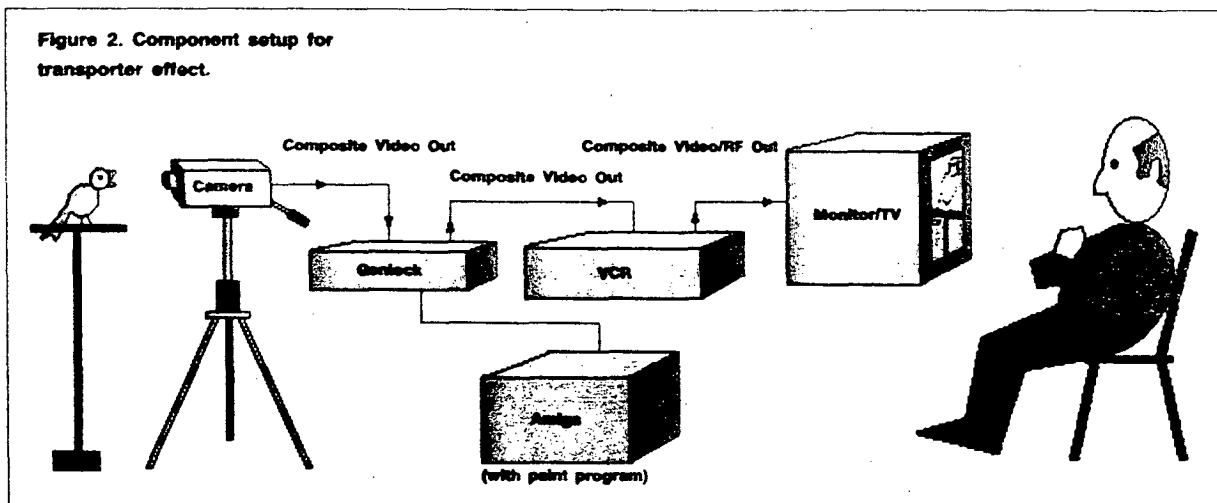
Choose an object (or person) to "transport" and set up your video camera so that your object is aligned in the center of the screen. Connect your video camera's composite video output to the composite video input of the genlock. (Note that because some older home video cameras and camcorders are not equipped with a composite video output, you may need to purchase a power supply for your specific model of camera that will furnish you with such an output.) Connect the composite video output of the genlock to the composite video input of the VCR. (See Figure 2 for a diagram of the setup described above.)

Turn on the power to your Amiga and load the paint program (DeluxePaint II, in this example). When the prompt appears, select interlace mode and then select palette from the project menu. The best colors for the transporter effect are blue or yellow-gold. (In our example, we will use gold.)

Select the lightest color of gold in the palette and copy it to the top of the third column and the bottom of the fourth column, proceeding from left to right. Select the darkest color of gold and copy it to the bottom of the third column and the top of the fourth column. Use the pointer to select the light gold at the top of the third column. Select the "spread" icon and touch the dark gold at the bottom of the third column. Repeat this step for the fourth column. You should now have a range of gold that begins with a light shade, gradually darkens, and then lightens again.

To make the transporter effect look real, you must cycle the complete range of gold shades. To accomplish this, touch the light-gold shade at the top of the third column, select the "range" icon, and touch the light-gold shade at the bottom of the fourth column. Now select the cycle speed—normally about one-half to three-quarters on is fast enough to appear real. Exit the palette menu and then trace the outline of the object that you will be transporting. When you ►

Figure 2. Component setup for transporter effect.

finish tracing the outline, turn on the dithering mode by pressing the right button on your mouse and select the paint can. There are three dithering types you can select. The first is identified by an icon box that is an up/down arrow; this is the icon we will use. (For more complex and interesting effects, you might experiment with the other two icons.) Move the slider all the way to the right so that the individual colors are thoroughly mixed.

The next step is to outline the object you wish to make disappear with one of the colors in the range. Using the paint can, fill in the outline completely (which may take a few moments). Now press the tab key to begin the cycling effect. Depending on your genlock, you can either dissolve the effect over the object or "cut" the effect (for a sudden appearance) on the object. To "cut" back and forth between the effect and the object, use the J key. This will swap the current page in DeluxePaint II with the background page. If your genlock will perform a dissolve, this is the best way to achieve this effect.

Finally, you are ready to "transport" your object. Insert a blank video cassette into your VCR and record the object without the effect, then record the effect overlaid on the object. While the effect is still being displayed, pause the VCR. Move the object out of the camera's frame of view, press PAUSE to begin recording again, and remove the effect (either by dissolving or cutting, as discussed above). Rewind the videotape, play it back, and see how easy it is to make an object transport to any imagined destination.

If you've used your VCR for any length of time, you are no doubt aware of the "glitch" that occurs every time you pause the VCR or perform an edit. This happens because the tape is not at the proper speed to start recording and the video head did not erase part of the old recording before starting with the new. To avoid this and other problems, VCR manufacturers began incorporating into recent units a feature called a flying erase head. When making an edit on units so equipped, the VCR will initiate what is called a pre-roll. The VCR will back the tape up about five seconds to allow sufficient time for the tape to get up to the proper speed. Once the VCR comes to the frame where the new video is to start, the flying erase head will erase the old video from that point on, creating blank space for the new information to be placed on the tape. This eliminates the glitch and the problem.

BEHIND PARTIALLY-CLOSED DOORS: FORCE FIELDS

Setting up a "force field" is similar to creating the transporter effect, except that the former does not apply to merely the outline of an object; a room or any "field" you wish affected can be subjected to this effect. An ideal place, for instance, would be a doorway where you would have someone stand behind

the area in which the force field will exist. (For the sake of continuity, we will use the doorway example throughout the explanation.) Position the video camera directly in front of the door so that the camera sits approximately eight to ten feet from the physical doorway.

Set up your color palette as described earlier for the transporter effect and outline the interior of the doorway with one or more of the colors in the range. Use the airbrush to fill in the outline, leaving some space for the camera to "see through" in order to permit the viewing of persons present behind the effect (as if, for instance, you are in a type of holding cell with the force field keeping you imprisoned while a "guard" is outside the cell door). Again, depending on your genlock, you can either dissolve this effect in and out (fade in about half way—a "ghost effect" is most effective), or use the J key to cut the effect on and off.

CLOSE ENCOUNTERS: THE SPACESHIP LANDING EFFECT

This effect requires a bit of preproduction planning and also requires a two-dimensional animation program, such as Aegis Animator or DeluxeVideo Construction Set, or a solid-object animation program, such as VideoScape 3-D (which we will use for our example) or Animate 3-D. If you use a 3-D program, you need not worry about creating your spacecraft; with VideoScape 3-D, for example, simply use the "infinite loop ship" (denoted in the file listing as "InfLoopShip") on the program's object disk. You must plot the course of the spacecraft —how the ship enters, lands, and exits the scene—and set the camera angle and the position of the light source before creating the effect.

The spacecraft will enter from the upper-right corner of the screen, move to the center, then land. After a slight pause, the craft will rise, turn away, and rocket off into the distance. The following text file can be entered into a word processor and saved into the motion directory of a backup of the object disk:

```
3DM1
6
40 8 25 190 0 0
0
5 8 20 270 0 0
23
0 0 20 270 0 0
22
0 0 20 270 0 0
- 10
0 5 25 300 0 0
20
- 40 10 35 300 0 0
20
```

The camera will be positioned at the origin. The ▶

script file for these movements should be saved into the camera directory as follows:

```
3DC1
2
0 0 0 0 0 0
0
0 0 0 0 0 0
95
```

After loading the information into the word processor, load VideoScape 3-D—the object, motion, and camera files. The light source defaults to the position of "shining" straight down onto the scene. Insert a blank, formatted disk into one of your drives and select "Begin Anim Recording" from the record menu. A requester will display asking you to select the drive in which you wish to save the anim, along with a file name. Select the drive that you inserted the disk into and press the "Begin Animation" button. (Note that the compilation will take about 25 minutes to conclude.)

After the animation has been compiled, the control window will reappear, at which time you should turn off the anim recording. Exit VideoScape 3-D and then load the CLI from the window and type "play-anim [file.name]." After the animation loads from the disk, type "2" to designate the speed of the animation, and then type "2" again to represent the number of replications of the action.

Once you are satisfied with the presentation of your animation, position your video camera at the scene (your backyard in this case) and connect the composite video output of the camera to the composite video input of the genlock. Connect the composite video output of the genlock to the composite video input of your VCR. Set your VCR in record mode and press Return on the computer keyboard to initiate the animation. Once the animation has played through completely, press Return twice more to repeat the action. Stop the recording of the videotape and view your masterpiece. Now you have documented proof of a "close encounter" that took place in your own backyard! If you wish, you can add sound effects to further enhance the realism of the scene.

These examples demonstrate only a minute sampling of the astounding array of video effects you can create with just a video camera, VCR, genlock, and your Amiga (with appropriate software). Your genlock and your software define the range of possibilities open to you; your imagination takes over from there. ■

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Workstation Amiga

Powerful personal computers,

including the Amiga,

are reshaping the current

scientific/graphics workstation

concept. Here we'll discover

if the Amiga, with a little

tooling up, will join the vanguard

of this movement,

ready to carry the heavy payloads

that will be required

of workstations of the future.

By Sheldon Leemon

U p until just a few years ago, the idea of computer workstations brought to mind immediately a system of dedicated terminals connected to a large mainframe host. And people working in the fields of science, engineering, professional graphics, education, and so forth would look to companies such as Apollo and Sun Microsystems for the answers to their high-powered computing needs. Now, however, these same people are turning to more powerful desktop systems that can handle demanding tasks, but offer much greater versatility at significantly lower costs. Apple's Macintosh II, IBM's PS/2 Model 80, and—yes—the Amiga are some of the more popular choices.

With its powerful graphics and multitasking capabilities, the standard Amiga models are already well-suited to many of the demands of a workstation. But what else would you need in order to modify an Amiga so that it could meet all the requirements of a true workstation?

We'll look at three basic areas—dynamic raw computing power, high-resolution display, and networking capability—by which workstations are distinguished from more ordinary computer systems to learn how you can enhance the Amiga to meet those requirements. In doing so, we should get a much more clear picture of how the Amiga stacks up against other workstation solutions.

Accelerators and Coprocessors

The first requirement for a workstation computer is a lot of raw computing power. Current standards demand a 32-bit microprocessor running at a double-digit clock speed and a floating-point math coprocessor chip. Although the 68000 microprocessor used by the Amiga is powerful for a home computer, it is still two generations removed from the 68030—the most powerful member of the Motorola family—and it does not have provisions for directly interfacing to a 68881 or 68882 math coprocessor. Therefore, for compute-intensive applications, it is desirable to upgrade the Amiga to run a 68020 or 68030 processor.

Changing a computer's microprocessor usually requires both hardware and software modifications. Fortunately, the Amiga operating system was designed from the beginning with an eye towards upward compatibility with more powerful Motorola processors. This means that almost all Amiga programs run on machines equipped with a 68010, 68020 or 68030 processor without change. The hardware considerations present a thornier problem. Because neither the 68020 nor the 68030 is plug-compatible with the 68000, you cannot simply drop the new processor into the existing socket—meaning that you will need an interface board. Finally Technologies' Hurricane is a piggyback board that drops into the 68000 socket, and it will run on two Amiga models. (See the accompanying sidebar "Like a Hurricane" for an ►

evaluation of this board.) CSA also has a piggyback board for the A500 and A1000 (although the company is about to release a new, less expensive series—the ND-500 and ND-1000—which will accelerate standard 68000s so that they run at 14 MHz). The A2000 also contains a CPU slot for a coprocessor board, and it is in this slot that you would plug CSA's 68020 CPU board or, if it becomes available in the US, Commodore's recently announced A2620 board. This CPU slot makes it possible to override the 68000 chip without physically removing it. (For a discussion of CSA's accelerator board—and of the CSA 32-bit memory boards mentioned below—see "Turbocharging Your Amiga 2000," p. 26, in the February '88 issue of *Amiga World*.)

The speed advantage offered by the 68020 and 68030 chips result largely from the higher clock speeds and full 32-bit data path they can use. Integrating these chips into the existing Amiga system, however, dissipates some of the benefits. Because the

Like a Hurricane

THE HURRICANE BOARD from Finally Technologies is designed to make your Amiga computer run faster and smarter. The board contains a 68020 microprocessor, a 68881 math coprocessor, and custom circuitry that lets these chips integrate with your Amiga computer. Finally has versions of the board available for two Amiga models. For purposes of review, I tested the Amiga 1000 model in an A1000 and, with the help of an adapter board, in an A2000.

The 68020 is the big brother of the Amiga's 68000 microprocessor. With minor exceptions, the 68020 will run software written for the 68000. The advantage to using the 68020 over the 68000 is two-fold. First, the 68020 is a full 32-bit processor—it fetches, manipulates, and stores data in 32-bit chunks as opposed to the 16-bit chunks the 68000 stores and fetches. Also, the 68020 typically runs at a much higher clock speed than the 68000. In the case of the Hurricane Board, the 68020 runs at over 14MHz—double the clock speed of the 68000. All else being equal—and it isn't—the 68020 should run a minimum of twice as fast as the 68000.

The 68881 is a cousin to the 68020. Its job is to perform mathematical calculations at blinding speeds. It is very good at this. Hundred-fold increases in mathematical computing power are not unusual when you use the 68881 instead of performing floating-point math functions in software alone. Up to now, a major stumbling block to the acceptance of the 68881 has been the fact that so little commercial software has been written to take advantage of the chip. With the advent of Workbench 1.3, which contains automatic support for the 68881, more programs—and consequently more users—will be able to take advantage of the power of the 68881.

INSTALLATION

The Hurricane board is a piggyback board. Rather than plugging into an expansion slot (or the CPU slot on the Amiga 2000), the Hurricane board plugs directly into the motherboard of your computer. More precisely, the Hurricane board plugs into the socket that normally contains your 68000 microprocessor. Installation consists of opening up your Amiga, removing the 68000, and plugging the Hurricane into the vacated 68000 slot. Taking an Amiga 1000 apart is not too bad as long as you remember where all the screws go.

The Hurricane is a tight fit in the A1000, so you have to be careful not to bend any of the long pins that plug the board into the 68000 socket. I installed the board into two different A1000s as well as into an A2000 using an adapter board. I had no problems with any of the machines once the board was installed, but all the pulling and plugging weakened one of the pins on the board. When I shipped the board to an associate to look at, the pin broke off in transit. The broken pin is not the result of poor design or workmanship; it is a reminder that you (and I) should take extreme care in handling electronic components.

COMPATIBILITY AND PERFORMANCE

Because Commodore has constantly stressed the importance of 68020 compatibility with software developers, I wasn't surprised to find that none of the major commercial software packages I ran on the Hurricane board failed to function properly. What was a bit surprising, and pleasantly so, was the fact that the Hurricane board worked properly with all my expansion hardware, including a C Ltd Hard Drive on my A1000 and a BridgeBoard and A2090 Hard Drive Controller on my A2000. As far as compatibility is concerned, moving from the 68000 to the Hurricane Board is a near-seamless transition.

Performance is another matter. As the 68020 on the Hurricane Board runs at double the clock speed of the 68000, you might expect to see at least double the performance in an Amiga with the Hurricane installed. Unfortunately, because of the architecture of the Amiga, this theoretical increase in performance doesn't pan out.

In its native configuration, the Amiga bus has a clock speed of 7.16MHz. This clock speed governs the 68000, the custom chips, and access to chip RAM and ROM. Although the Hurricane board uses a 14.3MHz 68020, this chip must throttle back to 7.16MHz whenever it accesses anything on the Amiga bus. Consequently, as most Amiga functions involve accessing the bus, the 68020 spends much of its time running at 7.16MHz. The result is that you won't see a great increase in performance with software running on the Hurricane board.

When I ran the Dhrystone benchmark program dryr (Dhrystones using register variables) from Fred Fish disk #1, I came up with a figure of 645 Dhrystones with the Hurricane installed. This represents a 36% increase over the 472 Dhrystones you get

from a standard Amiga. When I tested the Hurricane board with software that supports the 68020/68881 combination, I got a more pleasant surprise. A rendering with Sculpt 3D that took 999 seconds with a standard Amiga (and 256 seconds with a CSA 68020 Board), was completed in 158.5 seconds on the Hurricane Board.

As you can see, the Hurricane Board provides a modest performance boost to any software your run. It comes into its own, however, when you run software that can take advantage of the on-board 68881. Math-intensive applications written for the 68881 will see performance increases of an order of magnitude over similar applications running on a native Amiga. Although Sculpt-Animate 3D and Turbo Silver are the only packages that, as of this writing, use the power of the 68881, I expect many more programs will do so in the near future. The Hurricane Board is ideal for heavy-duty graphics and number crunching; its usefulness will grow exponentially as the use of the 1.3 IEEE libraries becomes more widespread.

As this review was going to press, Finally Technologies forwarded a prototype 32-bit memory board for evaluation. This board connects to the Hurricane board and provides native 32-bit memory for use by the 68020. When accessing this memory, the 68020 can run at full speed. With 32-bit memory, I got an all-time high of 1215 Dhrystones. Sculpt 3D rendering time decreased to 106.5 seconds. As you can see, 32-bit memory really makes the Hurricane sing.

CONCLUSION

Currently, the Hurricane Board is the best way to increase the performance of your Amiga. Although it works best when you use software that supports the 68881, it does increase the performance of your Amiga in general. With 32-bit memory, the performance increase is substantial. The Hurricane Board is excellent for graphics and video applications. For general-purpose applications, however, the promise of the Hurricane Board lies in the future, with the acceptance and widespread use the the IEEE libraries in commercial programs. ⊏

—Bob Ryan

existing RAM and ROM on the Amiga use a 16-bit data path, these chips are limited to the narrower path when they read instructions from normal Amiga memory, or when they execute ROM Kernel routines. The high-speed processors must also pause periodically when communicating with the slower Amiga memory. One way of counteracting these effects is to connect the replacement processor to its own supply of 32-bit memory. This allows it to load programs into the faster memory, and reduces the number of times that processor must access the slower Amiga memory when executing a program. Both Finally Technologies and CSA offer 32-bit memory boards.

With the addition of a Memory Management Unit (MMU), a coprocessor can transfer the Amiga ROM Kernel routines into 32-bit memory, and thus speed up all operations that use the operating system. (An MMU is a chip that protects memory from being overwritten and remaps memory locations. Both functions are used in moving the ROM Kernel routines to 32-bit memory. After the routines are copied into 32-bit RAM, the MMU protects the memory from being overwritten and reassigns the addresses for the routines to the 32-bit RAM. A MMU is standard on Commodore's A2620 board and is available as an option on the other two 68020 boards.)

The kind of speed advantage that accelerators provide, therefore, depends on whether or not they are equipped with 32-bit memory and an MMU. A plain 68020 board may not run programs significantly faster than the normal 68000 processor, because it must access the slower bus so often. With 32-bit memory, programs will generally run two to four times faster. Yet, without an MMU, even this speedup may not be very noticeable. A microprocessor often spends most of its time waiting for input from the user, and a 68020 chip really doesn't "wait" any faster

than a 68000. Also, much of a program's time is spent calling ROM Kernel routines, which means slowing down to Amiga memory speeds. Therefore, using an MMU to transfer ROM routines to 32-bit memory should result in noticeable speedups in such routine operations as window redraws.

Perhaps even more important than the processor-speed increases that accelerator cards offer is the way in which they enable the integration of floating-point math coprocessor chips (such as those provided by CSA, Finally Technologies, and Commodore) into the system. Both the 68000 and 68020 can perform only basic math functions, while most floating-point math is done by software. A 68881 math coprocessor performs floating-point math in hardware—at speeds far faster than software. You could connect a 68881 math coprocessor to a 68000 system by interfacing it as a peripheral device (see MicroBotics) and achieve up to 10 to 20 times faster math calculations than software-based floating-point operations. When interfaced to a 68020 processor, however, a 68881 will do such calculations at speeds from 50 to 100 times faster. (CSA tells us that, in addition to the 68881 math coprocessor it has been marketing, it is now offering a 68882, which should produce even faster calculation speeds.)

The problem with using a math coprocessor is that in order to take advantage of it, software must either be written specifically for the 68881, or must be written using the Amiga IEEE math libraries. Because the use of 68881 chips is still so rare, very few programs take them into consideration. Compilers such as the AC Fortran and Manx C make special provisions for generating 68881 code—meaning that for custom scientific applications, an Amiga can run faster than a VAX 11/780. Although very few commercially available applications programs take ad- ►

vantage of the 68881, this may change as the use of accelerator cards and math coprocessors becomes more widespread and prices continue to fall. One particularly well known example of such a popular commercial software package making use of 68881 technology is a special version of Byte by Byte's Sculpt-Animate 3D that can generate ray-traced drawings up to 20 times faster when used with a 68020-68881 accelerator. A similar type of package, Prism's Turbo Silver, also shows dramatic increases in speed when used with a 68881.

THE POWER PLAYERS

[Note: See the Product Information box for further information about products described below.] Hardware accelerator boards for the Amiga are currently available from CSA and Finally Technologies. CSA offers a 14MHz 68020 board with a 68881 math coprocessor, along with two versions of 32-bit memory cards. One

type of memory card uses up to 2MB of static RAM chips, which are much faster than dynamic RAMs, but much more expensive as well. The other type of memory card uses the slower dynamic RAMs, but allows you to add up to 32MB of 32-bit memory. CSA also offers a piggyback 68030 board (running at 16 MHz with a 68882 coprocessor) that offers processing that is up to four times faster than the 68020.

The Hurricane board from Finally Technologies offers a 14MHz 68020, a 16MHz 68881, and up to 4MB of 32-bit dynamic RAM. Finally also offers a 68030 upgrade that will boost your existing 68020 Hurricane board.

It is also possible to obtain 68881 math coprocessors separately. MicroBotics offers a multifunction module for its StarBoard memory card that can add a 68881 to any Amiga. Progressive Peripherals & Software is also planning to offer memory products that will incorporate the 68881, using the same

Amigas in the Laboratory

COMMODORE MAY HAVE a tough time selling the Amiga in certain markets, particularly the business community, where its name is too closely tied to the home computer market. One market that doesn't have to be sold on the benefits of the Amiga, however, is the technical market. Reseach labs, universities, video production houses, even employees of other computer manufacturers are not put off by Commodore's past; they recognize an elegant, sophisticated system when they see one.

Consequently, the Amiga is being used in ways that would shock anyone who looks upon it is a home computer. From the banks of the Charles to the shores of the Pacific, the Amiga is satisfying the needs of technical users across the country.

• At Ohio State University, Professor Charles Csuri of the Advanced Computing Center for the Arts and Design is integrating the Amiga into the apE (Animation Production Environment) project. apE is both a set of tools and a development environment that allow researchers, students, and others to visualize the results of experiments and simulations. Currently, apE is being developed on a Cray supercomputer. One of the goals of the project, however, is to make the power of the system available to students at all levels. With its low cost and high performance, the Amiga is an obvious choice as a low-end apE workstation. Using Amiga products such as Animate 3D, the apE project hopes to make the concept of scientific visualization available to students of all ages.

• The University of North Dakota's Center for Aerospace Sciences has been studying the physics of clouds since 1980. One part of the study is the Aircraft Icing Research Program, designed to determine those cloud structures more likely to produce icing on aircraft. The goal of the program is to be able to predict and avoid icing situations. The Center uses an Amiga mounted in a Citation jet as a front-end to a powerful minicomputer. The Amiga acts as an intelligent display station for the minicomputer. The information it displays directs the pilot into different parts of a cloud, where critical data is gathered. Without the Amiga's real-time display, flying into the correct spot in a cloud would be a hit-or-miss operation.

• At the University of Lowell (MA), Rich Miner of the Center for Productivity Enhancement directs a team of engineers and students that is looking to create a standard, device-independent image-processing system. Called the Image Kernal System (IKS), this system lets researchers run the same image-processing programs on different hardware systems. To demonstrate the system, the Center has produced an expansion board for the Amiga 2000 that implements IKS. Future work at the center includes work on pattern- and edge-detection and the development of high-resolution graphics hardware for the Amiga. (For more information on the latter item, see the main article under the section "High-Resolution Displays.")

• At Palomar Observatory, Fred Harris of Cal Tech uses the Amiga to calibrate the Charged-Coupled Device cameras that have replaced photographic plates as the mainstay astronomical-recording media. The Amiga is also used as a front-end data system for observation and analysis at Palomar. In the future, the tracking system for the giant 5-meter Hale Telescope may be controlled by an Amiga. (For more information, see "Searching the Heavens," p. 71, in the November '87 issue of *AmigaWorld*.)

• At the UCLA School of Medicine, Dr. Ron Harper uses the Amiga to combine information from different imaging technologies to obtain a comprehensive view of the human brain. (See "Surgery . . .68000-Style," p. 57, in the January '88 issue of *AmigaWorld*, for more information.) Also at UCLA, Professor John Hodgson uses the Amiga to research how the body moves.

These institutions and others, such as NASA and Sandia Labs, have discovered the power and versatility of the Amiga. As more people discover the price/performance advantage of the Amiga, you can expect to see it on many more scientific workbenches. □

—Bob Ryan

Enter the Integrators

ONE PROBLEM FACING the Amiga in the workstation market is the fact that every installation must come up with its own hardware and software configuration. Faced with continuously "reinventing the wheel," many customers opt for more mature systems. Such a situation is ripe for companies willing to do the system configuration.

Tucked away in a basement office in Ludlow, Massachusetts, is a small company with big plans. Amicore International is a start-up operation that hopes to capitalize on the power of the Amiga 2000 to revolutionize the workstation market.

The goal of Amicore is to develop a "hypermedia" workstation using the Amiga as the foundation. By combining graphics, audio, video, and other media as only the Amiga can, Amicore hopes to be able to produce a product that appeals to scientists and videographers alike, and anyone in between.

Amicore consists of four principals with varying backgrounds. President Andy Petrie is an inventor with a long history in high-tech companies, Rudi Vogel comes from a marketing background with DEC, Don Petrie is a graphics designer, and Mike Perrella is the video expert. They hope to provide the know-how needed to catapult the Amiga into the high-end workstation market.

Amicore is starting small. To make ends meet, it produces adapter cables that let you run Amiga 1000 peripherals, such as Digi-View and FutureSound, on the Amiga 500 and 2000. By November, the principals expect to offer their first workstation system, consisting of an Amiga 2000, advanced graphics hardware (that they plan to license), and commercial and custom software. Amicore wants to hear from other Amiga developers interested in the hypermedia concept. The address is Amicore International, 451 Center St., Ludlow, MA 01056.

To further develop the hypermedia workstation, Amicore is building a digital media lab. The lab will be a proving ground for the hypermedia concept. In addition to selling bundled turnkey systems, Amicore expects to sell entire hypermedia installations, and to provide training and service.

Does Amicore have a chance? Based upon the growing realization of the Amiga's capabilities in the video and scientific markets, the future looks good. Its success will depend upon how well it integrates technologies and products from different sources. □

—Bob Ryan

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scheme as Microbotics to interface the chip. Official support for the 68881 interfaced as a peripheral device will be included in Workbench 1.3, which should spur software manufacturers to add math chip support to more of their software.

A number of other accelerators are currently in the works. MicroBotics is working on a full line of accelerators for A500 and A2000 computers. Commodore has already announced its own A2620 accelerator card for the A2000 in Europe, containing a 68020, a 68881 math coprocessor, a 68851 MMU, and two or four megabytes of 32-bit RAM. Whether the A2620 will be available in the US is subject to speculation, as Commodore is sensitive about treading on the toes of the growing number of third-party accelerator manufacturers already in the American market.

High-Resolution Displays

The second characteristic of workstations is a very high-resolution display screen. The Amiga's 640 × 400 16-color display capability isn't bad for starters, particularly as its ability to use the overscan area of the screen can push this resolution to over 700 × 440. In order to get 400 lines of resolution on a 200-line monitor, however, the Amiga must use an interlaced display. This type of display makes the Amiga a good choice for video work, where interlacing is standard, but the "flicker" it causes makes the computer's high-resolution mode very difficult to work with for more standard computer applications.

MicroWay offers a de-interlacing board called the

flickerFixer, which retails for $595 and fits into the video slot of the Amiga 2000. Because the A500 and A1000 both lack this video slot, they cannot take advantage of the MicroWay card. flickerFixer provides a steady, non-interlaced 400-line output that can be displayed on a multi-scanning monitor, such as the NEC MultiSync. Although the combination of display card and monitor is fairly expensive by Amiga standards, the business or professional user may find it to be well worth the cost. Using flickerFixer with the A2000 is something of a revelation. It makes programs such as Professional Page and X-CAD look much more like worthy competitors to similar programs on IBM and Macintosh systems. It even makes the Workbench look more professional. flickerFixer should enhance almost any kind of professional application, except those using video software, which requires an interlaced output. In general, high-resolution animated displays will always appear a little jerky, because flickerFixer combines the interlaced fields. (For a more complete evaluation of flicker-Fixer, see p. 64 in this month's Review section.)

Commodore has announced that it too is working on several display enhancements, including an enhanced chip set. Consisting of upgraded Agnus, Denise, and Gary chips, the set will output a non-interlaced 400-line display to dual-scanning or multi-scanning monitors. The new chips will not be available until the release of Workbench 1.4 and probably will not work on the Amiga 1000. They will, however, be a cheaper alternative to the flickerFixer, although it is doubtful they can provide all of its functionality. ►

Because it would be difficult to increase the existing display bandwidth, the 400-line non-interlaced displays will have only half as many color bit planes as the 200-line displays. This means a maximum of four colors in 640×400 mode, with the same sort of performance penalities for memory operations in chip RAM that you currently get with 16-color hi-resolution displays. Still, a true 640×400 color display gets us a lot closer to workstation range.

Commodore is also working on a new high-resolution gray-scale monitor, the A2024, which should sell for under $1000. It will work with all Amiga models because it uses the standard Amiga video port. The A2024 can be used to de-interlace the normal Amiga display, providing a 640×400 display with up to eight gray levels, and it will also support an extended display of up to 1008×800 pixels at two or four gray levels. Normally, the largest display segment that the Amiga hardware can output at one time is 640×400 pixels, two color planes deep (four colors). Therefore, a combination of hardware and software trickery is required to create the extended display. The software creates a bitmap made up of from four to six normal-sized displays. It then sends this display out a piece at time to the monitor, which stores each piece in RAM until it can assemble the entire picture. As a result, the screen is only redrawn 10 or 15 times a second, instead of the normal 60 times.

This characteristic will make it difficult to do smooth animation on the A2024, but it will not impair its usefulness as a display for desktop publishing or CAD programs. Because the screen memory used for the extended display is organized as one large Amiga bitmap, all graphics and text operations are carried out using the normal Amiga operating system routines. Programs that can adapt to a larger-than-normal size Workbench screen will run on the extended A2024 screen without any changes. Other programs will need only minor modifications to take advantage of the big screen.

"VIEWING" THE FUTURE

Such enhancements take the current Amiga display hardware about as far as it can go. In order to get closer to the kinds of screen resolutions typical of workstation computers, entirely new display hardware is needed. A group at the Center for Productivity Enhancement at the University of Lowell in Massachusetts has built a prototype of a graphics card for the Amiga 2000 that can display 1024×800 pixels, using 10 color bit planes. This means that 1024 colors (out of a palette of 16.7 million) can be displayed on screen at once. The board uses a Texas Instruments TMS 34010 display chip clocked at 50MHz, and includes 512K of dynamic RAM for on-board programs and 1.25 megabytes of video RAM. The display chip contains its own on-board blitter. Although the group is undecided about manufacturing the board commercially, it points out that similar cards in the IBM PC market cost about $2500. (For more information

about the Lowell group, see the accompanying sidebar "Amigas in the Laboratory.")

While the Lowell card provides the type of high-resolution color display typical of workstations, the question of how to get software to use that display remains up in the air. The Lowell group plans to provide a graphics library that could be called directly from software, and it is working on display programs to allow several IFF files to be shown on the display at the same time. It also would like to implement an X-Windows driver, so that an Amiga with this enhanced display could be used as a high-resolution graphics terminal for X-servers. The most desirable way to integrate this high-resolution display, however, would be to develop Intuition support for it. Existing Amiga software could then take advantage of it without substantial modifications. To develop such support would require a complete rewrite of the current Amiga ROM Kernel graphics library, which is linked inextricably to the current Amiga display hardware and blitter. As formidable as such an undertaking may seem, it is absolutely necessary if display resolutions on the Amiga are to catch up with the current state of the art.

Networking

The final requirement for workstations is the ability to connect with mainframe computers and other workstations over a network. In a group development situation, it is vital that all members of the group have access to a collection of shared files. Networking also makes it possible to use the Amiga as a graphics display engine for data generated by a number-crunching mainframe computer.

The only full-featured network system for the Amiga is the Internet package from Ameristar. At $899, it includes an Ethernet controller board and a number of programs for communicating over the network. The most powerful software it provides is an implementation of the Network File System (NFS) widely used on Unix systems in universities, research labs, and large corporations. Using NFS, the Amiga can transparently access files stored on a Sun or VAX system. For example, what the VAX system sees as the user/amiga directory, the Amiga may see as DH0:. Other programs allow the Amiga to run as a terminal on the network, and to execute programs on a host computer. There is also software for retrieving files from non-Unix systems.

Ameristar representatives say that the company sells about one-half of its controllers to universities, who want to use the Amiga to add graphics output to mainframe applications, and another half to corporations, who want to use Amigas largely as inexpensive terminals on existing Ethernet systems. Ameristar plans to add support for networked windowing systems, such as X-Windows and Sun Microsystems' NEWS. Support for such systems would make it possible to run mainframe programs using a windowing graphics interface on the Amiga, and X-Win ►

dows, which would further enhance the machine's capabilities as a graphics terminal. Ameristar also hopes to introduce a lower cost Ethernet network card for the Amiga 500.

The only other network currently offered on the Amiga is a low-cost point-to-point system based on the C Ltd SCSI controller. The controller, which ranges in cost from $299 for the 1000 version to $199 for the 2000 version, is normally used to interface SCSI hard drives. Using the SCSI-Net software the company packages with the controller, however, it is possible for several Amigas to share a single hard drive over the SCSI bus, at SCSI speeds. While this setup is useful in certain situations, it is subject to a number of limitations. There is a 30-foot maximum on cable lengths between machines, and only eight devices can be connected to the bus at any one time. There are also no provisions for file-locking, a feature that prevents one user from overwriting changes made to a file by another user. The company plans to remedy these deficiencies in the next version (3.0)—due out shortly after the official release of the 1.3 version of the Amiga operating system—by adding file-locking, by implementing noding (which will allow the interconnection of up to 255 buses), and by adding other enhancements that should make SCSI-Net a much more LAN-like system.

Although not yet available, some other networking systems are rumored to be in the works. Commodore is reported to be interested in developing a TOPS network system for the Amiga, which would enable communication with Sun, Macintosh, and DEC computers. The plan calls for a system based on low-cost hardware similar to that of the Macintosh AppleTalk network. As of yet, however, no definite plans for such a system have been announced.

Even without the additions described in each of the three sections above, the Amiga stacks up pretty well as a personal workstation. The availability of third-party network systems, display enhancements, and accelerator boards do, of course, make the machine very attractive to the scientific, educational, and technical communities. This does not mean, however, that Commodore can simply let the third-party developers blaze the workstation trail all alone. Workstations are growing ever more sophisticated and less expensive. Commodore must act quickly to prepare the Amiga for the higher-resolution displays, 32-bit buses, and built-in networking capabilities that are increasingly becoming standard features on personal computers. ∎

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AMIGA 2000
COMMODORE BRIDGES THE GAP

By David Barlow

This hybrid combines the outstanding sound and graphics potential of the original Amiga with IBM compatibility.

Although Commodore had a head start in the field of business micros with the now legendary Pet range, in recent years it has been unable to maintain its grip on this most lucrative sector of the microcomputer market. Its image has been dragged down by its highly visible involvement in home computers, and the unexceptional Commodore PC-10 range of IBM compatibles has done little to restore confidence.

But it has not been all bad news. Things started to look up last year when Commodore started to ship the Amiga 1000, a truly revolutionary and innovative personal computer. Judged on specification alone it should be wiping the floor with nearly all the IBM PC- and PC/AT-compatible opposition. It features the powerful Motorola 68000 processor and one of the most advanced graphics and sound systems ever seen on a micro.

But there is more to a successful personal computer than just mind-blowing hardware. Without a comprehensive range of robust and easy-to-use business software the chances of success are small. Commodore even shifted the emphasis of the Amiga 1000 away from general-purpose software — where the IBM standard now dominates — to vertical markets, in the hope of encouraging software houses to develop specialised applications that could make full use of the Amiga's advanced hardware. Although this ploy boosted sales, it made little impact on the IBM-compatible market.

HYBRID

Commodore has responded with the Amiga 2000, which to all intents and purposes is an Amiga 1000 combined with a built-in IBM compatible. The new system unit is considerably larger than the old one, most of the increase going into extra height to allow a conventional expansion bus to be included. The top half of the front panel houses the Amiga floppy-disc drive; the standard machine is fitted with one 3.5in. unit but there is room for a second. The lower half is where the optional IBM-compatible 5.25in. disc drive is located.

The rear panel offers a similar array of ports to those found on the Amiga 1000, including stereo phono for audio, external disc drive, monitor, and serial and parallel interfaces. The last two conform to IBM PC standards, so it should be possible to use standard peripherals on the Amiga 2000.

The internal layout has changed, though the basic components remain largely the same. The Motorola 68000 chip running at 7.14MHz is supported by the three very powerful custom chips called Agnes, Paula and Denise, which handle screen, I/O and sound facilities. The chip is coupled to 1Mbyte of RAM which can be expanded to 9Mbyte by plug-in memory expansion cards.

You convert the Amiga 2000 to an IBM

AMIGA 2000

▥ VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	☐	☐	■	☐
Ease of use	☐	☐	■	☐
Documentation	☐	■	☐	☐
Value for money	☐	☐	■	☐

☐ Great for users hooked on the as yet unexploited potential of the Amiga but who occasionally need to run functional software.

compatible by fitting a plug-in board. It contains an Intel 8088 processor running at 4.77MHz, a floppy-disc controller, a PC BIOS ROM, the interface electronics necessary to communicate with the Amiga and 256K of non-parity-checking RAM which can be expanded to 512K by plugging in 256Kbit chips. To complete the IBM-compatible specification there is a blank socket for the Intel 8087 arithmetic co-processor. The board is based on the Sidecar IBM-compatible option offered on the original Amiga 1000, which has been modified to plug into an expansion bus.

Expansion potential, one of the weak areas of the original 1000, has been turned into one of the 2000's strengths. There are five Amiga-compatible slots and four IBM-compatible slots, two of them eight-bit and two 16-bit PC/AT ones.

Amiga memory can be expanded to 9Mbyte by adding cards. There are two types of board: the 2Mbyte, also available with 512K or 1Mbyte of RAM; and the 8Mbyte board, also available with just 6Mbyte of RAM. The IBM memory expansion is not quite as efficient on space because the bridge board can only be expanded to 512K. If you want to expand up to the current DOS limit of 640K you have to fit the extra 128K on an expansion card.

The review machine was fitted with the IBM bridge board, an Amiga 3.5in. floppy drive, a 5.25in. floppy and a 20Mbyte hard disc. With this configuration there is still room for a further Amiga 3.5in. floppy. Commodore will supply a 40Mbyte hard-disc version and an optional tape streamer, so it is clear that the Amiga 2000 is aimed at the serious end of the business market.

KEYBOARD

The Amiga 1000/Sidecar combination had distinct limitations when it came to IBM compatibility. Most of them arose because the Amiga keyboard did not conform to the IBM layout. Commodore has now made further concessions to the IBM camp by giving the Amiga 2000 a keyboard that should prove adequate for both sides of the machine's complex personality. All the original Amiga 1000 features are there, including the two special Amiga keys, but a closer look reveals dual engraving on many keys — one for the Amiga environment and one for the IBM.

The 2000's keyboard is more akin to the PC/AT layout and has dedicated cursor keys but only one LED indicator on the Caps Lock key. However, on the review machine for some reason this often worked in reverse. The keyboard is well made, with a good action and a three-position tilt facility.

The Amiga is primarily intended for use with the Commodore 1081 colour monitor. Connections are more what you would expect to find in the world of video rather than micros, and include a Scart plug on one end and a 25-pin D-type plug on the other, with flying phono audio leads. The 1081 monitor is only medium resolution, and many serious users may find this unacceptable for prolonged periods of use. Unfortunately, you cannot just use another unit from an alternate supplier as you might with an ordinary IBM compatible because of the specialist nature of the Amiga. Commodore

offers a high-resolution screen, but it is considerably more expensive.

The Amiga 2000 uses two operating systems. The 68000 CPU runs multi-tasking Amigados 1.2, enabling users to run several applications at one time. The easy-to-use windowing environment makes the most of this feature by allowing background applications to be monitored in small frames inside the foreground activity.

The other operating system is MS-DOS — in this case the now outdated version 2.1. MS-DOS on the Amiga looks the same as MS-DOS on any IBM compatible with the difference that it is effectively booted up from within Amigados. This means that IBM PC applications can be run alongside Amiga applications and — in theory at least — data can be transferred from one environment to the other using cut and paste techniques.

Even though the review machine was fitted with a hard disc it was still necessary to boot it up from the Kickstart floppy. This takes you to the traditional Amiga Workbench, where you can select either Amiga or IBM PC activities. There are two IBM PC icons, one called PC Mono the other PC Colour.

All IBM applications are initially run from the mono window and, when loaded, convert to colour if required by calling in the PC Colour icon. One snag is the time it takes to get into an IBM application from switching on the machine: loading dBase III took 3 minutes 10 seconds. But once into PC applications, the Amiga ran at the rate of an ordinary IBM PC.

The 4.77MHz Intel 8088 processor is now almost unacceptably slow. Commodore must have seen this problem coming, so why it did not develop an 8086- or 80286-based bridge board is a mystery. The Amiga IBM PC display is a bit on the coarse side and appears to be closest to the CGA standard; it is OK for colour graphics but too grainy for long-term use on text applications.

COMPATIBILITY

Processor benchmarks are almost identical to those of the IBM PC. Unfortunately it was not possible to test disc performance as the floppy drive on the much travelled review machine was not working. This also precluded the running of any IBM compatibility tests, but early reports from the U.S. are encouraging in this respect. However, it may not be as compatible as a dedicated IBM clone because of the highly complex way in which PC applications work within an alien multi-tasking environment. A similar setup developed by Digital Research with Concurrent DOS runs PC applications under its PC Mode emulator, and it has never proved as robust or compatible as machines running software under their native operating systems.

The Amiga side of the 2000 works more or less like the original Amiga. The advanced Workbench environment makes it easy to use, and the windowed multi-tasking capability can be used to its full extent. But despite an improvement in the availability of applications software the Amiga still seems to have more than its fair share of games and demos that are intended to exhibit its superb graphics and sound. There are now many more business applications, but Amiga owners do not have anywhere near the same degree of choice as the IBM-compatible owner.

The Amiga is bundled with a few desktop aids and Amiga Basic, which is similar to Microsoft Basic but is extended to support the powerful graphics and sound facilities. The review machine was accompanied by two brief manuals covering an introduction to the system and a description of Amigados. Presentation was rather dull, with black-and-white printing making otherwise useful screen shots difficult to read. Production models will be shipped with a more comprehensive set of documentation.

CONCLUSIONS

■ The Amiga 2000 is one of the most powerful personal computers currently available and on this basis alone it must be regarded as something of a bargain.

■ It offers impressive expansion potential in both Amiga and IBM-compatible areas.

■ The price will ensure that nobody is likely to buy the Amiga on the strength of its IBM compatibility alone. The success of the machine is likely to be dependent on the more widespread availability of Amiga business software.

Gregg Williams, Tom Thompson, and Richard Grehan

The Commodore A2000

The new machine features slots and optional PC compatibility

Editor's note: *The following is a BYTE product preview. It is not a review. We provide an advance look at this new product because we feel it is significant. A complete review will follow later.*

When Commodore released the first Amiga computer, the A1000, in September 1985, the world got a look at a sophisticated 68000-based computer whose unusual multitasking hardware and stunning graphics had never been seen in an under-$1500 microcomputer (see the August 1985 BYTE for more details). Even though it did have a connector on its side that allowed future hardware expansion, the A1000 was essentially a "closed box," and many potential users felt the machine was limited as it stood.

Now, with the new Amiga 2000 (see photo 1), Commodore has made accessible much of the potential that was locked inside the A1000. With a larger case that can enclose hard disks, Amiga and IBM expansion cards, the A2088 board (the one-card equivalent of an IBM PC), and a price tag of under $1500 (for the basic machine with 1 megabyte of memory and an 880K-byte 3½-inch floppy disk drive), the A2000 has the potential to grow—and grow inexpensively—in whatever direction you want. The A2000 will suit the engineer, artist, and businessperson better than the A1000 ever could.

System Description
The A2000 comes in a metal housing of approximately the same width as the

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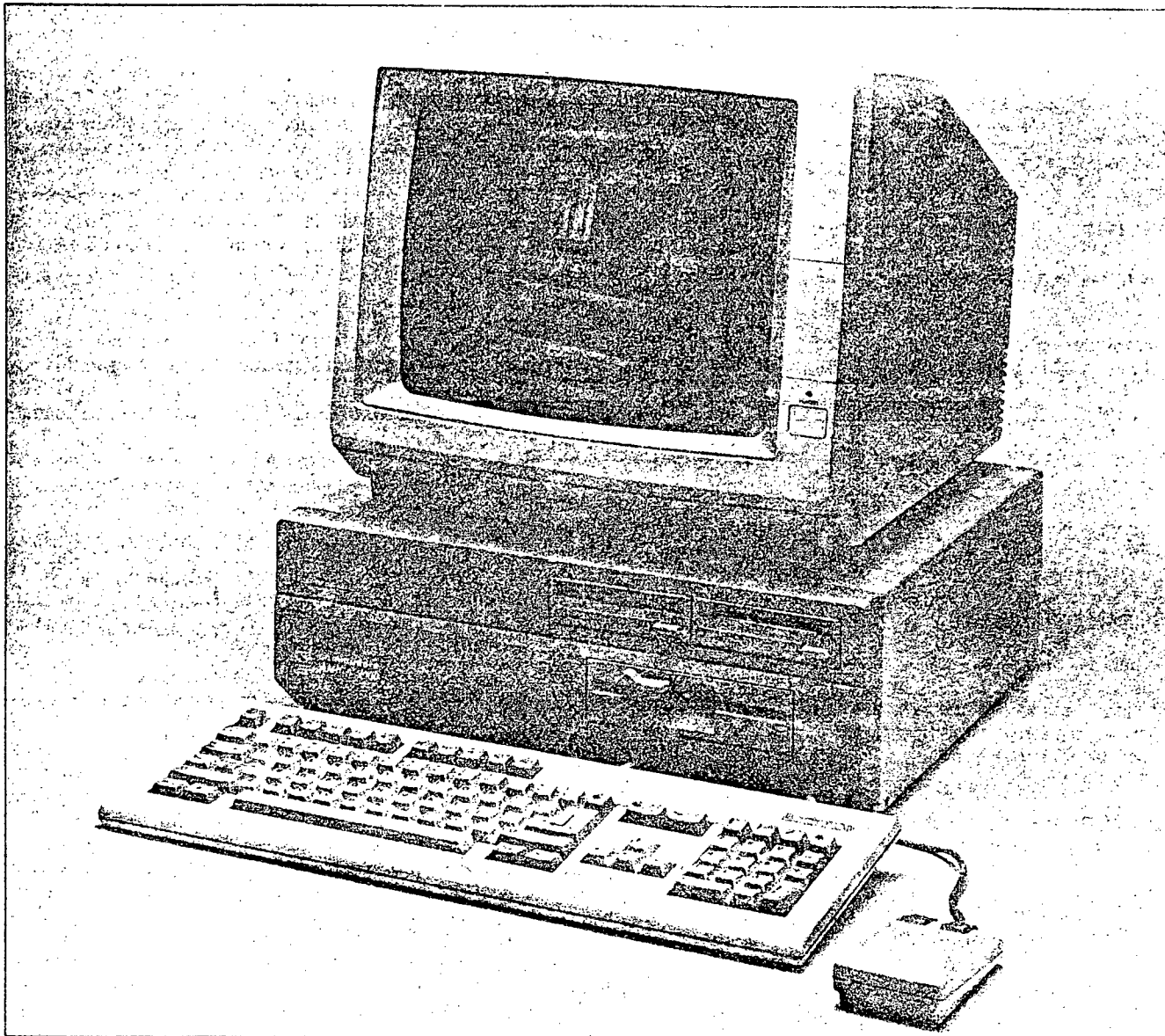
A1000 but several inches deeper and substantially taller to accommodate internal peripheral boards. You'll immediately notice knock-out front panels for an additional 3½-inch floppy disk drive and either a 5¼-inch floppy disk drive or hard disk drive. The mouse ports have moved from the right side of the housing to the bottom front panel on the machine. The detachable keyboard now plugs into the front with a PC-style keyboard connector, rather than to the rear of the unit as on the Amiga 1000.

If you check the In Brief section for the A2000 with the A1000's hardware specifications, you'll see that they're quite similiar: a 68000 CPU running at 7.14 MHz with the same three custom chips handling video, DMA, sound, and I/O (see figure 1). But here the similarities end: The Amiga 2000 has a battery-powered calendar/clock, 1 megabyte of RAM, and a built-in expansion bus with slots. Also, the latest version of the low-level system routines are in ROM, eliminating the Kickstart disk required to load these routines into write-controlled storage RAM as you do on the Amiga 1000. See the text box "Version 1.2 Changes" for additional information on modifications to the system routines and Workbench.

The A2000 serial and parallel ports accept standard cables, eliminating the cabling nightmare of the A1000 caused by the voltages that were present on some of the pins. There's an external drive connector as on the A1000, but the RCA jack for composite video output is gone (see photo 2).

Keyboard
The keyboard (photo 3) now has 94 keys instead of 89. New keys include Help, Enter, and math keys (+, −, *, /) for the numeric keypad. The cursor keys are arranged in a "T" fashion instead of a cross.

The keyboard has full *n*-key rollover capability, which eliminates a "ghosting" phenomenon (extra keycodes that are generated if several keys are pressed simultaneously) that is present in the A1000 keyboard.

Slots
Unlike the A1000, which is equipped with only a single external edge connector, the A2000 comes with seven internal slots for peripheral cards. Five slots use the Amiga system bus, and four slots are on a secondary bus that is IBM XT-compatible. (Commodore has also added 36-pin connectors for potential IBM AT compatibility in the future.) The slots total seven because two pairs of slots—a pair being one slot on the Amiga bus and one slot on the secondary system bus—are physically situated to serve as bridges for Amiga/PC data communications (see photo 4). The Amiga 2088 card (described later) resides in one of these "bridge" slots. You can plug the 2088 card into either bridge slot depending on your needs. If PC emulation is your major concern, you will want to position the 2088 card so that three of the four PC bus slots are available for peripheral cards. Or you can position the card to permit the use of four out of five Amiga bus slots.

There is an 86-pin slot for access to the Amiga CPU bus called the CPU bus slot. This slot taps directly into the unbuffered signals from the Amiga's CPU and is identical to the external slot on the Amiga 1000. It can be used for special peripherals, such as a coprocessor, that need to be tightly coupled to the CPU.

Finally, there's a slot provided for the support of either NTSC or PAL composite video boards. Since the A2000 does not produce a composite video signal (as the A1000 did), you must insert a composite

Photo 1: *The Amiga A2000 computer. The A2000 comes with 1 megabyte of memory and one 3½-inch floppy disk drive. You can also substitute internal hard disks for the second (left) 3½-inch and the 5¼-inch drives that are installed in this machine. The image of the IBM PC shown on the screen was captured using NewTek's Digi-View software.*
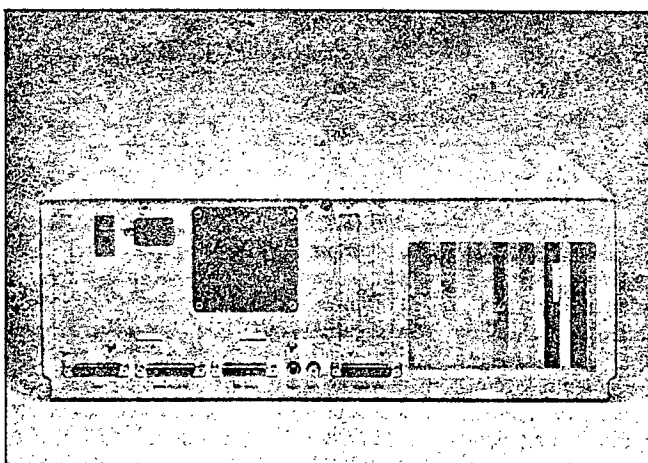

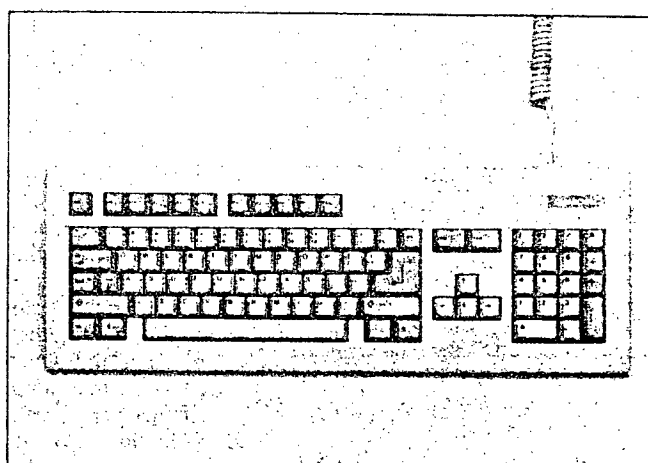**Photo 2:** *The A2000 back panel. Notice the cutouts for outputs from peripheral cards.*

Photo 3: *The A2000 keyboard. All the keys on the keypad are labeled on their front face with the IBM PC-related functions associated with them.*

video card in this slot to generate the required signal.

Buses

Data traffic among the slots and the CPU is handled by three distinct buses (see figure 2).

The CPU bus consists of 86 lines, some of which are connected directly to the 68000 CPU. There are no buffers between the CPU and the CPU bus slot.

The PC bus is a 62-line IBM XT bus. A peripheral board—such as the A2088 board—is required to allow the Amiga to communicate to this bus.

The Amiga bus consists of 100 lines that carry CPU and other signals that handle external interrupts and bus arbitration logic. These lines are buffered, which simplifies the task of designing the interface for a peripheral board. It must be noted that several of the Amiga bus signals are not identical to the 100-line expansion bus on the Zorro backplane. (Zorro is a bus card that extends the external slot for the A1000 by allowing for five plug-in boards. See table 1 for further information.) Additionally, the required form factor for the boards has changed: The square Zorro boards will not fit in the space provided for the rectangular A2000 boards.

AutoConfiguration

You encounter a problem when you include slots in a microcomputer: How do you make sure that all the peripheral boards will interact properly on the bus? For the Amiga, an AutoConfiguration protocol (referred to for the remainder of this article as AutoConfig per the Commodore documentation) is used to ensure that all peripheral boards are installed into the system at boot-up. This AutoConfig protocol is provided by version 1.2 of the system software and is manipulated via two lines on the Amiga bus (CONFIG-IN and CONFIG-OUT).

At power-up or reset, all peripheral boards are in an unconfigured state. The CONFIG-IN line goes low to the first peripheral board on the bus, allowing it to respond to bus cycles. The processor reads signature data from the peripheral board. This data informs the configuration software of the size of the board's address space, whether initialization code must be run to complete the configuration of this board, the manufacturer's serial number, and whether the board is to be added to the Amiga's free memory pool (if this peripheral is a memory board). With this information, the Amiga now computes how much address space this board requires and writes a base address to its address latches. The board will respond to bus accesses at this new address until a reset occurs. The Amiga also runs

any initialization code that the board requires.

Once the board has been configured into the Amiga's address space, it lowers CONFIG-OUT, allowing the next board on the bus to respond to the processor. This signal is passed along, daisy-chain fashion, as each board is configured on the Amiga bus.

In the event board initialization fails, the software can issue a write to an optional "shut up" address that is provided in the board signature data. Writing to this address causes the board to lower its CONFIG-OUT line and never respond to any address until the system is reset. This allows the AutoConfig sequence to proceed while removing any malfunctioning boards from the system.

The CPU bus slot does not support the AutoConfig protocol. However, there is special code in Kickstart to detect and determine the capacity of any memory board that may be installed in this slot.

Fast and Chip Memory

Memory boards placed on the CPU bus or Amiga bus have the advantage of being *fast* memory. Fast memory is RAM that does not have to share bus access with the custom blitter chip that manages the video display. RAM that the blitter chip can access is called *chip* memory. The blitter operates at a higher priority than the 68000 and steals bus cycles when necessary to maintain the display. This results in contention for chip memory access between the CPU and blitter. Programs normally have to run in chip memory on the A1000 because all of the 512K bytes of internal RAM are chip memory. On the A2000, half of the megabyte of RAM is fast memory; this should result in an increase in program performance. Since an image must be located in chip memory for the blitter to display it, locating program code in fast memory also allows more images to be placed in chip memory.

Amiga 2088 Board Hardware

Simply put, the A2088 board is a modified IBM XT-compatible computer on a single 13.25- by 4.5-inch card (see photo 5). Its microprocessor is an 8088 operating at the standard 4.77-MHz clock rate. A 16K-byte EPROM provides a BIOS with modifications by Commodore that supply routines necessary for communication between the 8088 and the Amiga. The A2088 can accept up to 512K bytes of RAM on board (it will be shipped with 512K), not counting 128K bytes of dual-port RAM used for interprocessor communication. A socket adjacent to the 8088 chip allows you to add an 8087 math coprocessor chip. Additionally, the A2088 card is equipped
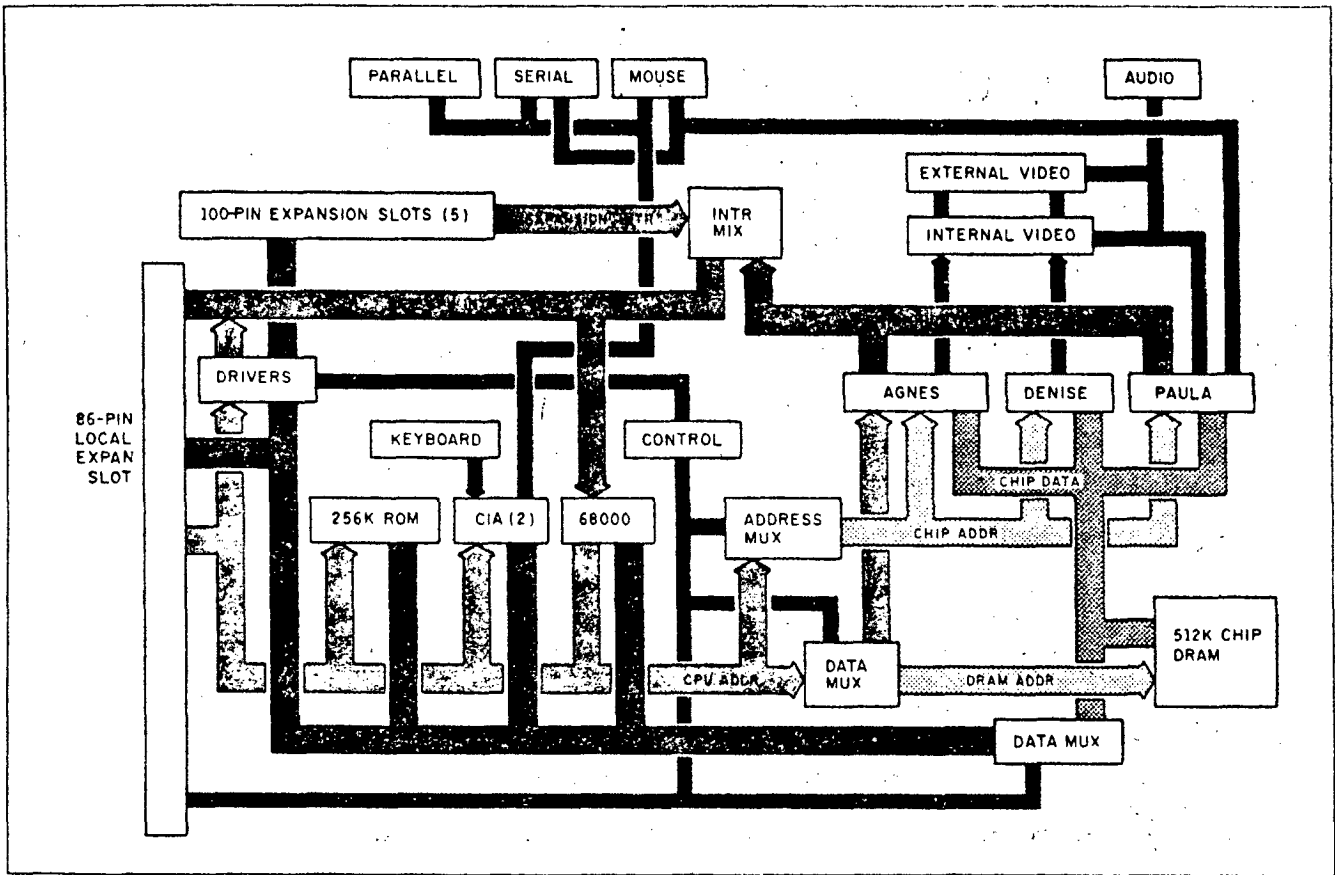
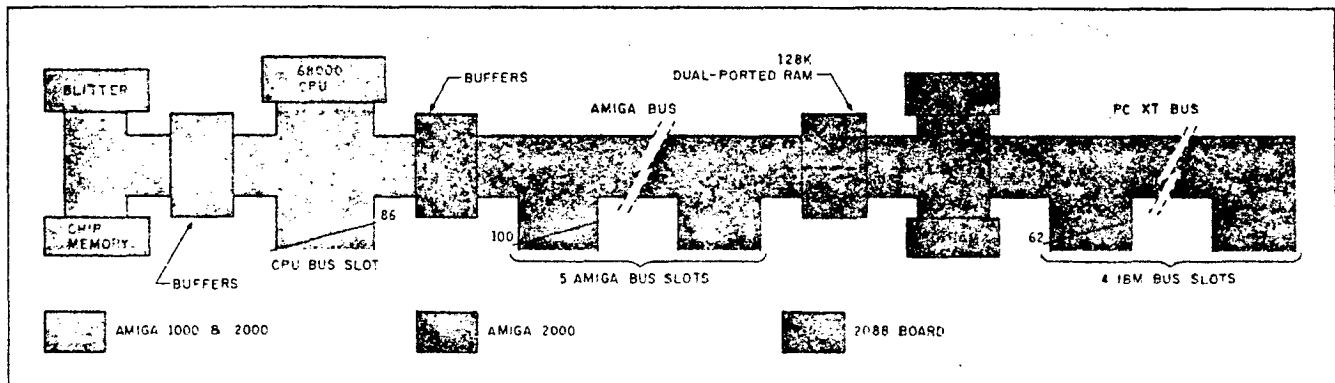Figure 1: *A detailed block diagram of the Amiga 2000.*

Figure 2: *A simplified block diagram of the Amiga 2000 with the Amiga 2088 board installed. The CPU bus slot, Amiga bus slots, and PC bus slots can operate without interfering with the blitter chip.*

with an SMC 9268 floppy controller chip and a standard 5¼-inch floppy connector; this permits you to connect up to two 5¼-inch drives in daisy-chain fashion—one external and one internal.

What makes such complexity possible on a single board? The answer is a custom integrated circuit that Commodore refers to as the PC Multifunction chip. This single chip does the work of a DMA controller, an interrupt controller, and a timer as well as providing all the PC bus timing signals. An 8088 wired to a PC Multi-

Table 1: *Differences between the 100-pin Zorro expansion bus and the 100-pin Amiga bus.*

Pin number	Zorro signal	Amiga bus signal	Comment
19	INT2	EINT2	Name change
22	INT6	EINT6	Name change
40	IPL0	EINT7	Signal change
42	IPL1	EINT5	Signal change
44	IPL2	EINT4	Signal change
92	7M	7ME	Name change
96	RESERV7	EINT1	Signal change

function chip and some memory would make a complete PC, less peripherals.

The A2088 card has two edge connectors, one PC-compatible connector that plugs into a slot on the PC side of the A2000, and a 100-pin slot for the Amiga bus side. Consequently, you insert the A2088 board into one of the two bridge slots. The PC-side edge connector drives PC bus signals and provides A2088 with access to peripherals plugged into the other PC card slots. The Amiga bus edge connector is the means by which the A2000's 68000 processor accesses the A2088's dual-port RAM. This RAM is designed to be accessible by both the PC and Amiga sides of the machine.

Some additional hardware on the A2088 board deceives the PC side of the A2000 into believing that it is indeed a PC. For example, the PC Multifunction chip expects to be connected to a standard PC keyboard (which communicates through a synchronous serial interface), but the A2000's keyboard is not PC standard, nor is it connected directly to the A2088 board. So the designers of A2088 added a parallel-in/serial-out shift register and some clever software. When a key is pressed on the keyboard, it is translated (on the Amiga side) into its PC keyboard equivalent and this value is loaded into the dual-port RAM. The Amiga side then alerts the A2088 board to the presence of the key value, software on the A2088 board transfers the value from dual-port RAM to the shift register, and the key value is transmitted serially into the PC Multifunction chip looking as though it has just come hot from a keyboard.

Amiga 2088 Card Software

How does the A2088 board coexist with the Amiga? In general, each computer responds when the other sends it an interrupt. Hitting a key on the Amiga sends an interrupt to the A2088. This triggers an interrupt service routine on the A2088 that feeds the board's hardware with a keystroke exactly as if it had been typed into a keyboard on the PC side. When the A2088 draws to either the graphics or monochrome display memory, it sends an interrupt to the Amiga, which then looks at the A2088's video display memory (part of the dual-port RAM) and determines what and how to draw on the Amiga screen.

When you click on the "PC Mono" or "PC Color" icons, these programs run a program called PCWindows. PCWindows opens a screen and a window in which the A2088-generated information will appear. The A2000 sees the 2088 board as a peripheral device and looks for its associated library routines on the default disk. PC-Windows (or any other Amiga program) then has access to a collection of routines that allow it to interact with the 2088 card's hardware in a way that is both high-level and unchanging; this allows Commodore to modify the actual Amiga 2088 card's hardware or the library software without affecting existing software.

The PCWindows program starts several Amiga tasks (remember that the Amiga itself is multitasking) that are awakened by the interrupts from the PC as described above. Actually, an interrupt causes the Amiga to send an exec signal to the task. In this way, an Amiga programmer does not have to deal directly with interrupts.

Dual-Port Memory

The Amiga and the PC sides of the computer need to be able to read from and write to the dual-port memory quickly, yet each machine's architecture presents different needs. For example, the 8088 processor stores a 16-bit quantity in low-byte-first order (i.e., with the least significant byte stored at a lower address), while the 68000 processor in the Amiga stores a word with its high byte first. Also, the PC stores a color pixel as 2 adjacent bits within the same byte of color graphics video memory, while the Amiga stores the 2 bits in separate bytes.

The engineers who designed the Amiga 2088 card came up with an elegant but convoluted solution. On the PC side (with one exception), each word of memory maps to one location. The Amiga side can reference a given chunk of memory in three ways, using three different locations. It uses one address to access a byte of memory, another to access a word of memory, and a third to access 2 bytes of color video memory (see figure 3). In the second case, the 2 bytes of the word are read on the Amiga side in the opposite order of how the PC side sees them.

In the third case, the word of data read by the Amiga side contains the first bit of each of the 8 pixels involved in the first byte and the second bit of the pixels in the second byte (see figure 4). This interleaved access makes the PC's 320 by 200 four-color mode possible. The A2088 card also supports a 640 by 200 one-color mode, but since each pixel is defined by one bit, no such bit manipulation is needed.

In other words, the Amiga and the PC see the same memory differently depending on what memory location the Amiga side uses to access it. By putting these functions in hardware, the Amiga and the PC can run their usual software without having to worry about data conversion or, more importantly, the time it might take to perform such conversions.
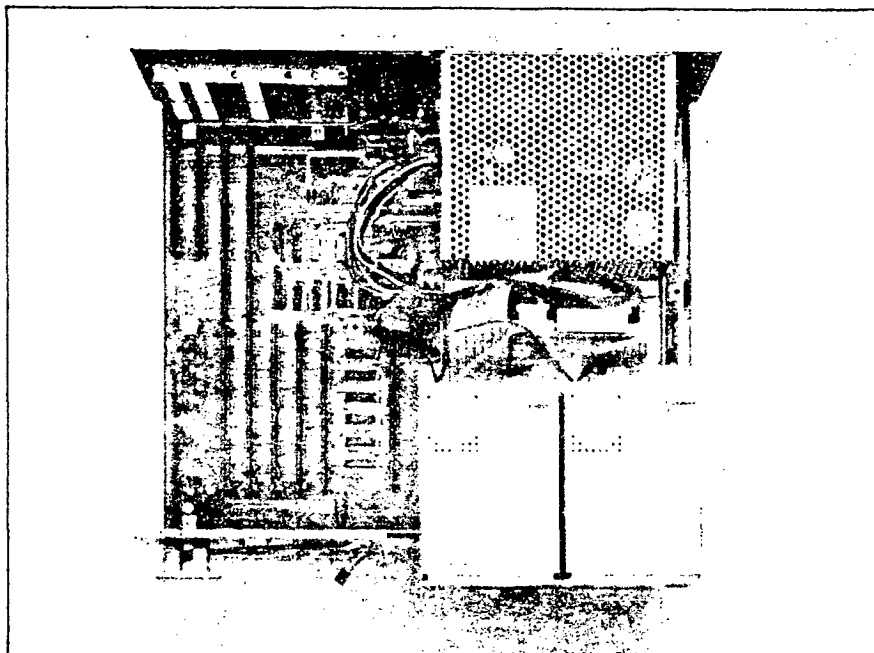

Photo 4: *Inside the A2000. Note the slots in back (top) and the two floppy disk drives in front (lower right). The CPU slot is directly to the left of the disk drives. The five connectors in the bottom left corner are the five Amiga slots. The four connectors in the upper right corner are the four PC slots: two can hold standard IBM PC cards, and two can hold IBM AT cards. The 2088 PC emulator card must go in one of the two slots that have PC and Amiga connectors in common. The video slot is in the upper right corner but is not visible in this photo.*

Dual-port
RAM control
and 2088
interface

Dual-port RAM

512K bytes
PC RAM

Amiga bus
connector

PC BIOS ROM

PC floppy
disk controller

8088 CPU

8087 NDP
socket

PC bus
connector

PC multi-
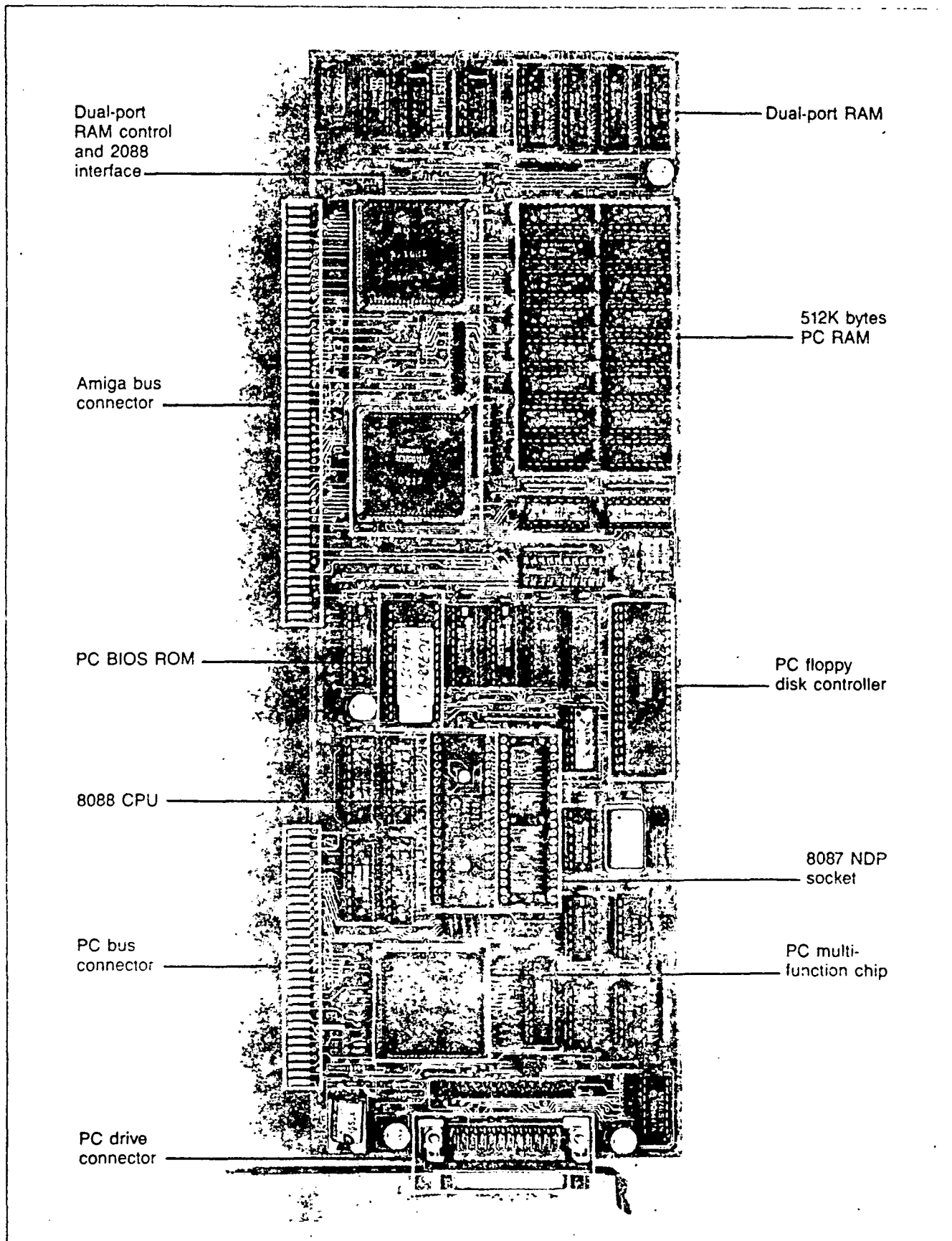function chip

PC drive
connector

Photo 5: *The A2088 PC emulator board. This board contains the 8088 processor, memory, ROM, and support chips of an IBM PC-compatible computer and correctly uses any PC peripheral cards connected in the PC slots.*
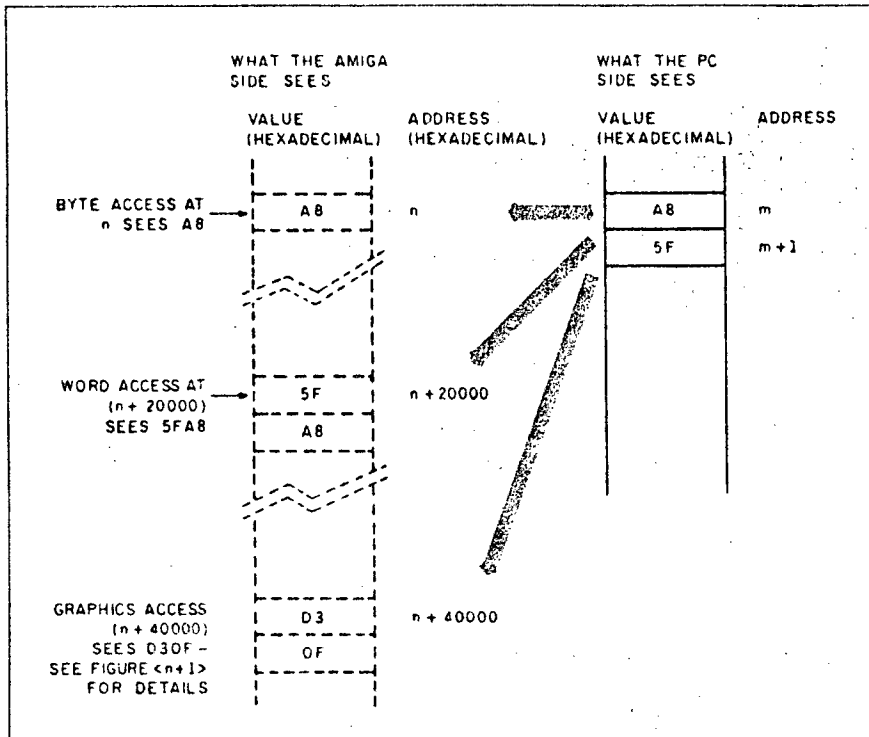
Figure 3: *Three modes of access for the Amiga 2088 board's dual-port RAM. Though each memory location in the dual-port RAM has only one address on the PC-compatible side, it appears at three different locations in the Amiga's address space. The dual-port RAM maps the bits to the Amiga side in a different order based on the location accessed.*
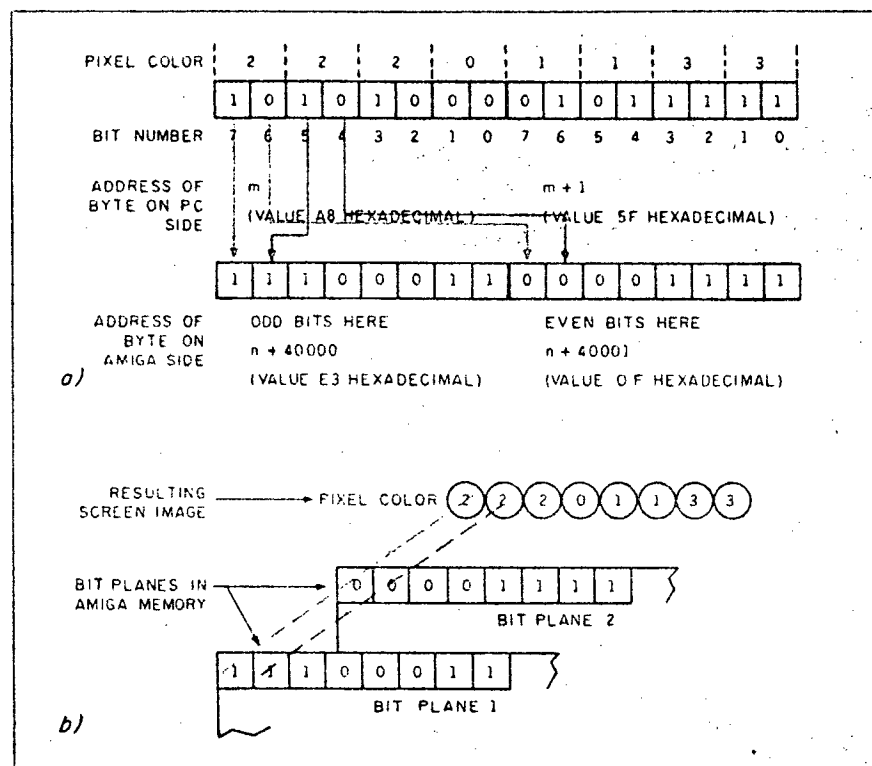

Figure 4: *Graphics access of the dual-port RAM. Two adjacent bits on the PC side make up a pixel, but these bits must be in different bit planes to recreate the same pixel on the Amiga side. Figure 4a shows how 2 bytes on the PC side (top) are mapped into the Amiga side (bottom). Figure 4b shows how the 2 bytes on the Amiga side are placed in different bit planes to recreate the pixel pattern created on the PC side.*

Different portions of the dual-port memory are reserved for specific usage. A 64K-byte area is used as a general-purpose buffer (most often used to transfer disk sectors between the two machines), 32K bytes are used for the PC's color video memory, and 8K bytes are used for its monochrome (character) video memory.

A 16K-byte area is called parameter RAM. This memory serves two functions. First, both computers use one byte of it, called the lock byte, to signal if they are about to reserve part of the general-purpose buffer for their use (which they release as soon as they are finished with it). It is possible that the two independent computers might try to allocate the same memory simultaneously. By checking the lock byte until it has an "unused" value, setting it to a "used" value, allocating memory, then restoring the "unused" value, the two computers can successfully share the dual-port memory.

The parameter RAM's second function is to store blocks of parameters that one computer sets and the other computer reads. For example, when the Amiga wants to transfer a block of data to the PC side, the data is passed through an area of the general-purpose buffer, but the parameter RAM contains information necessary to perform the transfer: the location and length of the data and the desired destination for it on the PC side.

The final 8K-byte area of the dual-port RAM is called the I/O page RAM. On the Amiga side, this memory maps to a certain range of addresses, while on the PC side it corresponds to a standard set of I/O register locations on the PC that are used to control the serial and parallel ports and the PC's monochrome and color CRT controller. In some cases, these locations are the registers. In others, they duplicate the value of the register, and the Amiga can read its value but not change it; in these cases, the dual-port memory is said to *shadow* the register.

PC Video Display

Now that we have an overview of how the Amiga and the A2088 talk to each other, let's look at some specific situations. A monochrome (character-based) or color (character- or graphics-based) video display gets from the A2088 to the Amiga's display as follows. When a program running on the PC side outputs data to the screen, the BIOS screen I/O routines write information into the monochrome or color video memory portion of the dual-port RAM. The act of writing to this memory generates an interrupt from the A2088 to the Amiga. The Amiga recognizes this as a video memory interrupt and "wakes up"

The reality of the PC world is that no area is always empty in every possible PC configuration.

a task that compares the contents of the dual-port video memory with what currently appears in the active PC window on the Amiga display. This task is *smart*: It knows the current contents of the Amiga display and updates only those portions that have changed. This makes, for example, the addition of one character to the display a pretty quick process, much quicker than updating an entire screen.

If the PC is currently in the monochrome display mode (which, on the PC side, stores the screen as a matrix of ASCII values), then the video display task must convert that character to a rectangular matrix of bits and paint them to the Amiga display. To do this, the Amiga refers to a file called PCFONT.FONT that describes the bit patterns of the IBM monochrome character set (ASCII characters plus additional characters defined by IBM). If the character being drawn has a background color other than the default, the Amiga monochrome video display task has to draw an image into several Amiga display bit planes.

The Case of the Nine-headed Buffer

It turns out there are not three but nine sets of addresses for the 64K-byte general-purpose buffer memory. Three of them come from the need to address the memory in byte, word, and graphics modes. Where do the rest come from?

The answer lies within the structure of the IBM-compatible PC. The first 640K bytes of memory (hexadecimal 00000-9FFFF) are reserved for programs. This means that areas like the video memory, PC BIOS, ROM BASIC (for IBM PCs), and the ROM code associated with certain expansion cards must live in the space between hexadecimal A0000 and FFFFF. In the Amiga 2088 card, the 64K dual-port buffer memory must also reside somewhere in that space.

The reality of the PC-compatible world is that no area is always empty in every possible PC configuration. The 64K areas starting at hexadecimal A0000, D0000, and E0000 are most likely to be free. Therefore, the Amiga 2000 engineers designed the 64K area to map (on the PC side) to one of these three areas so as not to conflict with the hardware and software you will be using with the Amiga 2088 card. (This option can be selected from the Amiga Workbench screen.) Consequently, any byte within this 64K region can map to one of three address ranges on the PC side, and each range can be accessed on the Amiga side from three separate ranges.

Accessing a Hard Disk

Commodore has designed the Amiga 2088 board so that the Amiga side of the A2000 can access a partition of a hard disk on the PC side. You run the usual FDISK program on the PC side to allocate part of the hard disk for the PC. Commodore has provided a similar program called ADISK that you run to create an AmigaDOS partition on the hard disk.

On the Amiga side, this partition of the PC hard disk appears as JH0: and can be treated like any other Amiga disk (although you cannot use it to boot up the system—you must boot from the floppy disk in DF0:). JH0: has its own device driver that uses the dual-port memory and an interrupt mechanism to get (or put) file sectors to the hard disk.

How do the two sides of the machine establish and coordinate conversation with one another? To answer this with an example, let's suppose you have a PC-compatible hard disk whose controller is plugged into one of the PC slots. We'll follow the processes that take place when you power on the A2000 (refer to figure 5).

When power is applied to the system, the 8088 on the A2088 board is immediately placed in a RESET state. Basically, this keeps the processor from running
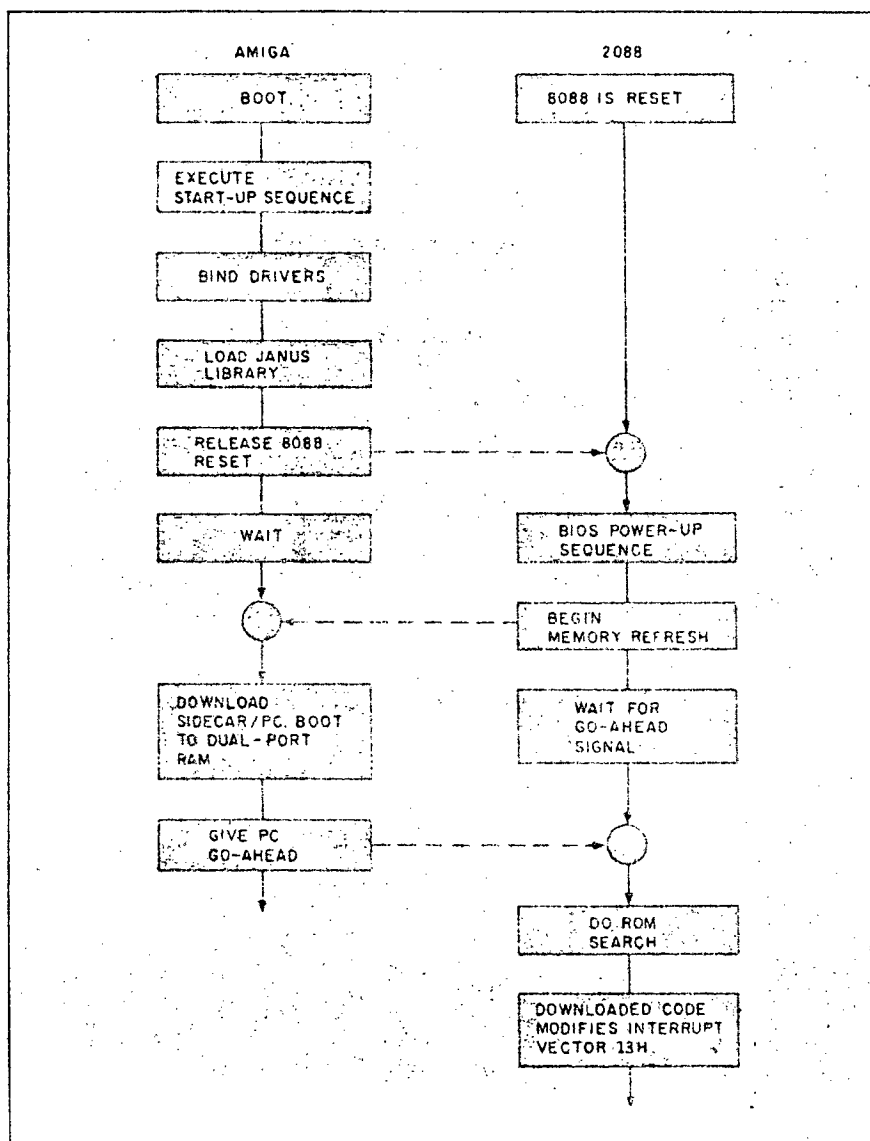

Figure 5: *The sequence of events necessary to boot the A2088 board with the Amiga 2000.*

Version 1.2 Changes

Version 1.2 of Kickstart and Workbench corrects a number of bugs present in version 1.1 and adds improvements to existing features. There are also a number of new AmigaDOS commands. These are covered briefly in the appropriate sections.

Workbench

An Expansion drawer holds drivers and code required to configure and communicate to boards on the Amiga bus. For example, libraries for interfacing to the A2088 board reside in this drawer. This drawer is searched for drivers and initialization code at boot-up.

The tool SetMap allows you to select several different keyboard types, such as German, French, or Spanish.

NTSC and PAL video displays are supported.

Two utility programs for manipulating MS-DOS disks are provided. One program formats disks to the MS-DOS standard, another allows copying data to or from MS-DOS disks.

AmigaDOS

Some new commands:

addbuffers — adds sector cache buffers in memory for a drive, improving disk access time.

binddrivers —binds device drivers in the Expansion drawer to peripheral boards configured on the Amiga bus.

changetaskpri and settaskpri — allows you to change or set the running priority of a CLI task.

mount — mounts a new device. The device's characteristics and unit number are stored in the text file MountList in the devs directory.

path — allows you to specify a search path for AmigaDOS to use when searching for a program.

ROM Kernel

The 68881 math coprocessor is now supported under multitasking. Several new graphics functions have been added: DrawCircle, DrawEllipse, AreaCircle, and AreaEllipse.

Figure 6: *Modification of the disk controller interrupt vector to support a hard disk drive. This sequence of modifications allows you to use any type of PC hard disk with the A2088 board.*

wild and perhaps doing some damage. Meanwhile, the Amiga side goes through the boot process (including AutoConfig); it executes the start-up sequence, executes a BINDDRIVERS command that loads hardware device drivers into memory and loads the A2088 Library routines. When all this loading is completed, the Amiga releases the 8088 from its RESET condition and enters a loop to await a signal from the 8088.

Released from RESET, the A2088 board's 8088 now begins executing a BIOS power-up routine. This code is, for the most part, standard and includes routines that check the 8088, perform a ROM checksum, initialize DMA channels, set up interrupt vectors, and more. However, Commodore has modified the routines so that when the A2088 has begun memory refresh, it signals the Amiga and then enters a loop to await a "go-ahead."

Once the Amiga has been informed that memory refresh has begun on the PC side, it reads a block of code (called PC.BOOT) from its own disk and loads it into the parameter area of the dual-port RAM (note that this is 8088-executable code). This is the only code that exists in the dual-port RAM, and it is loaded so that it appears to the PC in an address range above the region in which a peripheral board's ROM would appear. The Amiga gives the 8088 the "go-ahead" signal.

Now the A2088 completes the BIOS power-up sequence. As part of this sequence, the 8088 checks for peripheral board ROMs in the address region C8000 to F4000 hexadecimal by scanning that area in 2K-byte increments for a series of 3 signature bytes (hexadecimal 55AA followed by a length-indicator byte). If such a sequence is found, the BIOS transfers control to the address location following the signature bytes, which it assumes to be initialization code for the attached device. In this example, the device is a hard disk controller, and the initialization code takes this opportunity to reroute the INT 13H vector (see figure 6). This vector has been set by the power-up routines to point to the BIOS code that handles floppy disk I/O; the hard disk ROM alters the vector to point to its own routines. In this way, a request for hard disk I/O is intercepted by the ROM; floppy disk I/O requests are identified and passed onto the BIOS handler. The hard disk ROM initialization routine then exits and BIOS continues the scan for peripheral board ROMs.

As the BIOS power-up routine continues searching for peripheral ROMs, it encounters the PC.BOOT code in the dual-port RAM. This code is preceded by the necessary signature bytes so that it
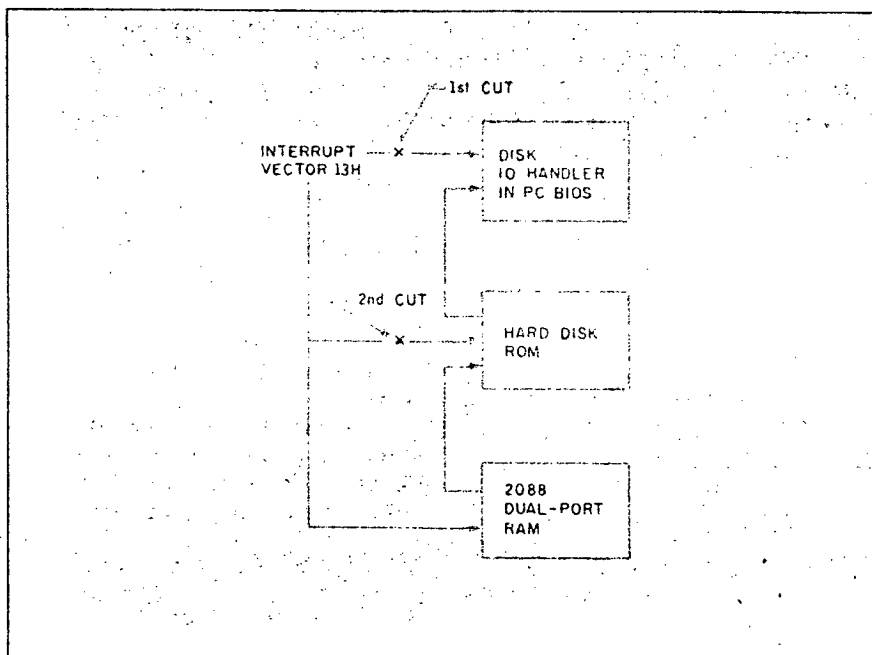
continued

Because of the complex interaction between the PC and the Amiga, the designers had to make some compromises.

"looks like" a peripheral board ROM. BIOS dutifully passes control to what it thinks is a peripheral initialization routine but which is actually a routine in the PC.BOOT code that reroutes the INT 13H vector again. Now a disk I/O request will be intercepted first by the PC.BOOT code—the Amiga side has "wired" itself into the PC side's disk I/O routines. The BIOS completes its ROM scan and the remainder of the boot process.

From this point on, the Amiga side can make I/O requests to PC disks directly to the ROM routines on the PC hard disk controller card or onto the BIOS for floppy I/O. In this way, the Amiga side can access an AmigaDOS partition on a PC hard disk by going "beneath" whatever DOS happens to be running on the PC side. (If the Amiga side were forced to access a disk on the PC side through, say, PC-DOS, an AmigaDOS partition would be inaccessible—PC-DOS will not recognize a non-PC-DOS partition.) Additionally, the PC.BOOT code performs necessary semaphore functions that prevent simultaneous disk I/O requests from both sides of the machine. Whenever the PC side performs disk I/O, PC.BOOT intercepts the I/O request and sets a flag in the dual-port RAM that tells the Amiga side to hold off on any disk I/O requests of its own.

Limitations of the Amiga 2088 Board

With the Amiga 2088 board containing an actual IBM PC-compatible computer on its board, you can run virtually any IBM- or MS-DOS-compatible program and plug in virtually any expansion card. This approach works so well because it is not an emulation of a PC—it is a PC. Right?

No, not really. Because of the complex interaction between the PC and the Amiga, the A2000 designers had to make some compromises. Your personal preferences will determine how major they are to you. Starting with the small problems and working up:

• The video display won't support flashing characters. This attribute, done in hardware on the PC, would have to be done in software on a continuous basis and would take up a lot of the Amiga's computing power. Since flashing characters

aren't widely used, the A2000 designers left them out.
• The Amiga will display only monochrome PC video, 320 by 200 four-color graphics, and 640 by 200 two-color graphics. However, you can disable the Amiga-produced screen and get any kind of video you want (Hercules, EGA, PGA, or whatever) by plugging a video card into a PC slot and feeding its output to an appropriate monitor.
• IBM-compatible PCs can make only simple tones and beeps through a speaker in the body of the computer, while the Amiga can make complex sounds through a separate audio output or the sound channel of a television. Because the Amiga 2000 is multitasking, its designers could find no good way to integrate the PC audio into the Amiga's sound channels. Commodore reports that the A2088's and Amiga's sound signals can be mixed and routed to the Amiga monitor's speaker.
• While a PC program is in use, the Amiga mouse and cursor belong to the Amiga, not to the PC, so PC applications that use a mouse won't work. Commodore plans to implement this feature eventually by having the mouse emulate a Microsoft mouse.
• The PC can be given control of the Amiga's parallel port by running a program called LPT1:. This maps the parallel port to the LPT1: printer device on the PC side and prevents the Amiga from using it at all. The PC will not be able to use the Amiga's serial port when it is first released, but Commodore says it's working on similarly enabling that connection sometime in the future.
• One of the most serious flaws of the 2088 card/Amiga duo is its inexact display of the PC's video on the Amiga's screen. Remember that as the PC writes to its video memory, the Amiga must update the PC window (on the Amiga's display) to correspond with the visual interpretation of the contents of the PC's video memory. Unfortunately, even the Amiga can't keep up with that process instantaneously and this causes some noticeable effects. For example, since the Amiga must draw the characters displayed in a text window, scrolling the entire screen often causes the display to jump several lines at a time. Also, some graphics programs that use animation work (Microsoft's Flight Simulator, for example), but others don't (ExecuVision).

The A2000 designers have done what they could to improve this situation. If you are having update problems with the PC color display, you can decrease the number of bit planes the Amiga has to draw into, thus reducing the number of colors that can be shown but also decreasing the amount of time the Amiga spends

to update the screen once.
• We saw only rudimentary cut and paste functions for the transfer of text (not graphic) data between a PC window and the Amiga's Notepad. For example, you can type DIR in the Notepad, copy it into the Clipboard, and then use an EDIT menu to paste the directory command into the PC window. Conversely, you can select text in the PC window by dragging the mouse over the selected region (the copy to the Clipboard is automatic) and pasting it into the Notepad. The degree to which the transfer of data between the two machines is implemented could determine the ultimate success of the Amiga 2000.

Pricing

At the time of this writing, Commodore has set only preliminary suggested retail prices for the A2000 and related products (see the text box "A2000 Peripherals"). The A2000 with 1 megabyte of memory and one 3½-inch floppy drive is set at $1499; the A2088 IBM PC-compatible board, $499; internal 3½-inch or 5¼-inch floppy drives, $199; external 3½-inch or 5¼-inch floppy drives, $299; 2-megabyte expansion memory card, $499; composite video interface card, $99; hard disk controller supporting ST506 and SCSI hard disks, $349; standard analog RGB monitor, $349; long-persistence phosphor analog RGB monitor, $499.

The under-$1500 price for the A2000 is fairly competitive. This makes an A2000 with a high-quality RGB color monitor cost around $2000, which is slightly less than the $2199 price of an Apple Macintosh Plus (not counting the inevitable discounting more likely to be available on the older Macintosh Plus line).

Potential buyers of the A2088 board should note that the hidden cost of a 5¼-inch floppy drive brings the price of a usable IBM PC-compatible computer to between $700 and $800.

Caveats

We wrote this product preview in December 1986, after two meetings with Commodore engineers and several follow-up calls; there was very little documentation because the A2000 and the Amiga 2088 board were so recently finished. We had access to two machines for little over a week. One had an Amiga 2088 board with a 10-megabyte Hardcard shared by the Amiga and the PC, an IBM multifunction board, and 512K bytes of memory; the other had a 5¼-inch, 20-megabyte hard disk connected through the SCSI port of the Amiga 2094 Hard Disk/SCSI controller board and an Amiga 2050 2-megabyte memory board. Both had 512K bytes

A2000 Peripherals

Commodore will release the following peripheral boards with the Amiga 2000.

Hard Disk Controller

The 2094 Hard Disk/SCSI (HD/SCSI) controller board is a full-size Amiga card that plugs into one of the Amiga bus slots and allows access to the two most popular hard disk interfaces: ST-506 and SCSI (small computer system interface). To date, most hard disks available for microcomputers are equipped to connect via the ST-506 standard interface. However, more and more SCSI-compatible hard disks are emerging, and indications are that this interface will ultimately replace the ST-506 standard due to SCSI's faster transfer rate and flexibility. The HD/SCSI board can control up to two ST-506–compatible drives and up to seven SCSI drives in any combination.

The ST-506 portion of the board is built around a custom LSI chip called the DJC (manufactured by the Konan Corporation) that performs most of the control functions (data serialization, error cor-

rection, etc.). The data-transfer rate on the ST-506 side of the board is on the order of 5 megabits per second. On the SCSI side, the HD/SCSI board uses a Western Digital 33C93 SCSI controller chip. This chip incorporates some intelligence, so that SCSI commands can be issued quickly and succinctly. Up to 128K bytes at a time can be read to or written from a hard disk. The board's data-transfer rate on the SCSI side is around 10 megabits per second.

An on-board Z80A processor running at 4 MHz can operate both the ST-506 and SCSI sides of the board. (The Amiga's 68000 can issue commands directly to the 33C93 chip. When we saw the board running an SCSI drive, it was with the 68000 managing the SCSI channel.) The Z80 is provided with a 2K by 8 on-board RAM into which the 68000 can download commands so that the Z80

can perform a series of hard disk functions in a true coprocessing fashion. Throughput is further enhanced by a proprietary DMA controller chip with a built-in 64-byte FIFO memory. Using this chip, you can transfer data from disk to memory at full speed (depending on which interface your disk is connected to) while consuming only 16 percent of the Amiga bus's time. This suggests some interesting possibilities, since you could download an entire screen's data from a hard disk directly to video memory at the rate of approximately 800 ns per byte.

The HD/SCSI board provides not only an SCSI 50-pin connector, but also a Macintosh Plus–compatible DB-25 connector. This addition is good planning; you can immediately draw from the growing number of Mac Plus SCSI drives that appear to be getting less expensive by the week.

Memory Boards

Commodore will release three memory boards with the A2000. The boards fall into two general classes: One plugs into the 86-pin CPU slot and two plug into Amiga bus slots. The former will be shipped with early versions of the A2000 and will be populated with 512K bytes, bringing the total memory of the machine as shipped to 1 megabyte. (Commodore intends to ultimately provide 1 megabyte directly on the A2000 motherboard, so that later A2000s will not come with this board installed. Since the stated purpose of the 86-pin CPU slot is to allow for the installation of an alternate CPU—a 68020, perhaps—purchasers of early A2000s may find themselves unable to make use of any future coprocessor boards unless they give up some memory.)

The other two memory boards plug into an Amiga bus slot. One board can

be populated with up to 2 megabytes of RAM in increments of 512K bytes, 1 megabyte, or 2 megabytes; the other can accept up to 8 megabytes (Commodore had not yet determined what partial amounts the board could be configured to accept). These boards are based on the same design; the engineer who had developed them told us that once he had built a working version of the 2-megabyte board, it took him only a matter of weeks to produce an 8-megabyte board. Both boards perform memory refresh during cycles when the processor is off the bus, so that memory refresh is invisible.

You may be asking yourself what advantage the 2-megabyte board has over the 8-megabyte board, particularly if the latter is available in partially populated form. The advantage is simply cost: The 2-megabyte card is a single-layer circuit board, while the 8-megabyte card is a

double-layer circuit board. Additionally, the 2-megabyte board can accept the less expensive 256K-bit DRAM chips as well as 1-megabit DRAM chips; the 8-megabyte board can only accept 1-megabit DRAM chips.

All three memory boards sit on the fast RAM side of the A2000 where there is no contention between the 68000 and the graphics processors. The 2-megabyte and 8-megabyte boards support the AutoConfig feature and, although the 1-megabyte board does not, the system is able to recognize its presence. None of the memory boards support write protection, an extremely desirable feature if you plan to use the memory for a RAM disk. (We mentioned this to the boards' designer; he told us that he thought he could add write protection to the 8-megabyte board by reprogramming a PAL, and that he would consider adding the capability.)

of memory on the motherboard but lacked the extra 512K that will ship in the CPU slot of the A2000. The computers, according to Commodore, were off the "first production run" and had no wires on any of the circuit boards. The Amiga 2088 board ran MS-DOS 2.11, but Commodore said the board would ship with MS-DOS 3.2. The A2088 board didn't have an 8087 coprocessor installed, so we cannot comment on its performance. The Amiga software was pretty stable but might still undergo some small changes.

Observations

The computer we looked at was still unfinished, so this product preview is not the place for us to run benchmark programs and, in general, critique its strengths and weaknesses. Still, we feel the comments

below are in order, largely because the units we saw were much more "stable" than most of the other computers we preview.

Overall, the A2000 with the optional A2088 card delivers a second-computer-in-a-box better than most of the previous attempts to do so in this industry. Stan Wszola, a BYTE editor who regularly uses

Though the interaction between the Amiga and the PC is minimal, there are opportunities for someone to write a hybrid program.

an IBM PC compatible, said the A2000 ran and looked like a normal PC. We ran one benchmark, the Sieve of Eratosthenes, and found that the Amiga ran it within one second of the time recorded for a "plain vanilla" IBM PC.

One fascinating implication of using the Amiga to display the PC monochrome and video screens is that the colors used in the screen can be chosen from the Amiga's palette of 4096 colors. This makes working with PC software—especially programs that use graphics—a lot easier on the eye. When a PC screen is in an Amiga window, you can scroll both vertically and horizontally to see any portion of it (see photo 6). Alternately, you can double-click on the window and get a full 25-line by 80-character display with no window border. If you set your colors right, you don't even know you're on an Amiga! On the other hand, the system with the A2088 board installed takes between 1½ and 2

minutes to boot even if you aren't going to use the PC capabilities.

Though the normal interaction between the Amiga and the PC is minimal, there are some real opportunities for someone to write a hybrid program that uses both the 8088 in the PC (perhaps augmented by an 8087 numeric coprocessor) and the 68000 in the Amiga to achieve performance that is beyond either of the two machines alone.

Amiga's use of Kickstart 1.2 in ROM speeds up the A2000's loading, but it presents problems to some prospective customers. There is no way the A2000 can load Kickstart 1.1 into memory, and we found several programs that wouldn't run correctly in the A2000. In general, games were less likely to run than "serious" applications, and (this comes as no surprise) older programs were less likely to run than ones released more recently. This is a problem that should eventually go away as more new products come out using Kickstart 1.2 and older ones are (perhaps) upgraded.

Clive Smith, general manager of the Commodore Product and Market Development Group, indicated that the 2088 was just the beginning of the A2000's extension into coprocessing. "Commodore has provided for integrating 80286 processors and coprocessors into the Amiga environment," Mr. Smith said. "Commodore is currently developing its own A2286 card and support software, which will bring [IBM PC] AT-level coprocess-

ing to the Amiga environment. The next multiprocessor/multiDOS environment which Commodore is implementing for the A2000 is a 68020-based version of UNIX 5.2 [UNIX System V, version 2] that uses a proprietary MMU [memory management unit] currently under development and evaluation, which will be manufactured by the company's MOS Technology division."

Conclusions
Who will buy this machine? Certainly people who want an 8-megabyte Amiga with one or more hard disks will. Although the original Amiga, the A1000, can be expanded, that task was taken on by small companies that work in low volumes and so must charge higher-than-average (when compared with the IBM or Macintosh worlds) prices. Commodore never produced a card cage for the A1000 and will eventually discontinue the machine (no specific date has been set, though, and Commodore pledges to continue supporting the A1000).

The A2000's expandability and its IBM PC compatibility make the computer a valid possibility for business and scientific users. The ability to expand the machine's memory and disk storage within a reasonably sized box is an unobtrusive but important change from the A1000. Some users will be attracted to the multiprocessing of a machine that can run 8088 and 68000 software in parallel, with the possibility of the same computer someday running, say, an Intel 80286 processor with a Motorola 68020 processor and assorted numeric coprocessors on both sides.

Professionals (especially scientists, engineers, and artists) who are already attracted to the Amiga's graphics or other features will now be able to buy a machine with the memory and disk storage they need. Other users who are attracted by the Amiga but who work in offices that use IBM PCs can now "safely" buy an office computer that has both Amiga and IBM capabilities. These same people may now be interested in buying an Amiga for home use, knowing that they can also use it to do PC-related work brought home from the office.

Software for the Amiga family of computers has grown to quite a respectable level in the year and a half since the A1000's release. Now that Commodore has introduced a machine that has elbow room inside it for more system resources and for entirely new hardware products, we can expect similar growth in Amiga hardware in the year to come. This development can only help the fortune of this most capable and exciting line of microcomputers. ∎
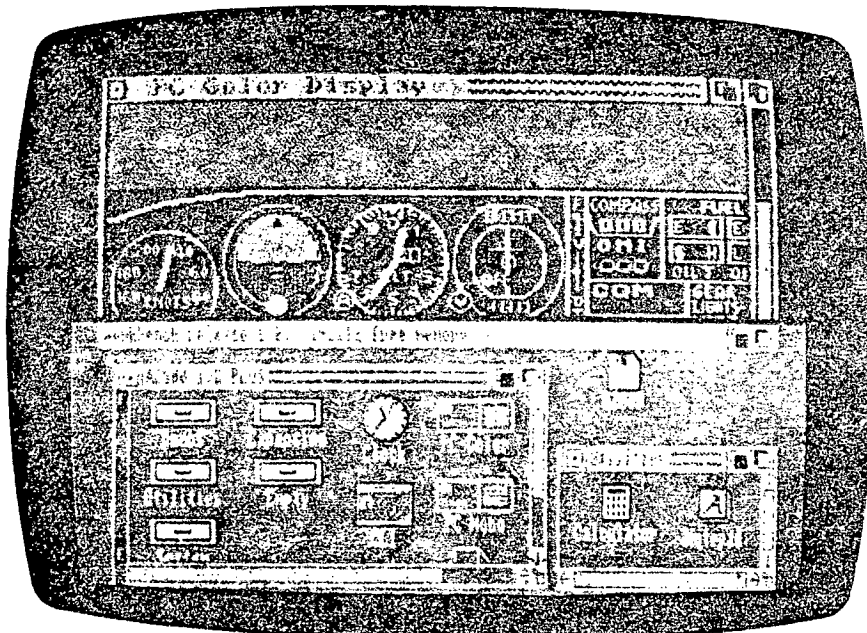

Photo 6: *Running IBM PC software on the A2000. Here, the Amiga's desktop screen has been "pulled down" to reveal the PC color display screen. You can see Microsoft's Flight Simulator program running in the PC screen.*